



## INDEX NUMBER ANALYSIS ON THE CHANGE OF PRICES IN PETROLEUM PRODUCTS

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### ABSTRACT

*The value of money does not remain constant over time. It rises or falls and is inversely related to the changes in the price level. The fluctuation of Prices of Petroleum Products (PPP) in Nigeria has been a major concern for some time now. This research seeks to establish change in Prices of Petroleum Products over the years which can be achieved by determining the change in price of Petrol, Gas and Kerosene and also pattern of the aggregate Prices of Petroleum Products over the years*

### INTRODUCTION

Nigeria is blessed with abundant natural resources of which Petroleum Products formed important factors in her domestic economy. These Petroleum Products range from aviation fuel, diesel to kerosene just to mention a few. Nigeria is the eighth among the world's oil producing countries. The Nigeria economy is heavily dependent on Petroleum Products which account for over 95 percent of exports earnings and about 85 percent of government revenues (Emediegwu, 2017)

Petroleum is believed to have an enormous bandwagon effect on the economy and even on agricultural products, this normally occurs in the economies of the West Africa sub-region which fail to diversify. For any oil producing nation that does not want to experience an adverse effect on the economy has no other ways than to diversify their economy so as to prevent crises in one sector of the economy spilling over to the other sectors.

Food items are an essential commodity for a healthy nation. Arguably, the most important aspect of agriculture is that it's the source of a nation. The production and supply chain of all food items are maintained by Petroleum Products in the area of fertilizer production, fueling of farm equipment and movement of agricultural outputs to the final consumers. These will be achieved when Prices of Petroleum Products are stable and consequently improve the economy of a nation. Every



*between 2014 and 2021 using Statistical Tool called Index Numbers with help of Excel Package. Year 2014 was selected as the base year period in which prices of every commodity was believed to be relatively stable globally with absence of major war around the world unlike what is currently going on between Ukraine and Russia, the major export of Wheat and Petroleum Products. It was revealed generally that Prices of Petroleum Products (PPP) increased by an average of 73.5% over the period under review in relation to 2014, the base year. It was also discovered that there was an average increase of 44.1%, 54.5% and 183.7% in prices of Petrol, Gas and Kerosene respectively as compared to 2014, the base year. Bar charts and line charts are used to display and compare trends in Prices of Petroleum Products (PPP) over the period under review. Finding reveals that kerosene recorded the highest percentage increase of 183.7%, followed by Gas with 54.5% and Petrol recording 44.1%, increase in price as compared to the base year.*

**Keywords:** Index Number, Petroleum, Petrol, Gas, Kerosine, Price

meaningful government should always ensure that adequate food supply is maintained as such should not be affected by the price of petroleum (Raymond, 2010).

The relationship between persistent change in Petroleum Products prices (price hike) and inflation in Nigeria is an area that was not given direct attention by scholars. (Bobai, 2012) analyzed the relationship between petroleum prices and inflation in Nigeria. It focused on the impact of Petroleum Product price increase on the Nigerian economy from 1990 to 2011. Employing the empirical econometric analysis approach and using variables like inflation rate and petroleum prices, the results show that a positive relationship exists between PMS, AGO and inflation. It however found PMS to exert a higher effect on inflation than AGO, while a negative relationship exists between inflation and DPK. The overall effect clearly indicates that increase in Petroleum Product price contributes significantly to the rate of inflation in Nigeria.

(Labys, 2006) observes that higher oil prices can lead to higher inflation, lower corporate profits, higher unemployment and reduced national economic growth. Higher price volatility can lead to a reduction in investment, leading in turn to a long-term reduction in supply, and even reduced macro-economic activity. (Nwosu, 2009) researched into the impact of fuel price on inflation. The study employed the variance Auto regressive analysis to assess the relative contribution of fuel price on inflation. Available quarterly data series spanning a period of 1995 to 2008 was analyzed. The Results showed a positive



relationship between fuel price and inflation and therefore advocated that the policy of subsidizing fuel price should continue in Nigeria so as to help cushion the economy from the adverse effects of oil-price shock.

(Akinleye and Ekpo 2013) examined the macroeconomic implications of oil price shocks on macroeconomic performance in Nigeria. The study employed the vector autoregressive estimation technique and observed that both positive and negative oil price shocks influence real government expenditure only in the long run rather than in the short run. It also found that positive rather than negative oil price shocks have stronger short and long run effects on real gross domestic product, thereby triggering inflationary pressure and domestic currency depreciation in the process as importation increases. The study posits that crude oil price shocks are capable of impeding economic growth only in the long run while raising general price levels marginally in the short run leading to exchange rate depreciation and high importation.

(Ehinomeri and Adeleke, 2012) shared their views that the distribution of Petroleum Products in the Nigerian economy is fraught with complex problems resulting sometimes in product outages, inflated price of products and contentions on the pump price of products. Their research examines the various issues regarding the distribution of products and recommends that the downstream activities of the industry be completely deregulated to allow private sector and entrepreneur's full participation in the distribution of the products. Their findings hypothesized that the participation of entrepreneurs will drive effectiveness into the sector. Effectiveness according to them will bring down cost of operations with the consequence of reduction in the price of products for the benefit of all the stake-holders in the country.

(Arinze, 2011) focused on the impact of oil price on the Nigerian economy. The study contends that upward adjustments of Petroleum Products prices have resulted in inflation, high cost of living, and inequitable income distribution in Nigeria between 1978 and 2007. It also found that the various Nigerian regimes increased fuel prices a total of 18 times within this period with most of the increase occurring between 1990 and 2007 where prices were adjusted, twice a year, sometimes. The study revealed that petroleum price increase spur inflation rate to increase also. It therefore recommended diversification of the Nigerian economy to curb macroeconomic Instability which may arise from over dependence on crude oil.

(Ogunbodede et al, 2010) post that incessant price hikes of Petroleum Products have led to crisis and industrial actions led by some pressure groups in Nigeria. Based on this problem, their research examines the Petroleum Motor Spirit pricing crisis and the Nigerian public passenger transportation system. They used a perception scale on a 4-point Likert scale to elicit response from the operators of the public passenger transport



system. The Mean Weight Value (MWV) was calculated from the ranking of the perception scale. The results of these MWV were compared with the Group Arithmetic Mean (GAM) of each group to determine whether to accept or reject a problem item as being a reflection of the thinking of the majority for taking a decision. The results from that study indicated that price increases in PMS have increased transport fare, led to hoarding of fuel and many other related problems too numerous to list here. The study suggested that further research in related areas be carried out to identify more problems that exerted a lot of hardship on the people and the economy of the country to the extent that the poor were the worst hit. (Regnier, 2007) found that oil and energy price volatility increased following the 1973 oil crisis. This increase has been accompanied by an increase in price volatility for all commodities. In the late 1970s, however, price volatility for most products returned to pre-1973 levels, while oil price volatility continued to increase.

(Raymond, 2010) look at the effect of price changes of Petroleum Product in the short and long run and the factors responsible for the changes itself. (Ehinomeri and Adeleke, 2012), study the causes of fuel shortage in Nigeria and how it can be resolved and proffer recommendations on how the issue can be resolved based on the economic situation of Nigeria as at the time of the research. (Ogunbodede et al, 2010), only limit their work to the price hike of Petroleum Products crisis and transportation system. In the same vein, existing studies (like Arinze, 2011; Bobai, 2012) use fuel price which is just an aspect of petroleum price.

The present study identifies a base year period in the past with record of no major war or natural disaster and where prices of Petroleum Products are believed to be relatively stable (i.e., 2014) and determines changes in Prices of Petroleum Products (like petrol, gas and kerosene) beginning from the base period against the successive years and their corresponding trends.

The fluctuation of Petroleum Products price in Nigeria has been a major concern for some time now. The problem of hike of prices of food items each time there is an upward review of the prices of Petroleum Products suggested for this study to use index number to evaluate variation in price of Petroleum Products over time.

The aim of this research work is also to establish changes in prices and trends of Petroleum Products over the years which can be achieved by following objectives:

1. To establish changes in prices of Petrol of successive years against the base period and its corresponding trend.
2. To establish changes in prices of Gas of successive years against the base period and its corresponding trend.
3. To establish changes in prices of Kerosine of successive years against the base period and its corresponding trend.
4. To establish the trend of aggregate price of Petroleum Products of successive years against the base period and its corresponding trend.



It is understood that value of money is not a constant variable, it has an inverse relationship with prices and hence, it is a function of prices of commodities. It is a known fact that prices of Petroleum Products affect other essential commodities. This study provides the actual increase or decrease in price of Petroleum Products which in turn will avail a layman the opportunity to establish actual value of his money.

## METHODOLOGY

The data for this research are prices per litre of Petroleum Product, a secondary type of data collected from the Nigerian National Petroleum Corporation (NNPC) main depot in Jos. The year 2014 was considered as the base period freed from any kind of natural disaster and/or major war and period whose prices of petroleum was believed to be relatively stable. Prices of Petroleum Products of successive years beginning from base period were compared to determine changes in prices, average changes in prices of Petroleum Products and their corresponding trends.

## INDEX NUMBER ANALYSIS

Index number is one of the statistical tools used to compare a current value of time series relative to previous value of time series. The previous value of time series is the base time period. Therefore, successive comparisons of time series value to the value in the base period form a sequence of index numbers. (Bowerman and O'Connell, 2003). These index numbers are regarded as economic indicators. Index numbers of prices of Petroleum Products (like Petrol, Gas and Kerosine) for eight years were determined. Line and bar charts were used to display the numbers for easy comparison. They are a number of measures of index numbers namely:

- i. **Simple Index:** - this is obtained by dividing the current value of a time series by the value of the time series in the base time period and the ratio is then multiplied by 100. It is expressed as follows: Simple Index =  $\frac{p_1}{p_0} \times 100$

where  $P_1 = \text{Current value}$ ,  $P_0 = \text{Base value}$

- ii. **Aggregate price Index:** - Often time index of accumulated values of more than one times series are computed. Such an index is called aggregate price index. It is expressed as follows: Aggregate Price Index =  $\frac{\sum p_1}{\sum p_0} \times 100$

- iii. **Laspeyres Index:** - This is a weighted composite index that use quantity sold in the base period as the weight factor. It is expressed as follows:

$$\text{laspeyres index} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100.$$

Where  $p_1 = \text{Observed Price}$ ,  $q_0 = \text{Base Qty}$ ,  $p_0 = \text{Base Price}$ ,  $q_0 = \text{Base Qty}$



- iv. **Paasche Index:** - A weighted composite price index that uses quantities sold in the reference period as the weight factor. It is expressed as follows:

$$\text{Paasche Index} = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100.$$

Where  $p_1 = \text{Observed Price}$ ,  $q_1 = \text{Observed Qty}$ ,  $p_0 = \text{Base Price}$ ,  $q_0 = \text{Observed Qty}$ .

- v. **Fisher's Index:** - This index combines the Laspeyres and the Paasche index by finding the square root of their products.

$$\text{Fishes index} = \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1}} \times 100$$

### DATA ANALYSIS

Collected data on prices of petrol per liter, Gas per kg and Kerosine per liter for eight years were analyzed by a statistical tool called Index Number using excel package. The base period considered was 2014 believed to experience relative prices of Petroleum Products in the absence of any major war and natural disaster.

### RESULTS AND DISCUSSION

Table 1: Aggregate Price of Petroleum Products (PPP) and their Index Numbers

S/N	Years	Petrol ₦/Litre	Gas ₦/Kg	Kerosene ₦/Litre	Aggregate (PPP)	Index Values	% Increase Over years
1	2014	97	140	50	287	100	0
2	2015	127	140	70.5	337.5	117.596	17.6
3	2016	129	140	120	389	135.540	35.5
4	2017	144	163	150	457	159.233	59.2
5	2018	144	163	150	457	159.233	59.2
6	2019	143	170	150	463	161.324	61.3
7	2020	131	176	150	457	159.233	59.2
8	2021	160.5	562	202.5	925	322.300	222.3

Table one gives the aggregate index values of price of Petroleum Products (PPP) over eight (8) years. The aggregate index value tells us that the price of Petroleum Products (PPP) in 2015 increased by 17.6 % compared to 2014, the base year. There was also an increase in the price of Petroleum Products (PPP) in 2016 by 35.5% compared to 2014, the base year. The table also depicts the series of percentage increase in prices of Petroleum Products (PPP) over the last eight years. The line and bar charts below display the trend of aggregate index values and their percentage increase over the period under review.

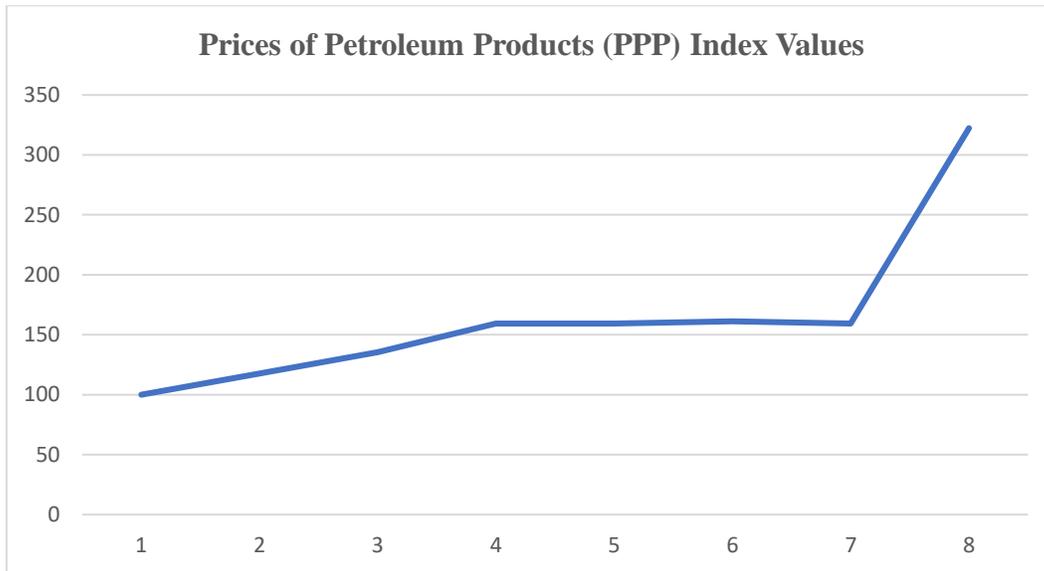


Figure 1

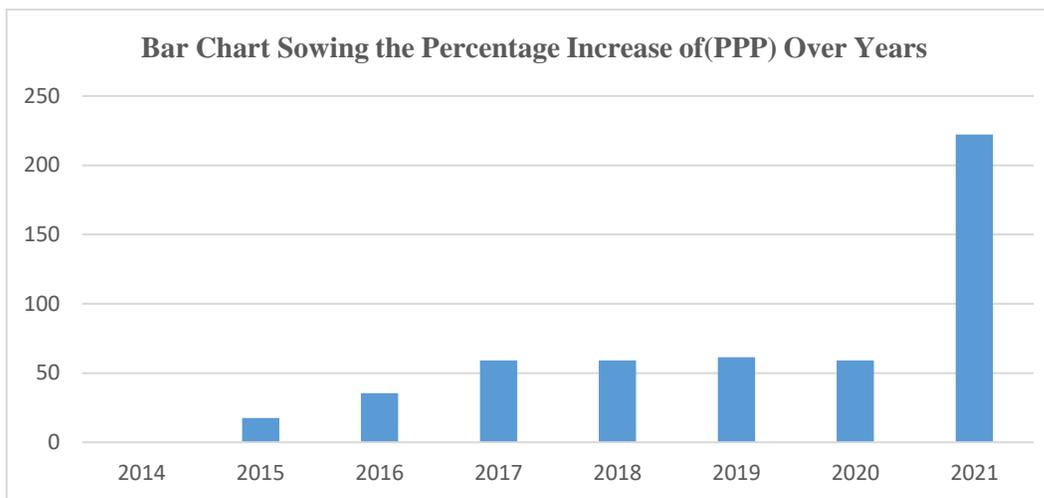


Figure 2

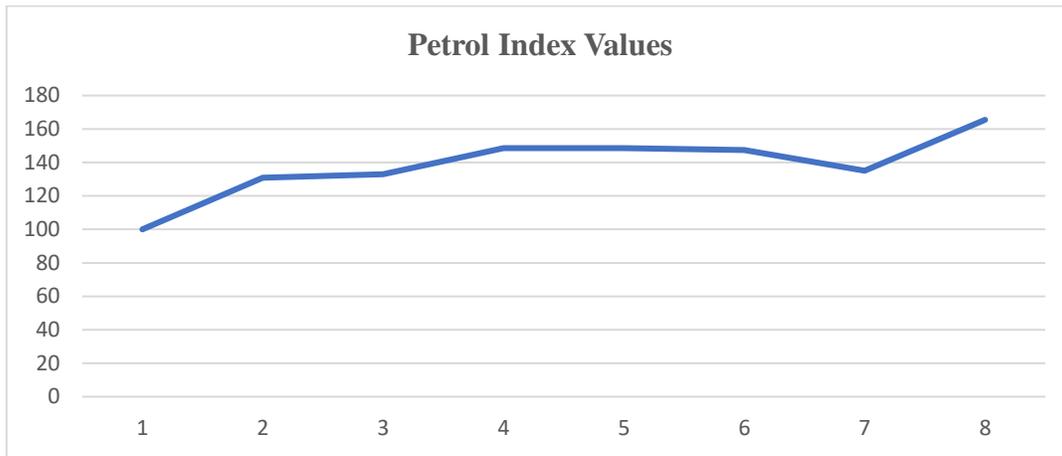
Table 2: Simple Index of Price of Petrol

S/N	1	2	3	4	5	6	7	8
Years	2014	2015	2016	2017	2018	2019	2020	2021
Petrol N/Litre	97	127	129	144	144	143	131	160.5
Index Values	100	130.928	132.99	148.454	148.454	147.423	135.052	165.464

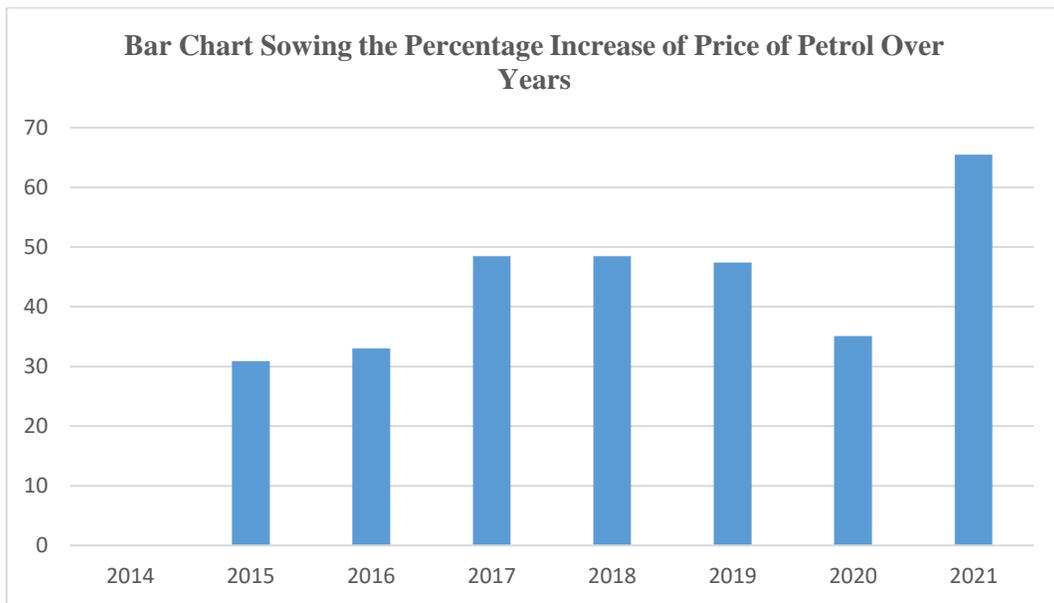


<b>% Increase Over Years</b>	0	30.9	33.0	48.5	48.5	47.4	35.1	65.5
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Table 2 depicts a series of simple index values of price of Petrol over the years exhibiting an average increase of 44.1% as it relates to the base year. However, the percentage increase of petrol in 2021 compared to the base year of 2014 is 65.5%. This shows that the year 2021 records the highest increase in prices of Petrol.



**Figure 3**



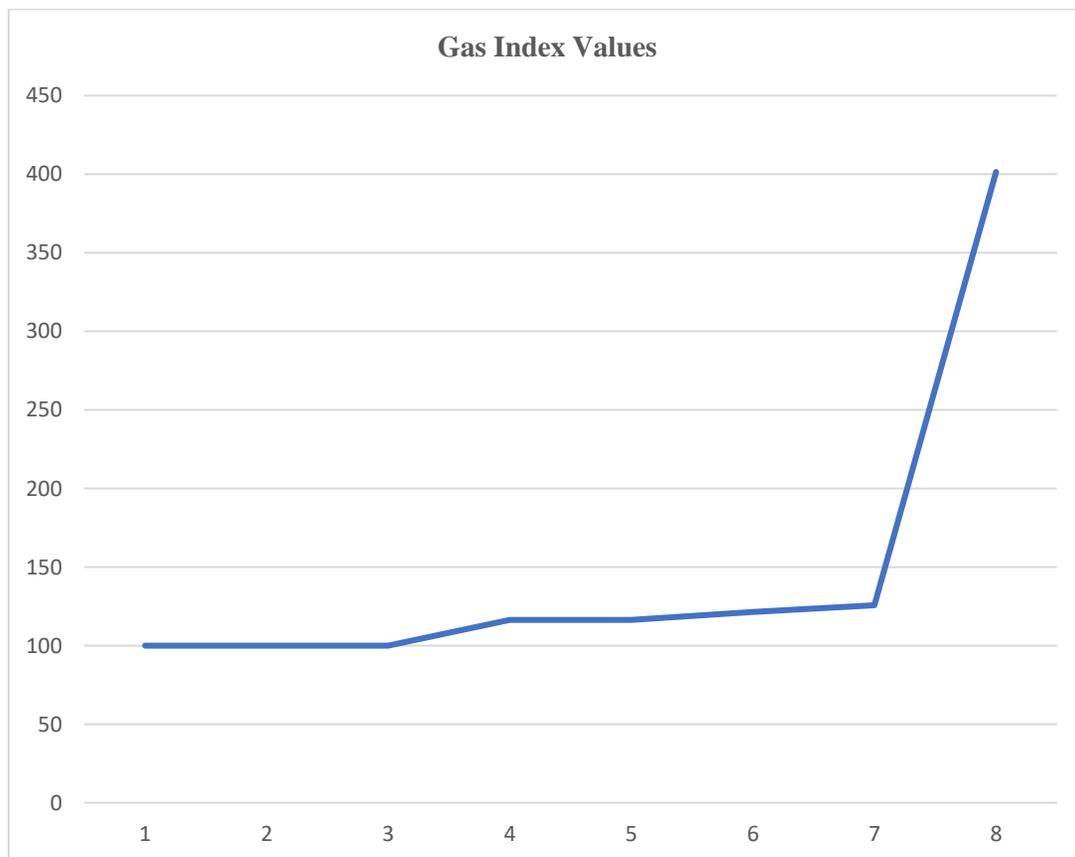
**Figure 4**



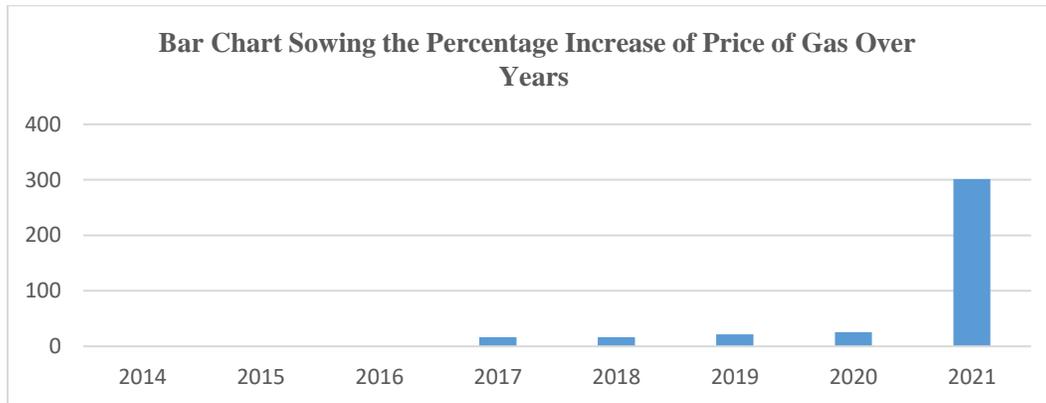
**Table 3: Simple Index of Price of Gas**

S/N	1	2	3	4	5	6	7	8
Years	2014	2015	2016	2017	2018	2019	2020	2021
Gas N/Kg	140	140	140	163	163	170	176	562
Index Values	100	100	100	116.429	116.429	121.429	125.714	401.429
% Increase Over Years	0	0	0	16.4	16.4	21.4	25.7	301.4

Table three similarly depicts a series of simple index values of price of Gas over the period under review exhibiting a relative stable in price of Gas being that the first three years under review record no change in price of Gas. But from 2017, there was a steady percentage increase in price of Gas up to 301.4% increase in the year 2021 compared to the base period of 2014. Charts below display the trend in index values of Gas and their percentage increase.



**Figure 5**

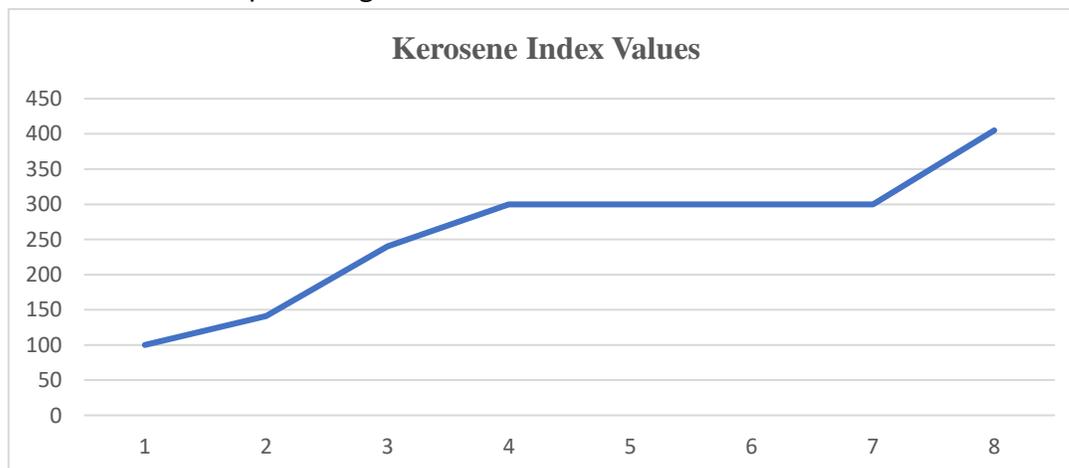


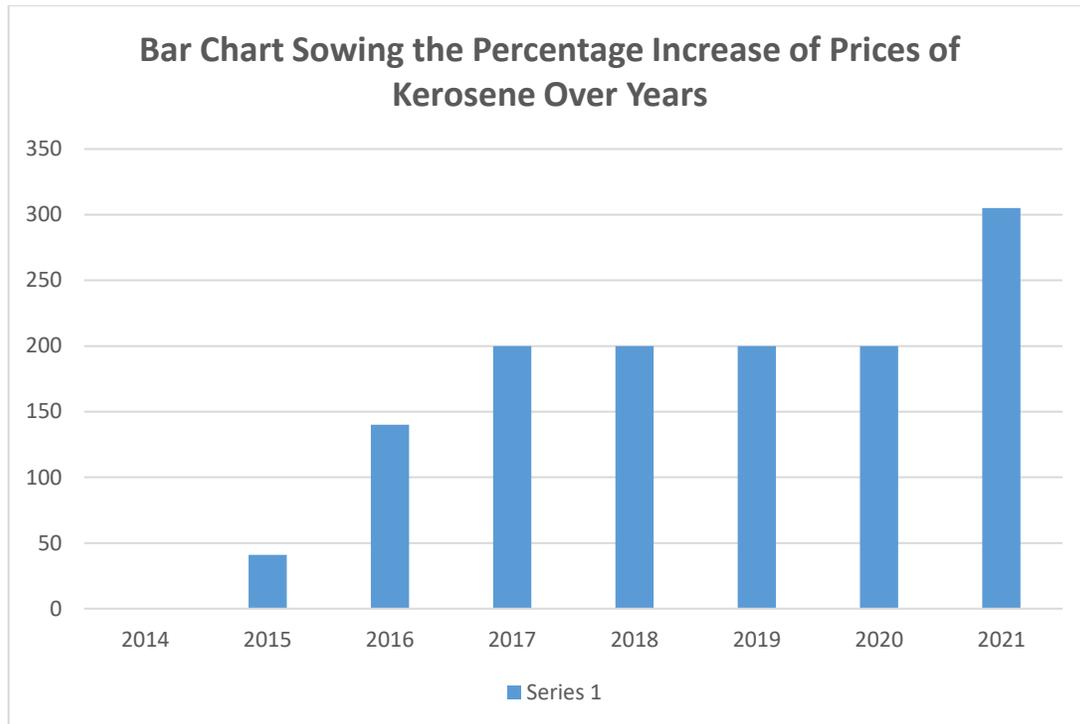
**Figure 6**

**Table 4: Simple Index of Price of Kerosene**

S/N	1	2	3	4	5	6	7	8
<b>Years</b>	2014	2015	2016	2017	2018	2019	2020	2021
<b>Kerosine N/Litre</b>	50	70.5	120	150	150	150	150	202.5
<b>Index Values</b>	100	141	240	300	300	300	300	405
<b>% Increase Over Years</b>	0	41	140	200	200	200	200	305

Table four equally provides a series of simple index values of the price of kerosene over the period under review. Percentage increase in price of Kerosene as it relates to the base year of 2014 is higher than the percentage increase in Petrol and Gas exhibiting an average of 183.7%. Although there was a stable index value of price of Kerosene between 2017 and 2020 maintaining 200% percentage increase but later to 305% increase in 2021 as compared to the base year of 2014. The charts below display pattern index values of price of Kerosene and their percentage increase.





### **CONCLUSION**

It can be seen generally that the price of Petroleum Products (PPP) increased by an average of 73.5% over the period under review in relation to 2014, the base year. It was also discovered that an average increase of 44.1%, 54.5% and 183.7% prices of Petrol, Gas and Kerosene respectively as compared to 2014 the base year. Petrol recorded the lowest average percentage increase reason being that the product is subsidized by the federal Government.

### **RECOMMENDATION**

In view of the results, it can be seen that kerosine recorded the highest average percentage increase of more than 180% over just seven to eight years as compared to the base period. Being the only Petroleum Product consumed by most poor Nigerians, the helpless Nigerians are by implication paying more to survive. It is therefore recommended that the Federal Government should ensure Petroleum Products are locally refined so as to eliminate cost of shipment which in turn will lead to decrease in Prices of Petroleum Products.

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## EFFECT OF MISCONCEPTIONS IN LEARNING SCHOOL GEOMETRY ON STUDENTS' ACHIEVEMENT IN GEOMETRY: FOCUS ON MISCONCEPTIONS ABOUT LINES AND ANGLES.

### ABSTRACT

*Geometrical knowledge is essential for mathematical mastery of secondary school students. In fact, evidence from literature revealed that geometrical ability of student is determined by their level of conceptions and misconceptions about geometry. In order to ascertain the effect of misconceptions in learning geometry among secondary school students, this study examined the effect of misconceptions about lines and angles in geometry class on students'*

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### INTRODUCTION

Understanding concepts in a subject is very important, if not necessary, for the learning of this subject. The kind of school geometry being learnt in Nigeria and many other countries of the world has been based on the formal axiomatic geometry which Eulid of Alexandria created over 2000 years ago. This kind of geometry is based on axioms, postulates, definitions, theorems and proofs. Various forms of misconceptions or conceptual misunderstandings in the learning of this great subject have been reported in the literature. A misconception is the inability of students or learners to really understand the ideas or philosophical notions held by the concept being learnt. The results of these misconceptions have been poor learning of geometry, leading to under-achievement. The current researcher got his inspiration to carry out an investigation into the effect of misconceptions in learning school geometry on students' achievement in geometry from this sad situation.

Research literature is replete with reports on various forms of misconceptions experienced by learners in their learning of school geometry. The most commonly reported learning difficulties in the literature are: misconceptions, imprecise terminology, identification, classification of basic