MODELING THE DETERMINANTS OF THE DEMAND FOR HOUSING CONSTRUCTION IN NIGERIA

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ABSTRACT

Houses are constructed to satisfy basic needs of shelter in human societies all over the world. In Nigeria, studies have shown that housing needs outstrip supply and that though need exists, housing consumers are unable to translate these needs into effective demand due to certain factors.

The study aims at identifying the determinants of the demand for housing construction in Nigeria using economic and social indicators. Data was collected from housing development companies and from the Federal Office of Statistics’ Annual Abstract of Statistics, Central Bank of Nigeria’s Annual Reports and the Federal Mortgage Bank of Nigeria. The data collected was analyzed using Pearson Product Moment Correlation and the Step-Wise Method of regression analysis and a model was generated for the study.

The results indicate that there is a significant positive relationship between the level of housing demand and the level of housing supply, money supply, foreign exchange rates, consumer price index, size of population and property price. The study also revealed that the main predictor of the future level of housing demand in Nigeria is property price.

Keywords: Demand, Demographic Indicators, Determinants, Economic Indicators, Housing Construction and Modeling.

INTRODUCTION

The demand for housing arises mainly from the desire of people to provide themselves with one of the basic necessities of life, namely shelter. Shelter has been universally accepted as the second most essential human need after food. Housing in all its ramifications is more than mere shelter since it embraces all the other social services and utilities that go to make a community or neighborhood a habitable environment. Bourne [1981] defined housing as a physical entity, a social artifact, an economic good, a capital stock, a status symbol and at times a political “hot-potato”.

The history of the housing sector in Nigeria has been full of failure and half successes. It will indeed be noted that the advent of the colonial era and the consequent urbanization eroded the traditional values and tastes of people in Nigeria because during the pre-
colonial days lived in simple and functional housing units made of mud walls with thatched roofs such that housing was not a relevant problem to the populace.

However, the infusion of foreign influence in terms of modern economy, tastes and preferences set in motion a process of urbanization the rate that was hitherto unknown. Such that after Nigeria’s independence in 1960, the country was unable to meet the demand for modern, adequate and suitable housing accommodation to house people migrating from rural to developing urban areas.

Though it is apparent that all consumers housing needs of ownership, overcrowding in homes, quality and affordability cannot be easily translated into a demand due to low incomes, for the few that are able to scale the affordability level, it is probable that other constraints to effective demand for housing exists. It might be as a result of this singular reason that most housing projects fail to receive the desired patronage after intent is known or the project is completed. It may also account for the reason why a large number of housing developers build only fewer than required housing units so that consumers would scramble for the few available units. Sadly, Government’s investment in housing since 1980 can be said to be dismal and this cannot be unconnected with the none use of suitable predictive indicators such as interest rates, population, property price index, level of employment etc that can predict the future housing demands in Nigeria.

It is the aim of this paper to find out the economic and social indicators that have a significant relationship with and can predict the future levels of demand for housing construction in Nigeria and in order to realize this aim; the following specific objectives are identified:

1. To find out if there is any relationship between demographic and economic factors such as interest rate, property price, size of population, unemployment and housing demand and supply.

2. To construct models from the determinants for predicting future levels of housing demand.

Knowledge of the factors that determine and can predict the future levels of housing demand is significant because knowledge of the future demand for products and services is vital to all industries. According to Akintoye and Skitmore [1994], it is a prerequisite for any viable corporate strategy. Construction contractors/Private Developers need some knowledge of the likely changes in demand for their services and the extent to which this will affect their workload in order to formulate appropriate pricing strategies. Clearly, the earlier contractors/housing developers know of likely changes in construction demand, the better they are placed to take strategic action. Furthermore, When construction demand is low, skilled workers leave and many companies go out of business this leads to lack of investment in human resources and therefore to low productivity in the construction industry. When construction demand eventually picks up, there is often a shortage of skilled personnel and a shortage of building materials, plants and machinery [Short, 1979].
Factors Determining the Housing Construction Demand

In its common, everyday sense, demand simply implies “what people want”. The Advanced Learners Dictionary [2000] defines demand as “desire shown by consumers or the amount of any article, commodity etc, that consumers will buy. Demand is viewed by Agbola [2001] as a desire or request by people who are ready to buy or pay for the goods or services. To Bourne [1981], Demand simply means what people want. Housing Demand is defined in The Second Draft report published by the Federal Republic of Nigeria [1992] as “the number and quality of dwelling units at a given price that can be afforded by households within limits of their resources. According to Agbola [2001], the effective demand for housing is derived from each household’s willingness to pay for the housing. The level of household income, its distribution, and the prices of available housing and of other goods and services, demographic patterns and the particular constitution of the household are important influences on decisions about how much to spend on housing. Therefore, Housing Demand can be said to be based on affordability levels.

Bourne [1981] argued that the demand for housing in aggregate represents the total of all households’ expenditures, government’s outlays and institutional investment in what has been previously called the housing “sector”. He stated that as in the case of other durable goods, the level of housing demand depends on the relative balance of changes in several different factors including:

1) Population growth
2) Demographic structure (e.g., age, household’s size)
3) Disposable income
4) Housing preferences and tastes, and
5) Taxation and investment polices.

Bourne was of the view that changes in any of these factors will alter both the level and direction of housing demand.

Ganesan [1979] summarized the characteristics of the demand for housing in Sri Lanka as follows:

1. The demand is less than the need as a large number of households are unable to translate their need into demand due to low incomes.

2. The demand for housing (through ownership, lease or rental) depends initially on the consumers’ assessment of the desirability of housing with all the other goods or services he could buy. This principle operates for only less than 50% of all households in Sri Lanka who have passed the subsistence level and entered the modern monetary sector.

3. The social and economic characteristics of the extended family system tend to restrict the demand for independent housing units even when households move above the subsistence level.

4. Climatic conditions allow people to live in dwellings regarded elsewhere as sub-standard, thus reducing consumer preferences for modern housing in comparison to
other goods and services in areas where they do not want interference with their economics links to the environment.

5. The law of supply and demand has only a restricted application, in view of the fact that the construction industry is properly tuned into only one component of housing demand - upper income group housing.

Another factor, which has been identified to affect housing demand, are Government Policies on interest rates and taxation. Government actions were noted to affect the construction industry at the microeconomic level.

Akitoye and Skitmore [1994] identified many possible causes of changes in construction demand including:

1. The Gross National Product (GNP)
2. Real interest rate and
3. Unemployment.

They declared that what is needed is a model or formula that will somehow combine these leading indicators for the purpose of explaining trends in construction demand.

Hua [1996] itemized some indicators that influence the level of demand for residential construction as identified by several writers including Ofori [1990]. He stated that the indicators may be economic or social and their individual’s significance varies from one country to another. The following is a list of such indicators: -

1. National income per capita
2. General demand for construction
3. Size of population
4. Rate of household formation
5. Interest rate
6. Property price
7. Levels of supply of residential property
8. Disposable income
9. Economic growth
10. Level of unemployment /employment
11. Existing housing stock
12. Rate of inflation
13. Construction cost
14. Mortgage credit availability/supply
15. Household personal savings.

This list is in exhaustive as argued by Bourne [1981]; housing has a number of attributes that make the question of demand extremely complex. It is expensive to purchase, durable and heterogeneous. It is also fixed in location and embedded in a particular real estate market and neighborhood context. This means that the demand for housing in any given area cannot be easily separated from the demand for land, location and the services (e.g., schools) which that neighborhood delivers. This view is buttressed by Agbola [2001] who was of the opinion that the effective demand for housing is derived from each household’s willingness to pay for the housing, the level of household income, its distribution, and the prices of available housing and of other goods and services, demographic patterns and the particular constitution of the household.
Agbola [2001] views housing demand as the housing requirement of individuals or households over and above the minimum standard. According to him, such people feel that they require or demand such higher standard housing and can pay for it. He stated that the effective demand for housing is a function of:

1. Affordability – each households’ willingness to pay for the housing
2. Level of household income
3. Household distribution
4. Prices of available housing and other goods and services
5. Demographic patterns
6. Constitution of the household, which determines the growth of demand overtime.

The demand for any type of landed property can also be influenced by a number of factors such as:

1. Population changes;
2. Changes in the standard of living or in taste or fashion;
3. Changes in society
4. Population movement
5. Changes in social services (shops, schools, cinemas and other facilities);
6. Changes in communication; and
7. Changes in statutory requirements such as the town and country planning Acts.

From an economic viewpoint, the main determinants of quantity demanded include:

1. Price of the goods
2. Prices of other goods
3. Income
4. Population
5. Preferences (tastes)
6. Information
7. Expectations
8. Credit availability

**Review of Theoretical Framework/Models Used by Other Researchers**

The theoretical statements that formed the basis of the framework used for this study were deduced and modified from the demand and supply theory, the economic concept of elasticity and models developed by Akintoye and Skitmore [1994] and Hua [1996].

The determination of prices in housing markets is based on the interaction between the buyer and seller with prices being offered and agreed before a final transaction is made. The theoretical framework for this study and models would be focused on the demand factors and constraints that determine the value of properties in the housing market. Value constitutes a measure of the relationship between supply and demand. An increase in the value of an object is obtained either through an increase in demand or a decrease in supply.
Models of UK Private Sector Quarterly Construction Demand

Akitoye and Skitmore [1994] were able to establish the general factors of construction demand for the UK as:

a. **Economic conditions**: A single indicator of economic conditions is the national income. Among other factors, the quantity and to some extent quality of construction demand is dependent on the national economy.

b. **Construction price**: It is suggested that the demand for construction may depend on the relative price level of construction.

c. **Real interest rate**: This was used as a proxy variable for credit market conditions. This evaluation of alternatives ensures that investment projects are undertaken only if they yield a stream of returns that, in discounted present value, exceeds the cost of financing.

d. **Unemployment level**: An increase in unemployment or even a declining rate of growth of employment in an economy may discourage investment in construction. This is due to the link between construction demand and the total purchasing power of the population.

e. **Profitability**: The manufacturing price: cost ratio could be used as a proxy for profitability. High profitability in the manufacturing sector may affect the construction industry either directly as capital investment in new buildings or indirectly as increased pay to personnel and increased returns to shareholders, encouraging increased spending on housing or other forms of construction works associated with the private sector.

Whilst Hua [1996] made use of economic indicators to predict the demand for residential construction in Singapore. He proposed economic indicators because of his belief that they are essentially measures of performance of the economy and may therefore be proposed as reliable inputs for the modeling of residential construction demand in Singapore. He identified a total of 12 economic indicators, as being significantly related to the demand for residential construction including: National income per capital, General demand for construction, Interest rate, Property price, Disposable income, Economic growth, Level of unemployment/employment, Existing housing stock, Rate of inflation, Construction cost, Mortgage credit availability/supply, Household personal savings.

Although according to Hua [1996] apart from these, other indicators that have been known theoretically to influence construction demand but their significances were disputed by the statistical analysis in the study includes: the size of population, rate of household formation and Levels of supply of residential property.

**Model Structure**

From the work of past researchers in this field such as Akintoye and Skitmore [1994], Hua [1996] and Agbola [2001], a predictive regression model was proposed to help in identifying those factors that can be used to determine future changes in the levels of housing demand in Nigerian cities.

Twelve variables are proposed in this study as potential leading indicators of the level of housing construction demand. These variables include – levels of housing supply, interest
rates, cost of foreign exchange, national disposable income, rate of economic growth, level of employment, consumer price index, money supply, population growth, and profitability/income of the housing developers, property price and affordability of households. Assuming a linear relationship between the level of housing demand and the demand variables, then the model can be stated as:

\[ VHD = b_0 + b_1 VHS + b_2 IR + b_3 VFX + b_4 VNDI + b_5 VEG + b_6 VUE + b_7 VCPI + b_8 VMS + b_9 VSP + b_{10} VPMD + b_{11} VPP + b_{12} VAF \]

Where; 
- \( VHD \) is the estimated level of housing demand,
- \( b_0 \) is the constant term,
- \( b_1, b_2, b_3 \) etc are regression coefficients to be estimated,
- \( VHS, IR, VFX, VNDI, VEG, VUE \) etc are estimated indicators of the level of housing demand.

The characteristics/nature of these variables are further outlined in Appendix A.

Data and Methodology

The research was carried out in Nigeria however, it was based on findings in the following cities: Lagos, Port – Harcourt and Abuja (The Nation’s capital). These cities were selected for the study because of their representative nature. Lagos was picked because of its prior status as the former capital of Nigeria and can be said to be the commercial nerve center of Nigeria it also represents the Western part of Nigeria. Port – Harcourt is a fact growing oil city with lots of development going on because of the influx of people who work with the ever-expanding oil companies it also represents the Eastern part of Nigeria. Abuja, which would be used to represent the North and middle belt part of Nigeria, is also a fast developing city due to the presence of the Federal Government, which is bent on developing Abuja into a Federal Capital Territory. All these cities have a unique similarity in that they experience a continuous growth in the urban population due to the fact that they are either a commercial city, an oil city or the Federal seat. People go there daily in search of a form of livelihood.

Three methods were used in collecting the data required for the research: the use of Questionnaires, Personal Interviews and Secondary Data from Central Bank of Nigeria, Federal Office of Statistics, Nigerian Social Insurance Trust Fund, National Population Commission, Local Planning Authorities, Mortgage Banks and Contracting Organizations. The data collected were annual over a fifteen year period and was analyzed with the use of Pearson product moment correlation coefficient (r) and multiple regression analysis were used to reveal possible relationships, contributions, and dependencies or otherwise between the variables in the study and also to find out if there were significant results.
Results and Discussions

Objective 1
To find out if there is any significant relationship between demographic and economic factors such as interest rate, foreign exchange rate, national disposal income, economic growth, level of employment, consumer price index, money supply, size of population, profitability/income of the housing developers, property price, affordability of households, levels of housing supply and housing demand.

The results of the correlation co-efficient computed for each of the stated variables, which are presented in Appendix B and housing demand is presented in table 1.

Table 1. Correlation coefficients computed between housing demand and other stated variables

<table>
<thead>
<tr>
<th>Variable Code</th>
<th>VHS</th>
<th>VIR</th>
<th>VFX</th>
<th>VNDI</th>
<th>VEG</th>
<th>VUE</th>
<th>VCPI</th>
<th>VMS</th>
<th>VSP</th>
<th>VPMD</th>
<th>VPP</th>
<th>VAF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Housing Demand (VHD)</td>
<td>.792**</td>
<td>-.239</td>
<td>.717*</td>
<td>.355</td>
<td>.735</td>
<td>.365</td>
<td>.748*</td>
<td>.854**</td>
<td>.735*</td>
<td>.659*</td>
<td>.744*</td>
<td>.170</td>
</tr>
</tbody>
</table>

1 – tailed signif: *P – 0.01  ** P – 0.001

It can be seen from table 1 that there is a significant positive relationship between the level of housing demand and the level of housing supply, rate of economic growth and total savings at P < 0.001 (one tailed level of significance). Table 1 also shows that there is a significant positive relationship between the level of housing demand and foreign exchange rates, consumer price index, size of population, average profitability of developers and property price index at P < 0.01 level of significance. It can also be seen from table 1 that no significant relationship exists between the level of housing demand and interest rates, national disposal income, level of employment, construction cost, price of building material, housing vacancies and affordability (by civil servants).

Objective 2
To find out if future levels of housing demand can be predicted from changes in demographic and economic factors such as interest rate, foreign exchange rates, national disposal income, economics growth, level of employment, consumer price index, money supply, size of population, profitability/ income of the housing developers, property price, affordability of households and levels of housing supply.

Twelve variables presented in Appendix B are proposed in this study as potential leading indicators of the level of housing demand. These variables include - interest rate, foreign exchange rates, national disposable income, economic growth, level of employment, consumer price index, money supply, size of population, profitability/income of the housing developers, property price, affordability of households and level of housing supply.

The data analyzed, which is presented in Appendix B, was annual based over a ten-year period. Using the level of housing demand as dependent variable, the step wise method of regression analysis was computed for the level of housing demand and its independent variables and these results are presented in table 2.
Table 2 Model fitting Results using Step wise Method of Regression Analysis for housing Demand (dependent variible: HD)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Coefficients</th>
<th>Standard Error of the Estimate (SEE)</th>
<th>t-value</th>
<th>Sig. T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Price (PP)</td>
<td>10.473</td>
<td>2.274</td>
<td>4.606</td>
<td>0.002</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-253.323</td>
<td>1563.370</td>
<td>-0.162</td>
<td>0.876</td>
</tr>
</tbody>
</table>

R-square = 0.752; adjusted R- square = 0.716
Final Parameter: Standard error of the estimate = 2756.83

Analysis of Variance:

<table>
<thead>
<tr>
<th>DF</th>
<th>Sum of Squares</th>
<th>F. Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>53200653</td>
<td>21.213</td>
</tr>
</tbody>
</table>

An evaluative multiple regression equation derived from the above analysis/results is as follows:

VHD = - 253.323 + 10.473VPP ………………………………..(1)

Equation (1) indicates that housing demand is positively correlated with the property price whilst the relationships with interest rates, foreign exchange rates, national disposable income, economic growth, level of employment, consumer price index, money supply, size of population, profitability/income of the housing developers, affordability of households (civil servants) and levels of housing supply are unsupported by the data.

The total variation in the level of housing demand is highly explained by the variations in the property price ($R^2 = 0.752$). This means that this predictor accounted for 75.2% of the variations in the level of housing demand and that only about 24.8% in the observed relationship cannot be explained by the selected predictor.

The step-wise method of regression analysis indicates that the t-values of this variable in equation (1) are statistically significant at the 5% level of probability. The adjusted $R^2$ value of this model is also relatively high (0.716). The regression model also yielded an f-ratio of 21.213, which is significant at the 5% level of probability. This indicates that the major source of variations in the level of housing demand can be totally explained by the regression sum of squares (i.e. within groups) in the analysis of variance of the regression model.

Based on these findings therefore, it can be concluded that the future level of housing demand can be predicted by changes in property price. It can however not be predicted by changes in interest rate, foreign exchange rates, national disposable income, economic growth, level of employment, consumer price index, money supply, size of population, profitability/income of housing developers, affordability of households and levels of housing supply.

**Validation of Models Constructed as Predictive Instruments For Housing Demand**

The model developed in Objective 2 of this paper was validated using newly collected data in order to determine if these models will function successfully in their intended operating environment.
5-data points each were used as sub-set data (validation sample), whilst the construction sample for the originally built models used for predicting future levels of demand and supply consisted of 10 – data points. (See Appendix B).

Table 3 shows the subset data points used for the validation of the model developed.

Table 3. Subset data points used for model validation of both levels of housing demand and supply

<table>
<thead>
<tr>
<th>CASES</th>
<th>MODEL VALIDATION FOR LEVELS OF HOUSING DEMAND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PREDICTED VALUES</td>
</tr>
<tr>
<td>1989</td>
<td>211.48m</td>
</tr>
<tr>
<td>1990</td>
<td>254.3m</td>
</tr>
<tr>
<td>1991</td>
<td>404.32m</td>
</tr>
<tr>
<td>1992</td>
<td>532.87m</td>
</tr>
<tr>
<td>2003</td>
<td>36250m</td>
</tr>
</tbody>
</table>

Fig. 1 shows the plots of the predicted values to the observed values of housing demand

It can be seen from fig. 1 that the plots of the predicted to the observed values in some of the cases were a bit deviated. This means that some factors such as unstable polity, poor incomes and general instability in the National economy that are extraneous to the ones used in building the model might have been at play.

Further analysis using the same steps on the five data points described earlier and presented in Appendix B was used to construct another model for predicting the future levels of housing demand. The features of these newly constructed models specifically; multiple R, $R^2$, Adjusted $R^2$, Standard Error and Analysis of Variance were compared with the characteristics of the original model and shown in table 4.
Table 4. Comparison of the multiple R, R², adjusted R², standard error and Analysis of Variance of the originally built model with the newly constructed model for future levels of housing demand

<table>
<thead>
<tr>
<th></th>
<th>Multiple R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Standard Error</th>
<th>ANALYSIS OF VARIANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature of Originally Built Model Based on 10 – Data Points</td>
<td>0.867</td>
<td>0.752</td>
<td>0.716</td>
<td>2756.83</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D.F</td>
</tr>
<tr>
<td>Regressn</td>
<td>1</td>
<td>1.61E+08</td>
<td>1.61x10⁸</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual</td>
<td>7</td>
<td>5.32x10⁷</td>
<td>7.6x10⁶</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Value</td>
<td>= 21.21</td>
<td></td>
<td></td>
<td>Sig F = 0.002</td>
<td></td>
</tr>
<tr>
<td>Feature of Newly Built Model Based on 5-Data Points (Validation Sample)</td>
<td>1.000</td>
<td>0.999</td>
<td>0.999</td>
<td>464.70</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D.F</td>
</tr>
<tr>
<td>Regressn</td>
<td>1</td>
<td>1.03E+09</td>
<td>1.03x10⁹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual</td>
<td>3</td>
<td>6.48x10⁵</td>
<td>2.16x10⁵</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Value</td>
<td>= 4774.88</td>
<td></td>
<td></td>
<td>Sig F = 0.000</td>
<td></td>
</tr>
</tbody>
</table>

It can be seen from table 4 that the originally built model based on 10-data points had a residual mean square of 7.6x10⁶ and a coefficient of determination (R²) of 75.2% whilst, the validation sample had a residual mean square of 2.16x10⁵ and a coefficient of determination (R²) of 99.9%.

If the features of the originally built model and the newly built model are compared, it can be seen that the coefficient of determination (R²) and the residual mean square of the new data are close to that of the original data and it can therefore be concluded that the data under investigation is uniformly distributed along the original regression derived. F-test results also show that the model developed was statistically significant.

Based on the results of the validation of the models, the statistical results obtained so far support the validity of the models that, Property price can be used in predicting future levels of housing demand.

Summary of Findings

The results of the data presented and analyzed, reveal that there is a significant positive relationship between the level of housing demand and the level of housing supply, money supply, foreign exchange rates, consumer price index, size of population and property price. The study also revealed that no significant relationship exists between the levels of housing demand and interest rates, national disposable income, economic growth, level of employment and housing affordability by civil servants. It can be concluded that the positive relationship between housing supply and demand is due to the fact that the demand for housing is made only after houses have been built. The relationship with foreign exchange is probably due to the fact that most of these houses are purchased by Nigerians based abroad who find these high exchange rates favorable for investment in housing.

Also, the results obtained suggest that an independent variable property price index was found to contribute significantly to future levels of housing demand. The total variation in the level of housing demand is highly explained by the variation in this variable with an R-square of 75.2% (R² = 0.752). Akintoye and Skitmore [1994] were able through a model fitting process using quarterly data to determine the predictors of the future level of housing demand as price level, GNP and interest rate. Hua [1996] also made use of economic indicators to predict the demand for residential construction in Singapore’ Hua
established a relationship between the following indicators which include: building materials price index, consumer price index, gross domestic product, property price index, prime lending rate, real GDP and unemployment rate and the future level of housing demand in Singapore.

The models developed by Akintoye and Skitmore [1994] and Hua [1996] show some agreement either this current research study, which has property price index as a major indicator of future levels of housing demand in Nigeria.

CONCLUSION

The central problem proposed by the research is to find out the economic and social indicators such as Interest Rates, Foreign Exchange Rates, National Disposable Income, Money Supply and so forth that have a significant relationship with and can predict the future levels of demand for housing construction in Nigeria.

The positive relationship found to exist between housing supply and demand is as a result of the fact that the demand for housing is made only after the houses are built and not before or during its construction. Furthermore the relationship with foreign exchange rates can be due to the fact that most of these houses are purchased by Nigerians who are based abroad and who find these high exchange rates favourable and are thereby able to purchase these houses which the local workers consider exorbitant. Housing Developers construct houses due to known existing demand probably from a prior deficiency in supply to applicants. This serves to explain the research finding of a significant positive relationship between the levels of housing supply and demand.

The housing demand regression model constructed demonstrates that housing demand will increase (all else being equal) with an increase in property price index.

Validation of the model indicates enough accuracy to pass the reliability test and strongly supports the assumption that there is a relationship between housing demand and property price

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APPENDIX A: CHARACTERISTICS/NATURE OF VARIABLES IN THE PAPER

Levels of Housing Supply (VHS): Hua (1996) argued the fact and was able to prove that the levels of supply of residential property determines to levels of supply of residential property determines to a large extent the demand for housing. This variable measured using the value of housing units constructed within a certain time period.

Interest Rates (VIR): The cost of a mortgage is set by the rate of interest that is charged on it. This may be set for a certain number of years, but will normally vary. Akitoye and Skitmore (1994), Hua (1996 and other writers such as Okupe (2000) have been able to show that interest rate has an effect on levels housing demand and supply. This can be easily calculated from the nominal interest rates available in the central Bank Annual Report.

Cost of Foreign Exchange (VFX): Okupe (2000) and Ganesan (1979) identified the cost of foreign exchange as being responsible for the high – cost of housing in which has led to the weak demand for housing and therefore the dampened motivation for private developers to construct buildings for sale. This variable was also measurable and obtainable from the Central Bank Annual Report.

National Disposable Income (VNDI): The level of income that people have has also been identified by researchers such as Hua (1996), and Bourne (1981) as a determinant of the demand for and supply of houses. It is believed that the faster the level of income people earn is growing the more money they have to invest in their houses and the more motivated are housing developers to supply of houses it is believed that the faster the level of income people earn is growing the more money they have to invest in their houses and the more motivated are housing developers to supply the necessary houses to meet the stated needs. The disposal income was also calculated from the Central Bank of Nigeria Annual Report.
Economic Growth (VEG): Akintoye and Skitmore (1994) and Bourne (1981) identified economic growth as a factor that determines the level of housing demand. A single indicator of economic growth is the overall level of income in the whole economy which is known as GDP (Gross domestic product). Such that if the behavior of the GDP is studied, the growth on the level of income on the average can be ascertained. According to Akintoye and Skitmore (1994) among other factors, the quantity of construction demand is dependent on the national economy.

Unemployment (VUE): It is believed by Akintoye and Skitmore (1994) that an increase in unemployment or even a decline rate of growth of employment or even a declining rate of growth of employment in an economy may discourage investment in construction. This view is supported by Hua (1996) because of the linkage believed to exist between construction demand and the total purchasing power of the population. The measure for unemployment refers to numbers claiming unemployment obtained from the federal office of statistics publications.

Rate of Inflation /Consumer Price Index (VCPI): Inflation is said to be an increase in the general price level. Inflation is identified by Hua (1996) as determining the level of housing demand whilst Okupe (2000) identified inflation as a major factor militating against the effective supply of houses in Nigeria. The rate inflation / consumer price index could be obtained from data in the central Bank of Nigeria Annual report.

Credit Availability / Money Supply (VMS): This is the total amount of money available in the entire economy. It is a factor believed by Hua (1996) and Okupe (2000) to determine the levels of housing demand and supply. It can be calculated from data available in the central Bank of Nigeria Annual Report.

Population Growth (VSP): This is a measure of the trends in the growth of all the people who live in a particular area, city or city or country. It is believed by Hua (1996 and Bourne (1981) to be a factor that determines to a large extent the level of housing demand and supply. It is measured from statistical data obtainable from the Federal office of statistics and is calculated as a percentage change in population figures.

Profit Motive of Developers (VPMD): Akintoye and Skitmore (1994) and Ganesan (1979) the difference between the value of outputs and the value of inputs, and identified profit as production output price/ input cost ratio. it is believed that high profitability may encourage more investment in that area of the economy due to better employment conditions and income of workers in that sector and it might also motivate builders/developers to participate on a larger scale in housing provision leading to improved housing supply

Property Price (VPP): Hua (1996) and Bourne (1981) identified property price as a determinant of the level of housing demand and supply. According to Akintoye and Skitmore (1994) the relationship between demand and price is a recurring theme in economic literature such that price levels are dependent on the demand for construction. A measure of trends in property price in the housing industry is the cost of land transactions between the buyers and vendors. This local land costs can be obtained from discussions with local developers or real estate brokers and it is best expressed on a per square meter basis.
**Level of Housing Demand (VHD):** The relationship between demand and supply has already been established by different economic literature. The levels of housing demand would be measured by calculating the number of applications made by willing consumers / intending to purchase houses listed for sale by housing developers/ producers.

**Affordability of Households (VAF):** The percentage of houses built by Property Developers, which could be afforded by Householders, was determined and used to find out if it determines demand.
## APPENDIX B: ANNUAL DATA

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Aggregate Demand (VBD)</th>
<th>Supply of Residential Property (VIR)</th>
<th>Interest Rates (Prime Lending Rate)</th>
<th>Foreign Exchange Rate (YTD)</th>
<th>National Disposable Income (VNDI)</th>
<th>Economic Growth Real (GDP) (VGE)</th>
<th>Level of Employment (Unemployment Rate)</th>
<th>Rate of Inflation (Consumer Price Index)</th>
<th>Money Supply (Credit Av)</th>
<th>Size of Population (VSP)</th>
<th>Profitability/Income of Property Developers (VPMD)</th>
<th>Property Price Index (Land) (VPP)</th>
<th>Affordability (Civil Servants) (VAF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>24.9m</td>
<td>5.02m</td>
<td>25.5%</td>
<td>7.5</td>
<td>N197.5b</td>
<td>3.2%</td>
<td>N270.3</td>
<td>N27b</td>
<td>84.9m</td>
<td>34%</td>
<td>72%</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>937.1m</td>
<td>85.74m</td>
<td>26%</td>
<td>8.04</td>
<td>N225.6b</td>
<td>3.5%</td>
<td>N291.9</td>
<td>N37b</td>
<td>86.7m</td>
<td>23.4%</td>
<td>74%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>48.75m</td>
<td>29.65m</td>
<td>20.2%</td>
<td>9.9</td>
<td>*N282b</td>
<td>*N324b</td>
<td>3.1%</td>
<td>N343.9</td>
<td>*N49b</td>
<td>88.5m</td>
<td>22.4%</td>
<td>81%</td>
<td>50%</td>
</tr>
<tr>
<td>1992</td>
<td>390m</td>
<td>266m</td>
<td>29.8%</td>
<td>17.3</td>
<td>*N504b</td>
<td>N553.2b</td>
<td>3.4%</td>
<td>N514.3</td>
<td>N75b</td>
<td>91.3m</td>
<td>24%</td>
<td>87%</td>
<td>0%</td>
</tr>
<tr>
<td>1993</td>
<td>N255m</td>
<td>N420m</td>
<td>36.1%</td>
<td>22.16</td>
<td>*N766b</td>
<td>N821.9b</td>
<td>2.7%</td>
<td>N830.2</td>
<td>N120b</td>
<td>94.1m</td>
<td>8%</td>
<td>100%</td>
<td>96%</td>
</tr>
<tr>
<td>1994</td>
<td>N1296m</td>
<td>N140m</td>
<td>20.2%</td>
<td>22.0</td>
<td>N841.6b</td>
<td>N911.1b</td>
<td>3.2%</td>
<td>N1317</td>
<td>N177b</td>
<td>96.8m</td>
<td>16%</td>
<td>140%</td>
<td>44%</td>
</tr>
<tr>
<td>1995</td>
<td>N4611m</td>
<td>N625m</td>
<td>*44.0</td>
<td>9.01</td>
<td>N1,840.0b</td>
<td>N1,961b</td>
<td>3.9%</td>
<td>N2135</td>
<td>N204b</td>
<td>99.5m</td>
<td>20%</td>
<td>199%</td>
<td>17%</td>
</tr>
<tr>
<td>1996</td>
<td>N1632m</td>
<td>N1101m</td>
<td>*44.50</td>
<td>2.625b</td>
<td>N2,741b</td>
<td>6.1%</td>
<td>N2771</td>
<td>N241b</td>
<td>102.3m</td>
<td>19%</td>
<td>288%</td>
<td>1%</td>
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</tr>
<tr>
<td>1997</td>
<td>N2105m</td>
<td>N1475m</td>
<td>18.4%</td>
<td>81.65</td>
<td>N2,824b</td>
<td>N2,835b</td>
<td>6.0%</td>
<td>N3054</td>
<td>N277b</td>
<td>105.3m</td>
<td>18%</td>
<td>472%</td>
<td>2.7%</td>
</tr>
<tr>
<td>1998</td>
<td>N9491m</td>
<td>N1783m</td>
<td>19.5%</td>
<td>83.81</td>
<td>N2,716b</td>
<td>N2,722b</td>
<td>4.9%</td>
<td>N3230</td>
<td>N333b</td>
<td>108.4m</td>
<td>23%</td>
<td>649%</td>
<td>0%</td>
</tr>
<tr>
<td>1999</td>
<td>N4311m</td>
<td>N3557m</td>
<td>21.3%</td>
<td>92.34</td>
<td>N3,194b</td>
<td>*5.1%</td>
<td>N3489</td>
<td>N393b</td>
<td>111.8m</td>
<td>82%</td>
<td>775%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>N14861m</td>
<td>N11770m</td>
<td>21.3%</td>
<td>101.65</td>
<td>N4842b</td>
<td>6.3%</td>
<td>N3728</td>
<td>N638b</td>
<td>115.2m</td>
<td>94%</td>
<td>1096%</td>
<td>3.5%</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>N11586m</td>
<td>N5621m</td>
<td>26.0%</td>
<td>111.9</td>
<td>N5488b</td>
<td>5.4%</td>
<td>N4490</td>
<td>N817b</td>
<td>118.8m</td>
<td>44%</td>
<td>1287%</td>
<td>73%</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>N6817m</td>
<td>*N8876m</td>
<td>26.0%</td>
<td>126.51</td>
<td>*N5253</td>
<td>*N798</td>
<td>125.2m</td>
<td>33%</td>
<td>1495%</td>
<td>0%</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>N36253m</td>
<td>N8949.2m</td>
<td>24.5%</td>
<td>140.5</td>
<td>*N6146</td>
<td>*N997</td>
<td>130m</td>
<td>83%</td>
<td>1754%</td>
<td>16%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sources:**
(i) Federal Office of Statistics  
(ii) Central Bank of Nigeria  
(iii) Field Survey  
* Estimated