
AN ECONOMETRIC ANALYSIS OF THE IMPACTS OF POWER OUTAGE ON CONSUMERS IN NIGERIA

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ABSTRACT

The World Bank is committed to achieving the Millennium Development Goals of halving global poverty by 2015 and a stable power supply as well. As the international community measures its progress toward that goal, it must have solid and credible statistics that show where we are advancing and where we are falling behind. This study is carried out to critically analyze the economic consequences of power outage on consumers (Household, commercial and industrial consumers) in Nigeria. The Vector Autoregressive (VAR) techniques is employed in carrying out the study. It was discovered that there are significant negative consequences of power outages on the consumers' income, industrial output and commercial activities in Nigeria both in the short and the long run. The current power sector reforms were investigated and the study recommends that this should be done with much seriousness and transparent honesty. The current move to privatization of the sector, which is beclouded by emotion, myopic consideration and self-interest, is not acceptable. And as such, strong position should be taken by agitators on the need to deal with the issue seriously in order for the economy to be able to achieve the desired goal of uninterrupted power supply before 2015.

Key Words: Millenium Development Goals, Global Poverty, Power supply and International Community

INTRODUCTION

The problem of constant power failure has prompted a lot of Researchers and writer to focus on this sector of the economy over the years see for example Bellinton et al (1982), Ontario (1980), Ukpan (1973), Iyanda (1982), Uchendu (1993), Ariyo and Jerome (2004), Wodon et al (2008), Yepes et al (2008), Briceno- Garmedia and Smits (2008) as well as Adenikinju (2005) who wrote on different aspects of the cost of electricity outage to the Nigerian economy. Electricity supply in Nigeria was introduced in the year 1878 when a small generating plant was installed in Lagos by the colonial masters to serve the Government residential area. This translated to the electric company of Nigeria (ECN) in 1950, who undertook the construction of the Kanji hydro electric power authority and the shirorohydro electric power authority for its generation of electricity. In 1973, the National Electric Power Authority (NEPA) was established. The company which, was a public corporation, was responsible for the generating, transmitting and distribution of electricity in the country. As a government monopoly, it was plagued with inefficiency which is usually the characteristics of almost all government monopolies in the developing countries and as such, there is constant power outage and blackout all over the country; (Adenikinju; 2005). This problem led to

federal government consideration of the privatization of this corporation in the year 2005. This privatized company was renamed PHCN PLC and was broken into 18 independent units which included the transmitting company of Nigeria (TCN), 6 generating companies and 11 distributing companies. Each of those companies is to be privatized (Atser, 2007). Despite this privatization move, the constant power outage still remains a problem to the Nigeria economy. This study joins other studies to examine this problem. It differs from the existing works in that, it focuses on the consequences of this power outage on the three major consumers in Nigeria (household, commercial and industrial sector) while others based their work on either the measurement of the cost of outage to one sector of the economy or focus on the causes of outage. Hence, the objective of this study is to examine the impact of power outage on consumers within the Nigerian economy. Apart from the introduction, the rest of the paper is divided into four sections. Section 2 presents the literature review. The methodology is presented in section 3 while section 4 deals with the findings and section 5 presents the conclusion and recommendations of the study.

LITERATURE REVIEW

THEORETICAL BACKGROUND AND LITERATURE REVIEW

This study relies on the theoretical background as developed by ROSTOW'S leading sector thesis, which was developed by Hirschman who maintains that "investment in strategically selected industries or sectors of the economy will lead to new investment opportunities and pave the way to further economic development" (see Familoni 2007). (Hirschman cited in Familoni 2007) identified convergent series of investment. Convergent series of investments are those projects that appropriate more external economies than they create while divergent series of investment create more external economies than they appropriate. Jhingan (1975; cited in Familoni; 2007) says that development policy always aims at the prevention of convergent series of investments and the promotion of divergent series. Thus, for development to take place, a deliberate strategy of unbalancing the economy should be adopted. This is possible by investing either in social overhead capital or in directly productive activities. The public private participation theory is another recent theory guiding the provision of public utility and maximizing the benefits from these utilities. By the late 1990's privatization was losing much of its earlier momentum, yet concern about infrastructure remained in many countries. It was at this time the public private partnership (PPPs) began to emerge significantly as a means of obtaining private sector capital and managerial expertise for infrastructure investment, both to carry on where privatization had left off and as an alternative to privatization. Another study by Oshodi and Oloni (2007), identified five theories of establishing the benefits to consumers: -The build, operate and transfer (BOT), the build - own- operate -transfer (BOOT), the build-lease -operate -transfer (BLOT), the build -transfer - operate (BTO), and design - build - operate (DBOT).

Empirical Studies

Several empirical studies on macroeconomic impact of power outage have been reported in literature. Bellinton et al (1982) in their survey; reported that there is variation in outage cost of electricity; they opined that residential outage costs are lower than those of commercial

and industrial consumers. And that industrial outage costs and the commercial costs difference is not too high. Vivian et al (2008), opined that African manufacturing enterprises report power outages on an average of 56 days a year, costing firms 5–6 percent of revenues. That is why many firms operate their own diesel generators, at a cost of about US\$0.40/ kwh. In the informal sector, where firms rarely have the capital for backstop generation, lost revenues from power outages can be as high as 20 percent according to them. Escribano, Gausch and Pena (2008) study reveals that deficient power infrastructure dampens economic growth and weakens competitiveness by the detrimental effect on productivity which in turn reduces the growth potential of any economy.

The consequences of power outage as highlighted in Guardian (2007) are that there is always black out throughout the whole country. The results being; Factory closure, health problem, lost of life and properties and Eruption of violence. This also was seen to dampens economic development. Abugu (2007) observed that power outage in Nigeria has relationship with the generator merchants who wants to sell other products and as such conspire with the leader who as such refuse to take the right step at the right time. Oshodi and Oloni (2007) opined that the erratic power supply in Nigeria can lead to slow growth in industry except the sector is revitalized using any of the public - Private participation strategies.

THE HISTORICAL EMERGENCE OF POWER GENERATION AND CONSUMPTION IN NIGERIA

The history of Electricity generation in Nigeria date back to 1896 when the first electricity generating machine was installed in Lagos; 24/25 Marina road fifteen years after its introduction in England. The purpose was to supply electricity to the governor's house and government house. During this period the total of the generators used then was 60KW. Towards 1913, the electricity supply was extended to Iddo. In 1922, Ijora 'A' power station was built. The control of electricity in Lagos state was under the public works department (PWD) at this period. In 1950, the electricity corporation of Nigeria (ECN) was established through the ordinance No 15 of 1950 which merged public works department, native authorities and, municipal authority under one control. Also in 1962, another body known as Niger Dams Authority (NDA) was established by an act of parliament. The Authority was responsible for the construction and maintenance of dams and other works on the River Niger and elsewhere generating electricity by means of water power, improving navigation and promoting fish brines and irrigation The energy produced by NDA was sold to ECN for distribution and sales at utility voltages. In first April 1972, the operation of ECN and NDA were merged in a new organization known as National Electric Power Authority (NEPA). The primary reasons for merging the organizations were:

- It would result in the vesting of the production and the distribution of electricity power supply throughout the country in one organization which will assume responsibility for the financial obligations.
- The integration of the ECN and NDA should result in the more effective utilization of the human, financial and other resources available to the electricity supply industry throughout the country.

Since inception of NEPA, the authority expands annually in order to meet the ever-increasing demand. Unfortunately, majority of Nigerians have no access to electricity and the supply to those provided is not regular. It is this backdrop that the federal government has embarked on aggressive power sector reforms with the intention of resuscitating NEPA and making it more efficient, effective and responsive to the yawning of the teeming populace. Hence in 2001 it was privatized and named the Power Holdings Company of Nigeria but still the problems of power outage still persist.

Effect of Power Failure on Households

Power failure impact on the household in various ways. Its impact varies from the experience of dark night to a lot of damages being caused to household requirements. Many households have their fridge, television sets, video sets and a host of household equipments damaged due to frequent power failure. Also, what the household would have purchased in bulk (perishable goods) and kept in refrigerators is bought in bits. According to Agenor and Moreno- Dodson (2005), studies have shown that infrastructure like improvement in road transport, electricity and sanitation as well as better communications has led to more enrolment and better attendance of children in schools. Improved Electricity also leads to having better teachers. It has also been highlighted as one of the factors that lead to improvement in learning, by allowing children to spend more hours on reading and using of electronic devices like computers and hence be able to access more information on their learning. Availability of electricity is essential for the functioning of hospitals and delivery of health services. This is because surgical operations can be done and vaccines can be refrigerated (Agenor and Moreno Dodson; 2006). According to Worldwide and Diog (2004) air pollution from the burning of solid fuels kills over 1.6million people a year. More efficient electricity stoves would reduce this death. Thus households pay more for what they would have bought cheaply; if purchased in bulk. Also some richer households buy generators which they operate when there is power outage. This is an additional burden to such households; apart from the cost of the generator they buy diesel or petrol to operate these. Poorer households that cannot afford the cost of generating set buy lantern s and candles. All these leads to additional expenses for the households. Apart from this, use of these back-up expose the households to threat like five outbreaks and health hazards. Ariyo and Jerome (2004) confirm this that households purchases back up electricity to ease problem they usually counter as a result of shortages.

Effect of Power Failure on the Commercial Sector

The commercial sectors also are affected by the impact of frequent power failure. Their consumption of electricity ranges from usage as a source of light to usage in cold rooms for selling perishable things. Some use computers and electric typewriters to transact their business. When there is frequent erratic power supply, these cannot be used and it may even cause damages to both their wares and the equipments. Big commercial enterprise like the leventiesand others use it to power their 'lift'. With power failure, their business will be at standstill since people will not be able to move in and out of their shops. Some use it to

power their air conditions and fans. When there is power failure, these will stop and there will be reduction in their efficiency.

Effect of Power Failure on the Industrial Sector

The industrial sector suffers a lot from frequent power failure in the words of Adenikinju (2005) the problem of unreliability rank high among issues in the business environment. Steel and Webster (1991) reported in their survey that electricity outage in small firms fall among their top four constraints to expansion. Also, Kessides (1993) reported that in Columbia, rationing of power was estimated to reduce overall economic output by almost 1 percent of GDP in 1992. All these are due to the frequent power failure which always affects these industries negatively. Evidence is provided by Reinikka and Svenson (2002) in Uganda. They also emphasized how inadequate public infrastructure may adversely affect private investment. According to Sambo (2005), the major factors contributing to the above unreliability and inefficiency in the power sector are: Frequent breakdown of generating plants and equipment due to inadequate repairs and maintenance; Lack of foreign exchange to purchase needed spare parts on time; Obsolete transmission and distribution equipment which frequently breakdown; Lack of skilled manpower; as well as Inadequacy of basic industries to service the power sector. Oshodi and Oloni (2006) also confirm that the erratic power supply in Nigeria can lead to slow growth in industry except the sector is revitalized using any of the Public-Private participation strategies.

METHODOLOGY

This model takes a VAR shape and is specified as

n

$$y_t = c + \sum_{i=1}^n \phi_i y_{t-i} + u_t \dots\dots (1)$$

Where y_t is (4x 1) vector of endogenous variables c is the (4 x 1) intercept vector of the VAR, ϕ_i is the (4 x 4) matrix of autoregressive coefficients, and u_t is the (4 x 1) generalization of a white noise. Variables used for the study include; power outage proxied by the difference between the total capacity provided and the total capacity consumed, the industrial output, wholesale and retail trade to proxied the commercial sector and the GDP to represent household

The VAR system can be transformed into its moving average representation as

$$y_t = \mu + \sum_{i=0}^{\infty} \gamma_i + \epsilon_t \dots\dots\dots (2)$$

Where y_t is the identity matrix while μ is the mean of the process. Equation two is used to obtain the forecast error variance decomposition and the impulse response function. The variance decomposition shows the proportion of the unanticipated change of a variable that is attributed to its own innovations and shocks to the variable in the system. The impulse response functions measure the response of each variable to a shock to itself and other variables.

FINDINGS

It is generally known that time series data are prone to spurious result. A way out of this however, is to test for the level of significance of each of the data used for any study. Hence, for this study, an attempt has been made the use of the Augmented Dickey Fuller and the result obtained is presented below:

Table 4.1 Unit Root Test

Variable	ADF Levels	ADF 1 st Order	2 nd Order	Level of integration
P O	-2.982378***			1(0)
I(0)	-1.676250	-4.784822		1(1)
PGDP	2.518647	-2.815783		1(1)
COM	-1.274859	-3.842854		1(1)

Critical value 1% = -3.7343; 5% = -2.9907; 10% = -2.6348

Note: *, **, *** represent significant levels at 1%, 5% and 10% respectively and absence of * represent significant at 1%, 5% and 10% levels of significant.

The result obtained from the unit root test carried out indicate that only PO was at order zero I (0) other variables IO, GDP and COM were integrated at their first differencing.

VECTO AUTOREGRESSION RESULT (VAR)

The VAR results indicate an Adjusted R- Squared of about 33%, 81%, 95% and 63% respectively for the power outage, industrial output, GDP and the commercial sector. The F-statistic indicates an overall significance of the industrial output, GDP and commercial sector while power outage equation is not significant.

VARIANCE DECOMPOSITION RESULT

The result indicate that for the first year a high value for power outage do not really affect the household ,industrial and commercial sectors. However, as power outage continue to reduce, the Industrial output, household ability to work and commercial sector improves since they have access to power. In the tenth year, as the power outage reduces, all the three sectors improve. A reduction in power outage in the 10th year to about 30% really ensure the growth of the commercial sector growth to about 46.2% and household improves on their labour to about 21% while industrial output also rises. In the case for industrial output equation it was seen that right from the beginning of production, power outage affects productivity in the sector. Although at the end of the 10th year trade accounts for more of the industrial sector output but, however, shortage of electricity has dwindled the value of trade in the 10th year. This, however, reduces the industrial output which will inadvertently result to food insecurity. Consequently, leading to poverty which has been one of the MDGs goals government seek to eradicate before 2015. For GDP equation it was shown that power outage still affects it. As power outage is increasing the level of household productivity falls and when power outage reduces, GDP rises. This result indicate that power outage affect household productivity inversely as high power outage dwindles the

productivity of the household and hence leading to a fall in the levels economic development. From the variance decomposition of commercial sector, however, result also indicates that as power outage continues to increase commercial activities dwindle. The result indicates an existence of negative relationship between power outage and trade in the Nigerian economy. Hence, power outage affects all the three sectors inversely

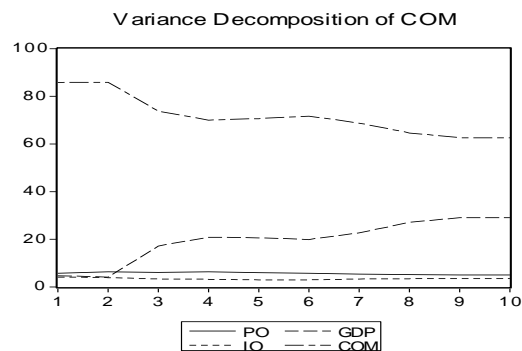
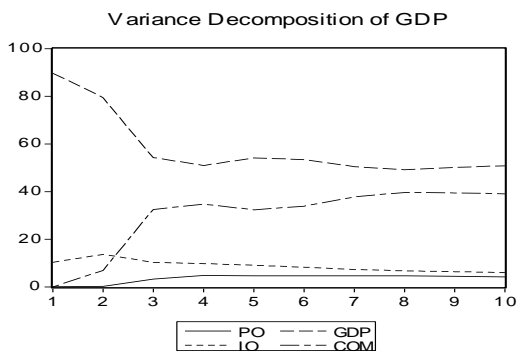
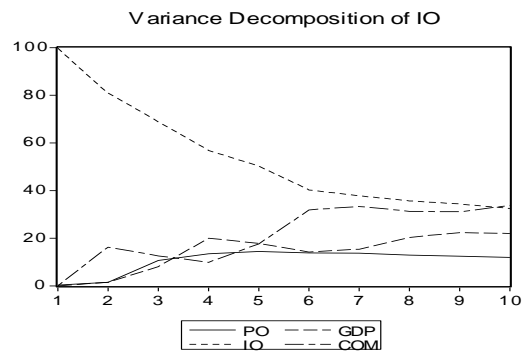
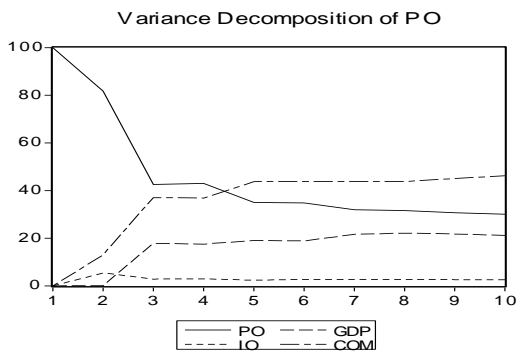
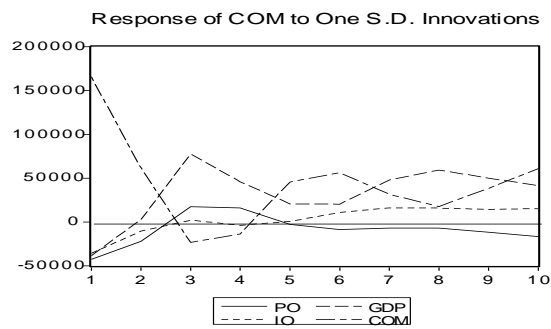
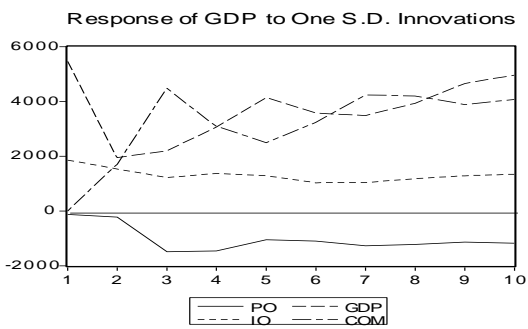
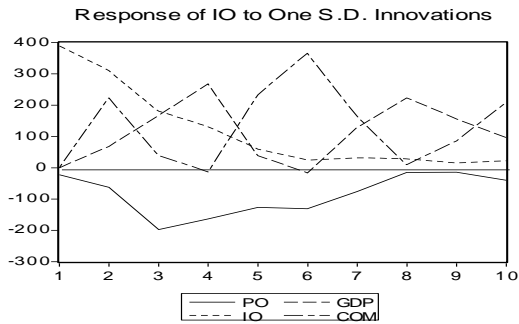
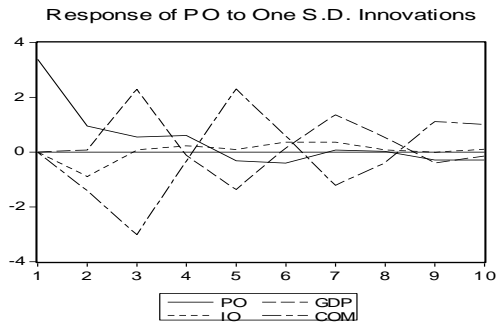
IMPULSE RESPONSE FUNCTIONS

An overall increase in power outage is followed by reduction in the household lowering of the labour efficiency for individual and a mixed shortage result for low productivity resulting from low capacity utilization. A look at the impulse response function graph in fig... indicate a divergence to the long run of a one standard deviation innovations to IO, COM and GDP does not converge indicating that the shocks to power outage do not dissipate overtime. So policy directed at controlling power outage may not likely to work out even in the year 2015 as stipulated by the objectives of the Millennium Development Goals (MDGs). Looking at the impulse response graph in appendix II, it indicate clearly that the response of industrial output, household and the commercial sector to power outage do not show any sign of convergence but divergent. This result indicate clearly that for the next ten years the country will continue to experience more power failure and no policy put in by the government during these period will be able to curb the problem of power in the country. Hence, the objectives of the government might not likely work in the nest seven years to come.

CONCLUSION AND RECOMMENDATION

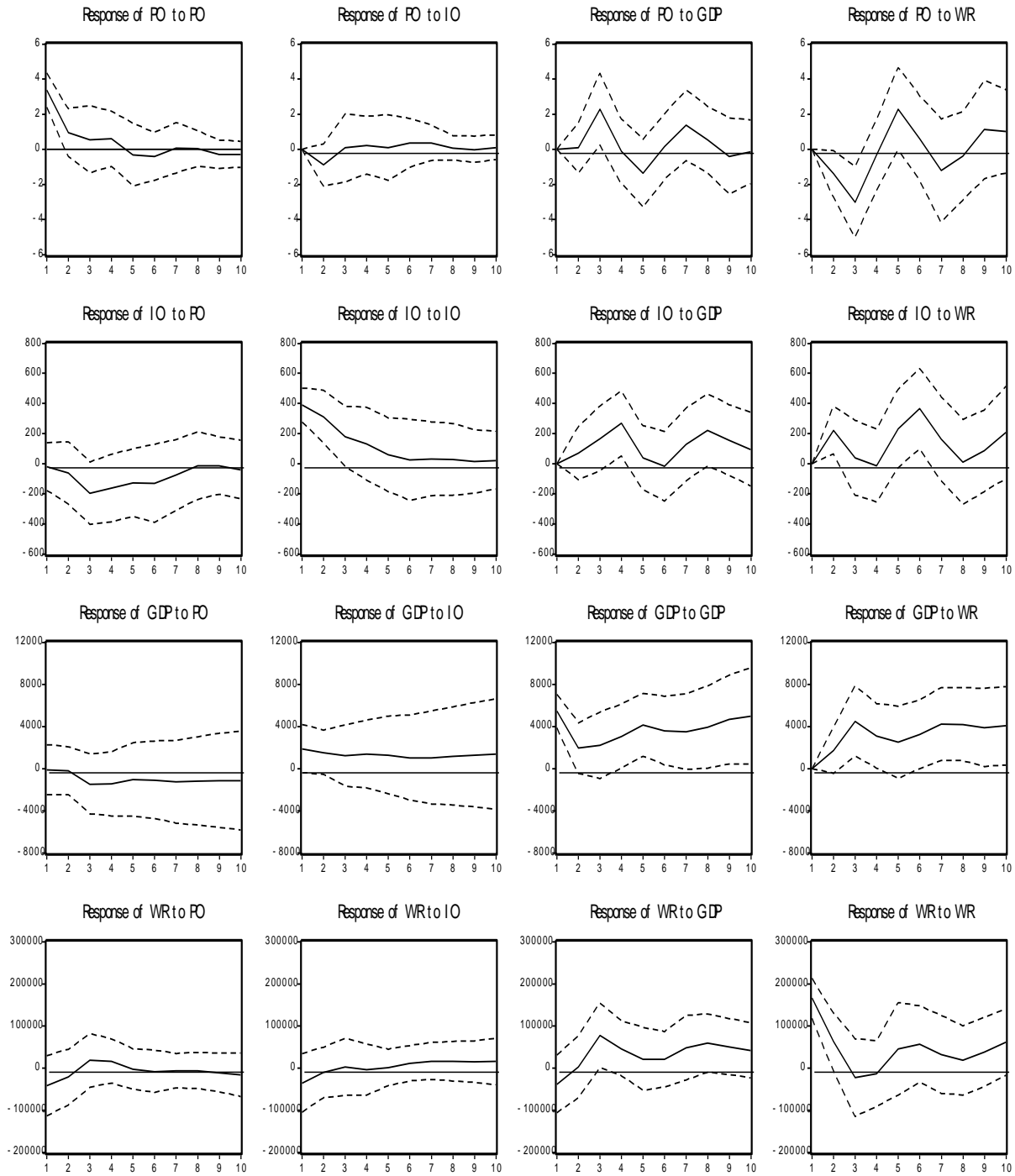
This study examines the impact of power outage on the Nigeria consumers. Conclusion reached from the study indicates that there are significant economic consequences of power outage on the commercial services, households and the industrial sector of Nigeria. The effects on all these sectors are negative and this has really destroyed the growth potential of the economy over the years. The study therefore recommends that; the Nigerian Government should therefore build more thermal stations and try as much as possible to increase the capacity utilized of the existing one. Also the capacity utilized in the hydro-stations should also be increased. The government should also try harder to settle the problem of Niger Delta, so that gas can be available for the operations of the thermal stations regularly. The privatization exercise, embark upon by the federal government should be given speedy attention to enhance the efficiency of the sector. The Public – Private Partnership should be adequately exploited to improve the efficiency in the sector. Staff of power holding company of Nigeria (PHCN PLC) should be thoroughly trained to be able to handle the machines with great expertise. Corruption among the staff of power holding PLC should be addressed to be able to bring sanity to the sector. All these have to be in place if the government must achieve their aim in 2015 as set out in the Millennium Development Goals (MDGs).

VARIANCE DECOMPOSITION RESULT



IMPULSE RESPONSE RESULT

Response to One SD Innovations ± 2 SE



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