Measuring the Effect of Regime Change on Petroleum Price In Nigeria Using Moving Index.

Abstract

Persistent instability of crude oil prices in the global market has adversely affected all the sectors of the Nigerian economy. The prices of petroleum products were reviewed more than ten times between 1990 and 2016. The adjustment in 2000 under the democratically elected government marked a turning point in the economy as petrol moved up to N30 per litre. Almost every change in government regime has a regime change in petroleum price. This research study the effect of change in government regime on change in petroleum price using moving index with a constant and moving base year. Data on prices of petroleum were collected from 1960 to 2021, spanning 62 years, and the changes in these prices over all the regime were observed via the time plot. The moving index with constant and varying base year were used for the analysis. The results of the analysis showed that regime change in Nigeria has impacted so much on the price of petroleum. The trend of change in petroleum prices using 1960 as a constant base year showed that regime change has significant effect on change in petroleum price, while the moving index with varying base year showed no significant effect on the change in the petroleum price. Thus, it is concluded that the changes in price of petroleum in Nigeria is not as a result of the change in regime, only but also as a result in change in time.The estimated trend of change in the prices of petroleum with the period under study showed an upward trend. The movement showed that price of petroleum is not likely to reduce in the nearest future but rather will increase if nothing is done to stabilize it.

Keywords: Change Point; Moving Index; Non-Linear; Petroleum Price; Regime Change

Introduction

1.1 Background to the Study.

Nigeria is blessed with abundant natural resources of which petroleum products play a major role. At present, Nigeria is the eleventh largest producer and seventh largest exporter of crude oil. The petroleum sector generates over 90% of the country's foreign exchange earnings in the domestic economy, and provides employment in various forms to Nigerians. In addition, the tremendous growth in oil earnings has influenced significantly Nigeria's international relations, and sometimes the politics of oil has taken center stage in the nation's history of international relations in the last few decades (Nigerian National Petroleum Corporation NNPC 2016).

Oil products are derived from crude oil and they include petrol, diesel, kerosene, natural gas, bitumen etc. Oil was discovered in Nigeria in 1956 at Oloibiri in the present Bayelsa State, after a century of searching (Dharam, 1991). Oil products are basically used in industries for production of goods and services and they are also used domestically for personal consumption in which the greater percentage of it comes from developed countries.

However, the persistent instability of crude oil prices in the global market has adversely affected all the sectors of the Nigerian economy negatively. The price instability of the crude oil in the world

market has led to the downfall of Nigerians economy in various sectors, such as the production, manufacturing and services sectors. This is because Nigeria is a monoculture economy. From 1990 to 2016, the prices of petroleum products were reviewed more than ten times. The adjustment in 2000 under the democratically elected government marked a turning point in the economy as petrol moved up to N30 per liter, diesel to N29 and kerosene to N27 (Runl, 2011). According to the government, the upward review of domestic prices of petroleum products was necessitated by the high spot market price of crude oil and the need for higher margins for the Nigerian National Petroleum Corporation (NNPC) to meet operational and capital costs.

The gory account of democratic transition and election conduct in Nigeria's First, Second and to some extent the Fourth Republics were abysmal. However, there were recorded history of sanity and transparency in the transition programmes and elections supervised by the military regimes, unfortunately, the success recorded during military period were eventually truncated by the self-succession ambition, personification of political offices and vulnerability of the military leaders to corruption made possible by civilian politicians' infiltration (Badmus Bidemi. G, 2017).

Almost all nations experience a change in political governance at one point or the other. It includes a change from one political party, political ideology and president/leader. For instance, in May 2015, General Muhammad Buhari from a different political party and with a different political ideology became President after defeating Goodluck Jonathan of the People's Democratic Party that had ruled Nigeria since the return to democracy in 1999. MuhammadBuhari becomes the 14th head of government in 55 years of post-independence. This political outcome may induce changes in economic outcomes. Against this background, we investigate the phenomena that dynamics in macroeconomic variables such as real output growth can be explained by government turnover. Government turnover is defined as a change or removal of the person in charge of government per time. A change of head of government implies that a new government with distinct policy preferences alters or abandons his predecessor's economic policies, which is then likely to disrupt economic outcomes.

Considering the big relationship between prices of petroleum on the economy of the nation, it simply implies that petroleum cannot be separated from the wellbeing of the nation economically. Based on the preceding argument, this study is largely going to investigate the impact of change in regime on petroleum prices in Nigeria as it affects the economy. The study will also determine the kind of impact change of regime has on petroleum prices in Nigeria.

Determine the trend of change in petroleum prices within regime changes in Nigeria.

Investigate the correlation between change in regime and change in prices of petroleum in Nigeria.

Estimate the trend of change in the prices of petroleum within the period understudy.

Though Nigeria is the 11th oil producer in the world according to OPEC's ranking, it was only 18.5 percent of the total crude oil that she produces that was made available for domestic consumption in 1994. 13.0 percent, 12.4 percent, 11.9 percent, 11.4 percent and 13.8 percent of the total crude oil were also available for domestic consumption in 1995, 1996, 1997, 1998 and 1999 respectively. There was a major increase to 25.1 percent in 2003, this drastically declined to 7.9 percent in 2005 but in 2006 it increased to 20.2 percent (CBN 2007).

It is evident that petroleum and money are so important to modern living that shortages disrupt essential transactions. Indeed, the occasional petrol shortages experienced by Nigerian towns and villages due to inefficient distribution is as a result of incompetence and corruption on the part of bureaucrats and the business class (Onwioduokitanda and Adenuga, 2000). This research will answer the following questions:

1. Dose change in regime impact petroleum prices in Nigeria?
2. What kind of impact dose change in regime has on petroleum prices in Nigeria?
3. What is the trend and pattern of change in petroleum products prices in Nigeria?
4. What is the correlation between change in regime and change in petroleum prices in Nigeria?

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The objectives of the study is to investigate the impact of change in regime on petroleum prices in Nigeria. The research will also accomplish the following purposes:Determine the kind of impact change of regime has on petroleum prices in Nigeria, Determine the trend of change in petroleum prices within regime changes in Nigeria, Investigate the difference in the average changes in prices of petroleum in all the regimes in Nigeria and Estimate the trend of change in the prices of petroleum with the period under study.

The study will make use of secondary data collected from U.S. Energy Information Administration from civilian regime in Nigeria. Therefore, the study will be limited to the territory of Nigeria. The research will focus on the investigate the impact of change in regime on petroleum prices in Nigeria. And will also determine the trends of the changes in prices of petroleum within the regimes under consideration civilian rule.

The research hypothesis for the research will be stated as follows:

H_0: There is no significant difference in the average changes in prices of petroleum in all the regimes

H_1: There is a significant difference in the average changes in prices of petroleum in all the regimes

The result of this research will be valuable to the government in the making of decisions that will improve the petroleum and change in regime in Nigeria. It will provide overview of the impact of change in regime on change of petroleum prices in Nigeria. This will also add to the body of knowledge and will serve as a guide to other researchers who may have interest in the same research topic.

2.0 Materials and Method

2.1Research Design

The study adopted the quantitative and ex- post facto research design in obtaining, analyzing and interpreting data relating to the objectives of the study. The ex- post facto design is most suitable in studies in which the investigation starts after the fact has occurred without interference from the researcher. The choice of this type of design allowed the researcher the privilege of observing variables over a long period of time.

2.2 Areaand Populationof the Study

Nigeria, a country located on the western coast of Africa. Is the largest African country with a population of 219,034,000 as at 2020 making is the 7th most populous country in the world, with most of her population been youth. She has a total area (SQ MI) 923,769; and lies within latitudes 4_10 and 13_90 North and longitudes 2_20 and 14_300 East. Nigeria is divided into 36 states of the federation (divided into six geopolitical zones) including the Federal Capital Territory (FCT) in Abuja and bordered to the north by Niger, to the east by Chad and Cameroon, to the south by the Gulf of Guinea of the Atlantic Ocean, and to the West by Benin. Hundreds of languages are spoken in the country, including Yoruba, Igbo, Hausa, and English (www.britannica.com). The largest city in Nigeria is Lagos state, with a population of 11.223 million people.

The target population of this study is the entire population of the nation which coincides with our study population. The population is the change in price of petroleum within the periods of change of government in Nigeria.

2. 3 Sourceand Methodof Data Collection

Secondary data was used for this study; the data was sourced from online. It was obtain from Office of the Secretary to the Government of the Federation (OSGF) at: https://www.statista.osgf.gov.ng.

2. 4 Data Description

The data comprises pump price of petroleum in Nigeria (in Nigeria) from 1960 to 2021. It also comprise different regimes of government for the same period. The data span 62 years (62 observation). There are 16 governmental regimes in Nigeria, so, the data is reduced to 16 observations, with each observation representing the average price of petroleum for that regime.

2. 5 Methodof Data Analysis

Data analysis was done using index number, Simple Price Index (SPI) method, Moving Price Index (MPI) method and t-test.

Simple Price Index Method

$$SPI_t = \frac{P_{1t}}{P_0} \times 100 (1)$$

where

SPI_t is the simple price index at time *t*, *t* = 1,2,…,T.

P_{1t} is the current year's price for petroleum at time *t*, *t* = 1,2,…,T. (P_{1t} changes with time).

P_0 is the base year's price for petroleum at time *t* = 1. (P_0 is constant all through the period).

Moving Price Index Method

$$MPI_t = \frac{P_t}{P_{t-1}} \times 100 (2)$$

where

MPI_t is the moving price index at time *t*, *t* = 1,2,…,*T*.

P_t is the current year's price for petroleum at time *t*, *t* = 1,2,…,T. (P_t changes with time).

P_{t-1} is the base year's price for petroleum at time *t* - 1. (P_{t-1} changes with time).

Student's t -Test

The one sample t-test was used to test if there is a significant difference in the changes of petroleum price with a change in regime. If the difference is significant, we conclude that a change in regime significantly affect the change in petroleum price, but if the change is not significant then we conclude that the change in regime does not have significant effect on the price of petroleum in Nigeria.

The one sample t-test is given by

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} (3)$$

where

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i$$

and

$$s = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2$$

and μ = 100 is assumed, since the price index is given in percentage. If all the indices are equal to 100 or are not different from 100, then it shows that the changes are not significant.

The hypothesis is stated thus:

H_0: μ = 100

H_1: $\mu \neq 100$

The level of significance, α = 0.05.

Decision rule: Reject H_0, if the p-value is less than the level of significance, α.

3 Results and Discussion

3.1 Data Presentation

In this research the data collected was presented and analysed based on governmental regime. The data on price of petroleum (in Naira) from 1960 to 2021 is averaged across the 16 governmental regimes since October 1st 1960 to December 31st2021. The data is presented using tables, time plot, bar chart, and histogram.

Table 1: Chronologies of Past Presidents and Heads of State.

Sn	Head of Government	Regime
1	Sir. Abubakar Tafawa Balewa	Oct. 1, 1960 – Oct. 1, 1966
2	Chief Benjamin NnamdiAzikiwe	Oct. 1, 1963 – Jan. 16, 1966
3	Major General Johnson Thomas UmunnakweAguiyiIronsi	Jan. 16, 1966 – Jul. 29, 1966
4	General Yakubu Gowon	Aug. 1, 1966 – Jul. 29, 1975
5	General Murtala Ramat Mohammed	Jul. 29, 1975 – Feb. 13, 1976
6	General Olusegun AremuOkikiola Matthew Obasanjo	Feb. 13, 1976 – Oct. 1, 1979
7	AlhajiShehu Usman Aliyu Shagari	Oct. 1, 1979 – Dec. 31, 1983
8	Major-General Muhammadu Buhari	Dec. 31, 1983 – Aug. 27, 1985
9	General Ibrahim BadamasiBabangida	Aug. 27, 1985 – Aug. 27, 1993
10	Chief Ernest AdekunleOladeindeShonekan	Aug. 26, 1993 – Nov. 17, 1993
11	General Sani Abacha	Nov. 17, 1993 – Jun. 8, 1998
12	General Abdulsalami AlhajiAbubakar	Jun. 9, 1998 – May 29, 1999
13	Chief Olusegun AremuOkikiola Matthew Obasanjo	May 29, 1999 – 29 May, 2007
14	AlhajiUmaru Musa Yar'adua	May 29, 2007 – May 5, 2010
15	Dr.GoodluckEbele Jonathan	May 6, 2010 – May 29, 2015
16	Major-General Muhammadu Buhari (Rtd.)	May 29, 2015 – Dec 31, 2021.

Source: Office of the Secretary to the Government of the Federation (OSGF).

Table 1 showed the 16 governmental regimes in Nigeria with their various prices of petroleum.

Figure 1 showed that there are 16 distinct regimes in Nigeria from Independence (1960) to date (2021). The time series data showed the yearly trend of the price of petroleum from 1960 to 2021 depicting various regimes in price changed. It is observed that there are some cases where there are more than one price changes within the same governmental regime, and some cases where we have constant price across different regimes. The time plot of the price of petroleum from 1960 to 2021 is depicted in Figure 1. The figure showed that there is an upward trend in the price of petroleum. It also showed the various price regimes (price change points).

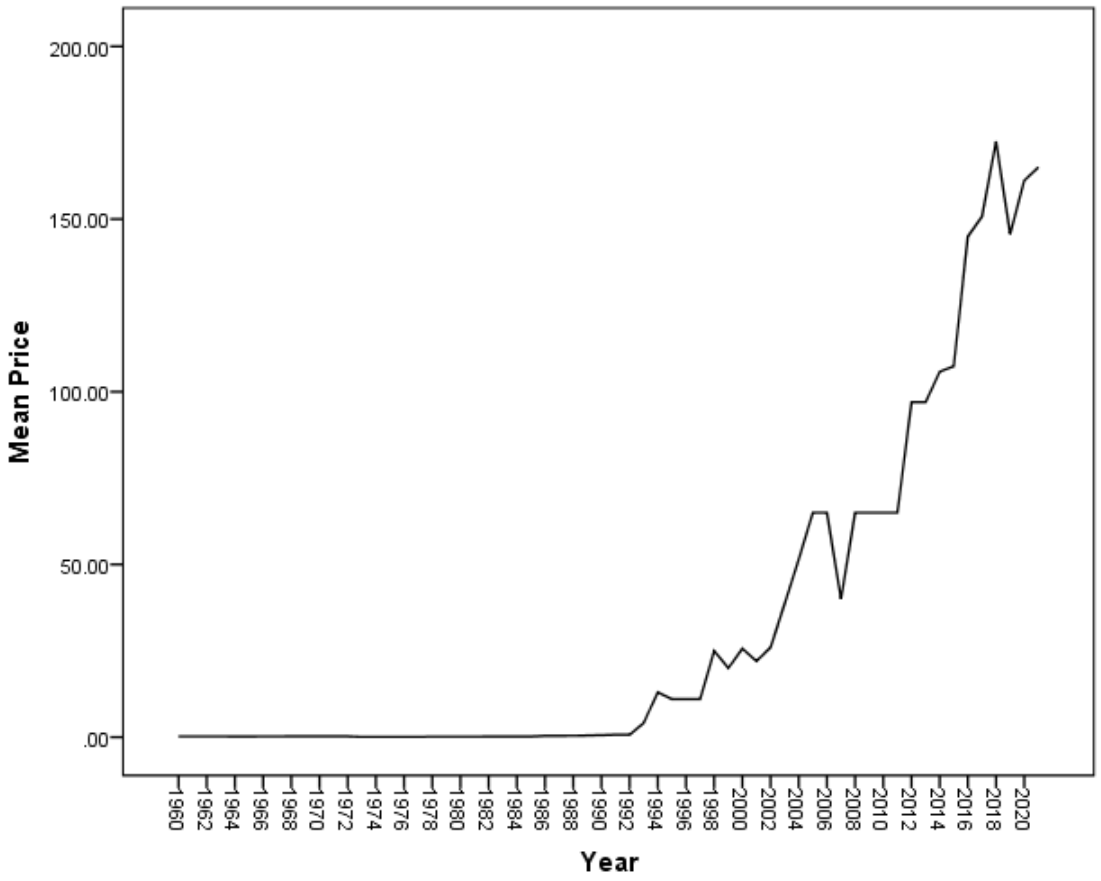

Figure 1: Time Plot showing Trend in Price of Petroleum (in Naira) from 1960 to 2021

Source: Researcher's Output

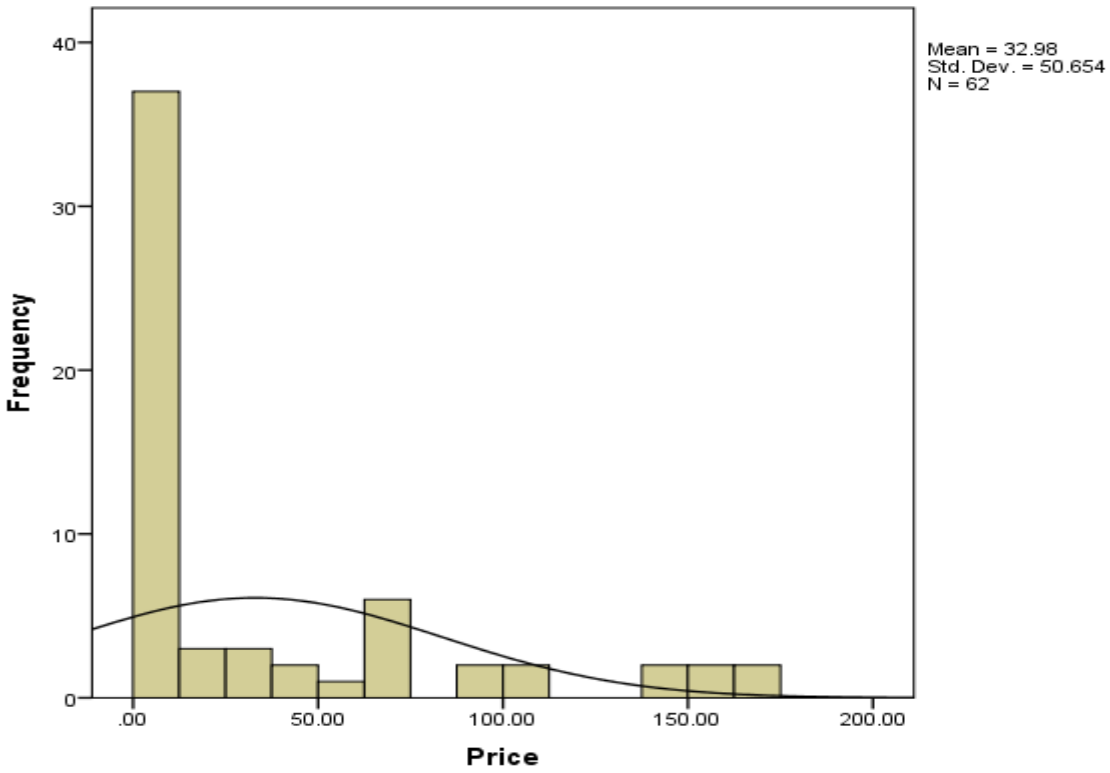

Figure 2: Histogram showing the shape of Price of Petroleum (in Naira) from 1960 to 2021

Source: Researcher's Output

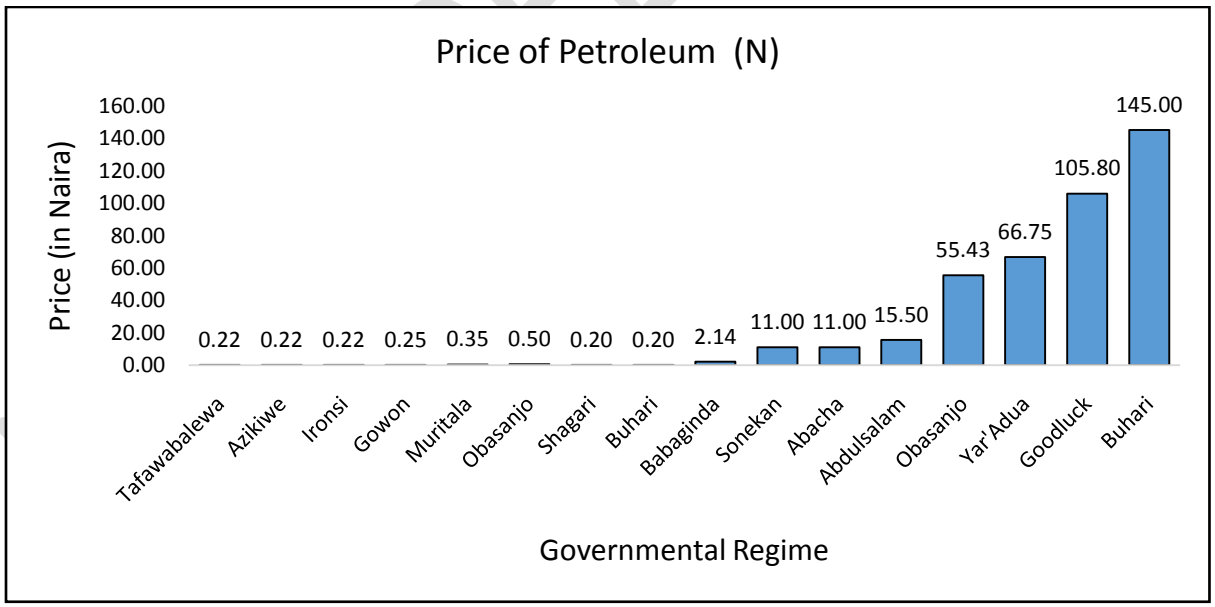

Figure 3: Bar Chart showing various Government Regimes and their Average Price of Petroleum (in Naira) from 1960 to 2021

Source: Researcher's Output

Table 2 showed that the data on petroleum prices in Nigeria is skewed to the right and has gaps. The data is not normally distributed. The modal class is less than ₦10. Figure 3 showed the various regimes and their prices of petroleum in Nigeria. It was during Babaginda regime price of petroleum rose above ₦ 1.00, that is, ₦2.14, it was during Sonekan regime it entered double digit (₦11.00). It was during Goodluck regime it entered three digits (₦105.80) and during Buhari regime it rose to ₦145.00.

4.1 DATA ANALYSIS

The data was analyzed using simple price index (SPI) and moving price index (MPI). The simple price index was computed for the various governmental regime using the price of petroleum in 1960 (Sir Tafawa Balewa) as the base year, while other governmental regime prices were used as current year.

Table 2: Bar Chart showing various Government Regimes and their Price Indices

Sn	Head	Regime	Price (₦)	Price Index	Moving Price Index
1	Tafawabalewa	1960-1963	0.22	100.0	-
2	Azikiwe	1963-1966	0.22	100.0	100.0
3	Ironsi	1966-1966	0.22	100.0	100.0
4	Gowon	1966-1975	0.25	113.6	113.6
5	Muritala	1975-1976	0.35	159.1	140.0
6	Obasanjo	1976-1979	0.50	227.3	142.9
7	Shagari	1979-1983	0.20	90.9	40.0
8	Buhari	1983-1985	0.20	90.9	100.0
9	Babaginda	1985-1993	2.14	972.7	1,070.0
10	Sonekan	1993-1993	11.00	5,000.0	514.0
11	Abacha	1993-1998	11.00	5,000.0	100.0
12	Abdulsalam	1998-1999	15.50	7,045.5	140.9
13	Obasanjo	1999-2007	55.43	25,195.5	357.6
14	Yar'Adua	2007-2010	66.75	30,340.9	120.4
15	Goodluck	2010-2015	105.80	48,090.9	158.5
16	Buhari	2015-2020	145.00	65,909.1	137.1

Source: Researcher's Output

For the moving price index (MPI), the price of two successive regimes were compared, the succeeding years are the base years, while the previous years are the current years.

Table 2 showed the head of government in the 16 regimes, their fuel prices, the simple price index and the moving price index. For the moving price index, the first data point is omitted since it is the first data point and non to be compared with. For the simple price index, Buhari regime has the

highest inflation rate in price of petroleum, while for moving price index, Babangida regime has the highest inflation rate in price of petroleum.

Figure 4 showed the simple price index for various regime in Nigeria. The simple price index showed that Buhari regime has the highest inflation rate when compared with the base year of 1960. Since Babaginda regime, the average change in prices have been trending up.

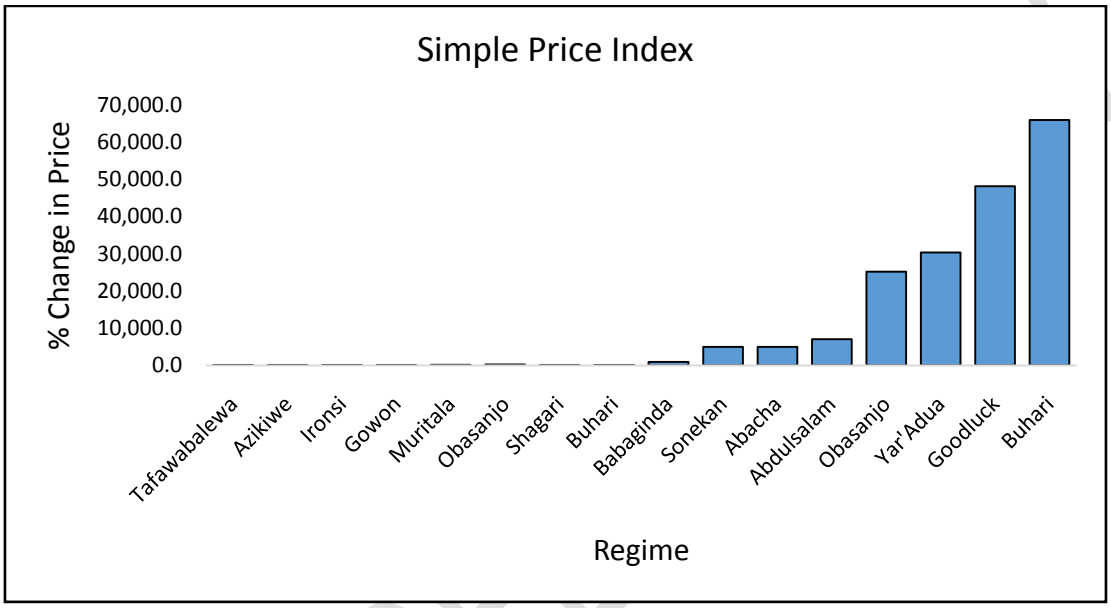

Figure 4: Bar Chart showing various Government Regimes and their Simple Price Index

Source: Researcher's Output

Figure 5 showed the moving price index for various regime in Nigeria. The moving price index showed that Babangida regime has the highest inflation rate. It is necessary to test if the difference changes in prices of petroleum from one regime to another is significantly different or not. The t-test was used to achieve this.

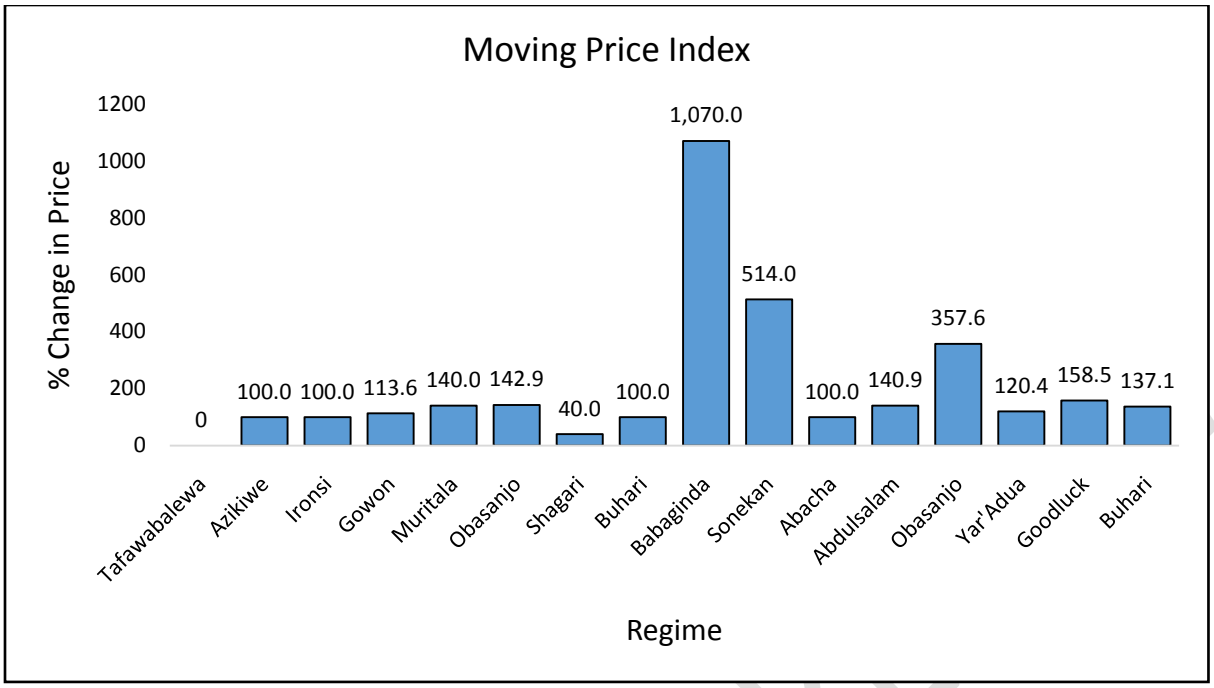

Figure 5: Bar Chart showing various Government Regimes and their Moving Price Index

Source: Researcher's Output

One Sample T-Test for Simple Price Index

H_0: There is no significant difference in the average changes in prices of petroleum in all the regimes

H_1: There is a significant difference in the average changes in prices of petroleum in all the regimes

Table 3: Mean for Simple Price Index of Price of Petroleum Regime Change

	N	Mean	Std. Deviation	Std. Error Mean
Simple Price Index	16	11783.525	20151.4694	5037.8674

Source: Researcher's Output

Table 4: One-Sample T-Test for Simple Price Index of Price of Petroleum Regime Change

	μ = 100					
					95% Confidence Interval of the Difference	
	t	df	P-value	Mean Difference	Lower	Upper
Simple Price Index	2.319	15	0.035	11683.5250	945.565	22421.485

Source: Researcher's Output

Table 3 showed the mean of the percentage change in price, which is 11783.525% with a standard deviation of 20151.4694. This shows a very large percentage change in the simple price index.
Table 4 showed that there is a significant difference in the average changes in prices of petroleum in all the regimes at 5% level of significance using the simple price index method. It implies that some regime has actually inflated the price of petroleum in Nigeria than other regimes. The descriptive statistics showed that Buhari regime has the highest inflation rate compared with other regimes.

One Sample T-Test for Moving Price Index

H_0: There is no significant difference in the average changes in prices of petroleum in all the regimes

H_1: There is a significant difference in the average changes in prices of petroleum in all the regimes

Table 5: Mean for Moving Price Index of Price of Petroleum Regime Chang

	N	Mean	Std. Deviation	Std. Error Mean
Moving Price Index	16	214.688	255.9056	63.9764

Source: Researcher's Output

Table 6: One-Sample T-Test for Moving Price Index of Price of Petroleum Regime Change

	μ= 100					
					95% Confidence Interval of the Difference	
	t	df	P-value	Mean Difference	Lower	Upper
Moving Price Index	1.793	15	0.093	114.6875	-21.675	251.050

Source: Researcher's Output

Table 5 showed the mean of the percentage change in price, which is 214.688% with a standard deviation of 255.9056. This shows an average of 114.68 increased of changes in prices of petroleum using moving price index.

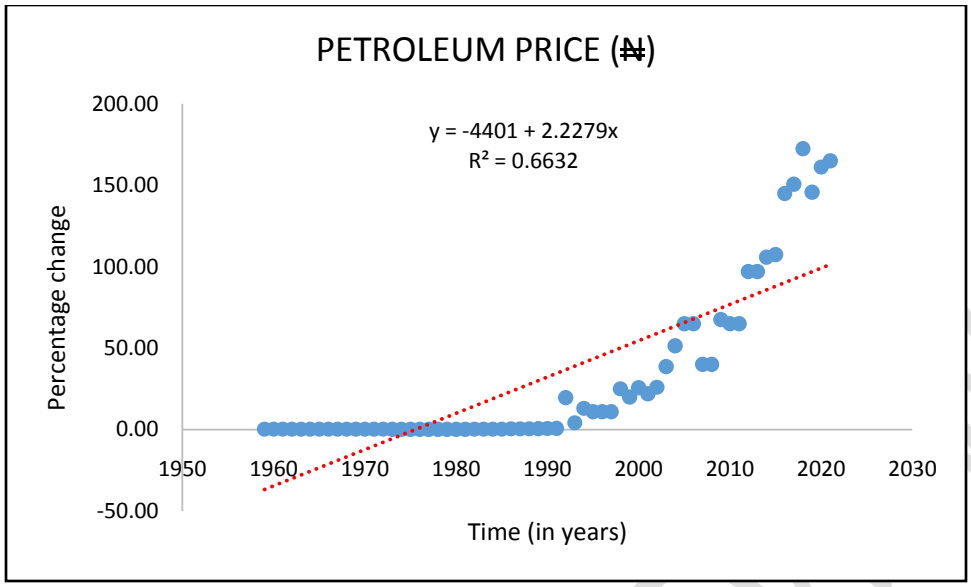

Figure 6: Trend of Petroleum Price in Nigeria (1960-2021)
Source: Researcher's Output

Table 6 showed that there is no significant difference in the average changes in prices of petroleum in all the regimes at 5% level of significance using the moving price index method. It implies that the regimes have not significantly inflated the price of petroleum in Nigeria. This showed that any observed difference might be due to chance.

The simple price index showed a significant difference because the base year is too far from the current year as time increased, but the moving price index showed no significant difference because the base year is the immediate past year.

Figure 6 showed the linear trend in the price of petroleum. The trend showed an upward direction. This implies that the price of petroleum is trending upward.

The trend line is given by

$$y = -4401 + 2.2279x$$

The coefficient of determination $R^2 = 0.6632$. This implies that 66.32% of the variation in price of petroleum can be explained by time factor and the remaining 33.68% can be explained by other factors such as regime change, and other governmental policies other than time effect.

4.0Conclusion

The conclusion is made base on the objectives of the research and the summary of the findings.

The study investigated the impact of change in regime on petroleum prices in Nigeria. The research gives the following conclusions.

The change of regime in Nigeria has impacted so much on the price of petroleum in Nigeria. has on petroleum prices in Nigeria. During independence, the price of petroleum was less than ₦1.00, but after 16 changed in regimes, the price of petroleum rose to more than ₦145.00 in 2021 in Nigeria.

The trend of change in petroleum prices using 1960 as base year showed that the changed as a result of regime changes in Nigeria is significant.

After investigating the difference in the average changes in prices of petroleum in all the regimes in Nigeria using moving price index, it is concluded that the changes in prices of petroleum in Nigeria is not as a result of the change in regime only but as a result in change in time.

The estimated trend of change in the prices of petroleum with the period under study showed an upward trend. The movement showed that price of petroleum is not likely to reduce in the nearest future but rather will increase if nothing is done.

The following recommendations are made to support further research in this field of stochastic statistics.

- The researchers recommend that Removal of subsidy on PMS should not be implemented to prevent hike in the prices of basic house hold commodities in the economy.
- Local refining of crude oil should be encouraged to boost production and availability of refined petroleum products for domestic use. This can be achieved through the setting of guidelines and standards for operators of illegal refineries to enable them operate legally as destroying the facilities amounts to waste of capital to the operators and the nation. The legal operation of these refineries would stimulate employment and boost immediate local supply capacity of petroleum products.
- Government should vigorously pursue the revitalization of the railways as an alternative to road transportation. This will reduce the incidence of illegal diversion of fuel through tankers and the demand for fuel for road haulage and mass transportation.
- Government should deregulate the downstream sector of the petroleum industry to attract investment as no investor that buys crude oil at international market price would be willing to refine and sell its products in a regulated market. The sector must be attractive enough to guarantee fair returns on investment.

Reference

Bidemi. G. (2017) Leadership Questions and the Rhetoric of Free and Fair Elections: A Prognosis of the 2007 and 2015 Elections in Nigeria. *International Journal of Political Science. Vol. 3*, No. 2, pp. 33-46

Bratton, Michael and Van de Walle, Nicolas 1997. *Democratic Experiment in Africa,* Cambridge: Cambridge University Press.

Dharam, P.G., (1991). *The Political Economy of Oil Gas in Africa.* The case of Nigeria, Lagos, Nigeria: Taylor and Francis Publishers.

Iwayemi, A. Adenikinju A. and Babatunde M. A.(2009). *Estimating Petroleum product demand elasticity in Nigeria*: A Multivariate Cointegration approach.

Jiang, Z.J.; Ou, Y.X.L.; Huang, G.X. Distributional impacts of the elimination of fossil fuel subsidies. China Econ. Rev. **2015**, 33, 111–122.

Onwioduokitanda E. A. and Adenuga O. 2000 "*Empirical Analysis of the Demand for Petroleum Products in Nigeria*". C.B.N 2000 Journal Publication pp 33-57

Linz, Juan. J. & Stepan, Alfred (1996). *Problems of Democratic Transition and Consolidation*. Baltimore: The John Hopkins University Press.

"Standard Handbook Oil Spill Environmental Forensics". *2016.* doi:10.1016/c2015-0-00228-3.

Walther W. Irion, Otto S. Neuwirth, "Oil Refining" in Ullmann's Encyclopedia of Industrial Chemistry 2005, Wiley-VCH, Weinheim. doi:10.1002/14356007.a18_051

U.S. Energy Information Administration > Petroleum > Navigator > Refinery Yield

"Pan oil". *panoil.in*. 2020

de Oliveira, Angélica Amaral; da Silva, Verônica Lima; de Aguiar Pontes, Danilo; Almeida, Daniel Freire; Silva, Domingos Sérgio Araújo; Ferreira, José Marcos Moreira; Santos, Ronaldo Costa; Urquieta-Gonzalez, Ernesto Antonio; Pontes, Luiz Antônio Magalhães (2021-01-02). "Mesoporous HBeta zeolites application in the desulfurization of 2-methylthiophene". *Reaction Kinetics, Mechanisms and Catalysis.* doi:10.1007/s11144-020-01921-6. ISSN 1878-5204.

Gallegos-Hernández, Anayeli Yazmín; Martínez-Rosales, Merced; Rico, José L.; Avalos-Borja, M. (2020-11-27). "Improvement in the hydrodesulfurization of dibenzothiophene over supported NiMoW catalysts". *Reaction Kinetics, Mechanisms and Catalysis.* doi:10.1007/s11144-020-01909-2. ISSN 1878-5204.

Rodriguez, Mildred; Pinto-Castilla, Susana; Morgado-Vargas, Myloa; Betancourt, Paulino (2020-10-01). "Influence of arsenic on light cycle oil hydrodesulfurization over a CoMcatalyst". *Reaction Kinetics, Mechanisms and Catalysis.* ***131*** *(1): 199–211.* doi:10.1007/s11144-020-01856-y. ISSN 1878-5204.

Saito, Hikaru; Sekine, Yasushi (2020-06-02). "Catalytic conversion of ethane to valuable products through non-oxidative dehydrogenation and dehydroaromatization". *RSC Advances.* ***10*** *(36): 21427–21453.* doi:10.1039/D0RA03365K. ISSN 2046-2069.

Kinetic studies of propane oxidation on Mo and V based mixed oxide catalysts. *Berlin. 2011*. doi:10.14279/depositonce-2972.

"The reaction network in propane oxidation over phase-pure MoVTeNb M1 oxide catalysts". *J. Catal.* ***311****: 369–385. 2014.*

"Surface chemistry of phase-pure M1 MoVTeNb oxide during operation in selective oxidation of propane to acrylic acid". *J. Catal.* ***285****: 48–60.*

Queen E.Oye and Philip O. Alege, 2020.Changes in Head of Government and Macroeconomic Fluctuations in Nigeria.

Wikipedia, 2021