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The Operational Performance and Value Creation of Nigeria's National Oil Corporation (NOC)

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Abstract

This paper set out to measure the operational performance of Nigeria National Oil Company (NNPC) in economic value creation from Nigeria's endowment of hydro-carbon. To achieve this goal, the conceptual model of value creation in the hydrocarbon based on the work of Tordo, Tracy and Arfaa, (2011) was adapted. Trend, descriptive analysis and correlation analysis were carried out. In addition, regression analyses were estimated employing Autoregressive Distributed Lag Model, ARDL. The major finding of the study is that the hypothesis that the operating performance is not creating value in Nigeria's hydrocarbon sector was accepted. Thus the operating, performance of Nigeria's hydrocarbon is suboptimal. This was indicated by the negative signs of most of the current and lag of the value drivers. In addition, it is evident that save for geology most of the value driver coefficient are below the average of 50 point further buttressing suboptimal performance. Based on the summary of research findings the study recommended that there is need to provide the relevant knowledge, tools, techniques, policy framework and concepts that can be used to accurately analyze and design as well as optimize petroleum investment decisions and projects which usually cover field development and exploration projects. Policy reformers should focus on making incremental but sustainable improvements in technical and institutional capacity. In general, NOCs that are wholly owned by the state tend to have larger national missions objectives and fewer incentives to improve efficiency than partially privatized NOCs. Hence there is need to partially privatized Nigeria NOC.

Key Words: Operational performance, Value Creation, National Oil Companies (NOC)

INTRODUCTION

Crude oil and natural gas are mixtures of hydrocarbons, that is, chemical molecules that contain only hydrogen and carbon. Nigeria is endowed with significant hydrocarbon which includes about 37.070 billion barrels proven oil reserves with a daily production capacity of 1.807 million bpd and 5.111 trillion cubic feet gas reserve as at 2014 Organization of the Petroleum Exporting Countries Annual Statistical Bulletin (OPEC ASB, 2015). However, apart from its direct fiscal benefits, the strategic management of this sector has not enhanced the competitiveness of the nation's economy. Nigeria has very low level of capital accumulation despite high rents from hydro-carbon (Hamilton, Ruta and Tajibaeva, 2005). According to Adenikinju and Ajayi (2004), the utilization of the abundant endowment of hydro-carbon is not at the optimal level when compared with other economies such as Saudi Arabia, Malaysia, Norway, Brazil, United States of America and Venezuela that are also richly endowed with hydrocarbon. This is also the situation when compared with other resource rich countries like Botswana, Indonesia, Malaysia and Thailand. Nigeria with her endowment of abundance natural resources varying from Oil, Gas, Copper, Tin, Columbite, Tantalite, and Vast Arable Land and so on is making suboptimal utilization of these endowments. This results to poor growth performance, Gleb and Grassman, (2010). Various factors contribute to suboptimal utilization of hydrocarbon endowment in Nigeria. According to Garba, (2008) it is obvious that Nigeria is richly endowed with natural resources. It is a fact that Nigeria has not managed its land, oil and gas and solid mineral resources efficiently or equitably.

In spite of received wisdom from the Hartwick rule of saving at least the economic rents from extracting and selling natural resource, (Gelb and Grasmann, 2010; and Van der Ploeg, 2010), Nigeria economy gains far less from her hydrocarbon endowment at all the value chain level; exploration, extraction, production, distribution and consumption level. To optimise there is need to maximize economic gain and minimize economic lost. According to Hartwick rule, the marginal Hotelling rents on natural resources like hydrocarbon should be fully saved and reinvested in physical capital, infrastructure or education, (Van der Ploeg, 2010). The level of revenue Nigeria is getting from hydrocarbon endowment needs to be improved on, in addition, for additional consumption to be sustainable a substantial part of the revenue need to be saved and invested productively. Resource rents themselves may therefore not be the problem. The question is whether Nigeria has the complementary human and institutional capacity to manage them to avoid the pitfall of resource curse, (Garba, (2008)).

High endowment of hydrocarbon deposits needs to be complemented by optimizing the economic gain from the endowment. Transforming crude hydrocarbon deposits into economic high-value assets that can be processed into a range of marketable products which are used to develop and grow highly-competitive economies is imperative. The richest hydrocarbon endowments cannot magically translate into much-needed economic development and growth without strategic optimizing management policies. Since the Nigerian economy is heavily oil-dependent, it's obvious that Nigeria's most critical economic need is to design and implement an economics model that will best enable it to maximize both the exploitation and economic/strategic benefits of its vast hydrocarbon endowments. Clearly the relevant policy question for a country like Nigeria with abundant hydrocarbon endowment is how to make the best of it. The problem of suboptimal use of Nigerian hydrocarbon resource endowment raises the research question, what is the level of the operating performance in the Nigeria's hydrocarbon sector with respect to value creation? This is an issue that will be addressed in this

paper. The general objective of this study is to measure the operating performance and the economic value creation by Nigeria National Oil Company (NNPC) from Nigeria's endowments of hydro-carbon.

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK OF VALUE CREATION IN NOC

The performance of a NOC should be measured with reference to its objective function. However, mission and objectives vary widely among NOCs, depending on its shareholder's policy objectives. But in general they often include one or more of the following: (i) to protect national hydrocarbon wealth, which requires the NOC to maximize the recovery factor on fields and optimize resources in line with the country's depletion policy; (ii) to promote economic development, which requires the NOC to maximize its financial and productive linkages, both forward and backward; and (iii) to promote the political interests of the state abroad (Stevens 2008). In other words, the NOC's objective function is the creation of value for society.

In this context performance simply refers to economic behaviour by the NOC that is conducive to overall value creation. NOCs directly create value, either through their role as operators, or through their national mission (Stevens 2008). They can also create value indirectly, for example, as an advisor to other elements of the government and as a regulator (although this may give rise to conflict of interest). The NOC's capacity to fulfill its missions and objectives determines its contribution to value creation. To measure NOC value creation this section proposes a composite indicator: the value creation index (VCI). Stevens (2008) identifies three categories that theoretically capture NOC value creation: operational performance, financial performance, and national mission performance. This paper will focus on operational performance. Figure 3.1 shows the categories and proxy variables selected for the creation of the index.

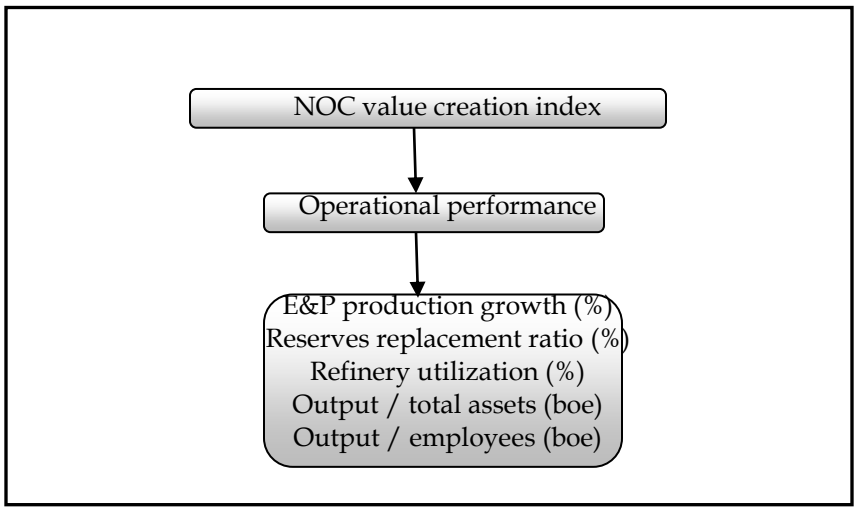

Figure 2.1 Components of the VCI
Source: Adapted from Tordo, Tracy and Arfaa, (2011)

Proxy Measures Used in Value Creation Index (VCI)

The rationale behind the selection of the proxy measures used for operation performance variables is discussed below.

Operational Performance Variables: Production growth and the reserve replacement rate (RRR), both net of acquisitions and disposals, are standard indicators of upstream effectiveness. While the exploration success rate might be considered as an additional indicator of technical and geophysical expertise, it is already partially captured by the RRR. Refinery capacity utilization is chosen to measure downstream performance. Growth in capacity utilization is considered a proxy measure of a NOC's ability to meet local demand, and to add value. NOCs without refining assets are not penalized in the data aggregation process. The ratios of output to total assets and output to employees reflect capital and labour efficiency, respectively. For the purpose of this index, output is defined as the sum of upstream production and refined products (where applicable), both expressed in millions of barrels of oil equivalent (MMBOE).

Determination of Value Creation Index (VCI)

For any given NOC, the VCI is calculated annually as the average of three sub-groups of the sub-components detailed in figure 2.1

$$I = \frac{1}{m}\sum_{i=1}^{m}\left(\frac{1}{n}\sum_{j=1}^{n}N_j\right)_i \qquad 2.1$$

Where I is the composite index, N_j is a normalized variable and j indicates the number of sub-components in each sub-group i. Normalization is necessary to aggregate the different individual indicators, which are measured on different units and have different ranges. We use the distance from the best and worst performers, where positioning is in relation to the sample annual maximum and minimum, and the index takes values between 0 (laggard) and 1 (leader):

$$N_j = \frac{X_j - X_j^{\min}}{X_j^{\max} - X_j^{\min}} \qquad 2.2$$

Where N_j is the normalized value, X_j is the original value, and X_j min and X_j max are the minimum and maximum values of the annual sample data.

The Value Drivers (VD)

The value creation model assumes that the state's historical, political, social, and economic environment (the state context) largely determines the objectives of its petroleum sector policy. The state's administrative capacity, effectiveness, quality of public policy, and accountability, and level of sector-specific knowledge affect its options with respect to sector organization and governance arrangements. As owner of the resource, the state can decide how, at what pace, and by whom they should be developed, thus defining the role of the market and the level of direct intervention through the NOC. State goals and objectives and sector policy and organization affect the strategy and corporate governance arrangements of the NOC. Finally, we expect that a country's resource endowment, distance to market, and quality of infrastructure (that is, its geology and geography) affect the state's objectives and policy choices, as well as the level of competition and performance of market participants (both NOCs and POCs). These value drivers can be grouped into five categories: geology, state context, sector organization and governance, NOC governance, and NOC strategy.

Ideally, one measure would exist for each of the theoretically-defined value drivers. Since these measures do not exist, we estimate them by using proxy variables that capture aspects that we believe to be important for each category. Table 3.1 lists the five value drivers and the proxy variables used to measure them.

Table 3.1 Value Drivers and Their Proxy Measures

Driver	Components
Geology	• resource endowment (mmboe)
State Context	• WB indexes on voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, corruption control • HC revenues as % of government revenues • HC revenues as % of GDP • WTO membership (yes-1/no-0) • OPEC membership (yes-1/no-0) • Net oil exports as % of GDP • Government budget surplus as % of GDP • Presence of stabilization mechanisms, such as petroleum funds (yes-1/no-0)
Petroleum Sector Organization and Governance	• Publicly disclosed national policy addressing hydrocarbon sector issues (yes-1/no-0) • Presence of country specific clear objectives and management separation (ordinal ranking with six categories) • Non-NOC percentage of oil and gas production • Non-NOC percentage of refined products production • Presence of clearly defined, publicly stated objectives ranked by priority and publicly measured for the NOC (ordinal ranking with five categories)
NOC Strategy and Behavior	• NOC upstream capital expenditures as % of total capital expenditures • NOC refining capital expenditures as % of total capital expenditures • NOC upstream equity production as % of total NOC refining throughput • NOC international revenues as % of total NOC revenues • Joint ventures and other partnerships, (ordinal ranking with four categories)
NOC corporate governance structure	• Percentage non-government ownership of NOC • Percentage of members of NOC Board of Directors that are independent • Appointment authority for chairman of BOD (ordinal ranking with three categories) • Independence of NOC capital and budget processes (ordinal ranking with five categories) • NOC financial transparency (ordinal ranking with five categories) • NOC upstream reserves transparency (ordinal ranking with five categories)

Source: *Adapted from Tordo, et al., (2011)*

To create a driver variable, each of its underlying proxy variables is transformed into a normalized variable and the driver variable is the result of the average of the normalized proxy variables.

Selection of Value Driver (VD) Proxy Variables

A. Geology: A question underlying this research is whether NOC operations and performance vary with a country's resource endowments. Some NOCs are based in countries that are net oil and gas exporters, while others mainly serve their home countries' energy security by reducing

import requirements. In several cases, domestic production does not satisfy consumption even though resource endowments may be substantial.
In other cases, production levels are well above local consumptions needs, whether because of exceptional endowment (as is the case for many Middle Eastern producers) or because of the level of local economic development (as for many African producers). The abundance of petroleum resources may also affect the government's depletion policy, the commercial conditions for exploitation, and the NOC's resource extraction strategy.
The size of a country's reserves base is also used as a proxy for prospectivity and of the availability of sector related infrastructure. For example, a country with large proven reserves and associated production will be more likely to have relevant sector infrastructure (although its quality would be difficult to capture by a proxy measure, (Stevens, 2008 and Wolf, 2009).

B. State Context: The state context driver comprises 13 proxy variables that aim to capture the institutional and economic environment in the home country of the NOC. We expect that stable, predictable, and efficient public policies contribute positively to the creation of value by NOCs and POCs. We also expect that the lower the stage of socioeconomic development, the more important the national mission becomes. We use the World Bank Worldwide Governance Indicators (WGI) to measure a country's political stability, institutional strength, regulatory quality, control of corruption, democracy and accountability, and rule of law. While many possible measures exist for these variables, the use of composite indicators is widely recognized.
We hypothesize that national dependency on the petroleum sector affects the government's macro-fiscal and sectoral policy focus and the objectives and goals that are given to the NOC. We use four proxy measures of dependency: petroleum revenue as a percentage of total government revenue, petroleum revenue as a percentage of gross domestic products (GDP), net oil exports as a percentage of GDP, and government budget surplus or deficit as a percentage of GDP.
Three dummy variables (World Trade Organization (WTO) membership, Organization of Petroleum Exporting Countries (OPEC) membership, and existence of revenue stabilization mechanisms) aim to capture a country's trade openness (which in turn affects the level and quality of competition, transfer of technology, and market opportunities), the presence of constraints on production levels, and the quality of fiscal policy, respectively (Stevens, 2008; Wolf, 2009 and Tordo, et al., 2011)).

C. Petroleum Sector Organization and Governance: - As the resource owner, the state has a wide range of options with respect to the implicit or explicit rules and procedures that govern the exploitation of the country's petroleum resources, including the objective of sector policy, the role of market participants, the distribution of institutional responsibilities, and the conditions for exploitation. A country's fiscal regime, regulatory compliance, regulatory uncertainty, and quality of environmental regulations all affect POCs' decisions to invest. The NOC has no choice as to whether or not to invest in its home country. Hence its ability to create value partially depends on how favourable its country's conditions are to investment. Transparency with respect to the NOC's institutional responsibilities and mission and objectives will ultimately improve the efficiency of the NOC. This is particularly true when the government pursues multiple policy objectives through the NOC. Knowing the relative importance of these objectives will allow the NOC to devise appropriate strategies, reduce administrative cost, and may reduce the perception of risk. Three proxy variables are used to assess the country's willingness to allow the NOC to operate within transparent public policies: the existence of a publicly-disclosed national policy addressing hydrocarbon sector issues; the existence of clear country-specific objectives and

management separation; and the existence of clearly defined, publicly stated, and measurable objectives for the NOC. We hypothesize that the presence of POCs or other countries' NOCs affects the performance of the domestic NOC by promoting efficiency and defraying exploration and development risk. Two proxy variables capture the openness of the petroleum production and refining markets in the NOC's country: non-NOC percentage of oil and gas production; and non-NOC percentage of refined products (Stevens, 2008; Wolf, 2009 and Tordo, et al., 2011)).

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D. NOC Strategy and Behaviour: - Like other oil companies, NOCs must make investments in capital to preserve future production capabilities. A proxy for the kind of strategic behaviour that is expected to create value is the NOC's capital expenditures as a percentage of total capital expenditures (upstream considered separately from refining capital). NOCs that are net importers of petroleum products may be more exposed to changes in economic cycles, especially when they carry the burden of subsidizing prices for domestic consumption. A measure of the NOC's self-sufficiency is upstream equity production as a percentage of total refining throughput measures NOC's self-sufficiency.

This is also an indicator for the country's security of supplies, which is often part of the national mission of the NOC. The ratio of international revenues to total revenue captures the NOC's ability to create value through access to the international markets. Another proxy for international participation is the existence of joint ventures and other partnerships, which captures the NOC's access to international best practices and technology.

E. NOC Corporate Governance: - The NOC's corporate governance structure affects the strategic options available to an NOC and therefore affects its capacity to create value. For example, the technology, competition, and management techniques in the oil industry are continually changing; successful companies are those that can anticipate changes, or rapidly adjust their strategy to accommodate them. This requires nimble decision-making processes that might not be compatible with the reality of a state-owned enterprise. We hypothesize that partially privatized NOCs may be more able to create value since they are subject to market scrutiny and are less exposed to political influence. We use the percentage of non-government ownership of the NOC and its ownership structure and organization to measure this dimension. Also, independent boards of directors are thought to be more effective in sheltering the NOC from political interference (regardless of whether or not the NOC is partially privatized), allowing it to focus on achieving its goals. The proxies for the independence of the board are the percentage of independent board members and who holds the authority to appoint the NOC's chief executive officer (Stevens, 2008; Wolf, 2009 and Tordo, et al., 2011)).

METHODOLOGY

Model Specification and Analytical Technique

This section investigates value creation through the experience of Nigeria's NOCs (i.e NNPC). Using the analytical framework developed in section 2.1 to 2.4 above, an exploratory statistical analysis of Nigeria's NOCs was attempted to determine the relevance of the value drivers identified in the value creation model. This section also discusses a preliminary attempt to statistically measure NOC value creation using the conceptual model presented in section 2.1 to 2.4. In particular, we hypothesize an explanatory relationship between the VCI and value drivers, and tested the hypotheses using data collected on Nigeria's NOCs for the period 1981 to 2016. It

was hypothesized that the five categories of value creation drivers described earlier stochastically contribute to explaining the VCI. This model can be written as:

$$y_i = \alpha + \sum_1^5 \beta_i x_i + \varepsilon_i \qquad 3.3$$

Where y_i is the VCI, the x_i is the value driver group indices, the β_i are the coefficients for each value driver group index, α is an intercept, and ε_i is a well-behaved stochastic disturbance associated with each observation. The VCI and the value drivers were calculated annually for a fourty-six-year period inclusive starting from 1981 to 2016.
Explicitly, the model estimated using robust standard errors is:

$$VCI_t = \alpha + \beta_1 geo\log y_t + \beta_2 state_t + \beta_3 pet\sec_t + \beta_4 nocsb_t + \beta_5 nocgov_t + \varepsilon_t \qquad 3.4$$

A priori **Expectations**

The geology value driver is expected to have a positive influence on value creation. Larger petroleum endowments should lead to more value creation if resources are extracted efficiently and revenues from its sale are re-invested to support production levels and replace reserves. The petroleum sector value driver is also expected to have positive sign. We expected that more favourable investment environments would improve NOC value creation directly, through better investment conditions, and indirectly through risk sharing with POCs. Furthermore competition from POCs should improve NOC value creation by inducing them to become more efficient. But this effect is indirect and depends on whether or not the government uses efficiency benchmarks to measure and reward the performance of its NOC. The NOC governance value driver is also positive. This would indicate the benefit of market discipline to value creation through financial transparency and private participation in the NOC's share capital. This will be in line with existing studies on the effect of commercialization on NOC's performance ((Aivazian, Ge, and Qui, 2005). In addition, independent board of directors (BODs) is expected to help to shelter the NOC from political interference and expedite decision-making processes. These in turn should improve the NOC's project efficiency, its ability to fulfill obligations in partnerships, its capacity to raise capital in the open market, and its ability to make efficient use of assets and employees. The state context and the NOC strategy and behavior drivers are also expected to be positively signed.

Data Sources

Secondary data was used in the study. This include annual time series data from CBN publications which among others includes; CBN Statistical Bulletin, CBN Annual Reports and Statement of Account. Data from NNPC publications was also employed. Also employed are data from National Bureau of Statistic (NBS) i.e. former Federal Office of Statistic (FOS), others are OPEC ASB, World Bank and IMF publications, BP Statistical Review, Word Development Indicator (WDI) and relevant data from previous studies.

RESULTS AND DISCUSSION

Operational Performance Model estimation is as shown in table 4.1

Table 4.1: The Results of Model Estimations

Dependent Variable: OP
Method: ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
OP(-1)	-0.270429	0.207614	-1.302560	0.2083
GEOLOGY	1.208506	0.198300	6.094316	0.0000
GEOLOGY(-1)	-1.358537	0.478180	-2.841057	0.0104
GEOLOGY(-2)	0.001117	0.514193	0.002172	0.9983
GEOLOGY(-3)	-0.661392	0.210792	-3.137653	0.0054
STATE	0.179819	0.112118	1.603831	0.1252
PETSEC	1.756999	0.760482	2.310376	0.0323
PETSEC(-1)	-0.557121	0.600183	-0.928252	0.3649
PETSEC(-2)	-0.503480	0.571641	-0.880762	0.3895
PETSEC(-3)	-2.320357	1.129210	-2.054850	0.0539
NOCSB	1.463675	0.547917	2.671345	0.0151
NOCSB(-1)	0.348331	0.162475	2.143906	0.0452
NOCGOV	-4.075083	1.497021	-2.722128	0.0135
C	0.752039	0.224504	3.349774	0.0034

R-squared	0.962036	Mean dependent var	0.378485
Adjusted R-squared	0.936060	S.D. dependent var	0.172647
S.E. of regression	0.043656	Akaike info criterion	-3.128527
Sum squared resid	0.036211	Schwarz criterion	-2.493645
Log likelihood	65.62070	Hannan-Quinn criter.	-2.914909
F-statistic	37.03604	Durbin-Watson stat	2.052323
Prob(F-statistic)	0.000000		

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

Source: Computed by the Researcher (2018) employing E-Views 9

The result above shows that the one period lag of operational performance index OPI(-1) has a significant and positive influence on operational performance index (OPI). The result also shows that there are significant effects of the lags of some of the value drivers' variables on value creation index (OPI). There is a significant effect of the current, first, and third lag of geology driver on operational performance index, implying that the current geology driver would still affect the OPI in the next three year. The current geology value driver and the first and third lag of geology all have a significant and negative influence on value creation. The negative influence indicates that positive variation of the geology driver would not be reflected by an increase in production or positive variation of the OPI. Larger hydrocarbon endowments should lead to more value creation if resources are extracted efficiently and revenues from its sale are re-invested to support production levels and replace reserves. The negative coefficient suggests that Nigeria NOC with it large resource endowments also have less incentive to produce them efficiently and to maximize the net present value from their extraction, especially based on the

country production sharing contract arrangement. In Nigeria's situation, domestic production does not satisfy consumption even though resource endowments are substantial.

The current state context drivers have a positive influence on operational performance value creation but it is not significant. Probably Nigeria membership of Organization of Petroleum Exporting Countries (OPEC) which in turn affects the quota level and quality of competition, and market opportunities, the presence of constraints on production level drive the positive influence of state context driver based on the data for this study. Nonetheless, considering some other measure of state context driver the result would have been negative for Nigeria. These other measures of state context driver includes: petroleum revenue as a percentage of total government revenue, petroleum revenue as a percentage of gross domestic products (GDP), net oil exports as a percentage of GDP, and government budget surplus or deficit as a percentage of GDP. The country's political stability, institutional strength, regulatory quality, control of corruption, democracy and accountability, and rule of law measured by the World Bank Worldwide Governance Indicators (WGI) all also have negative influence on value creation index in Nigeria. The current petroleum sector value driver is significant. But contrary to expectations, its coefficient is negative. The one time lag and two time lag of petroleum sector value driver are also both contrary to the a priori expectation of positive relationship between Petsec and VCI and they are in addition not significant. It is expected that more favourable investment environments would improve Nigeria's NOC value creation directly, through better investment conditions, and indirectly through risk sharing with IOCs. Furthermore competition from IOCs should improve NNPC value creation by inducing them to become more efficient. But this effect is indirect and depends on whether or not the government uses efficiency benchmarks to measure and reward the performance of its NOC. The ARDL model is designed to capture the time lag between changes in sector governance measures and their effect on value creation; hence a negative relationship does seem to be justified.

The current, one, two, and three period lags of NOC strategy and behaviour driver though are all significant, they have both positive and negative sign. The negative sign is contrary to the a priori expectation. Like other oil companies, NOCs must make investments in capital to preserve future production capabilities. A proxy for the kind of strategic behaviour that is expected to create value is the NOC's capital expenditures as a percentage of total capital expenditures. Nigeria's NOC that is a net importers of refined petroleum products is more exposed to changes in economic cycles, especially when they carry the burden of subsidizing prices for domestic consumption. This action generated a lot of corrupt practices through the subsidies scams. In addition, there is lack of independent board of directors (BODs) that are expected to help to shelter the NNPC from political interference and expedite decision-making processes. These in turn could not improve the NNPC project efficiency, its ability to fulfill obligations in partnerships, its capacity to raise capital in the open market, and its ability to make efficient use of assets and employees are all absent The NOC's corporate governance structure affects the strategic options available to an NOC and therefore affects its capacity to create value. For example, the technology, competition, and management techniques in the oil industry are continually changing; successful companies are those that can anticipate changes, or rapidly adjust their strategy to accommodate them. This requires nimble decision-making processes that might not be compatible with the reality of Nigeria's state-owned enterprise. Hence, the negative influence of NOCgov on Nigeria's NOC value creation. The ability of the NOC to finance its operations is crucial to value creation. But NNPC is given too little financial and budgetary

autonomy from the state, this likely hamper its efficiency and increase the cost of doing business. In addition, financial transparency and regular audits that allow the state to secure its interests (that is, avoid rent absorption) without excessively reducing the autonomy of the NOC is missing in NNPC.

It is also evident from the regression result that the R^2 of 0.962036 mean that the model is a "good fit" as 96.20 percent variation in the dependent variable (OPI) is explained by the explanatory variables, leaving the remaining 3.80 percent to other variables not captured by the model. In addition the F-statistics and F-statistic probability of 37.03604 and 0.000000 respectively indicate that overall, the regressors are statistically significant at one percent level of significance. In addition, the D-W statistic of 2.052323 is plausible indicating that there is no serial correlation since the value is in the neighbourhood of two.

CONCLUSION AND RECOMMENDATIONS

Stevens (2008) identifies three categories that theoretically capture NOC value creation: operational performance, financial performance, and national mission performance. This paper considered the operational performance in value creation of NNPC. The hypothesis that the operating performance is not creating value in Nigeria's hydrocarbon sector was accepted. Thus the operating performance of Nigeria's hydrocarbon is suboptimal. This was indicated by the negative signs of most of the current and lag of the value drivers. In addition, it is evident that save for geology most of the value driver coefficient are below the average of 50 point further buttressing suboptimal performance. On the basis of the findings, the study therefore concludes that generally, the implication of the failure along value chain has resulted in the depletion of Nigeria's resource wealth without a significant increase in the majority of its citizens' welfare. A large proportion of the value of extraction should have been invested in assets to support sustainable development such as infrastructure, education and health so as to meet up with the Hartwick's rule of resource extraction. Based on the summary of research findings and the above conclusion, the following recommendations were put forward for implementation to optimise the economic value from Nigeria's endowment of hydro-carbon:

- There is need to provide the relevant knowledge, tools, techniques, policy framework and concepts that can be used to accurately analyze and design as well as optimize petroleum investment decisions and projects which usually cover field development and exploration projects.
- In general, NOCs that are wholly owned by the state tend to have larger national missions objectives and fewer incentives to improve efficiency than partially privatized NOCs. Hence there is need to partially privatized Nigeria NOC.

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Appendix I
Data Presentation: Normalized indexes

Year	OP	GEOLOGY	STATE	PETSEC	NOCSB	NOCGOV
1981	0.58	0	0.5509	0.4306	0.3333	0
1982	0.64	0.0363	0.5128	0.4187	0.3333	0
1983	0.52	0.0302	0.5609	0.421	0.3333	0
1984	0.58	0.0303	0.6226	0.4215	0.3333	0
1985	0.59	0.0273	0.6195	0.4241	0.3333	0
1986	0.72	0.1546	0.4836	0.4109	0.3333	0
1987	0.5	0.1537	0.5804	0.4055	0.3333	0
1988	0.6	0.1631	0.5184	0.4074	0.3333	0
1989	0.62	0.2096	0.5674	0.412	0.3333	0
1990	0.51	0.2335	0.5848	0.4183	0.3333	0
1991	0.76	0.3668	0.5937	0.4192	0.3333	0
1992	0.51	0.4286	0.6509	0.4201	0.3333	0
1993	0.44	0.4243	0.6257	0.4183	0.3333	0
1994	0.3	0.3939	0.6287	0.424	0.3333	0
1995	0.41	0.3936	0.7336	0.422	0.3333	0
1996	0.37	0.3938	0.6577	0.4069	0.3333	0
1997	0.35	0.3948	0.7233	0.4062	0.3333	0
1998	0.31	0.4333	0.4932	0.4005	0.3333	0
1999	0.49	0.5682	0.6555	0.3887	0.3333	0
2000	0.33	0.6458	0.6024	0.3636	0.6667	0.125
2001	0.56	0.7666	0.7248	0.3512	0.6667	0.125
2002	0.46	0.8731	0.5442	0.411	0.6667	0.125
2003	0.25	0.8995	0.619	0.3378	0.6667	0.125
2004	0.25	0.9351	0.6671	0.3205	0.6667	0.125
2005	0.3	0.9322	0.6927	0.332	0.8333	0.1283
2006	0.24	0.9597	0.6613	0.3126	0.6667	0.1283
2007	0.19	0.9708	0.5036	0.3144	0.6667	0.1283
2008	0.17	0.9708	0.5783	0.2997	0.6667	0.1283
2009	0.15	0.9708	0.4056	0.2933	0.6667	0.1283
2010	0.15	0.9471	0.4307	0.2882	0.6667	0.1283
2011	0.28	0.9528	0.6561	0.2843	0.6667	0.1283
2012	0.2	0.9469	0.6585	0.2917	0.6667	0.1283
2013	0.21	0.944	0.5925	0.2796	0.6667	0.1283
2014	0.21	0.9802	0.587	0.2654	0.6667	0.1283
2015	0.25	0.967	0.514	0.2644	0.6667	0.1283
2016	0.23	1	0.5137	0.2639	0.6667	0.1283

Sources: the raw data used for the normalized indexes were obtained from CBN Statistical Bulletin, CBN Annual Reports and Statement of Account various issues. NNPC Annual statistical bulletin various issues National Bureau of Statistic (NBS) and OPEC Annual Statistical Bulletin various issues.