# Developing Predictive Models of Commercial Property Values in Emerging Economy: Case Study of Ikeja, Nigeria

By

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## Abstract

*In Ikeja Nigeria, commercial properties usually compete to locate along arterial roads and values of such properties tend to increase from time to time. The rate of increase has become unpredictable leading to inability of Estate Surveyors and Valuers to accurately predict such trend. This study focused on commercial properties in Ikeja with a view to determining spatial distribution and deriving models for predicting the trend of the values. In doing so, data were analyzed using polynomial regression models and spatial distribution of commercial property values along the arterial roads were depicted on a Value Map. Models were also derived to assist Estate Surveyors and Valuers, real estate developers and financiers in predicting accurately future values of commercial properties along the arterial roads in the study area.*

**Keywords:** *arterial roads, commercial properties, commercial property values, estate surveyors, developers, model, property market, spatial analysis, trend of property values.*

## Introduction

The importance of road network in physical and economic developments cannot be over-emphasized. This is evident in increasing demand for commercial properties along the arterial roads in Ikeja, a city in an emerging economy. Property and land values tend to increase in areas with expanding transportation networks and increase less rapidly in areas without such improvements; with rapid and continuous rise in housing and land prices expected in cities with transportation improvements (Goldberg, 1970). This was corroborated by Lean and Goodall (1977), who stated that urban areas naturally develop at nodal points in the transport network and those locations with good transport access to other areas have relative advantage over locations with poorer transport facilities and that urban locations having such relative

advantages are likely to be where transport routes converge.

According to Oni (2009), Ikeja city is a typical example in the history of growth and development of cities in Nigeria. The city became capital of Lagos State in 1976 and road networks were developed to cater for high concentration of pedestrian and vehicular movements. Similarly, commercial activities like banking, retail/wholesale businesses, and professional services congregate to take advantage of nearness to seat of governance. Concentration of activities attracted consumers and ancillary service providers. This partly caused increase in demand for commercial space and its concomitant effects on commercial property values along arterial roads that deliver much of the vehicular and pedestrian movements in the city.

There have been increases in rental values although not at equal rates along individual arterial roads. The problem facing the Estate Surveyors and Valuers, investors, and financiers is determining trend of commercial property values and predicting such trend with some level of confidence to assist them in decision-making.

The aim of this study is to determine the spatial distribution of commercial property values along the arterial roads, in addition to deriving a model for predicting their trends. It is anticipated that the model may become useful tool for professional Estate Surveyors and Valuers, Developers, Financiers, and Feasibility and Viability Appraisers in view of uncertainty and risks in property development in an emerging economy like Nigeria. This will assist in predicting, with some degree of accuracy, the fair rental values of commercial properties rather than relying on intuition in deciding future rental incomes from such properties.

**Theoretical Issues**

Earlier theorists (Haig, 1926; Goldberg, 1970; Downing, 1973; Kivell, 1993; McQuaid and Grieg, 2003) relate distance to rental value. They opined that land uses close to the Central

Business Districts (CBD) tend to generate higher revenue than locations farther away, and commercial property users locate along transport network to benefit from economic advantages associated with ease of movements, and that the farther away the distance from a CBD  the lower the rent.

According to Yago (1983), the importance of transportation cannot be over-emphasized, it centrally affects the relationship between physical space and society and changes in transportation affect the organization of human activities and structure the environment that spurs urban growth. In a study on urban transportation issues in India, Singh (2005) stated that due to increases in population brought about by both natural increase and migration from rural areas and smaller towns, availability of motorized transport, increases in household income, commercial and industrial activities, have added to transport demand. The expected effect on both residential and commercial property markets was positive, but the range of impacts vary from marginal to over 100% in the commercial sector from the North American evidence.

Urban areas naturally develop at nodal points in the transport network and areas with good transport access to other areas have relative advantage over locations with poorer transport facilities. Locations with relative advantages are found where different transport routes converge and general improvement of transport facilities will increase the size of population, whose effective demand can be tapped and therefore increase the amount of specialization and exchange that takes place (Lean and Goodall, 1977); while, according to Sivitanidou (1996), business activity clusters elicit significant effects on commercial land market as exemplified in firms valuing main and secondary centres accessibility in the urban areas.

Henneberry (1998) opined that increase in accessibility leads to reduction in relative transport costs of a site directly proved in increased demand that trigger land and property

values, intensity of land use, and values with substantial changes; while Wyatt (1999), in correlating location values of shops with accessibility index used expert system heuristics to select comparable properties from a database with questions asked about the subject property. He adjusted the values of comparables to account for differences between them and the subject property, and similarly for values of comparables to account for physical differences and the result displayed on Value Map.

According to Ajayi (1998), investors in property of various types are uncertain about the outcomes of their actions. Future events are difficult to forecast in precise terms and over time such forecast becomes unreliable. He stated further that risk is the level of probability that required return measured in terms of capital value and income would be achieved. Uncertainty implies that neither alternative outcomes nor their probabilities could be identified.

In Nigeria, a lot of risks and uncertainties affect commercial property development and there is lack of information or model to predict commercial property values to reduce the effects of such risks and uncertainties. In feasibility and viability appraisal of commercial property projects, expected values are decided by intuition with no accurate predictions of such values. It is in this regard that the study has become significant. A model that may assist in predicting trend of commercial property values in Ikeja will be a great contribution to knowledge and spur further research in this direction.

**The Study Area**

Ikeja city is a large component of Lagos metropolis. Lagos itself is the largest city in Nigeria, located at 6°34′60″N, 3°19′59″E along the West African coast and was the capital city of Nigeria replaced by Abuja on 12th December, 1991. Lagos remains the commercial nerve centre of Nigeria. It is located at the north-central part of Lagos metropolitan area sharing boundary with Ogun State at the north and bounded by Kosofe Local Government Area at the

east, Mushin and Oshodi-Isolo Local Government Areas at the south, while Alimosho, Agege and Ifako-Ijaiye Local Government Areas form the western boundary. Ikeja is one of the five political administrative divisions and one of local government areas of Lagos State as shown in Fig. 1.



**Fig.1:** Map of Lagos Metropolis Showing Ikeja, the Study Area
**Source:** Oni (2009)

Described in terms of its operational structures and in relation to the arterial road network, Ikeja metropolis is divided into seven sectors. Sector One lies at the north-central part of the metropolis and consists mainly of residential neighbourhoods with occasional commercial users of banks and service offices. Sector Two is of predominantly industrial concerns around WEMPCO, ACME and Lateef Jakande Roads; Sector Three is almost centrally located in the study area and consists of Oba Akran Avenue, Adeniyi Jones, Aromire Avenue, and Obafemi Awolowo Way. The aforementioned Obafemi Awolowo Way demarcated Sector Three from Five. Sector Three is predominantly residential interspersed by few industrial concerns and commercial outfits that over the years have displaced residential users along the arterial

roads. Sector Four lies at the eastern part of the study area served with Secretariat Road, Ikosi Road, Oregun Road, 7-up Road, bounded by Lagos/Ibadan Expressway and Ikorodu Road. Sector Five is bounded by Sectors Three, Four and Six consists of Allen Avenue, Opebi Road, Ola Ayeni Street, Toyin Street, Olowu Street, Kodesho Street, Simbiat Abiola Road, Otigba Street and Opebi Link-Road. The sector is characterized by concentration of commercial properties and represents the main commercial sector of the study area.

Sector Six occupies the southern part of the study area and consists of Government Residential Area (G.R.A), and institutional properties (Army Barracks, Police Barracks, High and Magistrate Courts, Lagos State Administrative Centre, Passport Office and Nigeria Telecommunication Limited). Properties along the major roads in the Sector have undergone changes in use from residential to commercial. Roads within the Sector include Mobolaji Bank-Anthony Way, Adekunle Fajuyi Way, Isaac John Street, Oba Akinjobi Street; while Sector Seven, which lies at the western part, consists entirely the Murtala Muhammed Airport as shown in Fig. 2 below.

**Fig. 2: Satellite Image Showing the Operational Sectors and Arterial Roads in Ikeja**
**Source:** Lagos State Planning Information Centre, Ikeja

**Material and Methods**

Attempt was made to collect data on commercial property values and the study identified that commercial properties are located along the arterial roads in the study area. Consequently, the arterial roads were identified and data collected in relation to number of commercial properties along the roads. Data were collected from primary and secondary sources and analyzed using Excel® Worksheet and Statgraphic® statistical software package.

Preliminary survey carried out on the study area, using the Lagos Street Map (2008) as guide, revealed that there are 9, 197 roads made up of dual carriageways, cul-de-sac, lanes, streets, avenue, ways, and crescents. Out of the total 9, 197 routes in Lagos metropolis, only 350 are arterial. When the 350 arterial routes were divided according to zones in Lagos metropolis, Lagos Island has 102 (representing 29%); Mainland, 119 (34%); Apapa, 39 (11%) and Ikeja, 90 (26%). From ninety roads that traverse the study area only twenty serve the commercial axes while others are within institutional, industrial, and residential neighbourhoods. Specifically, this study covered all arterial roads serving the commercial axis in Ikeja city to the exclusion of inter-city roads such as Lagos/Abeokuta Expressway, Oworonsoki/Apapa Expressway, Ikorodu Road, and Lagos/Ibadan Expressway that form rings around the study area.

There are 325 firms of Estate Surveyors and Valuers practicing in Lagos metropolis as at March 2008 out of which one hundred and ten (about 34%) operate in Ikeja metropolis. For commercial properties along the arterial roads in the study area, geographical information system was used to determine the population from where samples were made. In doing so, satellite image of the study area was derived using geographic information system. It revealed that there were estimated 2, 008 properties located along the arterial roads.

In determining the sample size that is adequate for this study, Bartlett *et al*'s (2001) model was used. According to Bartlett et al (2001)'s model, the appropriate sample size for

population of two thousand and eight commercial properties along the arterial roads in the study area is four hundred and ninety-nine which was rounded up to five hundred. Since interest is in the population of commercial property occupiers, preliminary survey of the sampled five hundred properties was carried out. The outcome showed that about five thousand occupiers representing average of ten per property were estimated. Consequently, appropriate sample size of occupiers of the sampled commercial properties was six hundred. This figure was rounded up to one thousand for administration of questionnaire sufficient to cater for differences in actual and estimated population of the occupiers.

In arriving at the sample size, two key factors were considered which are acceptable risk and consideration of the alpha level. These were addressed in this study to make the research finding reliable with the alpha level set at 95%. Five types of commercial properties were identified in the study area, which are retail premises, personal businesses, office properties, industrial factories, warehouses and non-specific commercial properties. In respect of this research, focus was on offices, shops, banking spaces and other types of commercial user along the arterial routes to the exclusion of residential, industrial, and non-specific commercial properties.

**Data Analysis and Discussion**

Estate Surveyors and Valuers and Occupiers of commercial properties in the study area were interviewed to determine values of commercial properties in Ikeja city over a five-year period. The value was measured as Naira per square metre per annum ($N/m^2$ p.a.). Data so obtained from sampled Estate Surveyors and Valuers were analyzed and mean rental values along each arterial road determined as shown in Table 1

**Table 1: Mean Rental Values of Commercial Properties along Arterial Roads in Ikeja**

| S/N | Road | Average Rent (Naira per square metre) p.a. | | | | | Mean Rent for 5years | Category |
|-----|------|-------|-------|-------|-------|-------|-------|----------|
| | | 2003 | 2004 | 2005 | 2006 | 2007 | | |
| 1 | Allen Avenue | 4,500 | 5,000 | 6,400 | 8,000 | 10,500 | 6880 | A |
| 2 | Adeniyi Jones Avenue | 4,500 | 5,500 | 6,500 | 8,500 | 9,000 | 6800 | |
| 3 | Opebi Road | 4,500 | 4,500 | 6,000 | 8,000 | 10,000 | 6600 | |
| 4 | Bank-Anthony Way | 3,500 | 5,000 | 6,000 | 7,800 | 9,500 | 6360 | |
| 5 | Oba Akran Avenue | 3,600 | 5,000 | 6,000 | 8,000 | 9,100 | 6340 | |
| 6 | Bank-Anthony/Opebi Way | 3,500 | 5,000 | 6,000 | 7,500 | 9,000 | 6200 | |
| 7 | Toyin Street | 3,600 | 4,500 | 5,800 | 8,000 | 8,700 | 6120 | |
| 8 | Aromire Avenue | 4,000 | 4,500 | 5,600 | 7,800 | 8,500 | 6080 | |
| 9 | Kodesho Street | 3,000 | 4,200 | 5,000 | 6,500 | 8,000 | 5340 | B |
| 10 | Ogba Road | 3,600 | 4,500 | 5,000 | 6,000 | 7,000 | 5220 | |
| 11 | Obafemi Awolowo Way | 3,500 | 3,500 | 5,000 | 6,000 | 8,000 | 5200 | |
| 12 | Simbiat Abiola Road | 3,000 | 3,500 | 4,800 | 6,000 | 8,000 | 5060 | |
| 13 | ACME Road | 3,500 | 4,000 | 5,000 | 6,000 | 6,500 | 5000 | C |
| 14 | Lateef Jakande Road | 3,000 | 4,000 | 4,500 | 6,500 | 7,000 | 5000 | |
| 15 | Olowu Street | 3,500 | 3,500 | 5,000 | 6,000 | 6,500 | 4900 | |
| 16 | Opebi Link-Road | 3,500 | 3,600 | 4,500 | 5,000 | 7,000 | 4720 | |
| 17 | Oregun Road | 3,000 | 3,500 | 4,500 | 6,000 | 6,500 | 4700 | |
| 18 | WEMPCO Road | 3,000 | 3,500 | 4,000 | 5,000 | 6,000 | 4300 | |
| 18 | Ikosi Road | 3,000 | 3,000 | 4,000 | 4,500 | 5,700 | 4040 | |
| 20 | Isheri/Agege Road | 3,000 | 3,200 | 3,500 | 4,000 | 5,500 | 3840 | D |
| **Average Mean Rental Value** (N) | | **3,515** | **4,150** | **5,155** | **6,555** | **7,800** | | |

Table 1 shows the rental values of commercial properties along the arterial roads in the study area covering a five-year period (2003 to 2007). The mean rental values ranged between N3, 840/m² to N6, 880/m² per annum. The percentage distribution of the values indicates that 40% of mean rental values ranged between N3,500/m² to N5,000/m² per annum; 20% ranged between N5,001/m² to N6,000/m² per annum; while another 40% ranged between N6,000/m² to N7,000/m² per annum. Allen Avenue accounted for the highest rental value followed by Adeniyi Jones Avenue, Aromire Avenue, Opebi Road and Bank-Anthony Way, while lowest rental value was obtained along Ikosi Road. The categories were determined based on range of mean rental values in the study area with percentage distribution shown in Table 2.

**Table 2: Pattern of Commercial Property Values along Arterial Roads in Ikeja Metropolis**

| S/N | Category | Arterial Roads | Range of Mean Rental Value | Mode | Percentage |
|---|---|---|---|---|---|
| 1 | A | Allen Avenue, Adeniyi Jones Avenue, Opebi Road, Bank-Anthony Way, Oba Akran Avenue, Bank-Anthony Way/Opebi Road, Toyin Street, and Aromire Avenue. | N6,001/m$^2$ - N7,000/m$^2$ | 8 | 40 |
| 2 | B | Kodesho Street, Ogba Road, Obafemi Awolowo Way, and Simbiat Abiola Way. | N5,001/m$^2$ - N6,000/m$^2$ | 4 | 20 |
| C | ACME Road, | N4,001/m$^2$ - N5,000/m$^2$ | 7 | 35 | 4 D Is heri/Ageg |
| **Total** | | | | **20** | **100** |

The finding in Table 2 was not unexpected as spaces along the arterial roads in Category A have over the years being the most sought after by commercial properties like banks, wholesale/retail outlets, and multi-storey office complexes until recently when other arterial roads experienced spill-over effects from the arterial roads in Category A.

In determining the trend (increase or decrease) in commercial property values in the study area, a polynomial regression model was used and resulting model and coefficient of determination shown in Fig. 3
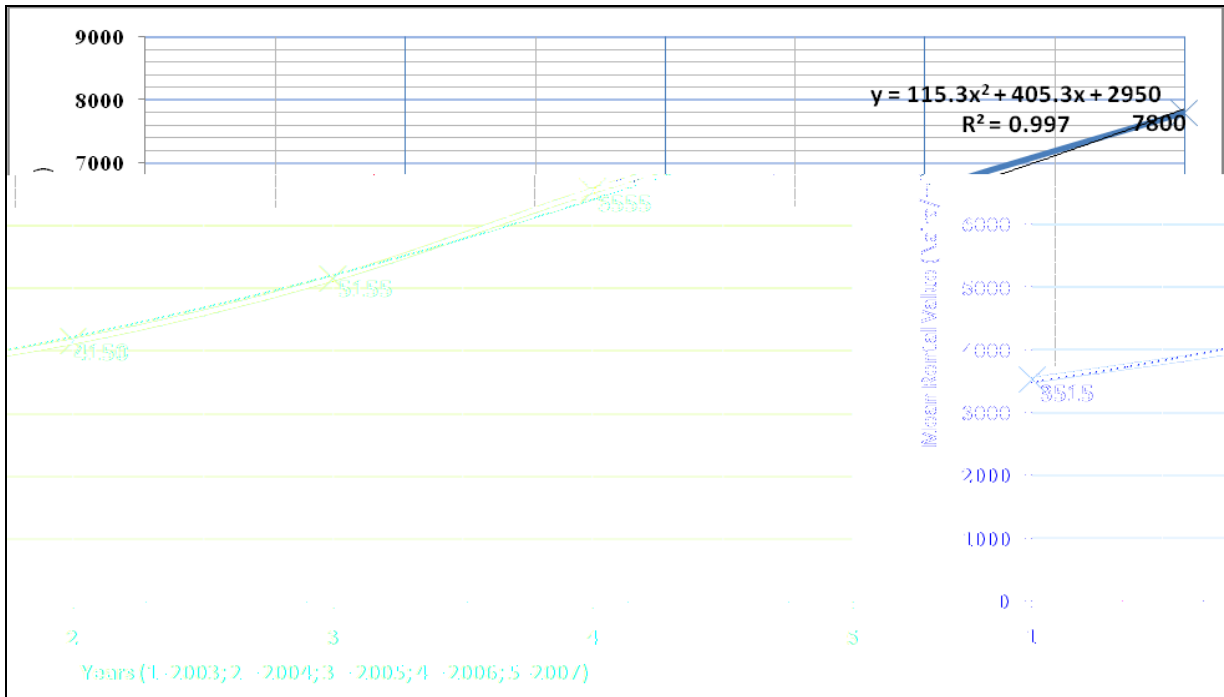
**Fig. 3: Trend in Average Mean Rental Values of Commercial Property in Ikeja (2003 – 2007)**

From Fig. 3, the trend line shows continous rise in mean rental values of commercial property values along the arterial roads in the study area. This is an indication that there will be increases in commercial property values and that the increases will continue into the future. The model is fitted for predicting future maximum commercial property values with coefficient of determination equals 0.997 implying that, *ceteris paribus,* there is high probability that the forecast will be realized.

A regression of the average of mean commercial property values (y) against number of years (x) resulted in Eqn. 1

$$y = (115.3) \, x^2 + (405.3) \, x + 2950 \qquad \qquad \textbf{…Eqn.1}$$

where,

y is in Naira per square metre

The model is expected to be true for number of years beginning from 2003 (taken as 1) and subsequent consecutive years represented by 2, 3, 4, and 5 as the case may be.  Eqn. 1 thus

represents a predictive model that may be used to forecast the likely average of mean rental values of commercial properties along arterial roads in the study area.

Furthermore, to determine the trends and range of commercial property values along the arterial roads in the study area in the nearest future, the minimum and maximum rental values for each of the five-year study period were extracted from Table 1. In this respect, the minimum rent for each of the study year was denoted as Set A while maximum rent was in Set B, the mean rental values represent the average of the minimum and maximum rents for each year as shown in Table 3

**Table 3: Details of Mean Rents Relative to Years in Ikeja**

| S/N | Year | Rent (in Naira/m$^2$) | | |
|-----|------|----------------------|----------------------|-------|
|     |      | Minimum (Set A)      | Maximum (Set B)      | Mean  |
| 1   | 2003 | 3,000                | 4,500                | 3,750 |
| 2   | 2004 | 3,000                | 5,500                | 4,250 |
| 3   | 2005 | 3,500                | 6,500                | 5,000 |
| 4   | 2006 | 4,000                | 8,500                | 6,250 |
| 5   | 2007 | 5,500                | 10,500               | 8,000 |

Consequently, in determining the trends of minimum and maximum rental values of commercial properties along the arterial roads in the study area, rental values were categorized into two, namely, Sets A and B. The mean rental values were analyzed resulting in trend lines of continous rise indicating that there will be increases in the minimum, maximum and mean rental values of commercial properties and such increases will continue into the future as shown in Fig. 4.
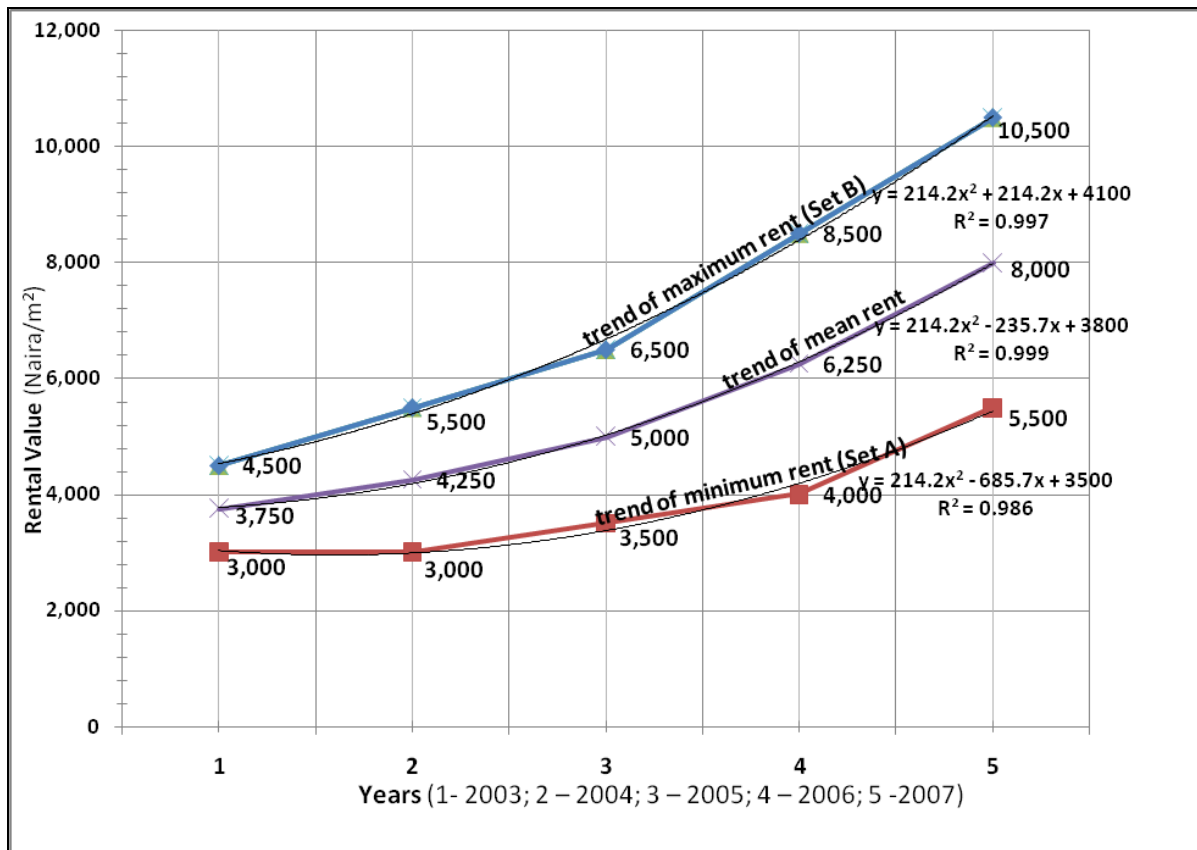
**Fig. 4: Graphical Illustration of Trends in Commercial Property Values in Ikeja (2003 – 2007)**

As shown in Fig. 4, individual models were derived from the analysis of the minimum, maximum and mean rental values in the study area individually against number of years. The analysis resulted in Eqns. 2, 3, and 4 for minimum, maximum, and mean rental values respectively.

$$y_{mini} = (214.2) \, x_{mini}^{2} - (685.7) \, x_{mini} + 3500 \qquad \textbf{…Eqn. 2}$$

Eqn. 2 is the model for predicting the minimum rental value of commercial property values along the arterial roads in the study area. In the model, $y_{mini}$ is the minimum rental value expressed in Naira per square metre $(N/m^{2})$, while $x_{mini}$ represents number of years. The model is fitted for predicting future minimum commercial property values with coefficient of determination equals 0.986, implying that *ceteris paribus* there is very high probability that the forecast will be realized.

The model for predicting maximum rental value of commercial property values along the arterial roads is shown in Eqn. 3

$$y_{maxi} = (214.2) \, x_{maxi}^2 + (214.2) \, x_{maxi} + 4100 \qquad \textbf{…Eqn. 3}$$

$y_{maxi}$ = the maximum rental value expressed in Naira per square metre ($N/m^2$);

$\mu_{maxi}$ = number of years considered in determining the trend in maximum rent

The model is fitted for predicting future maximum commercial property values with coefficient of determination being 0.997, implying that *ceteris paribus* there is very high probability that the such prediction will be realized.

In terms of average rental values, a model for predicting the average rental values of commercial properties along the arterial roads was equally derived as shown in Eqn. 4

$$y_{mean} = (214.2) \, x_{mean}^2 - (235.7) \, x_{mean} + 3800 \qquad \textbf{…Eqn. 4}$$

$y_{mean}$ = the average of the maximum and minimum rental value (in Naira per square metre)

$x$ = number of years considered in predicting future average rental values.

The model is fitted for predicting future average commercial property values with coefficient of determination being 0.999, implying that *ceteris paribus* there is very high probability that the such prediction will be realized.

From these, the model for predicting range of mean rental values of commercial properties was derived as shown in Eqn. 5:

$$y_{mini} < y_{mean} < y_{maxi} \qquad \textbf{…Eqn. 5}$$

Furthermore, the model for predicting specific mean rental values is given as:

$$\delta = y_{mini} + \gamma \qquad \textbf{…Eqn. 6}$$

where,

$\delta$ = expected mean rental values;

$y_{mini}$ = prevailing minimum rental values;

$\gamma$ = difference between maximum and minimum ÷ 2

Furthermore, variations were observed in terms of commercial property values along individual arterial roads in the study area. In addition to the model in Eqn. 1 derived to predict average commercial property values for the entire study area, models for predicting average rental values of commercial properties along each arterial road were derived and shown in Table 4.

**Table 4: Predictive Models of Commercial Property Values along Individual Arterial Roads in Ikeja, Nigeria**

| S/N | Road | Predictive Model | $R^2$ value |
|---|---|---|---|
| 1 | Allen Avenue | y = 1500x + 2380 | 0.945 |
| 2 | Adeniyi Jones Avenue | y = 1200x + 3200 | 0.973 |
| 3 | Opebi Road | y = 1450x + 2250 | 0.926 |
| 4 | Bank-Anthony Way | y = 1480x + 1920 | 0.991 |
| 5 | Oba Akran Avenue | y = 1400x + 2140 | 0.990 |
| 6 | Bank-Anthony/Opebi Way | y = 1350x + 2150 | 0.995 |
| 7 | Toyin Street | y = 1370x + 2010 | 0.974 |
| 8 | Aromire Avenue | y = 1230x + 2390 | 0.953 |
| 9 | Kodesho Street | y = 1230x + 1650 | 0.988 |
| Ogba | y = 830x + 2730   0.988   **11**   Obafemi Awolowo Way   y | Simbiat   Abiola | y   = |
| 13 | ACME Road | y = 800x + 2600 | 0.984 |
| 14 | Lateef Jakande Road | y = 1050x + 1850 | 0.958 |
| 15 | Olowu Street | y = 850x + 2350 | 0.938 |
| 16 | Opebi Link-road | y = 840x + 2200 | 0.874 |
| 17 | Oregun Road | y = 950x + 1850 | 0.970 |
| 18 | WEMPCO Road | y = 750x + 2050 | 0.969 |
| 19 | Ikosi Road | y = 690x + 1970 | 0.927 |
| 20 | Isheri/Agege Road | y = 580x + 2100 | 0.838 |

Table 4 shows different predictive models that may be applied for each of the arterial roads in the study area. The $R^2$ values indicate that, all things being equal, the predicted values of commercial properties using these models have almost one hundred percent probability of being realized.

In describing the spatial distribution of commercial property values along the arterial roads in the study area, attempt was made to obtain the range of mean rental values and depict the categories of mean rental values along the arterial roads in the study area on a Value Map to give a pictorial illustration of the pattern. From Table 1 earlier discussed, the pattern of commercial property values showed that range of mean rental values mostly common in the study area falls between N6, $001/m^2$ and N7, $000/m^2$ and are found along Kodesho Street, Ogba Road, Obafemi Awolowo Way, ACME Road, Simbiat Abiola Way and Lateef Jakande Road. This is followed by range of mean rental values of between N4, 0001 and N5, 000 per square metre along ACME Road, Lateef Jakande Road, Olowu Street, Opebi Link-road, Oregun Road, WEMPCO Road, and Ikosi Road; while the lowest mean rental values (N3,001 to N4,000 per square metre) are found along Isheri/Agege Road.

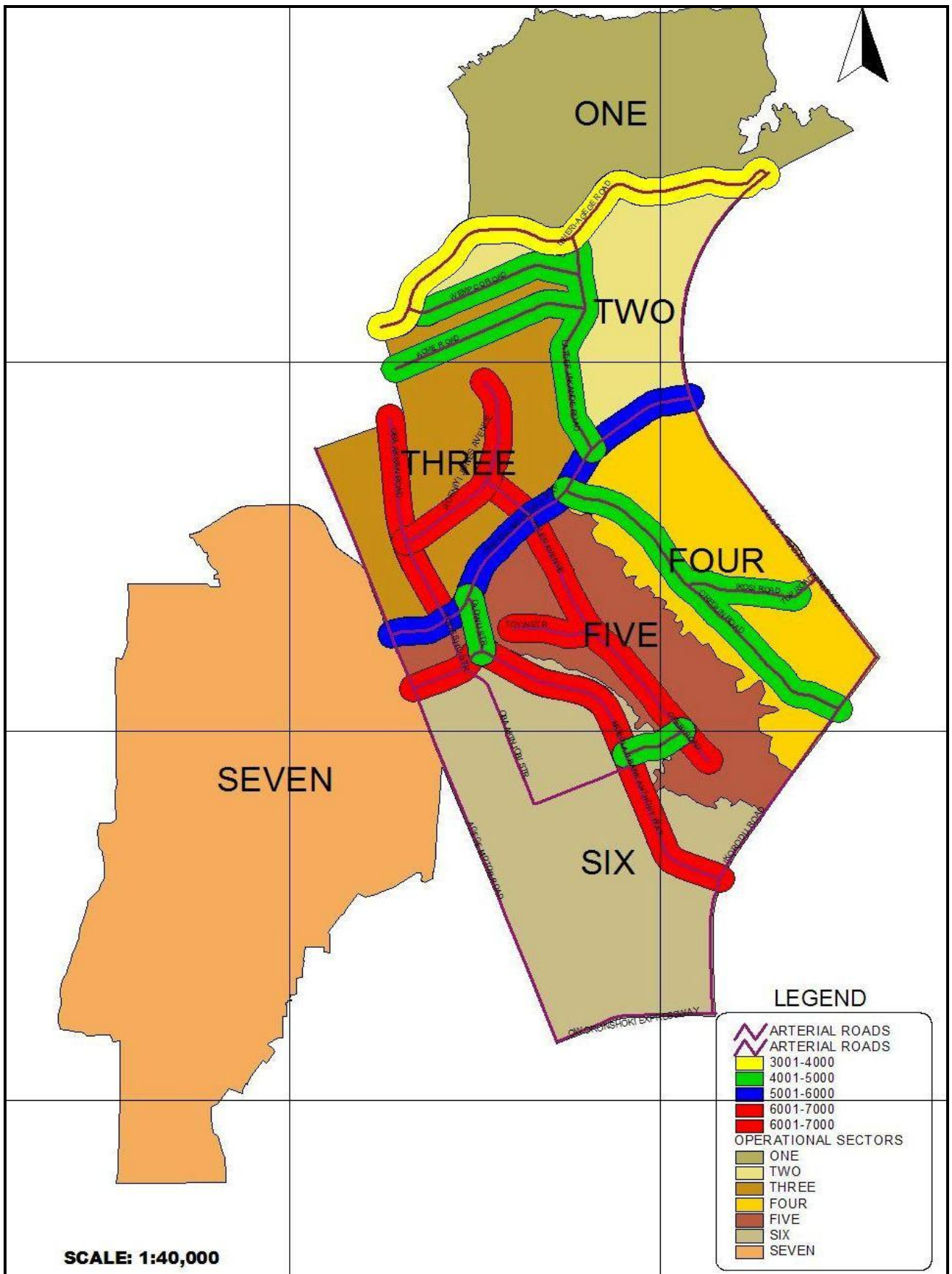The spatial distribution of the mean rental values as analyzed are depicted pictorially on the Value Map in Fig. 5

**Fig. 5: Value Map Showing Pattern of Commercial Property Values in Ikeja**

**Research Findings**

The study found a relationship between high rental values and locations around the Central Business District. For instance, the highest rental values in the study area are concentrated around Allen Avenue, Opebi Road, Aromire Avenue, Oba Akran Avenue and Toyin Street that are arterial roads in the central business district within the study area. The survey carried out also confirmed that banks and high net-worth commercial entities until recently predominantly seek locations in the area. Also, there has been high competition among such banks and between banks and other wholesale and retail shopping complexes with ease of movement and has accounted for high rental values along the arterial roads in the sector.

The study found that the highest mean rental values (in Category A) are concentrated around the central portion of the study area. Category B follows a little distance away from the central area, and Category C is found farther away while Category D are found at the remote and outlying precincts of the study area. This finding is consistent with earlier theories of Haig (1926), Goldberg (1970), Downing (1973), Kivell (1993), Sivitanidou (1996), Henneberry (1998), and McQuaid and Grieg (2003) which relate distance to rental value and stating that rental values decreases as distance from the central business district increases.

The analysis gave rise to predictive models for forecasting likely mean rental values of commercial properties along the arterial roads in the study area. This means that knowledge is derived of probable average of mean rental values of commercial properties within the study area in the foreseeable future. For instance, in the next twenty (20) years (i.e. year 2022), the model will be $y = (115.3) x^2 + (405.3) x + 2950$; where, $x = 20$. Therefore, the predicted average of mean value of commercial properties for year 2022 will be $y = 115.3$ $(20)^2 + 405.30 (20) + 2950$; $\beta = 46,120 + 8,106 + 2,950\beta = N57, 176 /m^2$ per annum. This indicates that the unit space in commercial properties along arterial roads in the study area

will be at the average rate of N57, 176 /m$^2$ p.a. in year 2022.

In addition, the research found that the minimum rental value of commercial properties along arterial roads in the study area could be determined using the model y $_{mini}$ = (214.2)x$_{mini}$ $^2$ - (685.7)x$_{mini}$. For instance, in 20 years' time (by year 2022 i.e. 20 years from 2003), the minimum rental values of the properties is expected to be: y $_{mini}$ = (214.2)(20) $^2$ - (685.7)(20) + 3500; y $_{mini}$ = (214.2)(400) − (685.7)(20) + 3500; y $_{mini}$ = 75, 466/m$^2$ p.a. Also, it was revealed that maximum rental value of commercial properties along arterial roads in the study area could be determined using the model y $_{maxi}$ = (214.2) x$_{maxi}$ $^2$ + (214.2) x$_{maxi}$ + 4100. Thus, in year 2022, the maximum rent expected to prevail in the study area is      y$_{maxi}$ = (214.2) (20) $^2$ + (214.2)(20) + 4100; y$_{maxi}$ = (214.2)(400) + (214.2)(20) + 4100; that is, y$_{maxi}$ = N94, 064/m$^2$ p.a.

From the illustrations, the range of commercial property values along arterial roads in the study area revealed is y$_{mini}$ < y$_{mean}$ < y$_{maxi}$. By substituting for y$_{mini}$, y$_{mean}$, and y$_{maxi}$ in Eqn. 5, the range of mean values of commercial properties expected to prevail by year 2022 would be N75, 466/m$^2$ p.a. < N84, 765/m$^2$ p.a. < N94, 064/m$^2$ p.a. This shows that commercial property values in 2022 will most likely range between N75, 000 and N95, 000/m$^2$ p.a. The model in Eqn. 5, is summarized as δ = y$_{mini}$ + γ, the expected average of the mean rental value of commercial properties along the arterial roads by year 2022 will, *ceteris paribus*, be

δ = N75, 000 + (N95, 000 − N75, 000)
                            2

Therefore, the expected average of the mean rental value of commercial properties along the arterial roads in year 2022 will be N85, 000/m$^2$ p.a.

When this is considered on annual basis, the polynomial trend analysis showed continuous rising trend from year to year. The resulting model for predicting commercial property values in relation to road network pattern is y = (115.3) x $^2$ + (405.3) x + 2950. This

implies that for every year ($\mu = 1$) the mean commercial property value (y) in the study area will increase by N3, 470.60/m$^2$ p.a., $R^2 = 0.96$. The $R^2$ of 0.96 indicates very high probability of attaining this prediction. This model will be useful for development appraisers, estate surveyors and valuers, and financiers in expressing opinions about the average annual increase in commercial property values and assists them in forecasting the feasibility and viability appraisals of investments in commercial property values in the study area.

Finally, the model for predicting minimum rental value of commercial properties along arterial roads in the study area is $y_{mini} = (214.2) x_{mini}^2 - (685.7) x_{mini} + 3500$. This means that for every year ($x_{mini}=1$) the minimum rental value will be N3, 028.50/m$^2$. The model for predicting the maximum rental value was also developed, which is $y_{maxi} = (214.2) x_{maxi}^2 + (214.2) x_{maxi} + 4100$ indicating that for every year the expected maximum rental value is N4, 528.40/m$^2$ p.a. From the foregoing, the findings showed that $r^2$ for $\beta_{mini} = 0.986$, $y_{mean} r^2 = 0.999$, and $\beta_{max} r^2 = 0.997$ indicating that, all things been equal, the predictive models have almost hundred percent probability of been achieved.

**Concluding Remarks**

The paper has attempted to analyze the spatial distribution, pattern, and trend of commercial property values along arterial road network in the study area. Models for predicting trends of minimum, maximum and mean commercial property values along such roads were developed. There is need to put into use these models and also give opportunity for further research. It is hoped that the findings will go a long way in assisting the Estate Surveyors and Valuers, Developers and Financiers of commercial property projects make projections and determine values with some level of confidence, especially in mitigating the effects of risks and uncertainty.

Presently in the study area, increases in demand for commercial properties by banks and corporate bodies are noticeable. Many firms and corporate bodies are relocating their

head offices to Ikeja. It is therefore envisaged that, all things being equal, the models are attainable and will be highly useful tools in predicting trend in commercial property values in an emerging economy.

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