

# INFLUENCE OF PRICES OF SELECTED BUILDING MATERIALS ON THE RATE OF HOUSING DEVELOPMENT IN MINNA (2003 - 2012)

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## ABSTRACT

This study focused on filling the wide gap between income and housing cost in Nigeria which has almost eliminated the low-income earners from the housing market. To solve this problem, this research studied the relationship between the prices of eight building materials (cement, gravel, sharp sand, reinforcement bar, emulsion, texcote & gloss paints and roofing sheet) and the rate of housing development with a view to suggesting strategies that will assist in the provision of housing to low-income earners by the government in Minna. Both descriptive and inferential statistics were used for data analysis. It was established that the trend of the rate of housing development significantly differs from the ones observed for the building materials but the rate of housing development could roughly be estimated by employing the price of sharp sand and the price of texcote paint respectively because these materials correlated significantly and positively with rate of housing development. A major recommendation from the research findings was that policy makers should use the changes in the prices of sharp sand and texcote paint to infer the solution to the problem of annual decrease in the rate of housing development.

**Keywords:** Building Materials, Housing Development, Regression, Correlation.

## INTRODUCTION

Housing is paramount to human existence as it ranks among the top three needs of man and its provision has always been of great necessity to man. As a unit of the environment, housing has profound influence on the health, efficiency, social behaviour, satisfaction and general welfare of the community. It is a reflection of the cultural, social and economic values of a society and one of the best historical evidences of the civilization of a country (Olotuah, 2000).

In Nigeria, like in many other developing nations of the world housing problems are multi-dimensional and the problems of population explosion, continuous influx of people from rural to urban centres, and lack of basic infrastructure required for good standard of living have compounded housing problems over the years. Ogieta (1987) has observed that the disparity between the price and quantity of housing on one hand, and the number of households and the money available to them to pay these prices on the other, constitutes the central problem of housing. According to Okupe & Windapo (2000) the

gap between income and shelter cost in Nigeria is very wide. This has almost eliminated the low-income earners from the housing market. A panacea to the problem is the persistent increase in the prices of building materials; this study focuses on facilitating improved accessibility level to housing finance by low-income earners in Nigeria by studying the impact of increase in the prices of building materials on the rate of housing development.

In order to study the identified problem this study aims to determine the influence of the price of building materials on the rate of housing development with a view of suggesting strategies of improving the provision of housing efficiency and development control in Minna. To achieve the aim, the following objectives are pursued:

- i. To present a trend analysis of the price of each of the selected building materials over the study period.
- ii. To present a trend analysis of the rate of housing development over the study period.
- iii. To determine the relationship between the price of building materials and the rate of housing development.
- iv. To suggest strategies that will assist in the provision of housing to low-income earners by the government in Minna.

The following null hypotheses were postulated for this research work based on the third objective and literature findings and study of Olakotan (2006):

- i. Ho: 1: There is no significant relationship between the price of each of the building materials and the rate of housing development.
- ii. Ho: 2: There is no significant relationship between the price of all the concrete materials combined together and the rate of housing development.
- iii. Ho: 3: There is no significant relationship between the price of all the painting materials combined together and the rate of housing development.
- iv. Ho: 4: There is no significant relationship between the price of all the building materials combined together and the rate of housing development.

The study covers Minna, Niger State between the period of 2004 and 2012. The selected building materials are 50Kg Portland cement, sharp sand, coarse aggregate (gravel), 12mm high tensile reinforcement bar, corrugated galvanised iron (G.I) roofing sheet, 20 litre gallon emulsion paint, 10 litre gallon of texcote paint and 4 litre gallon gloss paint. The officially compiled statistics of houses constructed annually kept by Niger State Urban Development Board were employed in lieu of actual field data on rate of housing development due to time constraint.

## **LITERATURE REVIEW**

### **Concept of Housing**

According to Jinadu (2004), housing can be classified under five categories as highlighted below:

- i. Housing types based on location or setting
- ii. Housing types based on ownership structure
- iii. Housing types based on structure, design or layout
- iv. Housing types based on internal composition/height
- v. Housing types based on building materials

In addition to the above, Achuen & Achuen (2006; 2008) gave another type of housing as “Social Housing” which could also be referred to as subsidized housing. Social housing is government-supported accommodation for people with low to moderate incomes. Social housing could also be rental housing owned and managed either by the state or not for profit organisations, or a combination of the two. It also includes affordable housing, community housing or cooperative housing. Most social housing providers are non-profit oriented.

It was reported in [www.manufacturingtoday.nigeria](http://www.manufacturingtoday.nigeria) (2012) that the official estimate shows a shortage of 16 million housing units in Nigeria with 80% of the population living in informal housing. These are structures of varying degrees of degeneration on land which they have no ownership or title rights. Ibimilua (2013) reported that the challenges of housing in terms of quality and quantity appear to be the same all over the world. The needy have less access to housing while the less needy have greater chances of accessing housing. In Nigeria, housing is generally inadequate in the rural areas in terms of quality, while the major problem in urban areas is more of quantity, although quantity is also an issue. The shortage of housing is one of the factors responsible for the poor environmental quality across Nigeria. In 1991, the national housing policy was promulgated in order to propose possible solutions to the housing problems in Nigeria. Twenty years on, millions of Nigerians are still homeless while many others are living in indecent houses. Ibimilua (2013) therefore identified the major challenges to be due to poor implementation, corruption, bureaucracy and political instability. He then recommended that housing finance, cooperatives, use of local building materials, development of infrastructure, policy implementation and review of the housing policy are the possible solutions to the housing problem in Nigeria.

### **Rising Cost of Building and Effect of Materials Price Increase on Construction Cost**

Building cost has been on the increase in our contemporary society and this attracts a great deal of concern to both private and public bodies. The rapid increase in cost of construction is observed to be influenced by various variables. Onibokun (1985) observed that although Nigeria is potentially endowed with natural resources to produce most materials required for their construction industry vast of the resource still lies fallow and local production of building materials had never matched demand at any time. Onibokun (1985) noted further that 20% paint and a reasonable percentage of the cement consumed in 1974 were imported. Omole (1988) is of similar view that essential materials like cement, finishing materials are sometimes scarce to come by in Nigeria. Oladapo (1988) in the same vein agreed that most building materials with the exception of wood could be said to be imported. Jackson (1988) reported that the basic cost of a building is determined by the design. A large house will cost more than a small one and equally finished large windows costs more than smaller one. Jackson (1988) added that about

50% of building cost goes in to materials and the remaining 50% is used up as labour and profit cost in buildings. Therefore, market force that is interplay of demand and supply, are one of the major factors affecting cost of building materials.

Osoba (1992) observed with dismay the upward trend in the cost of basic building materials, which according to him began after the civil war and other increases in cost of building materials coincide with Udoji award and the mismanagement of the economy. Other causes of upward trend in building material cost according to Osoba (1992) are:

- i. High demand of building materials arising from post-civil war.
- ii. Massive importation of building materials.
- iii. Inefficient distribution system aggravated by middlemen and high transportation cost.
- iv. Insufficient building materials.
- v. Massive intervention of government in direct housing construction.

In addition to the above, Olusola-Obasa (2012) reported that Key players in the cement industry say there will soon be an end to the annual increase in the price of cement in Nigeria, going by recent activities in the sector. They believe that with improved production capacity from cement plants across the country, supply may soon exceed demand. They said that when compared with the nation's overall demand for cement put at 17 million metric tons per annum, it was obvious that the supply of the product would outweigh the demand, leading to a crash in the product's price and also ending the era of importation of the product.

## **RESEARCH METHODS**

The source of data collection for this research work was the secondary source of data collection, that is, from the archives of building materials merchants on prices of building materials and Niger State Urban Development Board on the rate of housing development from already compiled records. The study employed the use of both descriptive and inferential methods of analysis to analyse the collected data.

The use of tables was employed to present data collected for the study while bar charts and line graph were employed to present trend analysis on the prices of building materials and rate of housing development respectively. The use of Simple Linear Regression was employed to determine the statistical relationship existing between the price of each of the selected building materials and the rate of housing development, while the multiple regression was employed to determine the statistical relationship existing between the price of all the selected building materials combined together and the rate of housing development, with the aid of the computer software package called the Statistical Package for Social Sciences (SPSS), while correlation analysis (using Spearman's correlation coefficient) was employed to determine the degree of association between the prices of building materials and the rate of housing development.

This paper sets level of statistical significance at 5%. Hence, for any value of Probability (P) from 0.00 to 0.05 there is significance in the test but for values greater than 0.05 there is no significance in the test.

## RESULTS AND DISCUSSIONS

The data collected for this study are presented in Table 1.

Table 1: Data on Building Materials Prices and Rate of Housing Development

| Year | 50 Kg bag of Cement (N) | Gravel [10 Tonne] N/Trip | Sharp Sand [10 Tonne] (N/Trip) | 12mm High Tensile Reinforcement Bar (N/Kg) | 20 Ltr Gallon of Emulsion Paint (N/Gallon) | 10 Ltr Gallon of Texcote Paint (N/Gallon) | 4 Ltr Gallon of Gloss Paint (N/Gallon) | Corrugated G.I Roofing Sheet (N/Bundle) | Rate of Housing Development in Minna (Nr.) |
|------|-------------------------|--------------------------|--------------------------------|--|--|---|--|---|--|
| 2003 | 1,550                   | 11,500                   | 10,000                         | 800  | 2,000                                      | 4,000                                     | 1,500                                  | 10,500                                  | 497  |
| 2004 | 1,300                   | 11,550                   | 10,000                         | 1,000                                      | 2,000                                      | 4,200                                     | 1,530                                  | 14,500                                  | 401  |
| 2005 | 1,200                   | 11,550                   | 10,250                         | 1,200                                      | 2,000                                      | 4,000                                     | 1,550                                  | 8,500                                   | 394  |
| 2006 | 1,300                   | 11,650                   | 10,350                         | 1,050                                      | 2,200                                      | 4,500                                     | 1,550                                  | 9,000                                   | 311  |
| 2007 | 1,450                   | 11,800                   | 10,200                         | 1,283                                      | 2,400                                      | 4,500                                     | 1,650                                  | 9,500                                   | 277  |
| 2008 | 1,500                   | 11,850                   | 10,500                         | 2,300                                      | 2,400                                      | 4,550                                     | 1,700                                  | 9,000                                   | 495  |
| 2009 | 1,700                   | 11,900                   | 10,550                         | 1,770                                      | 2,420                                      | 4,550                                     | 1,800                                  | 17,500                                  | 365  |
| 2010 | 1,600                   | 11,950                   | 10,700                         | 1,250                                      | 2,500                                      | 5,000                                     | 2,200                                  | 9,500                                   | 317  |
| 2011 | 1,650                   | 12,000                   | 10,800                         | 1,280                                      | 2,700                                      | 5,000                                     | 2,250                                  | 11,000                                  | 363  |
| 2012 | 1,700                   | 12,000                   | 12,000                         | 1,650                                      | 2,800                                      | 5,500                                     | 2,400                                  | 11,300                                  | 197  |

SOURCE: i. Author's Market Survey (2013)  
ii. Niger State Urban Development Board, Minna (2013)

Table 1 shows the data collected on four concrete materials (cement, gravel, sharp sand and reinforcement bar), three painting materials (emulsion paint, texcote paint and gloss paint), roofing sheet and the rate of housing development expressed in terms of number of houses approved annually for development by the Niger State Urban Development Board, Minna, for a ten-year period.

### Results for Inferential Analysis

Bar chart was used to carry out the descriptive analysis of data collected for the study. The bar graphs show the pattern of prices of building materials studied and the line graph shows the rate of housing development for a ten-year period (2003 - 2012). These bar graphs and line graph showing trend analysis are presented and discussed below.

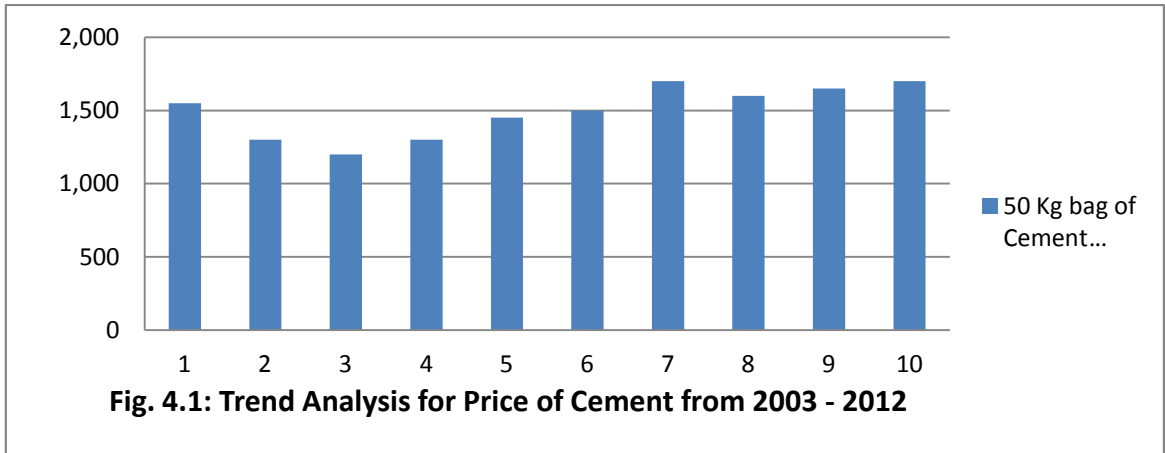
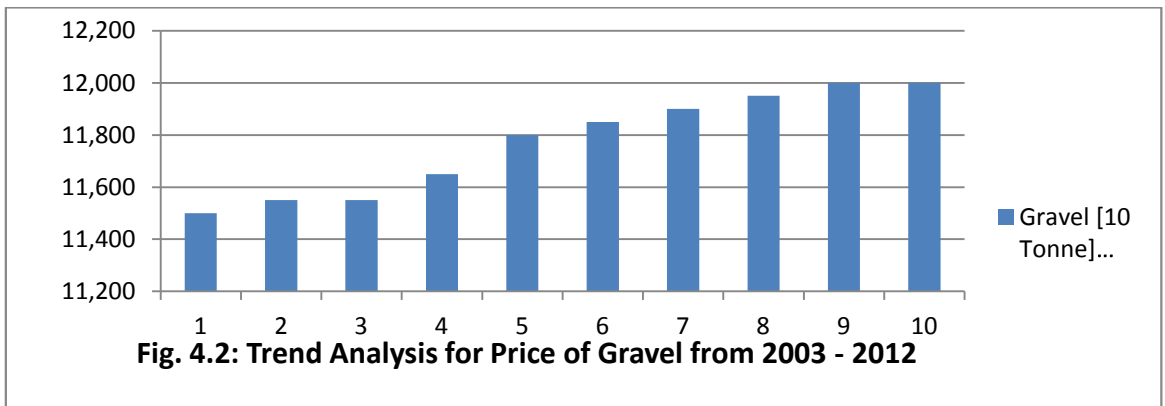
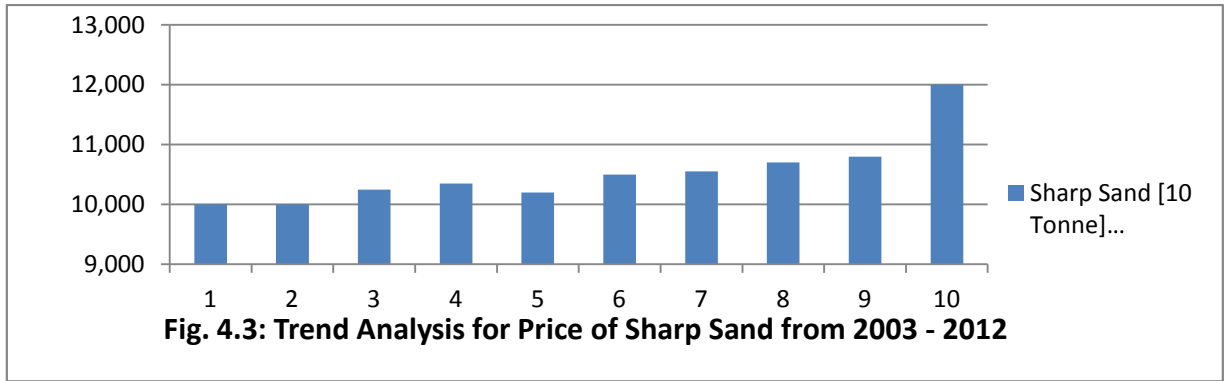


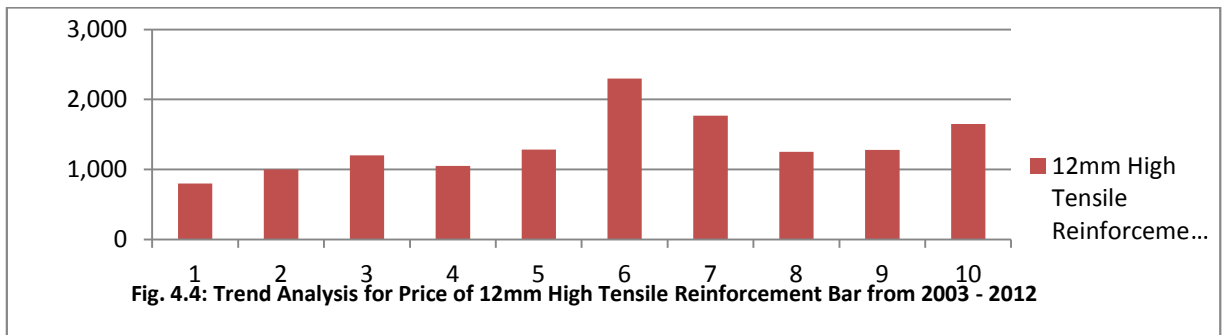
Figure 1 above shows the trend of the prices of the price of cement for the period under review (2003 - 2012). It was shown from the graph that the price of cement dropped annually for the first three years and this was followed by annual increase for the next three years. The next three years (i.e. the seventh to ninth year) shows further annual increment in the price of cement and the tenth year shows an increase in the price of cement. This therefore implies that the price of cement fluctuates over the period under review on the average.



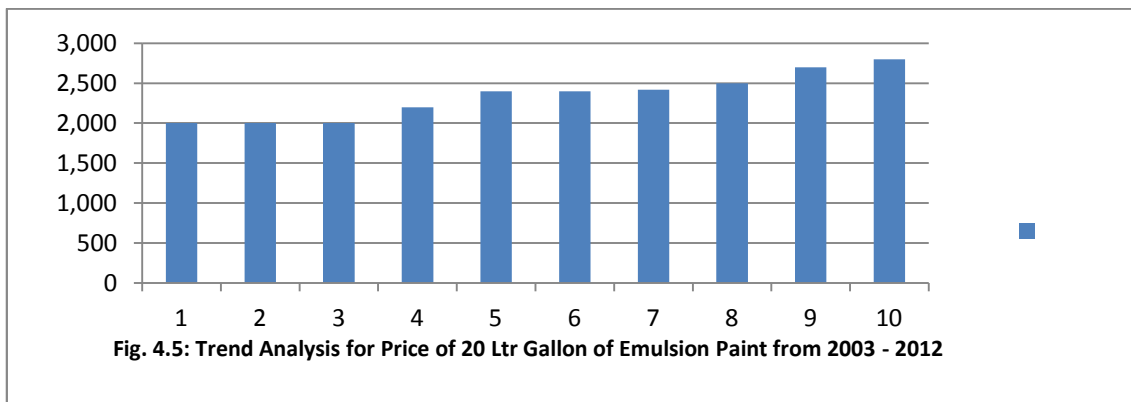
It was observed from the trend analysis of the price of gravel for a ten-year period (2003 - 2012) in Fig. 2 that the price of gravel increases annually over the period under review except during the third year (2005) when there was a decrease in the price of gravel. The trend pattern of the price of gravel differs from that of cement significantly.



The trend in the price of sharp sand was observed to show annual increment over the study period (2003 - 2012) in Fig. 3 except during the fifth and tenth years where a decrease in the price of sharp sand was observed respectively. The trend pattern of the price of sharp sand gives a similar result with that of gravel.



The price of high tensile reinforcement bar, from Figure 4, was observed to show annual increase in the first three years and this was followed by a decrease in the price of reinforcement bar in the fourth year. This was followed by annual increment from the fourth to the sixth year and an annual decrease in price was noticed again from the sixth to the eighth year. Finally, an annual increase in the price of reinforcement bar was observed from the eighth to the tenth year. This trend pattern implies that on the average the price of high tensile reinforcement bar fluctuated over the study period (2003 - 2012). This shows a trend pattern similar to that of the price of cement.



A different trend pattern was observed for the price of emulsion paint from that of the prices of cement, sharp sand, gravel and reinforcement bar. It was observed from Figure 5 that the price of emulsion paint was constant for the first three years and this was followed by an increase in price of emulsion paint in the fourth year. The price of emulsion paint was also noticed to be constant again for a three-year period (fifth to seventh year) after an increase in the fourth year. The last three years (eighth to tenth year) showed annual increase in the price of emulsion paint.

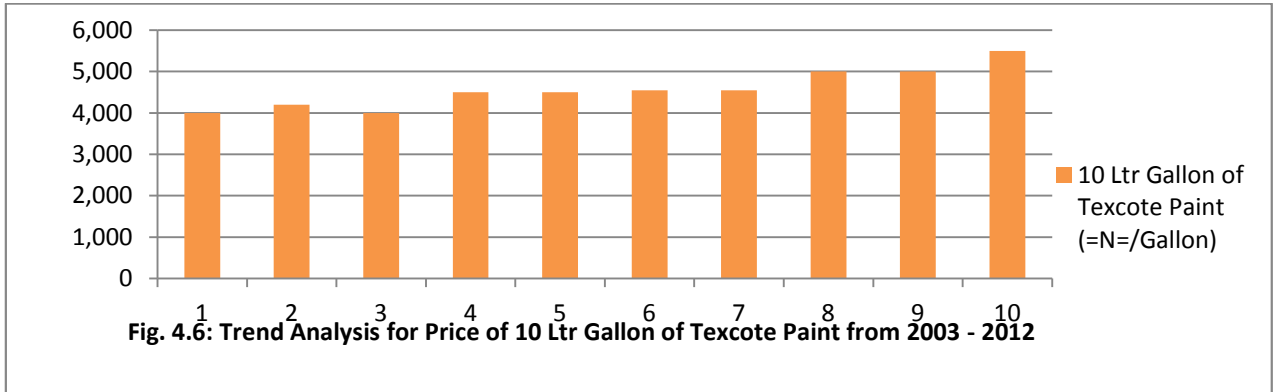


Figure 6 shows a fluctuating trend in the price of texcote paint for the first four years and this was followed by a trend showing constant price of texcote paint for a four year period (fourth to seventh year). The price of texcote paint increased in the eighth year, remained constant in the ninth year and finally increased in the tenth year. This trend in price of texcote paint is similar to that of the price of emulsion paint.

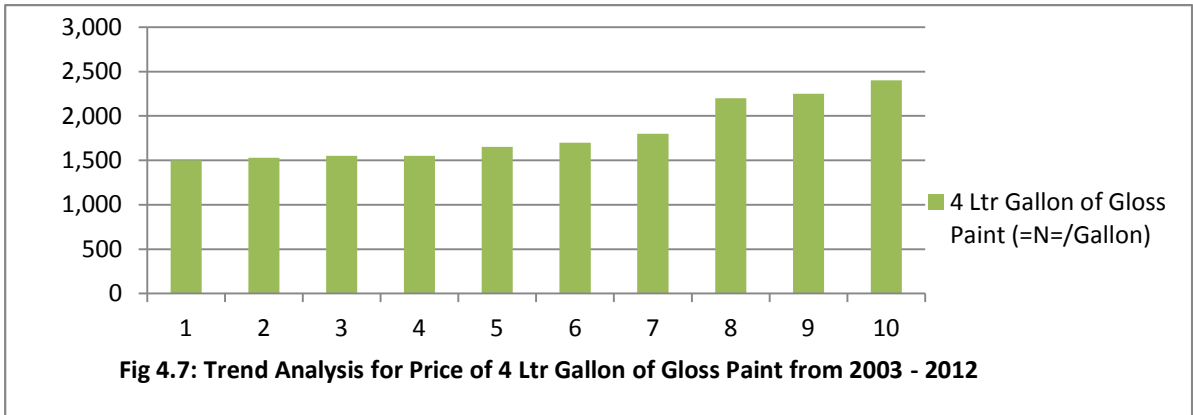
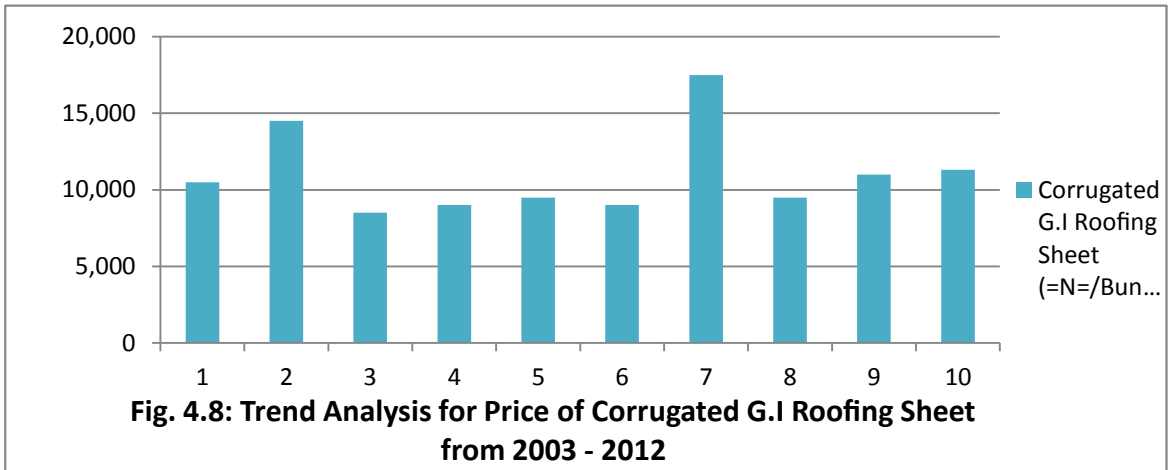


Figure 7 shows the trend of the price of gloss paint during the period under review (2003 - 2012). It was observed that throughout the period under review the price of gloss paint increased on annual basis. This trend pattern is unique and different from that of other building materials studied. This implies that a consistent trend pattern was noticed for the price of gloss paint.





It was observed from Figure 8 that the price of roofing sheet fluctuated for the first three years (first to third year) and then increased annually from the third to fifth year. Another fluctuating pattern was also noticed in the price of roofing sheet from the fifth to eighth year and finally an annual increase in the price of roofing sheet was noticed again from the eighth to tenth year. This pattern is also different from the ones observed for other building materials studied.

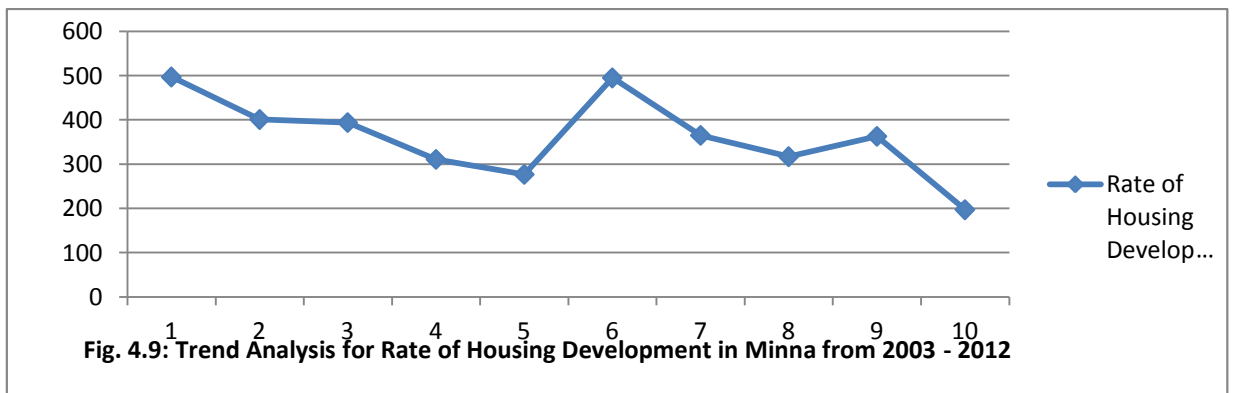


Figure 9 is a line graph of the trend analysis showing the rate of housing development for the ten-year (2003 - 2012) period studied. It was observed that there was a constant annual decrease in the rate of housing development from the first to fifth year (2003 - 2007) and there was a rapid increase in the rate of housing development in the sixth year (2008). This was followed by another constant and annual decrease in the rate of housing development from the seventh to tenth year (2009 - 2012) except in the ninth year when there was a slight increase in the rate of housing development. This implies that the trend pattern of the rate of housing development significantly differs from the ones observed for the building materials studied over the period under review.

## Results for Inferential Analysis

It was discovered from the inferential analysis that all the building materials showed a weak and non-significant relationship with the rate of housing development with R<sup>2</sup> values ranging from 0 to 48%, except for the prices of sharp sand and texcote paint which show significant but weak relationship with rate of housing development. The prices of five of the building materials (gravel, sharp sand, emulsion paint, texcote paint and gloss paint) however showed strong correlation (degree of association) with the rate of housing development with the correlation coefficient values ranging from 51%/0.51 to 69%/0.69 while the prices of three building materials (cement, reinforcement bar and roofing sheet) showed very weak correlation with the rate of housing development with the correlation coefficient values ranging from 0.4%/0.004 to 22%/0.22. The findings here slightly differs from that of Olakotan (2006) because in this case only two one concrete materials (sharp sand) showed significant and weak relationship with the rate of housing development while in the study of Olakotan (2006) there existed a strong and significant relationship between three concrete materials (cement, gravel and sand) and the rate of housing development.

The inferential analysis also revealed that positive correlation exists between the prices of four building materials (reinforcement bar, emulsion paint, gloss paint and roofing sheet) and the rate of housing development implying that there is a tendency for increase in the prices of reinforcement bar, emulsion paint, gloss paint and roofing sheet respectively to be accompanied by a corresponding increase in the rate of housing development and decrease in the prices of reinforcement bar, emulsion paint, gloss paint and roofing sheet respectively will be accompanied by a corresponding decrease in the rate of housing development. It was also discovered that negative correlation exists between the prices of four building materials (cement, gravel, sharp sand and texcote paint) and the rate of housing development implying that there is a tendency for increase in the prices of cement, gravel, sharp sand and texcote paint respectively to be accompanied by a decrease in the rate of housing development and decrease in the prices of cement, gravel, sharp sand and texcote paint respectively will be accompanied by an increase in the rate of housing development. This also slightly differs from the findings of Olakotan (2006) where positive correlation was observed between the prices of cement and sand respectively and rate of housing development, while negative correlation was noticed between the prices of gravel and reinforcement bar respectively and rate of housing development, as compared with the findings of this study where negative correlation was observed between the prices of each of the concrete materials and rate of housing development except for the price of reinforcement bar.

A combination of the prices of all the building materials also show a non-significant but very strong relationship and very strong correlation with the rate of housing development with R<sup>2</sup> and R values of 93% and 96% respectively. A similar relationship of a non-significant but very strong relationship and very strong correlation was observed between the prices of all concrete materials and all painting materials respectively with the rate of housing development with the R<sup>2</sup> and R values of 72% & 56% and 85% & 75% respectively. This finding is similar to that of Olakotan (2006) where a combination of

the prices of the building materials showed a non-significant but strong relationship with the rate of housing development.

It is evident from the findings of this study that the trend in the prices of building materials and rate of housing development in Minna, Niger State has changed from what the trend used to be from 1995 to 2005 as studied by Olakotan (2006). The summary of the inferential analysis discussed above is given in Table 2.

Table 2: Results Summary for Inferential Analysis

| Analysis No. | Variables                    |                    | Type of Model   | Observations  |          |       |      | Inferences |                          |        |                      |
|--------------|------------------------------|--------------------|-----------------|---|----------|-------|------|------------|--------------------------|--------|----------------------|
|              | X                            | Y                  |                 | Regression Equation   | R/R2 (%) | Fcal  | Ftab | Pvalue     | Strength of Relationship | Remark | Action On Hypothesis |
| 1            | Price of Cement              | Rate of Bldg. Dev. | Linear (Simple) | $Y = 533.267 - 0.115x$  | 22/5     | 0.410 | 5.32 | 0.540      | Weak                     | NS     | Accept HO            |
| 2            | Price of Gravel              | Rate of Bldg. Dev. | Linear (Simple) | $Y = 3193.651 - 0.241x$   | 51/26    | 2.786 | 5.32 | 0.134      | Weak                     | NS     | Accept HO            |
| 3            | Price of Sharp Sand          | Rate of Bldg. Dev. | Linear (Simple) | $Y = 1461.107 - 0.104x$   | 65/43    | 5.978 | 5.32 | 0.040      | Weak                     | SS     | Reject HO            |
| 4            | Price of Reinforcement Bar   | Rate of Bldg. Dev. | Linear (Simple) | $Y = 353.149 + 0.006x$  | 3/0.1    | 0.007 | 5.32 | 0.935      | Weak                     | NS     | Accept HO            |
| 5            | Price of Emulsion Paint      | Rate of Bldg. Dev. | Linear (Simple) | $Y = 808.655 + 0.191x$  | 59/35    | 4.322 | 5.32 | 0.071      | Weak                     | NS     | Accept HO            |
| 6            | Price of Texcote Paint       | Rate of Bldg. Dev. | Linear (Simple) | $Y = 182.199 - 0.135x$  | 69/48    | 7.407 | 5.32 | 0.026      | Weak                     | SS     | Reject HO            |
| 7            | Price of Gloss Paint         | Rate of Bldg. Dev. | Linear (Simple) | $Y = 646.116 + 0.157x$  | 58/33    | 3.948 | 5.32 | 0.082      | Weak                     | NS     | Accept HO            |
| 8            | Price of Roofing Sheet       | Rate of Bldg. Dev. | Linear (Simple) | $Y = 363.186 + 0.000x$  | 0.4/0.0  | 0.000 | 5.32 | 0.991      | Weak                     | NS     | Accept HO            |
| 9            | Combined BldgMaterial Prices | Rate of Bldg. Dev. | Multiple        | $Y = 17049.745 + 0.286x1 - 1.363x2 - 0.285x3 - 0.273x4 - 0.274x5 - 0.004x6 + 0.536x7 - 0.003x8$ | 96/93    | 1.712 | 4.41 | 0.533      | Strong                   | NS     | Accept HO            |
| 10           | Price of Concrete            | Rate of Bldg. Dev. | Multiple        | $Y = 5312.140 + 0.301x1 - 0.380x2 - 0.104x3 + 0.118x4$  | 85/72    | 3.224 | 4.41 | 0.116      | Strong                   | NS     | Accept HO            |
| 11           | Price of Paints              | Rate of Bldg. Dev. | Multiple        | $Y = 1228.018 + 0.175x1 - 0.340x2 + 0.154x3$  | 75/56    | 2.536 | 4.41 | 0.153      | Strong                   | NS     | Accept HO            |

Key: SS = Statistically Significant      NS = Not Significant

## CONCLUSIONS

From the analysis carried out and findings from this study, the following conclusions were reached:

- 1) There is a constant annual decrease in the rate of housing development over the study period on the average, implying that the trend pattern of the rate of housing development significantly differs from the ones observed for the building materials studied over the period under review.
- 2) All the building materials showed a weak and non-significant relationship with the rate of housing development with R<sup>2</sup> values ranging from 0 to 48%, except for the prices of sharp sand and texcote paint which show significant but weak relationship with rate of housing development.
- 3) The prices of five of the building materials (gravel, sharp sand, emulsion paint, texcote paint and gloss paint) however showed strong correlation (degree of association) with the rate of housing development with the correlation coefficient values ranging from 51%/0.51 to 69%/0.69 while the prices of three building materials (cement, reinforcement bar and roofing sheet) showed very weak correlation with the rate of housing development with the correlation coefficient values ranging from 0.4%/0.004 to 22%/0.22.
- 4) There is a tendency for increase in the prices of reinforcement bar, emulsion paint, gloss paint and roofing sheet respectively to be accompanied by a corresponding increase in the rate of housing development and decrease in the prices of reinforcement bar, emulsion paint, gloss paint and roofing sheet respectively will be accompanied by a corresponding decrease in the rate of housing development.
- 5) There is a tendency for increase in the prices of cement, gravel, sharp sand and texcote paint respectively to be accompanied by a decrease in the rate of housing development and decrease in the prices of cement, gravel, sharp sand and texcote paint respectively will be accompanied by an increase in the rate of housing development.
- 6) Finally, the rate of housing development can be estimated by employing the price of sharp sand and the price of texcote paint respectively.

## **RECOMMENDATIONS**

The following recommendations were made from the findings of this research:

- 1) The cost of housing development escalates as the price of major building materials like reinforcement bar, paints and roofing sheet increase, it is therefore imperative that policy makers should explore the possibility of using increase in price of materials like these to mitigate developmental pressures.
- 2) Detailed data should be maintained on the changes over time in the prices of materials like cement, reinforcement bar and roofing sheet to enable policy makers have a workable and implementable development plan for Minna town.
- 3) Policy makers should use changes in prices of sharp sand and texcote paint to solve the problem of annual decrease in rate of housing development has noticed from trend analysis.

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