Fiscal Institutions and Oil Resource Management in Nigeria: The case of Sovereign Oil Wealth (SOW) Fund

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Abstract

This paper examined the role of price rule as a form of fiscal institution in the management of Nigeria oil resources. Specifically, the paper investigated the possibility of using empirical approach to determining the benchmark price of Nigeria's Crude Oil. It adopted the ARIMA forecasting models using monthly data series from 2000m01 to 2012m12 to predict future movement in Nigeria crude oil prices. On the bases of the forecasted crude oil prices, the paper derived an empirical framework that accommodated long run price movement with allowance for short run adjustment mechanism. The paper found that current crude oil price benchmark is conservatively too low as a rule for managing Nigeria oil funds and the incessant withdrawal from the ECA fund clearly shows that the real benchmark is higher than the official benchmark. The paper therefore recommended a benchmark price of around US$88 for the 2014-2016 Medium Term Expenditure Framework instead of the US$74 proposed by the Government. Though, the proposed US74 seems to support the fiscal responsibility Act and to entrench fiscal discipline, the experience of Nigeria government has not shown such compliance and this has impaired significantly on management of the ECA/SWF fund.

JEL Classification: E61, E62, E63, H61.
Key Words: Fiscal institutions, Fiscal rules, Resource-rich economies

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1.0 Introduction

Synchronising revenue and expenditure has been a challenging experience for Nigeria like many other oil rich countries. This is partly due to the highly volatile commodity prices and the risk of 'Dutch disease', extraction from a finite resource and pressures to spend within a short-term horizon to improve infrastructure and quality institution. This has resulted in macroeconomic instability and real exchange rate volatility which complicates fiscal management and vulnerability to debt overhang problems (Budina and Van Wijnbergen, 2008, Hemming, 2013). A number of studies in the literature argued that establishment of special institutions to constrain the discretion of expenditure policies and promote fiscal discipline could help in mitigating such adverse effects oil revenue volatility and frugality of the government (Andrew, 2013, Sharma and Strauss, 2013, Allen 2012). Such fiscal institutions (FIs) include fiscal rules, resource funds, fiscal responsibility laws, and fiscal advisory councils, (Sharma and Strauss 2013, IMF 2007). The most fundamental of these institutions is the fiscal rule which defines, in specific terms, the level of various indicators of overall fiscal performance that must be met (Kopits (2001), Kopits and Symansky, 1998). There are two distinct sets of fiscal rules: (1) restrictions or rules on the procedure by which fiscal decisions are made; and (2) quantitative constraints on fiscal policy. Many countries operate procedural and numerical rules in tandem and thus the attainment of one implies the other (Schaechter et al., 2012).

The first signal of Nigeria readiness to establish such fiscal institutions and rules commenced with creation of a special oil fund account called Excess Crude Oil Account (ECA) in 2004. This account accumulates oil revenue above a stipulated oil price bench mark. Therefore what goes into the ECA account and the budget depends essentially on the oil price benchmark adopted. Currently, Nigeria has established the National Council of States and enacted the Fiscal Responsibility Act to serve as the advisory council and fiscal responsibility law respectively. However, Nigeria government's experiences with setting up of the oil benchmark as a fiscal rule has not been satisfactory. The government has been finding it increasingly difficult in terms of procedural and numerical rules[2] to adhere strictly to and accurately forecast revenue accruals based on the benchmark oil price rule for each fiscal year. It either sets a benchmark price that overshoots or undershoots the level that is consistent with the expected revenue for that fiscal year or 3-year medium term expenditure framework, (Akomolafe and Danladi 2013). Since attainment of this fiscal rule is dependent on the consistency with which the benchmark mimic the volatile and exogenously determined international price of crude oil, an accurate forecast of this crude oil price is crucial to attainment of the predetermined overall fiscal performance for the Nigerian government. More so, adherence to these fiscal rules and entrenchment of standard fiscal institutions are a prerequisite for efficient management of Sovereign Oil Wealth Fund established in 2013.

The purpose of this paper is to develop a simple framework for deriving an acceptable crude oil benchmark price, thus removing partly the subjectivity inherent in the current benchmark price setting in Nigeria. This also promotes understanding amongst the stakeholders in entrenching fiscal discipline and rules necessary for successful implementation of Sovereign Wealth Fund. More importantly, this would also reduce the rancour that usually follows the annual ritual of fixing this routinely important benchmark oil price. The rest of the paper is organised as follows. Section 2 reviews existing literature of oil price benchmark determination in Nigeria and other countries. Section 3 presents the approach adopted in this paper based on the Nigeria's economic risk specific factors and observed strength and weakness of existing framework. Section 4 presents the empirical estimate of the bench mark prices while section 5 concludes with policy significance of the framework.

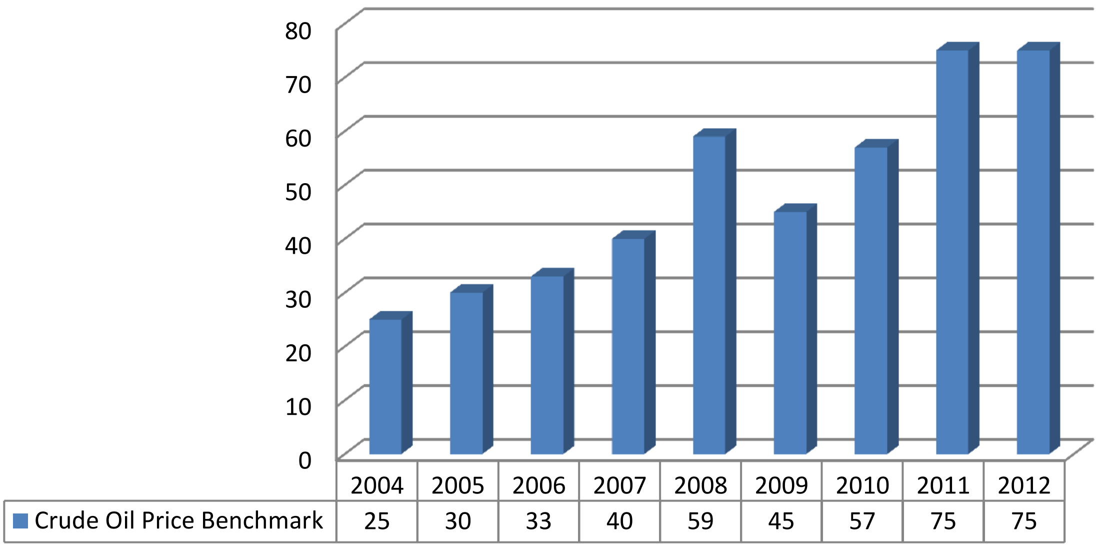
[2] Procedural in terms of which government institution (Executive or legislative) should set the price

2.0 Review of Existing Approach to Oil Price Benchmarking in Nigeria

The question then is what form of fiscal policy rules will perform better in reducing excessive withdrawal from ECA and promote the necessary medium-term budget deficit stability. While there is a specific rule with respect to debt management, for instance, Basci et al (2004) proposed two alternative fiscal policy rules in terms of their impact on debt sustainability: a rule that fixes the ratio of primary surplus to GDP ("fixed surplus rule") and one that sets the primary surplus as a linear function of debt to GDP ratio ("variable surplus rule") (Obinyeluaku 2006a &2006b). Economic literatures seem to be silent about the appropriate formula which must be applied to determine the level of savings required. However most studies mentioned in passive suggested the basis for deriving a national savings fund: firstly, the accumulation of excess revenue resulting from a price above the target price as in the case of Chile's copper stabilization fund (Fiess, 2001, Budina, & van Wijnbergen, 2008); secondly, revenue contingent sets a percentage of the commodity revenue as in the case of the Alaska's permanent fund (Kopits, 2001, Kopits & Symansky,1998) and thirdly, a mixture of both, a set percentage of commodity revenue and a reference price as in the case of Venezuela's stabilization fund are very common examples in the economic literatures (Arbatli, 2012, , Sharma & Strauss 2013),

The benchmark price in Nigeria is the predetermined crude oil price at which any excess above it would be transferred to the Excess Crude Account and/or the Sovereign Wealth Fund. The benchmark price of crude oil used since 2004 (Figure 1) is usually determined by the Executive arm of the government. However, this method has been criticized as highly subjective, lacking transparency and not based on any generally accepted accounting principles the (GAAP). This has often resulted in heated debates and intensive negotiations between the executive and the legislative arms of government; and this often leads to the delay in the release of the appropriation bill and the attendant adverse impact on the economy (Orok-Duke et al 2009).

Figure 1: Crude Oil Price Benchmark (US$per barrel



A perusal of the literature has not indicated substantial empirical studies to guide the development of an appropriate mechanism for determining the crude oil price benchmark. The approach common among some oil rich countries[3] is to use a long run price calculated based on past, spot or future prices or independent committee (Hemming, 2013, IMF 2007). However, such long run price rule especially in the case of Chile does not give much room for flexibility. For example the Chile's fiscal rule law does not have specific escape clauses that the authorities can apply in the case of shocks to the economy. As a result, the rule was suspended during the earthquake in 2010 (Sharma and Strauss, 2013). Evidences from studies have however shown that fiscal rules (such oil price benchmark) are more likely to be successful if there is some form of flexibility in their design (Fiess, 2001, Andrew 2013).

[3] These countries are Chile, Algeria, Russia, Mexico, Libya, Mongolia, Iran, Ghana, Colombia, Trinidad and Tobago Venezuela and Nigeria.

That is there should a trade-off between rigidity and flexibility. Such trade-off allows for dealing with shocks and changes in fiscal policy (Drazen, 2002, Arbatli, 2012).

There are two attempts at determining the benchmark price empirically in Nigeria (namely Orok-Duke, Otonkue and Ekot, 2009 and Akomolafe and Danladi 2013). Orok-Duke et al(2009) uses a simple descriptive scheme based on historical trends of monthly prices of crude and the prevailing economic situation. Based on the monthly data series, the paper estimated two price equations for determining the benchmark oil price for Nigeria using data from 2000 to 2005.

$$P_b = (\frac{1}{N}\sum_{i=1}^{N} P_i) * SF \quad 1$$

$$P_b = \frac{1}{2}(P_{max} + P_{min}) * SF \quad 2$$

P_b is the benchmark Price of oil for the year. P_i is the spot oil price in each month while N is the number months. P_{max} and P_{min} stand for the maximum and minimum spot oil price for a given period respectively. The SF is the saving factors which lies between 0 and one (0<SF>1). The ***SF*** is the saving factors which lies between 0 and one (0<SF>1). The paper used 0.6 & 0.65 and found US$33.4 and US$33.3 as most appropriate for 2005 crude oil benchmark as against US$ 35 per barrel adopted for the year.

Akomolafe and Danladi (2013) on the other hand estimated an ARIMA (2 1 0) model for the period 1993 January –2012.October. Based on the model estimated parameter, they argued that crude oil price level would stabilise around $100 in 2013 hence they suggested $80 per barrel as benchmark for crude oil price for 2013 budget. They premised the recommendation on the assumption that a benchmark lower than US$80 (say $60 or $70 per barrel) would be sub-optimal in the event that actual crude oil prices end up being higher than the forecasted price of $100 per barrel as idle resources would be left unutilized even in the face of rising poverty, unemployment, inadequate infrastructures and various economic hardships experienced in the country that the government would have otherwise deploy resources to ameliorate.

A careful assessment of the existing approached reviewed above clearly shows the literature is still young and evolving. There are still room for more rigorous empirical determination of the benchmark. More importantly, there is clear evidence of possible biases in the benchmark suggested especially by the two studies on Nigeria. For instance, how Orok-Duke et al (2009) arrived at the saving factor of 60% and 65% is not clear and what they meant by saving factor was not explicitly discussed. Secondly, the estimates are based on only the previous year's data and hence may suffer from small sample errors. While Akomolafe and Danladi(2013) estimates was based on a more rigorous estimation technique and with a sufficient long data series and frequency, the choice of USD$80 based on the USD$100 forecast estimate from the model is subjective and arbitrary

3.0 Empirical Model for Estimating the benchmark Price

3.1 Benchmark Price Setting Framework

The main essence of this paper is to suggest a simple mechanism that allows for trade-off between flexibility and rigidity. As a starting point, we assumed that the oil price benchmark in Nigeria follows the long run price rule setting process but in view of the experiences of other countries that have adopted long run price rule, the framework must also allow for some discretion on the part of the government to revise the estimate and accommodate some contingencies year in year out.

Therefore the benchmark price is assumed to be determined by the process

$$P_b = \bar{P} + \beta(P_{t-1} - \bar{P}) + \varepsilon_t \quad 3$$

where 0< $\beta < 1$ $\varepsilon_t = government\ idiosyncracy$ P_{t-1} is the average yearly price of oil in the preceding period and $\bar{P}$ is mean long run oil price that the short run price converges. The ε_t is the noise factor which captures the idiosyncrasy in preferences of the government. If the prevailing oil price equals the estimated long run price that is:

$$(P_{t-1} - \bar{P})=0 \quad 4$$

Then irrespective of the value of β the budget benchmark equals the long run price plus the preferences adjustment by the government.

$$P_b = \bar{P} + \varepsilon_t \quad 5$$

However if there is a constraint on the government to introduce their idiosyncrasy then Benchmark Oil Price becomes:

$$P_b = \left(\frac{1}{N}\sum_{i=1}^{N} P_i\right) + \beta\left(P_{t-1} - \left(\frac{1}{N}\sum_{i=1}^{N} P_i\right)\right) \quad 6$$

which is equivalently to

$$P_{bt} = \bar{P} + \beta(P_{t-1} - \bar{P}) \quad 7$$

Where $\bar{P} = \left(\frac{1}{N}\sum_{i=1}^{N} P_i\right)$ 8

Equation 7 is the baseline equation for determining the benchmark price. It states that the Benchmark price for period t (P_{bt}) equals the mean value of the oil price in the previous years and a fraction of the deviation of the immediate past period from the mean value. Therefore, there are two key parameters to be determined (the mean value $\bar{P}$ and the adjustment factor (β)) to calculate the benchmark Price. The detail of their estimations is the focus of next section

3.2 Modelling the Time Series Properties of Crude Oil Price

Among several time series forecasting model (like ARIMA and ARCH GARCH and their variants like TGARCH, EGARCH) ARIMA) models have been acknowledged to be the most popular in the literature. ARMA models remained the classical models among them because of their mathematical tractability. They give a good approximation of general stationary processes and relatively simple to compute explicitly all the parameters. The estimation procedure itself is quite clear and well understood, (Gileva 2010). The general ARMA model consists of two parts: an autoregressive (AR) part and a moving average (MA) part(Ahmed (2012)):

The MA (q) and AR (p) processes are can be written equations 9 and 10 respectively:

MA(q) : $Y_t = \mu + \epsilon_t + \theta_1\varepsilon_{t-1} + \theta_1\varepsilon_{t-1} + \theta_2\varepsilon_{t-2} + \theta_3\varepsilon_{t-3} + \cdots \ldots\ldots\ldots. + \theta_q\varepsilon_{t-q}$ 9

AR(p) : $Y_t = \emptyset_0 + \emptyset_1 Y_{t-1} + \emptyset_2 Y_{t-2} + \emptyset_3 Y_{t-4} + \emptyset_1 Y_{t-4} + \cdots \ldots\ldots\ldots. + \emptyset_p Y_{t-p}$ 10

Mixed Autoregressive Moving Average processes:

ARMA(p, q) : $Y_t = \emptyset_0 + \emptyset_1 Y_{t-1} + \emptyset_2 Y_{t-2} + \emptyset_3 Y_{t-4} + \emptyset_1 Y_{t-4} + \cdots \ldots\ldots\ldots. + \emptyset_p Y_{t-p} - \left(\epsilon_t + \theta_1\varepsilon_{t-1} + \theta_1\varepsilon_{t-1} + \theta_2\varepsilon_{t-2} + \theta_3\varepsilon_{t-3} + \cdots \ldots\ldots\ldots. + \theta_q\varepsilon_{t-q}\right)$

$$= \emptyset_0 + \sum_{i=1}^{P} \emptyset_i Y_{t-i} - \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} \qquad 11$$

where $\emptyset_i$ and θ_j are real coefficients, ϵ_t is a white noise process i.e. $\{\epsilon_t\}$ is a sequence whose iid elements have mean zero and variance σ2 and are uncorrelated across time: E(ϵ_t) = 0,E($\epsilon_t^2 = \sigma^2$), E$\epsilon_t, \epsilon_s = 0$) = 0 for t = s.

The 1-step ahead-forecast of Y_{h+1} can be easily obtained from the model as

$$\hat{Y}_t(1) = E[Y_{h+1}|Y_h, \ldots\ldots] = \emptyset_0 + \sum_{i=1}^{P} \emptyset_i Y_{h+1-i} - \sum_{j=1}^{q} \theta_j \varepsilon_{h+1-j} \qquad 12$$

and the associated forecast error is $\varepsilon_h(1)\ Y_{h+1} - \hat{Y}_t(1)$, the variance of 1-step ahead forecast error is $Var\ \varepsilon_h(1)] = \sigma^2$ For the k-step ahead forecast, we have

$$\hat{Y}_t(1) = E[Y_{h+k}|Y_h, Y_{h-1}, \dots \dots] = \emptyset_0 + \sum_{i=1}^{P} \emptyset_i \hat{Y}_{h(k-i)} - \sum_{j=1}^{q} \theta_j \varepsilon_{h(k-j)} \qquad 13$$

Where$\varepsilon_h(k-j)] = 0\ \ if\ k-i > 0\ and\ \ \varepsilon_h(k-j)] = \varepsilon_{h+k-i}$, $\hat{Y}_h(k-i) = Y_{h+k-i}$ If $k - i \leq 0$, the multistep ahead forecast of an ARMA model can be computed recursively.

There are three stages involved in the estimation of the ARMA models. The first is the identification and selection of the appreciate order of the model. At this stage the values of p, d, and q must be determined. Finding appropriate values of p and q in the ARMA(p,q) model is usually done by plotting the partial autocorrelation functions for an estimate of p and likewise using the autocorrelation functions for an estimate of q. For moving average type models theoretical autocorrelation function becomes zero after some lag (q) (i.e. it cuts off) while theoretical partial autocorrelations tends to zero (i.e. dies down). On the other hand for autoregressive type models theoretical partial autocorrelations becomes zero after some lag say p while theoretical autocorrelations tends to zero after that lag. The criterion for the selection of ARIMA process is summarized below

Table 1: n-order Selection for ARMA Model

Model	AC function	PAC function
AR(p)	Dies down exponentially	Cuts off after lag p
MA(q)	Cuts off after lag q	Dies of exponentially
ARMA	Cuts off after lag q	Cuts off after lag p

The principle of parsimony model selection is usually adopted by using the either or both of Akaike Information Criterion (AIC) and Schwarz criterion (SC). The ARMA model with the least minimum AIK and or SC values is adopted. The second stage involves the estimation of the parameters usually by employing a least squares approximation to the maximum likelihood estimator (Bruce et al (2005). The third stages involve conducting diagnostic test on the model to ensure that all the assumptions of OLS are satisfied. The estimated model must be checked for its adequacy and revised if necessary, implying that this entire process may have to be repeated until a satisfactory model is found; and then forecasting can be made (Ahmed 2012 and Akomolafe and Danladi 2013).

4.0 Data Description and Model Estimation:

4.1 Data Description

The monthly time series data used for the analysis covers a period of 13 years from 2000M01 to 2012M12 thus comprising a time series of 156 observations. In Nigeria, year 2020 has been adopted as an economic planning horizon. The development planning document tagged Vision 202020 detailed some programmes to be executed for Nigeria to join the top 20 economies in the world by year 2020. Also the government has a 3- year medium term planning framework called Medium Term Expenditure Framework. The 2014 to 2016 is currently being considered for approval in the National Assembly. In the MTEF, the government has fixed the benchmark crude oil price at US$74 per barrel which is lower than 2013 US$75 benchmark. The document also envisaged a drop in oil production from 2.5 million barrel per day to 2.3barrel per day. Therefore to capture this planning horizon of the government, the out-of-sample period is set for 2013 to 2020. This allows a comparison of the estimated model parameters with the projection by government for the medium and long term planning framework. The crude oil monthly data set was collected from US Energy Information and Administration (EIA) website[4].

[44] http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=INI0000004&f=M

The time series plot of the crude oil price in Figure 2, clearly indicates that the series is not stationary in the current form and there might be a non-stationary trend and structural changes in the level of the series. However with the inclusion of an intercept and trend variable the series become stationary at level. The correlogram plot of the series was examined and the AC died off exponentially while PAC cut off after lag 2 apparently suggesting a model of ARMA(2 0 0). Box and Jenkins (1976) recommended the use of seasonal autoregressive (SAR) and seasonal moving average (SMA) terms for monthly or quarterly data with systematic seasonal movements. A SAR(12) term was included in the equation specification for a seasonal autoregressive term since the data set is monthly data series . A common observation in macroeconomic time series is the present of unit root and a tendency for the series to be explosive and non-converging to the mean value. To avoid spurious regression and biased estimates, the time series properties was examined. Table 2 present the time series properties of the crude oil price and there is sufficient evidence to assume that the variable became stationary when both intercept and time trend variable.

Figure 2: Monthly Crude Price 2000-2012

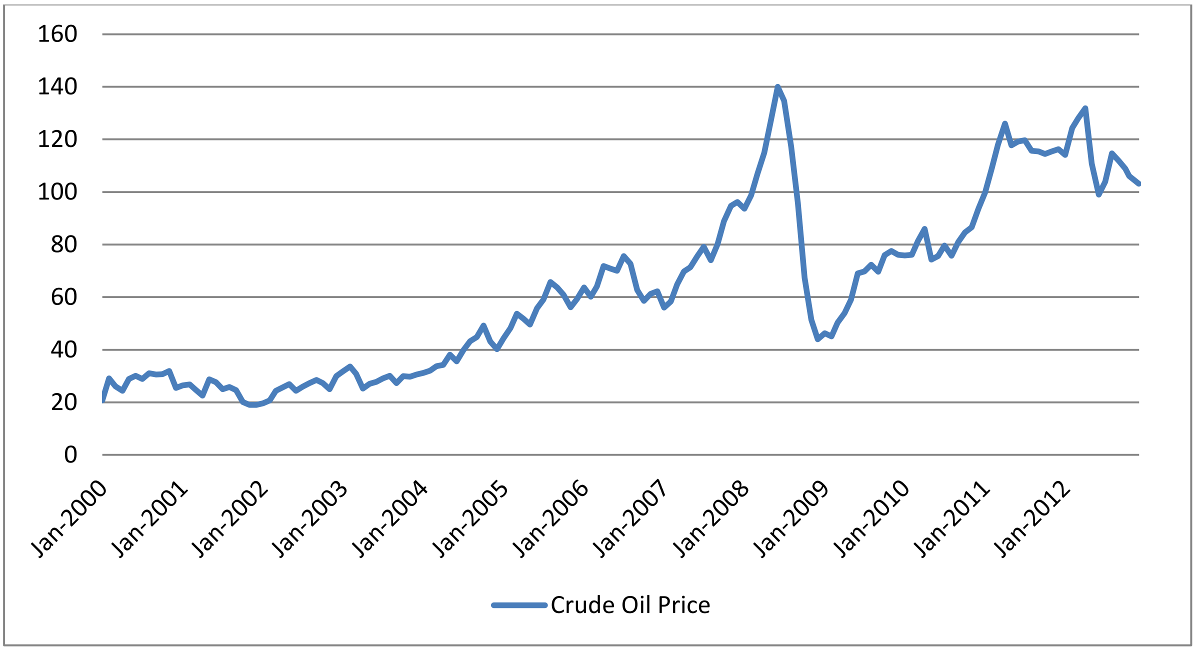


Table 2: Augmented Dickey-Fuller test statistics

Null Hypothesis: NCOP has a unit root			
Lag Length: 1 (Automatic - based on SIC, maxlag=13)			
		t-Statistic	**Prob.***
Exogenous: Constant		-1.711688	0.4234
Test critical values:	1% level	-3.473096	
	5% level	-2.880211	
	10% level	-2.576805	
Exogenous: Constant, Linear Trend		-4.101461	0.0077
Test critical values:	1% level	-4.018748	
	5% level	-3.439267	
	10% level	-3.143999	
*MacKinnon (1996) one-sided p-values.			

To identify the nth-order appropriate for the ARMA model, the auto correlogram of the detrended crude oil prices series was plot and examined based on the criteria in Table 1 above. It was found that the crude oil price series could either be driven by a AR(2) or ARMA (1 1) process. However, because of the uncertainty of the exact process and the general ambiguous nature of interpretation of the correlogram, it is necessary to identify several tentative models, and then perform diagnostic checks to determine the most appropriate. The usual way to estimate parameters in ARMA models, after choosing p and q, is the Ordinary Least Square (OLS) regression. Using Akaike info criterion and Schwarz criterion, the model with minimum regression errors based on the AIC and SC value is selected as the most appreciate model. Various models were estimated, but going by the rule of identification stated above, ARMA (2 0 12 0) model showed a good fit of the data and most appropriate for the analysis (See Table 3).

Table 3: Model Selection Parameters

Models	AIC	SC
AR(1)	6.448	6.510
AR(2)	*6.125**	*6.209**
MA(1)	7.401	7.459
MA(2)	6.789	6.868
ARMA(1 1)	6.190	6.293
ARMA(2 1)	6.152	6.276
ARMA(2 2)	6.146	6.292

(*) signifies the model that minimized the error term

Table 4 presents the estimated of the ARMA (2,0 12 0) with the least minimized error term as indicated by AIC and SC. After the first estimation it was found that the intercept was not significant and the model was re-estimated without the intercept. The estimated results show that convergence was achieved after 7 iterations and ARMA(2 0 12 0) roots were inevitable. As indicated by the Figure 3, the plot of the residual histogram is negatively skewed but normally distributed around the mean value. Jarque-Bera statistics further confirms that the residual is normally distributed. The Breusch-Pagan-Godfrey's heteroskedasticity and serial correlation tests also support the robustness and statistical fitness of the model.

Table 4: Estimated AR(2) Model(Dependent Variable: NCOP)[5]

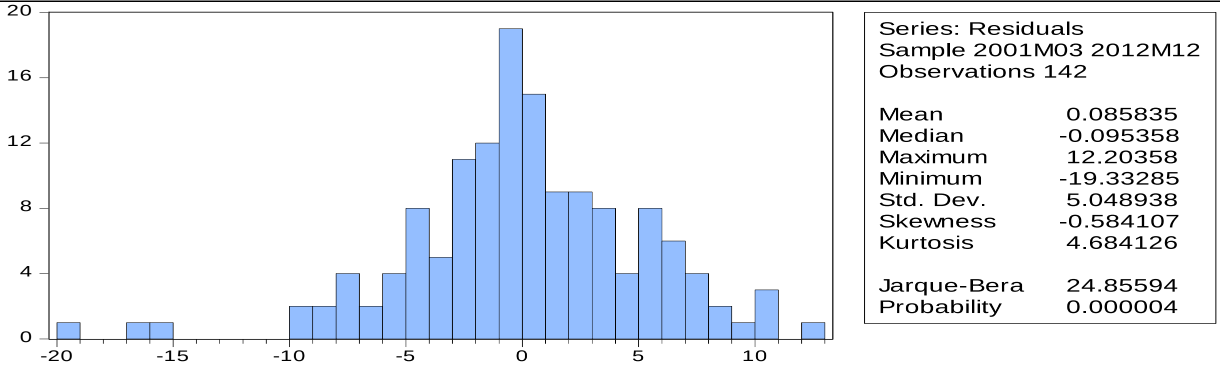
Variable	Coefficient	Std. Error	t-Statistic	Prob.
@TREND	0.756073	0.050941	14.84220	0.0000
AR(1)	1.444096	0.071658	20.15253	0.0000
AR(2)	-0.548815	0.071666	-7.657916	0.0000
SAR(12)	0.189284	0.092891	2.037701	0.0435

R-squared	0.976735	Mean dependent var	66.21514
Adjusted R-squared	0.976230	S.D. dependent var	33.10673
S.E. of regression	5.104265	Akaike info criterion	6.125795
Sum squared resid	3595.387	Schwarz criterion	6.209058
Log likelihood	-430.9314	Hannan-Quinn criter.	6.159629
Durbin-Watson stat	1.969567		

Inverted AR Roots	.87	.75+.44i	.75-.44i	.72+.17i
	.72-.17i	.44+.75i	.44-.75i	.00-.87i
	-.00+.87i	-.44+.75i	-.44-.75i	-.75+.44i
	-.75-.44i	-.87		

[5] The estimated was done base on seasonally detrended adjusted sample with 142 observations (2001M03 2012M12) after adjustments

Figure 3 : Diagnostic Test Statistics



Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.701898	Prob. F(2,136)	0.4974
Obs*R-squared	1.409843	Prob. Chi-Square(2)	0.4941

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	11.15933	Prob. F(1,140)	0.0011
Obs*R-squared	10.48315	Prob. Chi-Square(1)	0.0012
Scaled explained SS	18.03595	Prob. Chi-Square(1)	0.0000

4.2 Forecasting the Crude Oil Price with the ARMA Model

Having established the fitness of the ARMA model, the next step is to examine the forecasting power of the model for both in sample and out-of sample. The in sample was done for the period of 2000 to 2012 corresponding to entire sample period. Clearly, the plots in Figure 4 show that the model fits the data and substantially mimic the actual data series. The bias and variance proportions were significant small which suggest the proportion of bias and variation between the forecasted and actual series is insignificant.

Based on equation 13 the out of sample forecasted was estimated and Figure 5 plots the out of sample forecast for the period 2013 to 2020. From Figures 5 plot it is observed that oil price is likely to rise steadily from the current US$112 in 2012 to US$131.2 in 2014 and US$140 in 2015. Bearing an unforeseeable circumstance and also if the current oil market fundamentals remain positive, it is optimistic that the oil price could rise to as high as US$168 and US$186 respectively in 2018 and 2020 respectively. The estimates from the model compare favourably with the US IEA forecasts which suggest that could oil price would rove around US$130 and could rise to as much as US$186 in 2020 (See Figure 2)

Figure 4 : Plot of Actual and In Sample Forecast of Crude Oil Price

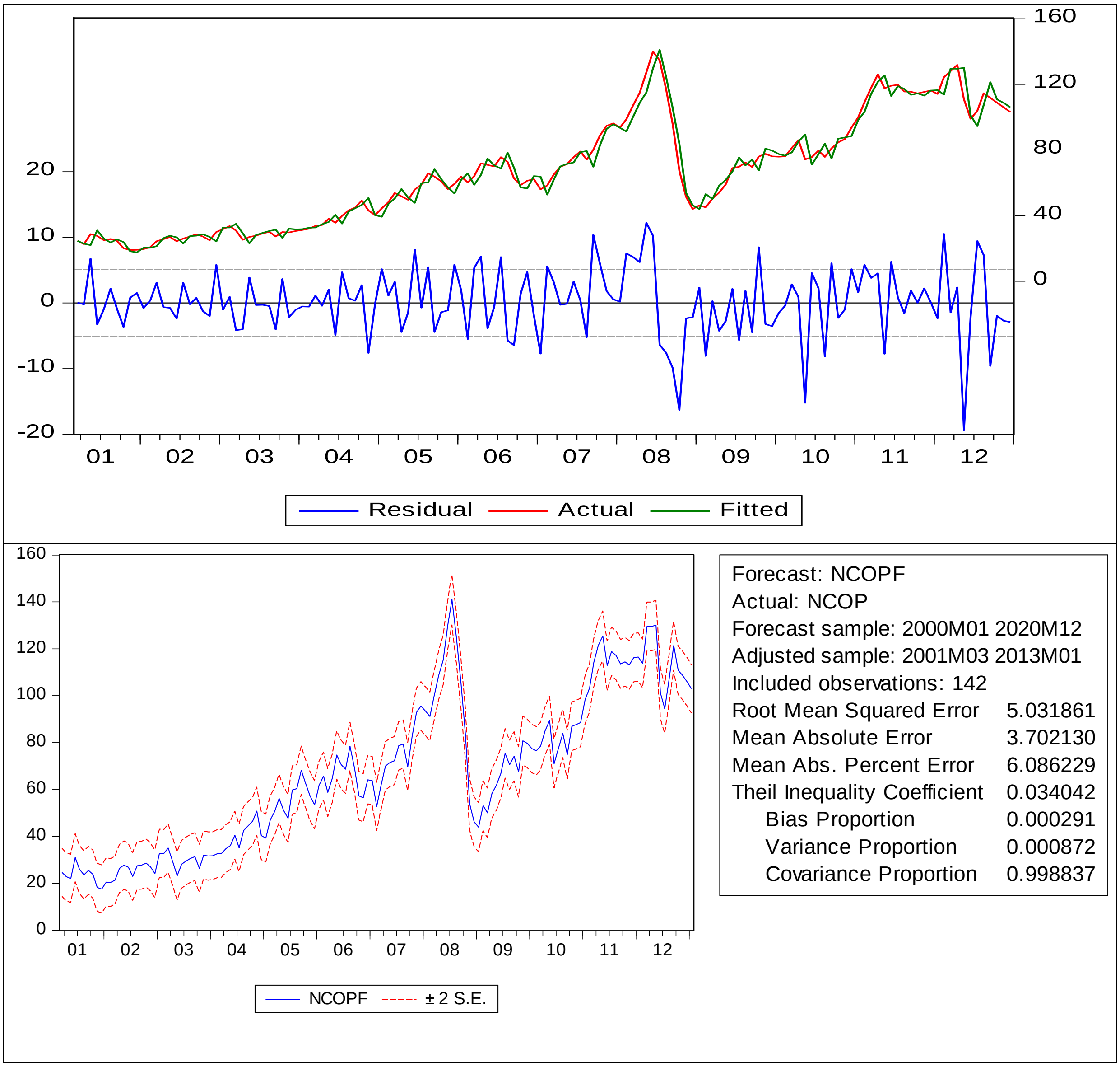
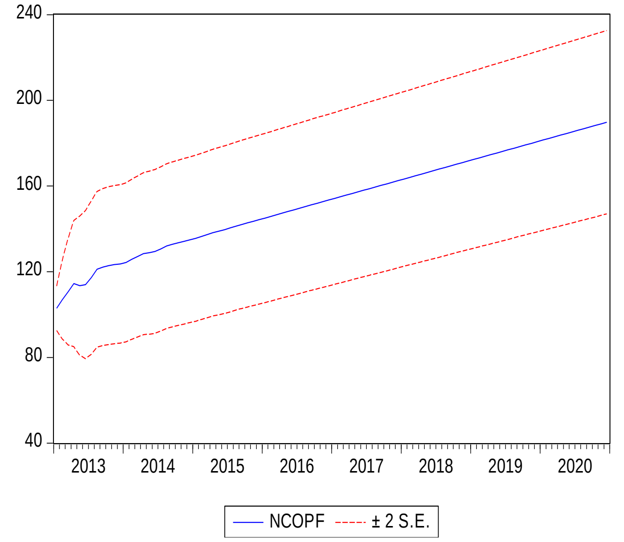
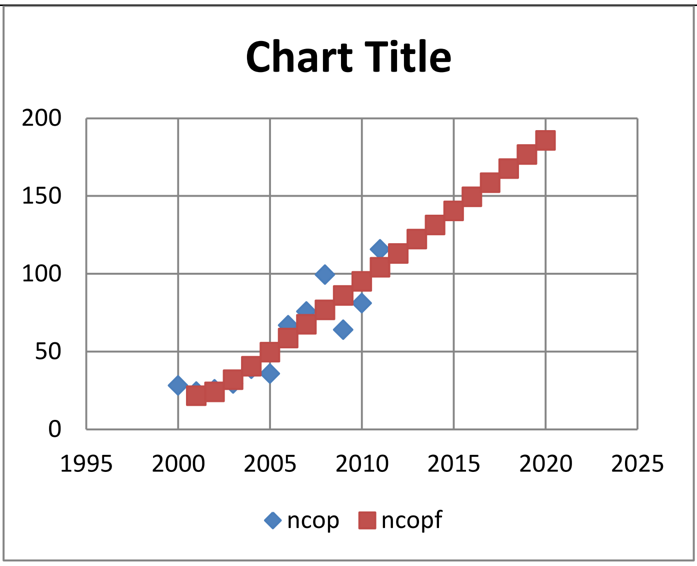


Figure 5: Out of Sample Forecast of Oil Price Movement (2013-2020)





	Reference Case	2015	2020
2010 U.S. EIA AEO	**Highest** **Lowest**	\$144.72 \$51.48	\$185.51 \$51.90
OUR ARMA MDEL ESTIMATE	**Highest** **Lowest**	\$140.3 \$96	\$186.6 \$139

Source: U.S. Energy Information and Natural Resources Canada

4.3 Deriving the Benchmark Oil Price Based of the Forecast

So far we have been able to derive estimates of oil price for the period of 2000 to 2020. Before the benchmark price is determined, the parameters $\overline{\boldsymbol{P}}$ and $\boldsymbol{\beta}$ must be determined. As explained earlier $\overline{\boldsymbol{P}}$ is the mean values of crude oil price was calculated to be US\$ 62.8 and US\$ 66.4 for the actual and in sample forecast crude oil price. The $\boldsymbol{\beta}$ was taken as 50% which is based on assumption that the variation in oil price is shared equally between saving and consumption. The assumption is that government is likely to maintain such pattern of spending from oil resources.

Table 5 presents the estimated of crude oil benchmark calculated based on the forecasted price movement. Three scenarios were presented namely the highest, lowest and mean benchmark price. It shows that for the Nigerian government to maintain fiscal stability and avoid excess withdrawal from the excess crude oil account, it should increase the benchmark price to around US$90 for the next three years. The model suggests an average price between of US$ 84 and US$93 per barrel as bench mark of oil for the years 2014 to 2016 against the US$ 74 per barrel adopted for the Medium Term Expenditure Framework for the year 2014 to 2016. The advantage of this model estimates over the current practice is that while the current approach does not give room for any flexibility and allowance to accommodate short fall in oil revenue, the estimated proposed framework sufficiently allows government to have adequate fund and at same time maintain a steadily increase in saving and investment into Excess crude oil account and Sovereign Wealth Fund Investment

Table 5: Estimates of Forecasted Benchmark for Crude Oil Price

		P_{t-1}		$0.5(P_{t-1} - \bar{P})$		P_{bt}		Average P_{bt}	
Years	$\bar{P}$	Highest	Lowest	Highest	Lowest	Highest	Lowest	P_{bt}	%
2013	62.8	113	82	25.1	10	88	72	**80**	88%
2014	62.8	122	87	29.7	12	92	75	**84**	86%
2015	62.8	131	96	34.2	17	97	79	**88**	83%
2016	62.8	140	105	38.8	21	102	84	**93**	80%
2017	62.8	149	113	43.3	25	106	88	97	78%
2018	62.8	158	122	47.8	30	111	92	102	76%
2019	62.8	168	130	52.4	34	115	96	106	74%
2020	62.8	177	139	55.7	38	119	101	110	73%

Sources: Author's Calculation

The adoption of lower benchmark for the budgets had led to excess withdrawal from the Excess Crude account. The account that had over US$20 billion in 2006 got depleted to as low as US$3.9 as at the middle of this year. The implication of this is that the lower benchmark is unsuitable due to high expenditure profile of government. The high rate of withdrawal made mess of the principle of saving into the account in first place. The establishment of Sovereign Wealth fund requires a steady flow of fund and a well-structured and planned withdrawal. The Sovereign Wealth fund was formally funded in early 2013 with seed money of US$1.0billion of which only US$200million has been invested. The failure to increase the funds might be due to the fear that the funds in the ECA would be needed to fund the budget later in the year. But if the benchmark had been high enough to account for the greater flexibility required in funding the budget whatever savings in the ECA could be easily be transferred to the Sovereign Wealth funds. The current approach to benchmark crude oil price determination seems to be a *net saving consumption income approach* where saving takes precedence before consumption. While such approach is economic intuitively good for fiscal discipline, but in an economy where there is pressure on government spending for both economic and social infrastructural development, then such approach may be detrimental to the sustainability of the savings in the excess crude account. Consequently since the amount to be invested in Sovereign Wealth Fund is dependent on the balance in the Excess Crude account then the essence of the Sovereign Wealth Fund might be endangered.

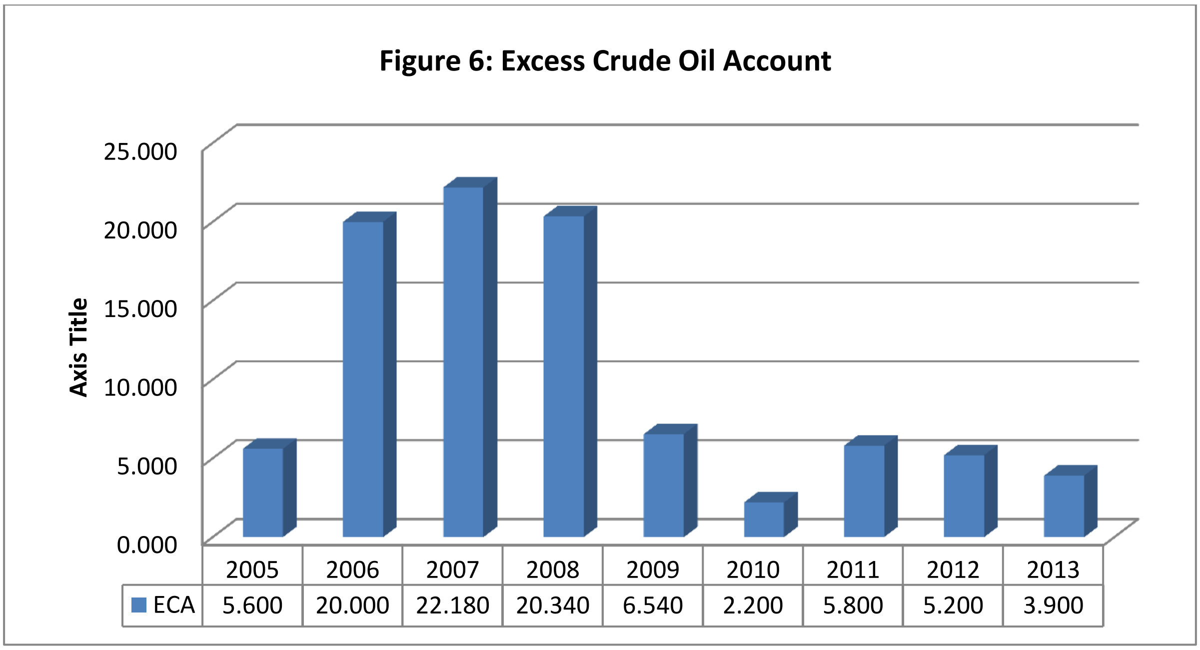


Figure 6: Excess Crude Oil Account

Sources: CBN Annual Reports and http://standardtimespress.org/?p=3362

5.0 Conclusion of the Results and Policy Implication

This paper has demonstrated that the oil price benchmark in Nigeria can be determined empirically. This helps in reducing the conflict that usually occurs at every year budget presentation and approval. It also ensures stable net saving into the Excess Crude oil account. Using the proposed framework, it was found that the current benchmark is conservatively low and thus put pressure on the saving in the excess crude oil account. Because this benchmark is too low relative to high expenditure profile of the government, the excess crude oil account could not serve the purpose it was meant. In contrast to the US$74 per barrel proposed in the 2014 to 2016 Medium term Expenditure framework, this paper suggests a bench mark around US$88 (between US$83 and US$92) given the optimistic and positive outlook of oil price in the international market. The oil price is expected to rove around US$120 to US$140 from 2014 based on our forecast which is found to be in tandem with the US EIA forecast of Nigeria crude oil price movement.

Obviously, one might be tempted to argue that the derived benchmark crude oil price is too optimistic but a critical look at withdrawal from Excess Crude oil account over the years shows that the actual benchmark used was conservatively low, every year the account is depleted and the net saving into the account has always been negative. At the onset of the account there was a net saving of over US$20billion in 2005, this amount has been withdrawn to as low as USD$4.0billion by 2010. By implication, it means in the subsequent years nothing was added rather the balance were been depleted. This then suggest that all the oil revenue in the subsequent periods were ploughed in to the economy, yet there was no serious fall in oil revenue during this period. In a recent report by the Federal Ministry of Finance, published in a Nigerian daily (Daily Trust on September 02 2013), the Government has withdrawn a sum of US$5.1billion from the account within just 6 months in 2013. If this withdrawal is quantified in terms of unit per barrel of oil sold, it clearly indicates that the real oil benchmark used is far above the official benchmark (Table 6).

Table 6: Quantifying the Withdrawal from ECA in Unit Crude Oil Price

	Amount withdrawn	Output/ year[6]	Withdrawal in Unit price per barrel	Official Price	Real Benchmark Price
2013 withdrawal	US$5.1b	876m	US$5.8 per barrel	US$ 75	US$80.1

Sources: Author Calculation

There were several altercations between the executive and legislative early this year about the benchmark price the budget should be based. While the executive used US$75, the legislative insisted that a higher price between US$80 and US$85 should be used. The incessant withdrawal from the account clearly vindicates the legislative and also supports the proposition in this paper. Similarly the two previous studies on the oil price benchmark in Nigeria had also advocated a higher than the official benchmark, this further indicates that the current official oil price benchmark is sub-optimal for the current expenditure profile of the government. Without a substantial reduction in the current spending profile, the benchmark for oil price cannot be sustained at such a conservatively low price level. Though the proposed US74 seems to support the fiscal responsibility Act and to entrench fiscal discipline, the experience of Nigeria government has not shown such compliance and this has impaired significantly the management of the ECA/SWF fund. A relatively higher benchmark gives more fiscal spending flexibility and ensures that incessant withdrawal from the fund is curtailed more especially the Sovereign Wealth fund.

[6] (2.4mpd*365days in year gives output per year)

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