Modeling the Demand-Supply Mismatch and Price Optimization of Natural Gas in Nigeria

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ABSTRACT

Natural gas usage in Nigeria is increasing and capturing a higher percentage of the country's energy mix. However, the demand is ever-increasing while supply is not able to feed domestic demand. The federal government has devised several strategies, policies, and regulations to ensure the market runs smoothly, but the lack of gas supply infrastructure and low gas prices among other factors remained a major issue. This study analyzes the demand-supply dynamics and price optimization of natural gas in Nigeria using the 2SLS. The study utilizes historical data and mathematical modeling techniques to identify the factors influencing the market, quantify the supply-demand mismatch, and develop an optimized pricing strategy. The research provides insights into the Nigerian natural gas market, offering policy recommendations to address the imbalance and optimize prices. The findings of this study contribute to a better understanding of the challenges and opportunities in the natural gas sector in Nigeria.

Keywords: Natural gas; Demand-supply; Mis-match; Price optimization; 2SLS.

INTRODUCTION

The availability and efficient utilization of energy resources are critical factors that drive economic growth and development in any nation (Khan et al., 2021). Nigeria has witnessed an increasing demand for natural gas due to its diverse applications, including power generation, industrial processes, and domestic consumption (Adeyemi-Kayode et al., 2022). However, the existing infrastructure and supply capabilities often struggle to meet this growing demand, resulting in a demand-supply mismatch (Meza et al., 2021). For instance, the Gas Based Industries (GBIs), which form the bulk of the country's strategic industrial sector, do find it difficult to access gas due to the lack of transmission pipelines, especially in the northern region of the country (Adamu & Darma, 2017). Therefore, depriving most of the Northern region which has approximately 66 projected gas-consuming industries (Adegun et al., 2022).

Additionally, when burned for energy generation, natural gas emits lower levels of carbon dioxide and other pollutants than oil (Munsif et al., 2021). For this reason, the Nigerian government, in its commitment to environmental sustainability, intended to use gas as a transition fuel for power generation, transportation, cooking as well as industry (Okoh & Okpanachi, 2023). Unfortunately, most of the electricity generation companies that relied on gas are continually besieged with various challenges, especially gas pipeline vandalization which are major means of transporting gas (Adam, 2018). This has caused the ongoing epileptic performance of the power stations and also resulted in a mismatch between the demand and supply of electricity, with serious economic implications for all sectors of the economy (Okediran, 2018; Ajiya, 2022). In the case of Nigeria, a country rich in natural gas reserves, understanding and effectively managing the demand-supply mismatch and price fluctuations of natural gas is crucial for sustainable economic

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development and energy security (Amuda et at., 2023).

Furthermore, the fluctuating price of natural gas has significant implications for both consumers and producers. Unpredictable price patterns can hinder investment in exploration and production, limiting the development of Nigeria's natural gas resources (Graham, & Ovadia, 2019). Conversely, excessive price volatility can affect consumers' ability to access affordable energy, impacting their economic well-being and quality of life (Occhiali & Falchetta, 2018). By optimizing price mechanisms, this study aims to strike a balance that benefits both producers and consumers, ensuring a balance between affordability for consumers and profitability for producers.

Similar studies have been done on domestic gas utilization in Nigeria (see, for example, Gabriel et al., 2012; Adamu & Darma, 2016; Adamu, 2016 and Onolemhemhen et al, 2017) but none of them, to the best of our knowledge, has dwelled on the demand and supply model in the Nigerian gas market. This study, therefore, seeks to address natural gas demand-supply mismatch in Nigeria, and also identify an optimal price that will clear the market. The paper is divided into five sections (5). The first part provides a brief background of the study, the second part entails an overview of the natural gas market in Nigeria, theoretical framework, and empirical literature. The third part presents the methodology while the fourth part consists of analysis and lastly the conclusion and recommendation.

LITERATURE REVIEW

Overview of the Natural Gas Market in Nigeria

The natural gas market in Nigeria has gained significant attention due to the country's abundant reserves and its potential to contribute to economic growth and development (Mustapha & Fagge, 2015). Nigeria has the largest natural gas reserves in Africa and the ninth-largest in the world, with an estimated 206.5 trillion cubic feet (tcf) of proven reserves (Energy Information Administration, 2021). Over the last decade, Nigeria produces an average of 2.53 tcf[1] of natural gas per year and consumes an average of 649 billion cubic feet (bcf)[2]. The country exports[3] most of its natural gas as liquefied natural gas (LNG), with France, Spain, China, and India being the top importers (EIA, 2023). Nigeria's domestic natural gas market is underdeveloped, with only a small fraction of the country's gas reserves being utilized (Rui et al., 2018).The government has set ambitious goals for the development of the domestic gas market, with plans to increase gas usage in the power sector, transportation sector, and industrial sector (Adewuyi et al., 2020).

However, the development of the domestic gas market faces several challenges, including inadequate infrastructure which results in gas flaring, regulatory uncertainty, and security concerns (Abu et al., 2023). The issue of gas flaring, the burning of associated gas during oil extraction, has been a persistent problem in Nigeria. Studies indicate that gas flaring not only contributes to environmental pollution but also represents a significant loss of potential revenue and natural gas resources (Anyadiegwu et al., 2020). Addressing this challenge is crucial to increasing natural gas availability for commercial use. Similarly, the availability and adequacy of infrastructure for natural gas transportation, processing, and distribution pose significant limitations to the market's growth. The lack of well-developed pipelines and storage facilities inhibits the efficient movement of natural gas across the country. This results in supply constraints and hampers the realization of the sector's full potential (Enete et al., 2018). Enhancing infrastructure investments anddevelopment is essential to unlock the value of Nigeria's natural gas reserves.

The policy and regulatory frameworks governing the Nigerian natural gas market have implications for its growth and attractiveness to investors. The Nigerian Gas Master Plan (NGMP) was established in 2008 to address policy issues and encourage private-sector participation in the gas sector. However, there have been criticisms regarding the implementation and effectiveness of the plan (Ebele & Amadi, 2017). A robust and transparent regulatory framework, combined with consistent policy implementation, is necessary to

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attract investments and ensure market efficiency. Moreover, as an abundant domestic resource, natural gas can enhance energy security and reduce dependence on imported energy sources (Olayiwola et al., 2019). Therefore, the development and optimization of the natural gas market are critical to achieving sustainable energy goals.

Empirical Literature Review

The Nigerian natural gas market has been the subject of extensive research due to its significant reserves and potential for economic development. In their study, Adenikinju and Olumuyiwa (2017) analyze the factors affecting natural gas demand in Nigeria. They highlight the importance of the power sector as the main driver of demand, along with industrial consumption and liquefied natural gas (LNG) exports. Understanding these demand factors is crucial for modeling the demand-supply dynamics accurately. Demand-supply analysis provides insights into the dynamics of a market and helps identify factors contributing to mismatches (Marcato & Nanda, 2021). In their research on energy demand in Nigeria, Ayodele and Adeleye (2018) emphasize the need to consider population growth, economic activities, and energy policies in analyzing the natural gas demand-supply balance. They stress the importance of incorporating macroeconomic variables and sector-specific factors to enhance the accuracy of demand-supply models. Similarly, effective pricing strategies play a vital role in optimizing the natural gas market (Nagle & Muller, 2018). In the context of Nigeria, Agbonlahor and Ugwoke (2019) examine the impact of gas pricing on the country's economic growth. They emphasize the need for transparent and market-driven pricing mechanisms that balance the interests of consumers and producers. Their study underscores the significance of pricing reforms in stimulating investment and improving the efficiency of natural gas utilization.

To the best of our knowledge, empirical studies on natural gas demand and supply mismatch are rarely found in most developing countries, particularly in Nigeria. Therefore, this makes this work a Nobel study as no study of this sort has been found to precede it. Perhaps this could be because most developing countries, especially in Africa do not utilize the resource due to the poor market structure or appropriate pricing mechanism (Adams et al., 2019). However, some studies have investigated the demand for gas, the supply of gas, and sometimes the demand and supply nexus. For instance, Ishwaran (2017) used the computable general equilibrium model to analyze medium to long-term natural gas demand and supply in China.

Several studies have focused on demand-supply mismatch and price optimization in the natural gas sector, providing valuable insights applicable to Nigeria. For instance, a study by Zhang and Qi (2019) investigates the demand-supply dynamics of natural gas in China. The research utilizes an econometric model to analyze the factors influencing demand and supply, allowing for accurate forecasting and policy recommendations. Such models can be adapted to the Nigerian context to address the demand-supply mismatch effectively. Furthermore, Chien and Hu (2016) conduct a study on natural gas pricing and optimization in Taiwan. They propose a stochastic programming model that optimizes the natural gas price and volume allocation across different sectors. Their research highlights the importance of considering both demand and supply uncertainties when optimizing natural gas prices, ensuring efficient resource allocation.

Another relevant study by Carattini et al. (2018) explores the impact of price volatility on energy demand and efficiency. Although their research focuses on the European Union, the findings can apply to the Nigerian natural gas market. The study highlights the need to manage price volatility to encourage investment and ensure long-term sustainability. While there is existing literature on the Nigerian natural gas market, demand-supply analysis, and pricing strategies, there is a research gap concerning the modeling of demand-supply mismatch and price optimization specifically in Nigeria. This study aims to address this gap by developing a comprehensive model that captures the complexities of the Nigerian natural gas market and optimizes pricing mechanisms. By integrating insights from previous studies and adapting existing models,

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this research seeks to contribute to the understanding and management of the demand-supply dynamics and price optimization in Nigeria's natural gas sector.

THEORETICAL FRAMEWORK

Some studies have shown energy is a fundamental part of the production function. For instance, (Ayres, Bergh, Lindenberger, & Warr, 2013) and (Vlahinic & Zikovic, 2010) found that energy is as important as labor or capital in economic growth. Hence, labor and capital cannot be dissociated from energy use. In another related study, (Stern & Cleveland, 2004) and (Provoski, 2003) established a relationship between energy and economic growth and concluded that energy plays a very vital role in economic growth.

This study focuses on addressing the mismatch in natural gas demand-supply in Nigeria. Therefore, the construction of a hybrid model which involves formulating a new production model with the inclusion of natural gas demand in Nigeria becomes imperative. According to (Mahmood & Ayaz, 2018) the production function has many benefits. It explains the structure of growth by stating the peripheral sources of energy since the (Solow, 1994) model can be used to show the endogenous segment of innovative advancement as a necessary part of the hypothesis of economic development. Thus, the hybrid function has factors of production: capital, labor, and energy (natural gas). Capital and labor are predictable, while natural gas explains productivity growth:

$$Y = F(K, L, E) \qquad 1$$

The overall effect of natural gas consumption on the GDP growth of Nigeria based on the hybrid new production function is premised on microeconomics principles of supply and demand equilibrium with the following assumptions; firstly, equilibrium is always attained in the natural gas market. Thus, structural models that include dynamic equations of supply and demand for natural gas and assume equilibrium at the market price of natural gas are employed; secondly, endogenous variables are influenced by all macroeconomic exogenous variables; the price of natural gas and its quantity are assumed to grow over time at a constant rate; finally, we regard an increase in the quantity of natural gas due to natural gas utilization as a positive quantity shock to our model.

METHODOLOGY

This study utilizes secondary data for its analysis. Using two stages least square (2SLS) estimate, a simultaneous equation modeling will be used to solve the hybrid demand-supply model earlier identified, to address the supply-demand mismatch existing in the Nigerian gas industry, after which an equilibrium price will be established to bridge the mismatch. The study will cover 2001 to 2017, using quarterly data which translates to sixty-eight quarters (68). The rationale for choosing this period was due to information gathered from the Nigerian gas master plan and also data availability which is expected to provide new insights into natural gas domestic consumption.

The hybrid model was built to address the supply-demand mismatch by identifying an equilibrium price, where demand and supply equates. Studies done on energy demand, especially utilizing natural gas domestically, have employed the use of demand-supply models in addressing problems relating to excess demand over short supply. In the work of Zhou (2015), a dynamic demand-supply model of the natural gas sector was designed and estimated; the cumulative economic impact of LNG utilization in New Brunswick.

Although the study was concerned with how to increase the supply of natural gas to basically residential, commercial, industrial, and transportation sectors in a particular province; it suggests both a micro and macroeconomic logic to attaining an equilibrium position.

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This study, therefore, follows the Zhou (2015) hybrid model which is instructive and relevant to the work since it captures fundamental endogenous variables that describe a demand-supply model for natural gas demand in Nigeria. The model is given as:

$$Q^d = F\,(P, OILP, CPI, GDP, POP, WAGER, \varepsilon_1) \quad 2$$

$$Q^S = F\,(P, OILP, CPI, GDP, POP, WAGER, \varepsilon_2) \quad 3$$

Where Q_d is the quantity demanded

Q_S is quantity supplied

P is price

$\in_1$ and $\in_2$ are error terms.

And OILP is the oil price, CPI represents the consumer price index, GDP denotes gross domestic product, POP stands for population, and WAGER is wage rates which is a predetermined variable.

The demand-supply framework is a hybrid model that shows the link between the demand for Total Gas Utilization as a proxy for quantity demanded and Total Gas Production as a proxy for quantity supplied.

$$LTGU = f\left(LNGP, LLNG, LCPI, LCOP, L\frac{Y}{GDP}, LTGU\right) \quad 4$$

$$LTGP = f\left(LTGP, LNGP, LLNG, LGDP, L\frac{Y}{GDP}\right) \quad 5$$

Where (LTGU) is Log of Total Gas Utilized used as a proxy for the quantity of natural gas demanded, (LTGP) is Log of Total Gas Produced and is used as a proxy for the quantity of natural gas supplied, (LNGP) is the Log of Natural Gas Price, Log of Liquefied Natural Gas (LLNG) used as a proxy for exports, Log of Total Gas Produced (LTGP), Log of consumer price index (LCPI), Log of Crude Oil Price (LCOP), Log of Liquefied Natural Gas (LLNG), Log of Gross Domestic Product (LGDP), and Log of per capita income (LY/GDP). The variables have been logged and simulated into a structural model as follows:

$$LTGU_t = \alpha_0 + \alpha_1 LNGP_t + \alpha_2 LLNG_t + \alpha_3 LCPI_t + \alpha_4 LCOP_t + \alpha_5 L\frac{Y}{GDP}t + \alpha_6 LTGU_t + \varepsilon_{t1} \quad 6$$

$$LTGP_t = \beta_0 + \beta_1 LTGP_t + \beta_2 LNGP_t + \beta_3 LLNG_t + \beta_4 LGDP_t + \beta_5 L\frac{Y}{GDP}t + \varepsilon_{t2} \quad 7$$

The Hybrid demand-supply model will be estimated using the two-staged least squares. The two staged least squares (2SLS) was developed by Henri Theil (1953) and Robert Basmann (1957). It is an extension of the OLS, which is useful when there are feedback loops in a model and is also required when dependent

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variable's error terms are correlated with the independent variables. The 2SLS includes four types of variables, the dependent variable, exogenous variable, endogenous variable and instrumental variable. This procedure basically purifies the stochastic explanatory variable of the influence of the stochastic disturbance term (Gujarati & Portet, 2009).

Data on natural gas demand was sought from NNPC ASB 2017 1st edition and price of natural gas was sought from World Bank Commodity Price Data. Data on GDP population was sourced from World Development Indicators website. Also, data on gas flared and gas utilized by the three different strategic sectors (domestic, commercial and export) were sought from Oil and Gas Industry Annual Reports (NOGIAR) 2017 – Department of Petroleum Resources. Total Natural gas produced, crude oil produced, crude oil price, consumer price index (CPI), and investment (local and foreign) were sought from Open Data for Africa Portal, sources from world development indicators and OPEC ASB 2018.

DATA PRESENTATATION AND RESULT DISCUSSION

The demand-supply model was estimated using the 2SLS. The estimated models were identified based on the J-Statistics which also showed the appropriateness of the instruments used for the estimation. Also, the instrument rank which is positive and greater than 2 confirms that the model is identified. This is done using the General-to-Specific Modelling (Campos, Ericsson, & Hendry, 2005), where the least significant variables were dropped off the model because the model presented problems of serial correlation, autocorrelation, and heteroskedasticity (see Nkwatoh, 2016; Egbichi et al., 2018). Also, lagged dependent variables were included in the model to remedy the estimated models from serial correlation. This approach is known as the Cochrane-Orcutt Method (Cochrane & Orcutt, 1949).

Demand Model (Total Gas Utilization)

Table 1: Total Gas Utilisation (Gas Demand) Model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.862841	0.867439	2.147518	0.0359
LNGP	0.053379	0.032518	1.641552	0.1061
LNG	0.463651	0.058970	7.862525	0.0000
CPI	0.266495	0.147483	1.806950	0.0760
LCOP	-0.095566	0.040166	-2.379297	0.0207
YGDP	-0.166300	0.144740	-1.148954	0.2553
TGU (-3)	0.407183	0.109017	3.735036	0.0004
R-squared = 09669; F-statistic = 286.246; J-statistic = 10.817; Prob(J-statistic) = 0.0048; Instrument rank = 9				

Source: Author's computations using Eviews 9.0

Table 1 displays the Gas Demand Model with an R2 value of 0.966, indicating that about 97% of explanatory variables account for changes in Total Gas Utilization (TGU). The J-Statistics value of 10.82 and the instrument rank (9) which is greater than 2 confirms appropriate instrumental variables for the model. Regarding specific relationships, the model suggests an insignificant positive relationship between Natural Gas Price (NGP) and TGU, implying that a percentage increase in NGP leads to only 5.3% increase in TGU, contrary to a priori expectations. Nevertheless, the nature of demand for natural gas is inelastic,

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implying that quantity demanded gas is positively related to the price of gas (Burns, 2021). And because the price of gas in the market is regulated by the government, when the demand for gas increases the pricing system shifts from either the cost of supply pricing or netback to a market-led pricing system as pointed out by Fritsch and Poudineh (2016).

The model also indicates a positive and significant relationship between Liquefied Natural Gas (LNG) and TGU, implying that a percentage change in LNG leads to an approximately 46.4% increase in TGU, aligning with a prior expectation. This implies that utilizing gas for LNG production increases the total amount of gas being used in the economy and is improving economic growth, especially in revenue generation, job creation, and reduction of gas flaring. Additionally, there is an unexpected positive but insignificant relationship between Consumer Price Index (CPI) and TGU, possibly due to peculiarities in the Nigerian context. The model demonstrates a negative and significant relationship between Crude Oil Price (COP) and TGU, as well as a negative and insignificant relationship between Per Capita Income (Y/GDP) and TGU, both of which conform to a priori expectations. Notably, there is a positive and significant relationship between TGU and itself, indicating that increasing gas utilization leads to increased demand for natural gas, in line with prior expectations.

Supply Model (Total Gas Production)

Table 2: Total Gas Production (Supply Model)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.129945	1.893840	2.180725	0.0330
NGP	-0.225868	0.068492	-3.297719	0.0016
LNG	0.579017	0.155543	3.722564	0.0004
GDP	-0.710017	1.045779	-0.678936	0.4997
YGDP	0.650160	1.264492	0.514167	0.6090
R-squared = 0.5488; F-statistic = 18.8805; J-statistic = 39.7964; Prob(J-statistic) = 0.0000; Instrument rank = 6				

Source: Author's computations using Eviews 9.0

Table 2 presents the Supply Model for Total Gas Production (TGP) with an R2 value of 0.55, indicating that approximately 55% of the explanatory variables account for changes in TGP. The J-statistics value of 39.79 confirms the appropriateness of instrumental variables for the model, as the instrument rank value of 6 is greater than 2. The model reveals a negative and significant relationship between Natural Gas Price (NGP) and TGP, with a percentage increase in NGP leading to approximately a 22.6% decrease in TGP.

This contradicts a priori expectations, which suggest that higher gas prices should incentivize production. However, this discrepancy is likely due to sabotage and insecurity in the Niger Delta region, disrupting production activities.

Conversely, a positive and significant relationship exists between Liquefied Natural Gas (LNG) and TGP, with a percentage increase in LNG production leading to a 57.9% increase in TGP. This aligns with a priori expectations, as increased LNG production boosts gas supply to the domestic market, reducing the demand-supply gap. Unexpectedly, there is a negative but significant relationship between Gross Domestic Product (GDP) and TGP, with a percentage increase in GDP resulting in approximately a 71% decrease in TGP. This contrasts with expectations, and it highlights Nigeria's resource curse phenomenon, where abundant resources fail to translate into overall economic prosperity due to corruption and over-dependence on the oil

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sector. This aligns with the findings of (Adamu, 2016).

On a positive note, there is a significant and positive relationship between Per Capita Income (Y/POP) and TGP, with a percentage increase in Y/POP leading to a 65% increase in TGP. This meets a priori expectations, as higher per capita income encourages gas utilization, narrowing the demand-supply gap and improving living standards.

Price Equilibrium

This is the price at which =; i.e. the equilibrium price at which the gas market will clear and the demand-supply gap will be eliminated. The price equilibrium is determined below:

$$TGU_t = 1.86 + 0.05NGP_t + 0.46LNG_t + 0.27CPI_t - 0.1\frac{Y}{GDP_t} + 0.41TGU_t \quad (8)$$

$$TGP_{t=}4.13 - 0.23NGP_t + 0.58LNG_t - 0.71GDP_t + 0.65\frac{Y}{POP_t} \quad (9)$$

Equate equation (8) and Equation (9)

$$1.86 + 0.05NGP_t + 0.46LNG_t + 0.27CPI_t - 0.1\frac{Y}{GDP_t} + 0.41TGU_t = 4.13 - 0.23NGP_t + 0.58LNG_t - 0.71GDP_t + 0.65\frac{Y}{POP_t} \quad (10)$$

Make NGP the subject and collect like terms:

$$0.5NGP_t - 0.23NGP_t = (1.86 - 4.13) + (0.46LNG_t - 0.58LNG_t) - (0.1\frac{Y}{GDP_t} - 0.65\frac{Y}{GDP_t}) + 0.27CPI_t + 0.41TGU_t + 0.71GDP_t \quad (11)$$

$$0.27NGP_t = -2.27 - 0.12LNG_t - 0.55\frac{Y}{POP_t} + 0.27CPI_t + 0.41TGU_t + 0.71GDP_t \quad (12)$$

Divide both sides by 0.27:

$$NGP_t = \frac{-2.27 - 0.12LNG_t - 0.55\frac{Y}{POP_t} + 0.27CPI_t + 0.41TGU_t + 0.71GDP_t}{0.27} \quad (13)$$

At Equilibrium, price will be,

$$NGP_t = -8.41 - 0.44LNG_t - 2.04\frac{Y}{POP_t} + 1CPI_t + 1.52TGU_t + 2.63GDP_t \quad (14)$$

Equation (14) gives the equilibrium price, where quantity demanded of gas equals quantity of gas supplied. The equilibrium price that has been established is the price that merges the gap between demand and supply in the natural gas market. In the natural gas market, the equilibrium price, where the quantity demanded of gas equals the quantity of gas supplied, plays a crucial role in balancing the forces of demand and supply. Several key factors have been identified that impact this equilibrium price.

Firstly, when there is a 1% increase in the supply of Liquefied Natural Gas (LNG), it results in a significant 44% decrease in the market price of natural gas (NGP). This suggests that for equilibrium to be restored,

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every time the supply of LNG increases by 1%, the market price of natural gas will drop by approximately 44%. Secondly, there exists a negative relationship between the per capita income (Y/POP) and the market price of natural gas (NGP). When there is a percentage increase in per capita income, it leads to a substantial 204% decrease in NGP. This implies that to maintain equilibrium, with each percentage increase in per capita income, the market price of natural gas will decrease by 204%.

On the other hand, there is a positive relationship between the Consumer Price Index (CPI) and the market price of natural gas (NGP). A 1% increase in the CPI results in a 100% increase in NGP. Consequently, for equilibrium to be restored, every time the CPI experiences a 1% increase, the market price of natural gas will rise by 100%. Additionally, the Total Gas Utilization (TGU) also impacts the equilibrium price. A 1% increase in gas utilization leads to a notable 152% increase in NGP. To restore equilibrium, each time there is a 1% increase in gas utilization, the market price of natural gas will rise by 152%.

Furthermore, a positive relationship exists between the Gross Domestic Product (GDP) and the market price of natural gas (NGP). A percentage increase in GDP results in a substantial 263% increase in NGP. Consequently, for equilibrium to be restored, with each percentage increase in GDP, the market price of natural gas will rise by 263%. It is important to note that these relationships provide insights into the possible impacts of specific factors on the natural gas market's equilibrium price. However, real-world market dynamics are far more intricate, and other factors, such as government policies, geopolitical events, technological advancements, and global energy trends, can also significantly influence the equilibrium price in the natural gas market.

CONCLUSION AND RECOMMENDATION

This study addressed the issue of natural gas demand exceeding supply in Nigeria. Through the utilization of a hybrid demand-supply model and the 2SLS estimation technique, the research identified a mismatch between the demand and supply of natural gas. Additionally, the study successfully established an equilibrium price that could effectively balance the market, reducing the gap between gas demand and supply. To address this imbalance and ensure a more efficient market, it is crucial for oil producers to commit to a zero-flare policy. This commitment would result in a reduction of gas wastage and treat gas as the valuable resource it is. To enforce this policy effectively, penalties should be imposed on companies that resort to flaring.

Moreover, ensuring a steady supply of gas to domestic consumers necessitates the development of sufficient infrastructure. Despite strategies like the Domestic Gas Supply Obligation (DSGO) implemented by the government, the lack of adequate infrastructure remains a challenge. Therefore, investments in infrastructure development are vital to ensure a consistent supply of gas to meet the demands of consumers. Lastly, policymakers should collaborate with researchers to determine an equilibrium price for natural gas. This projected equilibrium price would serve as a valuable guide to the market, indicating how much gas can be supplied and at what price point. By understanding the available gas supply and its capacity to meet demand, stakeholders can make informed decisions that promote market stability

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