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Oil Price Shocks and Oil Revenue: Investigating the Propositions for Well-being in Nigeria

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ABSTRACT

This paper analyzed and estimated the effects of oil price shock and oil revenue on well being in Nigeria for the sample period of 1980–2018. The Autoregressive Distributed Lag model (ARDL) estimated with the Ordinary Least Square technique was used to examine the relationship among the variables. Findings from the model revealed that there was a direct and significant relationship between oil revenue, private consumption, exchange rate, credit to the private sector and well being, however, credit to the private sector exhibited a positive and insignificant relationship on well being in the long run. There was a direct and significant relationship between the independent variables and well being in the short run; however, credit to the private sector indicated a negative but significant relationship. The study therefore recommended deepening savings during periods of increase in oil price for better economic outcomes.

Keywords: Oil Price Shocks, Oil Revenue, Exchange Rate, Private Consumption, Credit to the Private Sector
JEL Classifications: E39, K131, Q40

1. INTRODUCTION

Fossil fuel is a vital component of energy resources. Oil being a major source of energy is important to the world economy and a critical input to most industries and services in the global arena. Oil price movements either positive or negative engender uncertainty in the market. Huntington (2005) differentiates between higher oil prices and oil price shocks. The author argued that when oil price moves steadily higher but not rapidly over consecutive months it is merely higher oil prices while an oil price shock is when oil prices move rapidly upward over consecutive months. Aidoo (2016) opined that the fluctuations in crude oil prices results in

differing short and long run consequences for various countries depending on their oil importing or exporting status. Oil price shocks have implications for exporting and importing countries. The consequences on the economy/the impact of oil price shocks varies depending on the structure of the economy for a country like Nigeria whose economy is highly dependent on oil for instance oil exportation account for 15% of GDP and 80% of government revenue (Agbaeze et al., 2015), the implications are gloomy. A period of characterized by upward swing in oil price tends to economic boom and oil price plunge tends to significant drop in economic activities. A fall in oil price portends a gap between government revenue and expenditure. To close the gap means more borrowing and increase in debt service obligations.

Sub-Saharan Africa's oil production has risen by 40% over the past decade. Despite the rise in oil production, citizens of oil producing countries such as Nigeria, Angola, Cameroon and Gabon live in extreme poverty. The considerable crude oil resources in sub-Saharan Africa (SSA) can, if properly managed help accelerate growth in the region. Large upward oil price shocks provide an excellent opportunity for oil exporting countries to increase revenue and achieve economic growth (African Development Bank, 2009). Part of the major goals of macroeconomic management is to enhance the well-being of the citizens of a country. This is not limited to reduction of poverty, inequality and unemployment. It also includes having access to clean stable and environmental friendly energy systems. This boils down to using revenue judiciously to improve the well-being of the society. It is in the light of the above that (Ross, 2011) argued that material needs can never be a sufficient condition for happiness, but some degree of material satisfaction must be a necessary condition for most of the people.

The oil price shocks of 2015 where a barrel of oil dropped from $114 to below $35 brought the Nigerian economy to her knees. The economy simply went into recession with attendant challenges of rise in unemployment, poverty, inflation, low productivity and investment rate depletion of foreign reserves and high rate of debt servicing. In the year 2020, a sinister round of oil price shock is brewing, there has been a rapid fall of oil price for the months of February and March due to the occurrence of corona-virus pandemic. The current round of oil price shocks will certainly affect oil revenue to the Nigerian economy. Studies such as (Farzanegan and Morkwardt, 2009; Fowowe and Iwayemi, 2011) have examined the economic impact of positive oil price shocks on the Nigerian macroeconomy. Only few studies have focused on the impacts of oil price shocks on the well-being in Nigeria, such studies include (Marnaseh et al. 2019). This study adds to the literature by examining the magnitude of the impact of oil price shocks and oil revenue on well-being in Nigeria. Against this background, the objective of this study is to analyze and estimate the impact of oil price shocks and oil revenue on the well-being in Nigeria. In order to achieve the aforementioned objective, the paper attempts to answer the following questions: What is the relationship between oil price shocks, oil revenue and well-being in Nigeria? What is the relationship between well-being and debt? And what is the relationship between corruption and well-being in Nigeria. This study adds to the literature by examining the magnitude of the impact of oil price shocks and oil revenue on well-being in Nigeria. Following the introductory section is section 2 which handled the review of literature and in section 3, we discussed the research methodology. Section 4 present and discussed the empirical results. Finally, conclusion and policy recommendation were discussed in the section 5.

2. LITERATURE REVIEW

2.1. Conceptual Clarifications
In this section, we shall clarify concepts such as oil price shocks, oil revenue and well-being to give a clear understanding of the study. First, we distinguish between higher oil price and oil price shocks. When there is a steady increase in oil price over a consecutive period time, it is mere higher oil price. Oil price shocks occur when there is a rapid increase in oil price over time especially over consecutive months (Huntington, 2005). An oil price shock is synonymous with oil volatility and fluctuations. Volatility is viewed as the periods in which prices show wide swings for an extended time period followed by periods in which there is relative calm (Gujarati and Porter, 2009). Hamilton (1983) opined that the instability in oil price emanates from changes or fluctuations in either demand or supply side of the international markets.

Secondly, oil revenue comprises of crude oil sales, taxes on oil exploration companies and oil rents (Maneseh, 2019). The largest chunk of them all is crude oil sales, which is the product of oil price and the quantity of crude oil production. Nigeria being a monolithic economy is expected to exercise caution and prudence in the management of oil revenue for the simple reason that it is the highest source of revenue to the government. In order to achieve macroeconomic goals of improving economic growth and well-being it is imperative for the government to be efficient in the use of government revenue.

Thirdly, well-being refers to a good living standard in all ramifications. Per capital real Gross Domestic Product (GDP) is one of the indicators used for measuring well-being. When per capita GDP increases it imply an improvement in economic well-being. Another indicator of well-being is per capita consumption. Studies such as Pradham (2001) and Arora (2013) argued that per capital consumption is the preferred indicator for well-being in developing countries. Also, per capita consumption as a measure of well-being is advantageous since it is something directly important to consumers which are not covered in the GDP.

2.2. Empirical Literature and Theoretical Framework
The relationship between oil price shocks and the impacts on macroeconomic variables have been extensively studied by various scholars both in exporting and importing countries (Baumeister and Kilian, 2016a). The reason why economists care about oil price shocks is that these shocks affect economic decisions. These studies used different methodologies which produced different conflicting results over different time periods and countries. Aidoo (2016) asserted that examples of conflicting results of these studies vary according to whether the country is either a developed or an emerging economy and whether they are oil exporters or importing economies. The seminal work of (Hamilton, 1983) was the first to address the relationship between oil price shocks and US economic recessions. The study stimulated serious interest and discussions among scholars. The author examined the impact of oil price shocks on the US economy from 1948 to 1972 using six variables to estimate the effects of relatively high oil prices, whereby the results suggested that seven out of eight recessions during this period where caused by oil price shocks and these shocks decreased US output growth. Other studies have contributed to this evidence suggesting upward oil price shocks have strong and negative consequences for oil importing countries (Peersman and Van Robays, 2012). Brown and Yucel (2002) stated that rising oil prices signal the increased scarcity of the commodity which is a basic input to production that impacts output growth and reduces

productivity. This in turn negatively affects real income growth causing unemployment and inflation to increases.

Eltony and Al-Awadi (2001) examined the impact of oil price fluctuations on seven key macroeconomic variables for the Kuwaiti economy and found oil price shocks impact the demand for money, despite Kuwaiti monetary policy influence on economic activity being minimal. In a study on the impact of oil price shocks on Qartar's economy using data from 1970 to 2000 (Al-mulali et al., 2011) found a positive impact of oil price shocks on GDP both in the short and long run. However, they reported an adverse impact on inflation. In a regime of slow output growth and an increase in the real interest rate, the demand for real cash balances fall, and for a given rate of growth in the monetary aggregate, the rate of inflation increases. Therefore, rising oil prices reduce GDP growth and boost real interest rates and the measured rate of inflation (African Development Bank, 2009). Several studies have established that oil price changes have had a direct impact on investment decisions of firms and households see (Kilian et al., 2009; Naranpanawa and Bandara, 2012) for oversight. The use of existing capital, labor resources, investment in new physical and human capital may be affected by the shocks. Normally, in net oil importing countries, crude oil price and economic growth are negatively correlated while in net exporting country, the reverse is the case. However, there are some studies that show more complexity in Africa. Fowowe and Iwayemi (2011) found that oil price shocks do not impact on Nigeria output, however, lower oil prices significantly reduce economic activities. The results from Granger–causality, impulse response functions and variance decomposition analysis support the existence of asymmetric effect of oil price shocks due to the finding that negative oil shocks significantly explain changes to output and the real exchange rate. Umar and Kilishi (2010) investigated the impact of crude oil price changes on four key macrocosmic variables in Nigeria over the period 1970-2008 using VAR model. Results from the study indicated the impart of oil price change on consumer price index was not significant but the impart on money supply posed a danger to the management of the economy since it was a major macroeconomic policy instrument whereas GDP and unemployment are key macroeconomic policy targets. In an empirical investigation carried out on the impact of petroleum revenue on the economy of Nigeria for the period 1970-2009 (Ogbonna and Ebimobowei, 2017) used both primary and secondary data to achieve main objective of the study. The results revealed that oil revenue affect GDP per capita positively though insignificantly. Also oil revenue tends to have a negative effect on inflation. This suggests that oil revenue benefits few highly placed individuals in Nigeria as a result of its insignificant effect on par capita GDP.

Furthermore, studies such as (Oriakhi and Iyoha, 2013; Ijirshar, 2015) show a position relationship between oil price fluctuation and economic growth. However, Baghebo and Atima (2013) found a negative relationship between oil revenue and economic growth. In the same vein, Bakare and Fawehinmi (2010) assessed the extent to which oil reserve have affected standard of living in Nigeria. The study employed the Ordinary Least Square estimation technique. The results showed a significant and negative relationship between oil revenue and standard of living In Nigeria. Manaseh et al. (2019) examined the relationship between oil price fluctuation, oil revenue and well-being in Nigeria using time series data which covered the period 1981-2014, the study employed multiple regression technique and the result revealed that oil price fluctuation have no significant impact on well-being while oil revenue have significant impact on well-being. This study will add to empirical discourse by exploring another technique of analysis, adding other explanatory variables and extend the period to 2018. These constitute the gap in literature the study intends to fill. According to the African Development Bank AFDB (2012) the most persuasive way to achieve poverty reduction in the SSA is through strong macroeconomic growth. The relationship between the prosperity of a nation and its citizens and its wealth in oil reach resources is complex. Aidoo (2016) identified two effects through oil price shocks may lead to a drop in output; first, resource constraints may directly affect income and secondly decreased production through higher costs of inputs resulting in the fall of labour income. This means a reduction in household income decreasing investment and creating poverty (IMF, 2008). It is logical to assume that positive oil price shocks may benefits oil exporters (IMF, 2008) asserted that key economic and social indicators for oil exporting countries in SSA suggest that oil wealth has not been able to support sustained economic growth and development. Moreover, inequitable distribution of oil revenue among the population can fuel social tensions has been witnessed in the case of Niger Delta region (IMF, 2008).

In economic literature there are many theories that explain the impact of oil price shocks on well-being. This work is essentially couched on the Dutch disease theory and rent seeking theory. These two theories lucidly explain price shocks impacts in Nigeria. The Dutch theory was formulated to explain the poor economic outcome of the Netherlands following discovery of oil in the North. This theory asserts that a natural resource boom causes a country's exchange rate to appreciate, making its manufacturing export less competitive. Ismail (2010) opined that the Dutch disease can be seen as the process by which a boom in a natural resource sector results in shrinking non-resource convertible. The process engenders the specialization of the resource sector thus leaving the economy more susceptible to resource specific shocks. The Dutch disease has two effects on the economy; the resource movement effect and the spending effect. A situation where the disease impedes growth can lead to job loss that is unemployment thereby having well-being effects. The rent seeking theory provides support to the Dutch disease theory. Krueger (1974) introduced the term rent seeking but its use date back to the seminal work of Tullock (1967). Rent seeking means spending time and money not only on the production of real goods and services but also on trying to get the government to change the rules so to make more profits. This includes subsidies on output, promotion of collusion or making compulsory the use of professional services. The work of Van der Ploeg (2011) on Venezuela and Nigeria suggested that the political elites mainly benefited from public spending on infrastructure and industrial policy.

Charfeddine et al., (2018) analyzed whether the time different affects the impact of oil price changes on US GDP growth.

The study found that the proposed oil price measures have a dissipating effect with recent data up to 2016 Q4. The study was done on the US data the result might not reflect the situation in an oil dependent country such as Nigeria. In a study on crude oil price shocks and macroeconomic performance in Africa's oil producing countries (Omolade et al., 2019) used a panel structural Vector Auto-Regression model to analyse quarterly data using the Hamitton Index. The results showed that the reaction of output to sharp increases and declines in oil prices differ.

3. MATERIALS AND METHODS

3.1. Data and Variables
The objective of this study is to examine the relationship between oil price shocks and well-being in Nigeria. We used per capita GDP to proxy well-being as the dependent variable. The independent variables are private consumption, oil revenue and exchange rate. To estimate the effects of independent variables on the dependent variables, we specify:

$$PC\ GDP = F\ (PCONS, EXR, OREV, CPS) \qquad (3.1)$$

Where
PCGDP = Per Capita GDP
PCONS = Private consumption
EXR = Exchange rate
OREV = Oil revenue
CPS = Credit to the private sector

3.2. Estimation Technique
This study engaged the autoregressive distributed lag model (ARDL) approach as introduced in Pesaran et al. (2001) to examine the long run relationship between per capital GDP and oil revenue, private consumption, exchange rate, credit to the private sector in Nigeria. The reasons for using ARDL is that it has a number of advantages over other methods of estimate long run relationships between variables The first is that it can be applied irrespective of whether underlying independent variables are purely I(0), purely I(1) or mutually co-integrated (Pesaran and Shin, 1999). The second advantage is that it performs better than Engle and Granger (1987), Johansen (1991) and Philips and Hansen (1990) co-integration tests in small samples. Also, the third advantage is that the ARDL approach enables us to estimate an unrestricted conditional error-correction model (UECM) taking each of the variables in turn as dependent variables.

Pesaran and Smith (1995) later PSS (Pesaran et al., 2001) surmized that a long run association among macroeconomic variables may be investigated by employing the ARDL model under some conditions. After the establishing the stationarity status of each variable, Ordinary Least Squares (OLS) may be employed for estimation and identification. Rational estimation and inference can be drawn through the presence of a unique long run alliance that is crucial. Such inferences may be made not only on the long run but also on the short run coefficients, which implies that the ARDL model is correctly augmented to account for contemporaneous correlations between the stochastic terms of the data generating process (DGP). It is concluded that

ARDL estimation is possible even where explanatory variables are endogenous. Moreover, ARDL remains valid irrespective of the order of integration of the explanatory variables. But ARDL will collapse if any variable is integrated at I (2).

Equation (3.2) transformed into an ARDL Model as shown in 3.3 below

$$\Delta PCGDP = \alpha_0 + \alpha_1 GDP_{t-1} + \alpha_2 PCONS + \alpha_3 EXGR$$
$$+\alpha_4 OREV + \alpha_5 CPS + \sum_{j=0}^{p} \beta_1 \Delta PCONS_{t-j}$$
$$+\sum_{j=0}^{p} \beta_2 \Delta EXGR_{t-j} + \sum_{j=0}^{p} \beta_3 \Delta OREV_{t-j}$$
$$+\sum_{j=0}^{p} \beta \Delta CPS_{t-j} + e_i \qquad (3.2)$$

Where e_i is the error term, α_s are the long run parameters while β_s are the short run parameters to be estimated and p = (1,2,......, 1c). Δ is the first difference operator. An advantage of this model is that it can be used irrespective of whether the explanatory variables exhibit stationarity at level or at first difference or combination of both.

After the completion of ARDL estimation, the next step is to construct an Error Correction Model (ECM) suggested by PSS. Based on the foregoing, the error correction model for equation (3.3) is specified as:

$$\Delta PCGDP = \beta_0 + \sum_{j=0}^{p} \beta_1 \Delta PCGDP_{t-j} + \sum_{j=0}^{p} \beta_2 \Delta PCONS_{t-j}$$
$$+\sum_{j=0}^{p} \beta \Delta EXGR_{t-j} + \sum_{j=0}^{p} \beta_4 \Delta OREV_{t-j}$$
$$+\sum_{j=0}^{p} \beta_5 \Delta CPS_{t-j} + \sum_{j=0}^{p} \beta_6 \Delta ECM_{t-1}$$
$$(3.3)$$

Where ECM_{t-1} is the error term.

4. PRESENTATION OF RESULTS AND ANALYSIS

Pre-test for the stationarity of the variables was carried out using the Augmented Dickey Fuller (ADF) and Philips Perron (PP) unit root tests. The essence of the test was to ensure the suitability of the ARDL model framework used for the analysis of the data. The summary of the results are as presented in Table 1.

Table 1: Summary of unit root tests

Variables	ADF	PP	Decision
PCGDP	3.93**	3.86**	I (0)
PCONS	6.6*	6.94*	I (0)
ER	1.95	1.12	
D (ER)	4.54*	4.37*	I (1)
OREV	4.91*	4.21*	I (0)
CPS	4.43*	4.36*	I (0)

Source: Researchers' computation using Eviews. (1) D is the first difference operator (2) *, and **, signifies stationarity at 1%, and 5% respectively (3) ADF and PP critical values at 1%, and 5% levels are 4.24, 3.54 and 3.2 respectively. (4) All values were reported in their absolute term

From the summary of the unit root tests, while per capitaGDP (PCGDP), private consumption (PCONS), oil revenue (OREV), and credit to the private sector are stationary level {I(0)}, exchange rate (ER) is stationary at first difference {I(1)}. The result permits the use of ARDL model as none of the variables is integrated at second difference {I(2)}. To check for the existence of long-run equilibrium relationship among the variables of the model, coefficient diagnostic on an estimated generic ARDL model was carried out using the Bound test, and the result is as presented in Table 2.

From the summary of the ARDL Bound test, the value of the F-statistic, which is 5.98 is greater than the values of the upper and lower bounds at both 1% and 5% critical values. This is a confirmation of the existence of long-run equilibrium relationship among the variables of the model. The corresponding error correction regression (ECM), which represents the short-run analysis, and the long-run estimate were obtained from further coefficient diagnostic checks. Their respective results are presented in Tables 3 and 4 respectively.

In the long run, oil revenue, exchange rate, and credit to the private sector have positive significant impact on the dependent variable. A unit change in their respective values will induce 6.13, 6.76, and 7.71 change on the dependent variable. Furthermore, private consumption has positive insignificant impact, and one-unit change in its value will induce 0.75 change on the dependent variable.

From Table 4 the previous values of per capita GDP have positive significant impact on its current value. One unit change in the values of one period lag, two period lag, and three period lag of Per capita GDP can induce 3.25, 7.28, and 5.67 magnitude of change in the dependent variable. Oil revenue has significant impact on per capita GDP in Nigeria. However, while this significant impact is positive for its current value, it is negative for the first and second period lags. A unit change in their respective value will lead to 7.62, 4.15, and 7.07 change in the dependent variable. This finding supported the works of (Ogbonna and Ebimobowei, 2012; Manaseh et al., 2019). However, the finding is a departure from the works of (Bakare and Fawehinmi, 2010). Private consumption has positive significant impact, and a unit change in its current value and its one period can lead to 7.47, and 6.08 change on the dependent variable. The current value of exchange rate, its one period lag and two period lag have significant impact, while its third period lag has insignificant impact. While this impact is positive for the current value, it is negative for the first, second, and third period lags. One unit change in their respective values will induce 2.58, 5.37, 6.33, and 1.96 magnitudes of change in the dependent variable. Credit to the private sector on other hand has a negative significant impact, and a unit change in its value will induce 6.92 change in the dependent variable.

The error correction term {CointEq(-1)*) is negative and significant; an indication of satisfactory speed of adjustment. The coefficient of correlation (R^2) of 0.95 indicates that 95% change in the dependent variable is accounted for by joint-changes in the independent variables.

Table 2: Summary of ARDL bound test

F-statistic	1% critical value		5% critical value	
	Upper bound	**Lower bound**	**Upper bound**	**Lower bound**
5.98	4.37	3.29	3.49	2.56

Researchers' computation using Eviews

Table 3: Long-run estimate

Dependent variable: PCGDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
OREV	0.119111	0.019423	6.132418	0.0000
PCONS	0.048988	0.064987	0.753814	0.4626
ER	0.057461	0.007452	7.710495	0.0000
CPS	0.049747	0.019440	2.558982	0.0218
C	−7.761809	1.266767	−6.127256	0.0000

Source: Researchers' computation using Eviews

Table 4: ARDL error correction regression

Dependent variable: D (PCGDP)	Coefficient	Std. error	t-Statistic	Prob.
Variable				
D (PCGDP(−1))	0.433223	0.133270	3.250710	0.0054
D (PCGDP(−2))	0.729213	0.100162	7.280352	0.0000
D (PCGDP(−3))	0.427886	0.075484	5.668560	0.0000
D (OREV)	0.046146	0.006053	7.623437	0.0000
D (OREV(−1))	−0.044035	0.010617	−4.147378	0.0009
D (OREV(−2))	−0.036556	0.005171	−7.068842	0.0000
D (PCONS)	0.107121	0.014350	7.465001	0.0000
D (PCONS(−1))	0.093855	0.015442	6.077742	0.0000
D (ER)	0.037238	0.014429	2.580854	0.0209
D (ER(−1))	−0.100821	0.018791	−5.365298	0.0001
D (ER(−2))	−0.131397	0.020749	−6.332580	0.0000
D (ER(−3))	0.043011	0.021915	1.962638	0.0685
D (CPS)	−0.033734	0.009661	−3.491871	0.0033
CointEq(−1)*	−1.160800	0.167834	−6.916356	0.0000

R^2=0.95. DW=2.17. Source: Researchers' computation using Eviews

Residual diagnostic checks and stability tests was also carried out to ensure that the model can be relied upon for policy making. The results indicated; that the residual of the model is normally distributed (Figure 1), that the model is free from the problems of serial correlation (Figure 2), that the model is devoid of heteroscedasticity (Figure 3), and that the model is stable (Figure 4) in the appendix.

5. CONCLUSION AND POLICY IMPLICATIONS

The study analyzed and estimated the effects of oil price shocks and oil revenue on well-being in Nigeria over the period 1980 to 2018. Specifically, oil revenue, private consumption, exchange rate, credit to the private sector non-oil revenue are the explanatory variables while per capital GDP is the dependent variable. The analysis was carried out using the Autoregressive Distributed Lag (ARDL) model developed by Pesaran et al. (2001).

The result of the cointegration test based on the bounds testing approach showed that the variables are co-integrated which suggested a long-run relationship between them. Findings from the model

revealed that there was a direct and significant relationship between oil revenue, private consumption, exchange rate and well being, however, credit to the private sector exhibited a positive and insignificant relationship on well being in the long run. There was a direct and significant relationship between the independent variables and well being in the short run, however, credit to the private sector indicated a negative but significant relationship. The aforementioned findings have some implications for policy formulation.

First, the positive and significant relationship between well being and oil revenue lends credence to the fact that oil revenue is germane for well being. It becomes imperative to protect this source of revenue in the context of asset security and maintenance of peace in the Niger Delta region to enhance crude oil production. Credit to the private sector has to be channeled in such a way that it becomes impactful to the economy. The leakages and constraints to the flow of credit to the private sector have to be sorted out.

Secondly, the Sovereign National Wealth Fund has to be deepened and enhanced to enable it serve as a buffer for lean years as Nigeria is presently experiencing. During the periods of increased oil price, the country should save more to offset the constraints occasioned by persistent fall in oil price.

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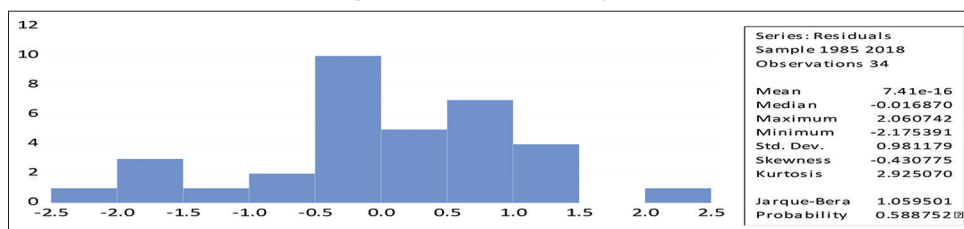
APPENDIX

Figure 1: Residual normality test

Figure 2: Breusch-godfrey serial correlation LM test

| F-statistic | 0.594559 | Prob. F (2,13) | 0.5661 |
| Obs*R-squared | 2.849369 | Prob. Chi-square (2) | 0.2406 |

Figure 3: Heteroskedasticity test (breusch-pagan-godfrey)

F-statistic	0.863550	Prob. F (18,15)	0.6209
Obs*R-squared	17.30272	Prob. Chi-square (18)	0.5024
Scaled explained SS	3.241572	Prob. Chi-square (18)	0.9999

Figure 4: (a and b) Stability test (CUSUM and CUSUM squares)