ECONOMIC IMPLICATIONS OF OIL AND GAS SUPPLY INFRASTRUCTURE DISRUPTION IN NIGERIA

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Overview

In May 2015, Crude oil and gas supply disruptions in Nigeria reached 750,000 barrels per day (b/d), the highest level since at least January 2009. The increased disruptions come as a result of incessant attacks on oil and natural gas infrastructure in the West African region. Nigeria's crude oil production disruptions are concentrated in the Niger Delta region, an oil-rich area bordering the Gulf of Guinea that is the mainstay of the country's crude oil production. Nigeria's oil production averaged 1.9 million b/d in 2015. By May 2016, Nigerian oil production had fallen to 1.4 million b/d, nearly a 30-year low. These supply disruption had attendant negative consequences on Nigeria, as petroleum have remained the major source of foreign revenue earner for the country. This situation was worsened by the low price of crude in the international market. The role of adequate and reliable energy supply infrastructure in economic development cannot be overemphasized. Hence, several studies have been conducted in this area. While studies had been conducted on events that caused supply disruptions in other Continents, and their economic impact, none of these studies assessed the economic implication of such supply disruption. This research gap informed the basis for this study.

Methods

The model adopted here assumes that monthly oil and gas revenue is linearly dependent on the value lost due to supply disruptions within the previous month. Thus, the model will consist of the equation below:

$$C_t = a + bY_{t-1} + e_t \ldots\ldots\ldots\ldots1$$

Where
C_t is revenue generated from oil and gas production in month 't',
Y_{t-1} is the value lost due to supply disruptions during the previous month,
'e_t' is an error term
The objective of the chosen econometric model is to obtain estimates of the independent parameters 'a' and 'b'; such that when these estimated parameter values are used in the model's equation, they enable predictions of future implications on the economy to be made based on past trend at different scenarios. Data for this study was obtained from NNPC (PPMC, PPPRA), Central Bank and the Nigerian Bureau of Statistics (NBS). Interest rate, inflation rate, exchange rate and foreign direct investment will constitute the dependent variables for which, we investigate their response to pipeline products transport disruption. To achieve this, we shall use the monthly gas, oil and products (Gasoline, Diesel and Kerosene) flow rates to assess the level of products supply disruption, against the expected rates.
The specifications which captures the response of the macroeconomic variables above to oil, gas and products flow is shown below:

Assumptions
$V_C = \sum (\text{Expected Volume} - \text{Actual Volume})*\text{Price}$
$V_G = \sum (\text{Expected Volume} - \text{Actual Volume})*\text{Price}$
$V_K = \sum (\text{Expected Volume} - \text{Actual Volume})*\text{Price}$
$V_D = \sum (\text{Expected Volume} - \text{Actual Volume})*\text{Price}$
$V_P = \sum (\text{Expected Volume} - \text{Actual Volume})*\text{Price}$

Specifications

$$INR_t = \alpha_1 + \beta_1 V_{Ct} + \varnothing_1 V_{Gt} + \lambda_1 V_{Kt} + \Omega_1 V_{Dt} + \psi_1 V_{Pt} + \mathcal{E}_t \dots\dots\dots2$$
$$EXR_t = \alpha_2 + \beta_2 V_{Ct} + \varnothing_2 V_{Gt} + \lambda_2 V_{Kt} + \Omega_2 V_{Dt} + \psi_2 V_{Pt} + \mathcal{E}_t \dots\dots\dots3$$
$$FDI_t = \alpha_3 + \beta_3 V_{Ct} + \varnothing_3 V_{Gt} + \lambda_3 V_{Kt} + \Omega_3 V_{Dt} + \psi_3 V_{Pt} + \mathcal{E}_t \dots\dots\dots4$$
$$INF_t = \alpha_3 + \beta_3 V_{Ct} + \varnothing_3 V_{Gt} + \lambda_3 V_{Kt} + \Omega_3 V_{Dt} + \psi_3 V_{Pt} + \mathcal{E}_t \dots\dots\dots5$$

Where VC, VG, VK, VD and VP represents quantitative losses associated with disruption of crude oil, gas, kerosene, diesel and petrol supply respectively, while INR, EXR, FDI and INF represents interest rate, exchange rate, foreign direct investment and inflation rate respectively.

α, β, $\varnothing$, V, λ, Ω, and ψ are parameter estimates.

$\mathcal{E}_t$ is the error term for the various models and t indicates times series.

The losses for each of the parameters are the difference between flow rates (expected volume of product delivery and the actual product delivered, within the period under review.

Results

This research, on completion, is expected to generate information on the basis of which, the economic impact of oil and gas transportation infrastructure disruption on the Nigerian economy, based on the indicators chosen in this study can be quantified

Conclusions

The result of this study, which is expected to be due before the presentation, will furnish quantitative information on how oil, gas and products transportation infrastructure disruption impacts Nigerian economy. This will help to influence decisions regarding security of oil and gas pipeline infrastructure in the country.

References

Crawley, F.K., Lines, I.G. and Matter, J. (2003). Oil and Gas Pipeline Failure Modeling.
    Trans IchemE, vol 81, Part B, 2003.
Oyedeko, K. F. K. and Balogun, H. A. (2015). Modeling and Simulation of Leak Detection for Oil and Gas Pipelines via Transient Model: A Case Study of the Niger Delta.
    Journal of Energy Technology and Policy, Vol. 5, No. 1, 2015, 16-27.
Pavel, P. Vytis, K. and Marcelo, M.(2015). Probabilistic Modeling of Security of Supply in gas Networks and Evaluation of New Infrastructure.
    Reliability Engineering and System Safety, 144(2015), 254-264
Shittu, W. Yahaya, S. and Gadiga, B.(2015). Modeling of Potential Pipeline Impact Radius and High Consequence Area in a Wetland Sub-region of Nigeria.
    Journal of Geographic Information System, 2015, 7, 692-905.
Theresa, B.(2004). Multiple Modeling Approach and Insights for critical Infrastructure Protection. National Infrastructure Security and Analysis Center, Sandia national Laboratories, Albuquerque, New Mexico, USA.