



## RELATIONSHIP BETWEEN FUEL PRICE STABILITY AND PRICE OF SELECTED BUILDING MATERIALS IN MINNA

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### ABSTRACT

This research examines the relationship between fuel price stability and price of building materials. Previous studies revealed that cost of construction projects have increased due to increase in price of petroleum products. This also caused the increase and fluctuation of the price of building materials thereby leading to cost overrun and project abandonment. To address this problem, this research examined the relationship between stable fuel price and cost of selected building materials in Minna. Data were gathered from the primary source which involves market survey. The selected building materials were six in number: high tensile reinforcement bar (12mm and 16mm diameter), timbers (2"x4", 2"x6" and 1"x12" sizes) and 50kg cement. Bar and line graph was used to present the trend in price of materials between periods of unstable and stable fuel price. Correlation analysis was used to determine the relationship between prices of selected building materials during unstable and stable fuel price periods. T-test was used to determine the difference between price of building materials when price of petrol was unstable and when it was stable. The prices of 12mm bar, 2" x 4", 2" x 6" and 1" x 12" timbers showed significant difference; while prices of 16mm bar and cement showed non-significant difference between the periods under review. It was thus concluded that stability of price of petroleum does not guarantee stability of the price of the selected building materials. The need for further research to examine the influence of interest rate and exchange rate on price of building materials was therefore emphasized.

**Keywords:** Building materials, fuel price, petroleum, stable, unstable.

### INTRODUCTION

Construction industry greatly contributes to the economy of any nation because it provides sources of livelihood and shelter for the citizens to be able to successfully carryout a project. Material, plant and labour are required for the successful execution of any project. Materials cover 50% - 60% of the cost of construction, labour takes 35% - 40% of the cost of construction while plant covers 5% in the cost of building projects. Materials are any physical substances that can be processed or used during a process to produce a product. Building materials are any material used for construction e.g. sand, door, tiles, cement, timber, bricks, PVC pipe and glass etc. Lewis (1981) reported that building material component comprises about 50 - 70% of actual construction cost while Jinadu (2004) stated that building material is the largest input in the construction industry. Therefore, the cost of material is very important. Cost of material in construction industry is directly or indirectly influenced by the cost of petroleum product. This is because petroleum product is used as fuel during production of some materials as well as for transportation of material to where they are needed. Petroleum products like

petrol and diesel are also used for operating or construction of equipment such as truck, Vibrator, Jack hammer and concrete mixer etc.

Nigeria is the largest country in Africa and sixth in the world in the production of crude oil discovered in 1956 and started production in 1958. Nigeria joined the Organization of Petroleum Exporting Countries (OPEC) in 1971. Prices of petroleum products have been increasing since 1977 until recently in 2012 when the Price of petroleum products became a bit stable. According to Isyaka (2014) Nigeria is one of the leading oil producing countries in the world, but despite the abundant natural resources in Nigeria, the country still suffers from massive shortage of Premium Motor Spirit (PMS) and its distribution to cater for the needs of the numerous users of its end product.

To this effect, Shittu et al. (2013), in a study to investigate the impact of petroleum price increase on the cost of building finishings during the period of unstable fuel price, discovered that the total cost of all construction projects have increased due to increase in price of petroleum products. This variation and fluctuation of market price of material for construction projects has led to cost overrun and project abandonment. The change in price of building materials during the period of fuel stability, therefore, leaves a gap which needs to be filled. As a result of this, this research studied the nature of cost of building materials when the price of fuel was unstable and when it became stable from 2005 to 2012 in order to fill this gap. This research is therefore important to help consultants and contractors execute construction projects in terms of effective management, planning and delivery.

In the light of these, this study examined the relationship between fuel price stability and cost of selected building materials in Minna, Niger State. To achieve this, the study was set out to: determine the relationship of price of building materials when the price of fuel was unstable and when it was stable; and determine the difference between the prices of selected building material at such periods.

This research covered six selected building materials. These are cement, reinforcement (12mm and 16mm diameter), timber (2"x4", 2"x6", 1"x12"), from 2005 to 2011 and 2012 to 2014 respectively. The study area is Minna, Niger State.

## **PETROLEUM INDUSTRY**

Crude oil is the major source of fiscal income for Nigerian economy. Petroleum is a heterogeneous substance made up of hydrocarbon that can be distilled to get other product. The common by-products distillation of petroleum are fuel, which include ethane diesel fuels (petro diesel) fuel oil, gasoline (petrol), jet fuel, kerosene and liquefied petroleum gas (Speight, 1999 cited in Idiake, 2011).

Oil industrial activities are divided into upstream and downstream. Upstream involve exploration, discovery and extraction of oil. While downstream involve delivery to processing plant, transportation and marketing of the finished product. In Nigeria, Nigerian national petroleum corporation (NNPC) is a body established in 1977, responsible for exploration, production, transportation, processing and marketing of petroleum products. According to Shittu et al (2013), the refined product lines that are presently offered for sale to the public by Pipelines and

Product Marketing Company Limited (PPMC), a subsidiary of NNPC, through the network of depots, are Liquefied Natural Petroleum (LNP), Premium Motor Spirit (PMS), Dual Purpose Kerosene (DPK), House Hold Kerosene (HHK), Aviation Turbine Kerosene (ATK), Automotive Gas Oil (Ago) and Fuel Oil which consists of Low Pour Fuel Oil (LPFO) and High Pour Fuel Oil (HPFO).

Nigeria is a country with a very high demand for all categories of petroleum products. Due to high demand, Nigeria imports petroleum products into the country to augment the local production from the refineries producing at a very low capacity. To cushion the effect of high pump price of fuel due to high cost of production Nigeria has to introduce Subsidy on Premium Motor Spirit (PMS) and Dual Purpose Kerosene (DPK).

### **Marketing and Distribution of Petroleum Products**

Marketing and distribution of petroleum products in Nigeria is done by (1) Major Oil Marketers known as Independent Petroleum Marketers Association of Nigeria (IPMAN) for example African Petrol (AP), Total, Oando PLC etc through their depots located all over the country and (2) Individual marketers that buys from the Major Oil Marketers (IPMAN) and sell to the consumers.

The major channels of marketing and distribution of fuel in Nigeria are through pipelines, rail and road transportations. These mode of marketing and distribution of petroleum products in Nigeria, affects the cost effects of the products with its attendant challenges and difficulties. For instance, the incessant bursting of the pipelines by vandals and bunkerers, the limited level of operation by the railways and the bad roads has contributed in no small measure to the high cost of petroleum products in Nigeria.

Ehinomeri and Adeleke (2012) shared their views that the distribution of petroleum products in Nigeria economy is fraught with complex problems resulting sometimes in products outages, inflated price of products and contentions on the pump price of products.

### **BUILDING MATERIALS**

Jinadu (2004) defined building material as the single largest input in construction industry ranging from cement to steel rod (reinforcement), timber, roofing sheets and gravel amongst other. Onibokun and Agboola (1990) classified building material into six broad categories on conventional method. These include; flooring material, wall material, ventilation material, roofing / ceiling material, painting materials and sanitary materials.

A nation's development is usually measured by the strength or weakness of building and construction in conjunction. Osoba (1992) observed with dismay the upward trend in the cost of basic building materials, which according to him began after the civil war. Also other increases in cost of building materials coincided with Udoji award era and the recent mismanagement of the economy.

Jagboro (1992) re-emphasized that all building materials used do not have the same significance on the cost of the building and also do not have same relative

importance on the existence of the building. Okafor (2003) classified construction cost into Direct Cost and Indirect Cost. Direct cost are cost of obtaining plant, material and labour, while indirect cost are cost of transportation, tax, loading and offloading material in vehicle etc. Some building materials can be reused after it has been used before, for example brick, block, concrete, straws and wood among others, while others are not reusable for example damp proofing materials and paint among others.

### **Factor Affecting the Cost of Building Materials**

The cost of building material is affected by transportation cost, demand of building materials, rate of importation, availability of building materials, level of competition/substitute and distance between the distribution location and source of building materials. The most significant factors here are transportation cost and distance between the distribution location and source of building materials.

According to Idiake (2011), production cost is directly affected by changes in diesel price consumption and indirectly by the increase cost of energy related consumables. Changing diesel cost also affect transportation costs primarily through fuel surcharge in the long hand distribution network (Raleigh, 2009 cited in Idiake, 2011). Simonson (2008) cited in Idiake (2011) observed that the American producer price index has gone up 6.5 percent as a result of 24 percent increase in diesel fuel cost. The risk involved in transportation of building material also affects its cost.

### **METHODOLOGY**

Data were gathered from the primary source in this study. This involves market survey and personal interview of business entrepreneurs that sell selected building material and marketers of petroleum products. Data obtained from market survey on the price of building materials form building materials market at Kuta road in Minna and those obtained through interviews on the price of petroleum (petrol) per litre from 2005 to 2014 were from petroleum marketers in Minna, Niger State.

This research used bar and line graphs to compare trends in price of selected building materials with respect to price of petroleum. Correlation analysis was used to analyze the relationship between the price of building materials during the period of unstable and stable prices of petrol. T-test was used to determine the differences between the cost of selected building materials when the price of fuel was stable and unstable.

### **DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS**

#### **Results and Discussions of Descriptive Analysis**

Below are the bar/line graphs presenting a comparison of the price of building materials during the period of unstable and stable prices of petrol. Figure 1 shows a comparison of the price of 12mm bar between the two periods under review. The price of 12mm bar was observed to follow different trend pattern between the two periods under review. While the price of 12mm bar fluctuated during the period of



unstable price of petrol, the price of 12mm bar remained constant during the period of stable price of petrol, in most of the cases.

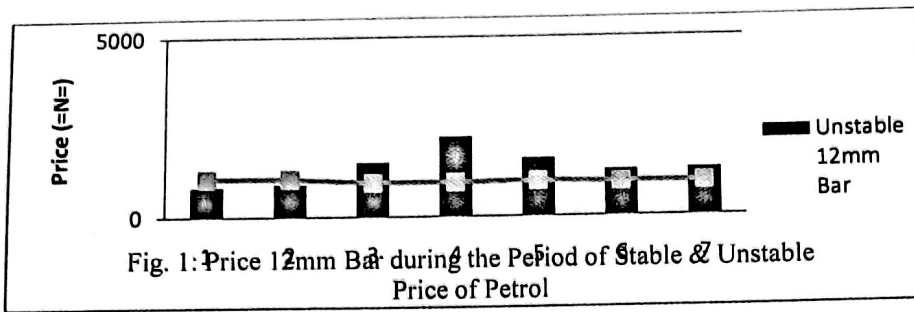


Figure 2 shows a comparison of the price of 16 mm bar between the two periods under review. It was observed that the price of 16mm bar moved along different trend pattern between the two periods under review. While the price of 16mm bar was increasing during period of unstable price of petrol, the price of 16mm bar was decreasing during the period of stable price of petrol or vice versa, in most of the cases. It was also observed that the price of cement was fluctuating during the two periods.

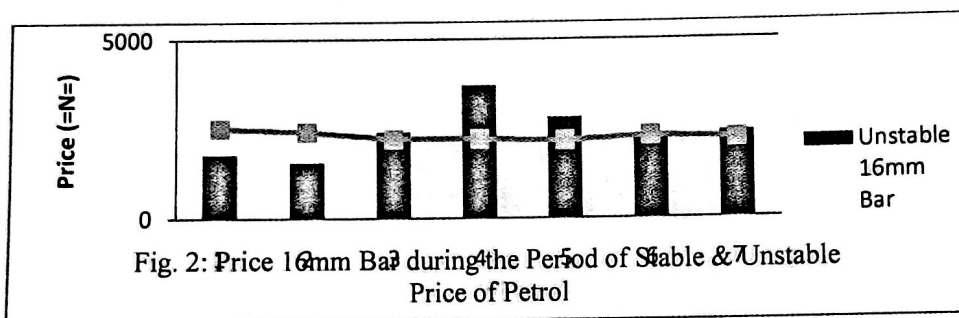


Figure 3 shows a comparison of the price of 2" x 4" timber between the two periods under review. The price of 2" x 4" was observed to follow different trend pattern between the two periods under review. While the price of 2" x 4" timber fluctuated during the period of unstable price of petrol, the price of 2" x 4" timber fluctuated for a while but remained constant in most of the cases till the end during the period of stable price of petrol.

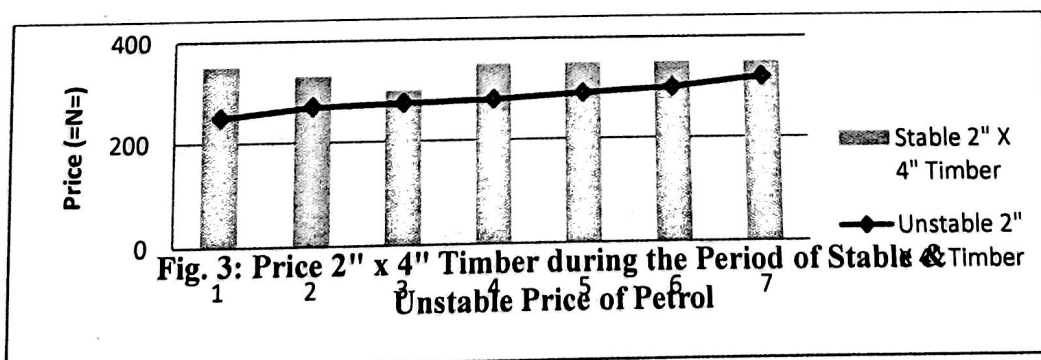


Figure 4 shows a comparison of the price of 2" x 6" timber between the two periods under review. The price of 2" x 6" timber was also observed not to follow similar trend pattern between the two periods under review. While the price of 2" x 6" fluctuated during the period of unstable price of petrol, the price of 2" x 6"

timber remained constant during the period of stable price of petrol, in most of the cases.

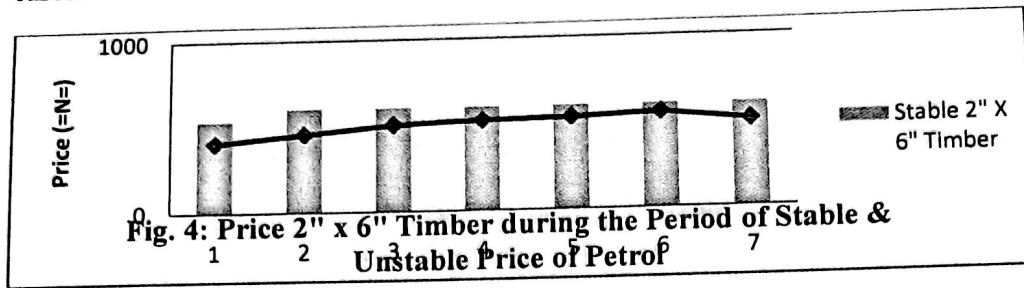


Figure 5 shows a comparison of the price of 1'' x 12'' timber between the two periods under review. The price of 1'' x 12'' timber was also observed not to follow similar trend pattern between the two periods under review. While the price of 1'' x 12'' fluctuated for a while and increased in most of the cases till the end during the period of unstable price of petrol, the price of 1'' x 12'' timber also fluctuated for a while but remained constant in most of the cases till the end during the period of stable price of petrol.

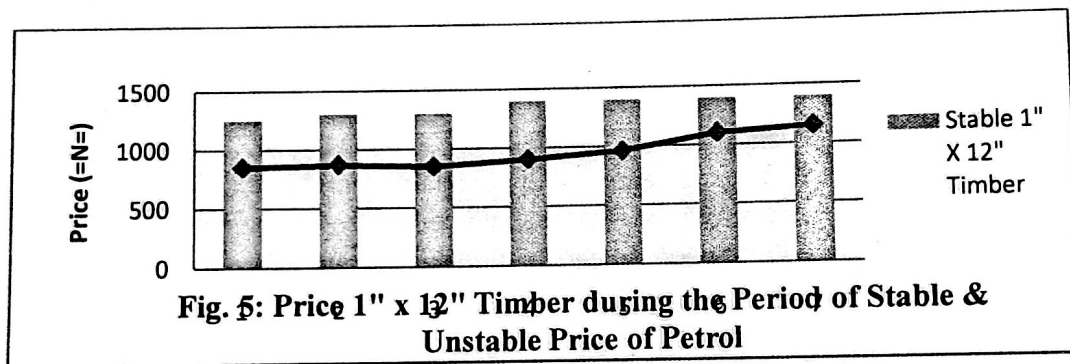
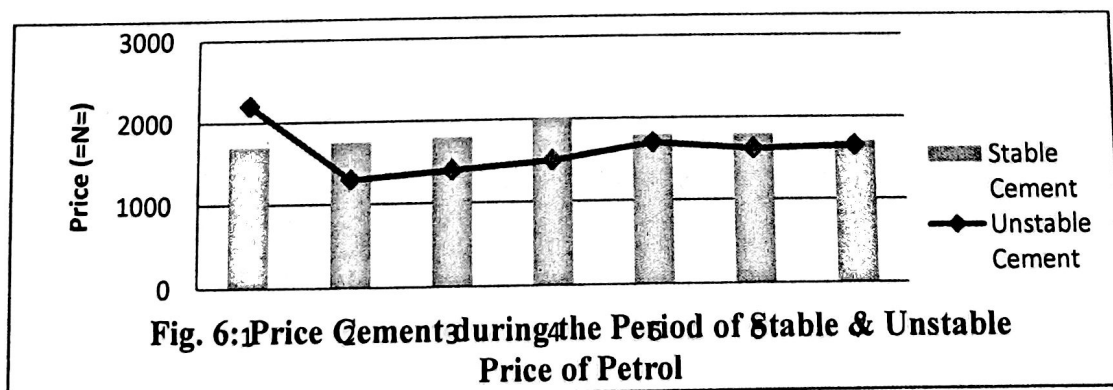


Figure 6 shows a comparison of the price of cement between the two periods under review. It was observed that the price of cement moved along different trend pattern between the periods under review. While the price of cement was increasing during period of unstable price of petrol, the price of cement was decreasing during the period of stable price of petrol or vice versa, in most cases. It was also observed that the price of cement was fluctuating during the two periods.



## **Results and Discussions for Correlation Analysis**

The first to sixth analyses are the correlation used to determine the relationship between the price of building materials during the period of unstable and stable fuel price. The first analysis studied the relationship between the price of 12mm high tensile reinforcement bar during the period of unstable and stable fuel (PMS) price. It was observed that the relationship was negative, strong and not significant. The correlation coefficient (R) observed was 72.1% indicating strong degree of association between the variables. The probability (P) value of 0.068 observed was greater than 0.05. This implies that the relationship between the variables was not significant. The second analysis studied the relationship between the price of 16mm high tensile reinforcement bar during the period of unstable and stable fuel (PMS) price. It was also observed that the relationship was negative, strong and not significant. The correlation coefficient (R) observed was 72.5% indicating strong degree of association between the variables. The probability (P) value of 0.065 observed was greater than 0.05. This also implies that the relationship between the variables was not significant.

It was observed from the third analysis that there exists a negative, weak and non-significant relationship between the price of 2" x 4" timber during the period of unstable and stable fuel price. The R value observed was 27.1% indicating weak degree of association between the variables. The P value of 0.557 observed was greater than 0.05. This also implies that the relationship between the variables was not significant. A strong, positive and significant relationship was, on the other hand, observed in the fourth analysis between the price of 2" x 6" timber during the period of unstable and stable fuel price. The R value observed was 79.4% indicating strong degree of association between the variables. The P value of 0.03 observed was less than 0.05. This implies that the relationship between the variables was significant.

In the fifth analysis, it was noticed that the relationship between the price of 1" x 12" timber during the period of unstable and stable fuel price was strong, positive and significant. The R value observed was 72.2% indicating strong degree of association between the variables. The P value of 0.067 observed was less than 0.05. This implies that the relationship between the variables was not significant.

The sixth analysis revealed a weak, negative and non-significant relationship between the price of cement during the period of unstable and stable fuel price. The R value observed was 38.7% indicating weak degree of association between the variables. The P value of 0.391 observed was greater than 0.05. This also implies that the relationship between the variables was not significant. The results of all the inferential analysis discussed above are summarized in Table 1.

**Table 1: Results Summary for Correlation Analyses**

Analysis No.	Variables		Observations		Inferences Strength of Relationship	Remark
	X <sub>1</sub>	X <sub>2</sub>	R (%)	P <sub>cal</sub>		
1	Price of 12mm bar during Unstable Fuel Price Period	Price of 12mm bar during Stable Fuel Price Period	-72.1	0.068	Strong	NS
2	Price of 16mm bar during Unstable Fuel Price Period	Price of 16mm bar during Stable Fuel Price Period	-72.5	0.065	Strong	NS
3	Price of 2x4 timber during Unstable Fuel Price Period	Price of 2x4 timber during Stable Fuel Price Period	-27.1	0.557	Weak	NS
4	Price of 2x6 timber during Unstable Fuel Price Period	Price of 2x6 timber during Stable Fuel Price Period	79.4	0.03	Strong	SS
5	Price of 1x12 timber during Unstable Fuel Price Period	Price of 1x12 timber during Stable Fuel Price Period	72.2	0.067	Strong	NS
6	Price of Cement during Unstable Fuel Price Period	Price of Cement during Unstable Fuel Price	-38.7	0.391	Weak	NS

**Key:**

SS = Statistically Significant

NS = Not Significant

**Results and Discussions for T - Test**

The seventh to twelfth analyses are T – tests used to determine the difference in the cost of the selected building materials when the price of petrol was unstable and when it was stable. It was observed that there was a statistically significant difference between the price of 12mm diameter reinforcement bar when the price of petrol (PMS) was unstable and when the price of petrol was stable in the seventh analysis. The observed mean value of the price of 12mm diameter reinforcement bar when the price of petrol was unstable was 1371.4386, while that of the price of 12mm diameter reinforcement bar when the price of petrol was stable was 982.8571. The observed T calculated value was 2.209, which was greater than the T tabulated value of 2.18.

It was also observed in the eighth analysis that there was no statistically significant difference between the price of 16mm diameter reinforcement bar when the price of petrol was unstable and when the price of petrol was stable. The observed mean value of the price of 16mm diameter reinforcement bar when the price of petrol was unstable was 2404.2857, while that of the price of 16mm diameter reinforcement bar when the price of petrol was stable was 2275.7143. The

observed T calculated value was 0.474, which was greater than the T tabulated value of 2.18.

On the other hand it was shown in the ninth analysis that there is a statistically significant difference between the price of 2" x 4" (timbers, when the price of petrol was unstable and when the price of petrol was stable. The observed mean value of the price of 2" x 4" timber when the price of petrol (PMS) was unstable is 283.5714, while that of the price of 2" x 4" timber when the price of petrol was stable was 340.0000. The observed T calculated value was 5.054, which was greater than the T tabulated value of 2.18. There was also a statistically significant difference between the price of 2" x 6" timbers, when the price of petrol was unstable and when the price of petrol was stable as shown in the tenth analysis. The observed mean value of the price of 2" x 6" timber when the price of petrol (PMS) was unstable was 492.8571, while that of the price of 2" x 4" timber when the price of petrol was stable was 590.0000. The observed T calculated value was 4.436, which was greater than the T tabulated value of 2.18.

The eleventh analysis also shows that there was a statistically significant difference between the price of 1"x12" timbers, when the price of petrol was unstable and when the price of petrol was stable. The observed mean value of the price of 1" x 12" timber when the price of petrol was unstable was 954.2857, while that of the price of 1" x 12" timber when the price of petrol was stable was 1350.0000. The observed T calculated value was 7.518, which was greater than the T tabulated value of 2.18.

The twelfth analysis shows similar a non-statistically significant difference between the price of 50kg cement when the price of petrol was unstable and when the price of petrol was stable. The observed mean value of the price of 50 Kg cement when the price of petrol was unstable was 1624.2857, while that of the price of 50 Kg cement when the price of petrol was stable was 1792.8571. The observed T calculated value was 1.45, which was less than the T tabulated value of 2.18. The results of all the T - test analysis are summarized in Table 2.



Table 2: Results Summary for T – Test between Unstable Price and Stable Price of Selected Building Materials n

Analysis no	Variables		Inferences			
	X <sub>1</sub>	X <sub>2</sub>	Mean Values	T <sub>cal</sub>	T <sub>tab</sub>	Remark
7	Unstable 12mm bar price	Stable 12mmbar price	X <sub>1</sub> = 1371.4386	2.209	2.18	SSD
			X <sub>2</sub> = 982.8571			
8	Unstable 16mm bar price	Stable 16mmbar price	X <sub>1</sub> = 2404.2857	0.474	2.18	NSD
			X <sub>2</sub> = 2275.7143			
9	Unstable 2"x4" Timber price	Stable 2"x4" Timber price	X <sub>1</sub> = 283.5714	5.054	2.18	SSD
			X <sub>2</sub> = 340.0000			
10	Unstable 2"x6" Timber price	Stable 2"x6" Timber price	X <sub>1</sub> = 492.8571	4.436	2.18	SSD
			X <sub>2</sub> = 590.0000			
11	Unstable 1"x12" Timber price	Stable 1"x12" Timber price	X <sub>1</sub> = 954.2857	7.518	2.18	SSD
			X <sub>2</sub> = 1350.000			
12	Unstable 50kg cement price	Stable 50kg cement price	X <sub>1</sub> = 1624.2857	1.45	2.18	NSD
			X <sub>2</sub> = 1792.8571			

**KEY**

SSD = Statistically Significant Difference

NSD = No Significant Difference

Unstable Price = Price of selected building material when the price of petrol was unstable (2005 to 2011)

Stable Price = Price of selected building material when the price of petrol was stable (2012 to 2014)

**CONCLUSION**

It was discovered from the research findings that only one of the selected building materials (2" x 6" timber) showed significant correlation between the period of unstable and stable price of petrol. All the other five selected building showed non-significant correlation between the two periods. This implies that the stability of petroleum products does not lead to the stability of the price of building materials.

It was also found that four of the selected building materials showed significant difference in their prices between the periods of unstable and stable price of petrol. These materials are 12mm reinforcement bar, 2" x 4" timber, 2" x 6" timber and 1" x 12" timber. On the other hand, two other selected building materials (16mm reinforcement bar and 50 Kg cement) showed non-significant difference in their prices between the two periods under review. This implies that while there is

stability in the price of petrol there is significant change in the price of building materials as compared to the period of unstable price of petrol.

It can therefore be concluded that the stability of price of petroleum products does not guarantee stability in the price of the selected building materials. There is a tendency for the price of building materials to change while the price of petroleum product remains stable.

In view of the research findings and conclusions made, the need for further research to examine the influence of interest rate and exchange rate, among other factors, on the price of building materials is imperative.

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