Affordable Housing in the Wake of Global Pandemics: A Reality or a Mirage the Kenyan Perspective?

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Authors’ contributions

This work was carried out in collaboration between both authors. Author EOK designed the study. Authors EOK and PMS performed the statistical analysis, wrote the protocol, wrote the manuscript, managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: This was an investigative study on affordable housing in the wake of global pandemics: A reality or a mirage the Kenyan perspective? 22 % of Kenyans stay in towns and the inhabitants in these cities continue to grow at the rate of 4.2 % annually. This growth rate has outstripped the supply of housing units built. For instance, Nairobi needs a minimum of 120,000 new houses per annually to satisfy the demand but a paltry 35,000 units are constructed annually. The excess demand is likely to continue pushing the housing prices beyond the reach of many Kenyans. Studies conducted in Kenya on housing prices focused on non-macroeconomic determinants and more importantly none of the studies globally envisaged how global pandemics can influence housing prices. Therefore, the influence of global pandemics like Corona Virus Disease (COVID-19) and macroeconomic factors on housing prices in Kenya remains unknown.

Study Design: Correlational research design.

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1.1 Background of the Study

The promulgation of a new constitution in 2010 recognizes housing as a basic right wherein article 43 (1) (b) every person has a right to accessible and adequate housing [4]. Kenya is also a signatory to international declarations such; The Universal Declaration of Human Rights of 1948; Committee on the Elimination of Discrimination Against Women (CEDAW); The Sustainable Development Goal 11; The Habitat Agenda and Agenda 2063 among others. These declarations according to [1] lay the foundation for the right to adequate housing, better living conditions for women, safe and affordable housing by 2030, using housing development as an instrument for halting the increase in poverty, homelessness and joblessness, addressing issues of urban development and human settlements including housing and providing access to better and affordable housing in clean secure and well-planned environments. Currently, the 2017 Big Four Agenda commits the Kenyan government to target growth in manufacturing, improved food security, universal health care and affordable housing development and based on the 2018 State Housing Programme as noted by [5] the government of Kenya targets to construct one million affordable houses in the coming five years.

1.1.2 Trend of housing prices in Kenya

People staying in cities are increasing at a proportion far quicker than can be absorbed and managed, leading to raised demand on services and amenities which enormously exceed supply. In several upcoming market urban centers, this leaves most of the inhabitants with limited choices but to dwell in informal settlements [3]. To tackle the shortage and affordability of

1. INTRODUCTION

1.1 Background of the Study

Housing is a key basic need and human right which plays a central role in ensuring economic advancement, poverty decline, cohesion and a suitable standard of living are achieved [1,2]. In the World currently, most people are residing in towns with over 1 billion residing in the informal settlement, a number which is projected to double by 2030 [3]. In Kenya, 22 % of Kenyans stay in towns and the inhabitants in these towns continue to grow at the rate of 4.2 % annually. This growth rate has outstripped the number (supply) of housing units built annually. For instance, Nairobi alone a Kenyan capital city as noted by [3] needs a minimum of 120,000 new houses annually to satisfy the demand but a paltry 35,000 units are constructed hence a deficit of 85,000 units annually. This is viewed in the context of demand and supply, excess demand will continue pushing the housing prices beyond the reach of many Kenyans. Affordable housing as envisaged by [4] constitutes adequacy and costing that does not exceed 30% of a household's income per month to rent or acquire. The skyrocketing housing prices due to the forces of demand and supply may make housing affordability to remain a mirage in Kenya.

1.1.1 Policies driving housing affordability in Kenya

The promulgation of a new constitution in 2010 recognizes housing as a basic right wherein

Methodology: The study employed unrestricted Vector Autoregressive analysis involving quarterly

Results: Results indicated that the total money supply had a positive influence on inflation that was highly influenced by extended broad money.

Conclusion: From the results, it was concluded that some macroeconomic factors, time trends and global pandemics like COVID-19 influence housing prices in Kenya. Professional, administrative and support services, time trend, transport and storage, information and communication, real estate and housing prices at lag 1 increased housing prices in Kenya by 0.41%, 0.41%, 0.94%, 0.37% and 0.59% respectively given unrestricted VAR coefficients and t-statistics of 0.41(4.184), 1.27 (9.862), 0.19 (2.740), 0.94 (10.178) and 0.59 (6.055) for the variables. Housing prices at lag 1 and 4, COVID-19, other services and tax on products reduced housing prices in Kenya by 0.26%, 0.99%, 3.29%, 1.01% and 0.05% respectively given unrestricted VAR coefficients and t-statistics of -0.26(-2.366), -0.99 (-8.770), -3.29 (-4.550), -1.01 (-6.568) and -0.05 (-2.807) for the variables respectively. Economic growth, financial and insurance activities and previous housing prices at lag 5 had no influence on housing prices in Kenya.

Keywords: Affordable housing; COVID-19; Kenya.
housing units in Kenya, the Big Four agenda and 2018 housing program aim at constructing a million houses in the coming five years that constitute 800,000 affordable houses and 200,000 social housing units for upgrading slum dwellings [5].

The trend in the housing prices based on the Housing Price Index (HPI) as in Fig. 1 indicates that from quarter 1 of 2013 as the base year, housing prices have been on an upward trajectory to 4th quarter of 2018. A downward trend can be observed from quarter 1 of 2019 which might be an indication that 2017 Big Four agenda on affordable housing and the 2018 housing program of targeting 1 million houses in the coming five years might have started to bear fruits of reducing house pricing.

1.2 Statement of the Problem

For housing policies like the Big Four agenda and 2018 housing programme to be effective [2] notes that policies have to be well-researched, evidence-oriented and receptive to the demand and actual requirements, as well as societal challenges pertinent to housing. This can only be achieved through research. Several studies have investigated the affordability of housing for example, [6,7,8] in their studies in European and Asian Countries found income, wealth, demographics factors, the housing stock, taxation, rental market guidelines, land and building regulations, building costs, urbanization rate, interest rates, inflation, real estate investments rates, population growth, economic growth, stock returns, interest and unemployment rates as the main determinants of housing prices. In Kenya, studies conducted by [9,10] depicted a bias towards establishing the determinants of housing demand and supply while a study by [11] indicates that the site, age of a house, number of bedrooms, number of bathrooms, type of house and presence of elevators are the main drivers of housing prices. From the studies, it is clear that we have mixed results where [8] find interest as a non-determinant while [7] established interest as a key determinant of housing prices. This is an indication that findings in one country should not be generalized to other countries. Kenyan studies by Kenya Bankers Association majorly focused on non-macroeconomic determinants and more importantly none of the studies globally envisaged how global pandemics can influence housing prices. Therefore, the influence of global pandemics like Corona Virus Disease (COVID-19) and macroeconomic factors on housing prices in Kenya remains unknown calling for an investigative study on affordable housing in the wake of global pandemics: A reality or a mirage the Kenyan perspective?

![Fig. 1. Housing Price Index in Kenya (2013 Quarter 1 as a base to 2020 Quarter 1)](image-url)
1.3 Study Objectives

1.3.1 Main objective

An investigative study on affordable housing in the wake of global pandemics: A reality or a mirage the Kenyan perspective?

1.3.2 Specific objectives

i. Develop a parsimonious model for housing price determinants in Kenya

ii. Determine the influence of macroeconomic factors, time trend and COVID-19 pandemic on housing prices in Kenya

1.4 Research Question and Hypothesis

i. What is the parsimonious model for housing price determinants in Kenya?

$H_0$ : Macroeconomic factors, time trend and COVID-19 pandemic have no influence on housing prices in Kenya.

$H_1$ : Macroeconomic factors, time trend and COVID-19 pandemic have an influence on housing prices in Kenya.

2. LITERATURE REVIEW

[12], asserts that cities globally are expanding rapidly giving an unbelievable prospect for the growth of the city economies. Conversely, the city’s inhabitants require decent and affordable housing which remains a greatest challenge globally. This challenge of affordable housing needs both short term and long term measures that involve the public sector, private sector and nonprofit participants to support the appropriate functioning of property markets that will solve both the supply side and the demand side of the housing market.

[6], in analyzing the various theoretical models noted housing prices depend positively on disposable income, wealth, and demographic needs while the prices are negatively associated with user costs and the housing stock. The study also notes that institutional and structural factors such as tax policies, rental market regulations, land and building regulations can affect house prices by altering demand and supply. Studies conducted in 24 European Countries and China by [7] and [8] respectively showed that per capita disposable income, land transaction price index, construction cost, urbanization rate, Consumer Price Index (CPI) of residence and investment in real estate had a positive influence while interest rate had no influence on the housing price in Shanghai, China. In 24 European countries, economic growth, stock returns, construction cost and inflation were found to increase the housing prices while interest and unemployment rates had a negative effect on housing prices. Similarly, [13] investigating housing allocation factors in China noted that the faction of agencies, ineffective monitoring systems, the lack of transparency of information and the absence of legal enforcement determines house allocation.

A study by [14] in Turkey based on established that the floor of the apartment, Garden floor, location, American type kitchen, Built-in oven, Balcony, Barbecue, major appliances, picture entry-phone, air conditioning, Built-in kitchen, shutter, ceramic floor, water heater, fire place, sound insulation, sports field, shopping mall, grocery market, park, community clinic, street market, gym, metro and sea were the key determinants of housing prices. [15], in their study in Malaysia established that location, size of the house, recreational facilities, house layout, transportation, land levy, permit fees, stamp duty, government policy and house finishing were the main determinants of housing prices.

Investigating the demand side of housing in Kenya by [9] found that in Nairobi economic growth, the number of households and housing prices influenced demand while [10] in a supply side study established that price of housing, stock of houses, income per capita, inflation and interest rate influenced the supply of houses in Kenya. A housing prices focused study conducted in Kenya by [11] indicates that housing prices are affected by house specific factors that include location, age of a house, number of bedrooms, number of bathrooms, type of house and presence of elevators are the main drivers of housing prices.

3. RESEARCH METHODOLOGY

The study employed correlational design using unrestricted vector autoregression involving quarterly time series data from quarter 1 of 2014 to quarter 1 of 2020 on changes in housing prices (HS), economic growth (G), financial and insurance (FI), manufacturing (M), information and communication (IC), other services (OS), professional, administration and support services.
(PAS), transport and storage (TS), tax on products (T), real estate (RE), agriculture (A), mining and quarrying (MQ), electricity and water supply (EW), construction (CO), wholesale and retail trade (WR), accommodation and restaurant (AR), public administration (PA), education (ED), health (H), other services, a time trend variable (Q) and a binary variable capturing the pandemic of COVID-19 (CR). Data on the variables was obtained from [11,16,17].

\[ H_S = f(H_{S,t-1}, G_t, F_{I_t}, M_t, T_t, RE_t, MQ_{t}, PAS_{t}, OS_{t}, EW_{t}, CO_{t}, WR_{t}, AR_{t}, PA_{t}, E_t, H_t, Q_t, CR_t) \]  \hspace{1cm} (1)

Where;

\[ CR_t = \begin{cases} 
1 & \text{if there is a pandemic e.g. COVID-19,} \\
0 & \text{otherwise} 
\end{cases} 
\]

\[ i = 1, 2, \ldots, n \]

A parsimonious model was established based on the inverse root of autoregressive polynomial characteristic, lag length techniques of Log Likelihood (LL), Akaike Information Criterion (AIC) and Bayesian Schartwz Criterion (SC) and diagnostic techniques of multicollinearity, serial correlation, heteroscedasticity and residuals normal distribution. The optimal lag length was selected based on lag length with the maximum log likelihood, minimum AIC and minimum SC. Multicollinearity was tested using variance inflation factors (VIF) where a value less than 10 as indicates absence of multicollinearity [18]. Heteroscedasticity, residual normality and serial correlation tests were by use of Breusch-Pagan-Godfrey, Jarque-Bera and VAR residual portmanteau tests.

The techniques led to adoption of a parsimonious model (2) in which the variables of lagged changes in housing prices, economic growth, financial and insurance, manufacturing, tax on products, real estate, professional, administration and support services, information and communication, transport and storage, time trend, other services and corona virus pandemic were adopted while agriculture, mining and quarrying, electricity and water, education, health, accommodation and restaurant services that appeared in model (1) were dropped.

\[ H_S = f(H_{S,t-1}, G_t, F_{I_t}, M_t, T_t, PAS_{t}, OS_{t}, TS_{t}, CR_t) \]  \hspace{1cm} (2)

4. RESULTS AND DISCUSSION

The unrestricted VAR results in Table 1 indicated that housing prices at lag 2, professional, administrative and support services, time factor, transport and storage, real estate, information and communication had a significant positive influence on housing prices in Kenya. Specifically, coefficients and t-statistics of: -0.59 (6.055) on housing price at lag 2 shows that the previous second quarter housing price increases housing prices by 0.59%, 0.41(4.184) on professional, administration and support services indicated that a 1% increase in professional, administration and support services that leads to increased PAS costs raises the housing prices by 0.41%, 1.27 (9.862) on quarterly time trend indicates that as we move from one quarter to the other, the housing prices increase by 1.27%, 0.19 (2.740) and 0.94 (10.178) on transport and storage and information and communication respectively implied that a percentage increase in transport and storage activities that include passengers and cargo movement raises housing prices by 0.19% while a percentage increase in information and communication raises the housing prices by 0.94% which might attributed to the fact that people may be having a bias towards acquiring property in areas with necessary infrastructure raising the demand and hence prices. A coefficient of 0.37 (2.447) on real estate depicted that a percentage increase in real estate development raises the housing prices by 0.37% which might be an indication that over time the type of houses developed have more advanced internal specifications that raise the prices.
The variables of housing prices at lag 1 and 4, corona virus, other services, tax on products had a significant negative influence on housing prices in Kenya. Coefficients and t-statistics of: -0.26 (-2.366) and -0.99 (-8.770) on housing price at lag 1 and 4 showed that the previous first quarter and fourth quarter housing price reduces housing prices by 0.26% and 0.99% respectively, -3.29 (-4.550) on corona virus indicated that in the presence of pandemics the average housing prices will reduce by 3.29% which may be attributed to reduced demand due to less movement and dwindled incomes witnessed during lockdowns and curfews, -1.01 (-6.568) and -0.05 (-2.807) on other services and tax on products respectively implied that a percentage increase in other services and tax on products reduces housing prices by 1.01% and 0.05 respectively. Economic growth, finance and insurance service, housing prices at lag 3 and 5 and manufacturing had no statistically significant influence on housing prices in Kenya. The results conform to the findings of [3] and [12] who established that interest rates under financial and insurance sector does not affect housing prices and institutional and structural factors such as tax policies, rental market regulations, land and building regulations affect house prices by altering demand and supply.

Table 1. Unrestricted Vector Autoregression (VAR) Estimates

|        | HS(-1)       | OS         | HS(-2)       | PAS         | HS(-3)       | Q          | HS(-4)       | TS          | HS(-5)       | T          | G          | RE          | FIN        | IC          | CR          | M           | R-squared | Adj. R-squared | Sum sq. resid | S.E. equation | F-statistic | Log likelihood | Akaike AIC | Schwarz SC | Mean dependent | S.D. dependent |
|--------|--------------|------------|--------------|-------------|--------------|------------|--------------|-------------|--------------|------------|------------|-------------|------------|------------|-------------|--------------|-----------|----------------|--------------|---------------|------------|----------------|------------|-------------|----------------|----------------|
| HS(-1) | -0.258437*   | (0.10921)  | -0.509010*   | (0.09758)   | -0.111921    | (0.11490)  | -0.992198*   | (0.11313)   | -0.147305    | (0.21450)  | -0.635368  | (0.47401)   | -0.015653  | (0.07084)  | -3.292006*   | (0.72354)    | 0.991806     | 0.950836    | 0.220980     | 0.271404    | 24.20827    | 15.35432    | 0.067966     | 0.863283    | -0.027895   | 1.224035     |
|        | (0.25636)    | (0.15301)  | (0.10358)    | (0.09886)   | [6.56840]    | (0.12889)  | (0.06921)    | (0.09269)   | [-2.36636]   | (0.10921)  | [-3.292006] | (0.72354)   | [-0.015653] | [-0.22097] | [-3.292006]  | [-0.72354]   | 0.991806     | 0.950836    | 0.220980     | 0.271404    | 24.20827    | 15.35432    | 0.067966     | 0.863283    | -0.027895   | 1.224035     |

Values in ( ) & [ ] are standard errors and t-statistics respectively. * indicates statistical significance at 5% level of significance
The goodness of fit analysis based on a coefficient of determination (R²=0.99) and an F-statistic of 24.208 indicate that the variables in the parsimonious model (2) explained 99% of changes in housing prices in Kenya. Fig. 2 shows that none of the inverse roots fall outside the circle an indication that the unrestricted VAR model is stable. Diagnostic test results in Tables 2, 3, 4, 5, 6 and 7 depicted that the optimal lag length was 5, no autocorrelation, residuals were normally distributed, no multicollinearity, there was no heteroscedasticity and all the time series variables were stationary after differencing.

Table 2. Lag length Determination

| Lag Length | LL      | AIC      | SC       |
|------------|---------|----------|----------|
| 1          | -31.42841 | 3.776383 | 4.368815 |
| 2          | -29.2446 | 3.840405 | 4.485112 |
| 3          | -22.08221| 3.436401 | 4.132749 |
| 4          | -5.570553| 2.057055 | 2.803855 |
| 5          | 15.35432*| 0.067966*| 0.863283*|

*LL- log likelihood, AIC- Akaike Information Criterion, SC- Bayesian Schwarz Information Criterion, *Indicates optimal lag length

Table 3. Autocorrelation Test Results

VAR Residual Portmanteau Tests for Autocorrelations

Null Hypothesis: no residual autocorrelations up to lag h

| Lags | Q-Stat | Prob. | Adj Q-Stat | Prob. | Df |
|------|--------|-------|------------|-------|----|
| 1    | 0.253161 | NA*   | 0.267225   | NA*   | NA*|
| 2    | 0.497812 | NA*   | 0.540658   | NA*   | NA*|
| 3    | 0.517430 | NA*   | 0.563956   | NA*   | NA*|
| 4    | 0.519872 | NA*   | 0.567049   | NA*   | NA*|
| 5    | 0.829994 | NA*   | 0.987929   | NA*   | NA*|
| 6    | 0.838904 | 0.3597 | 1.000950   | 0.3171 | 1  |
| 7    | 2.311106 | 0.3149 | 3.331937   | 0.1890 | 2  |
| 8    | 2.311847 | 0.5103 | 3.333216   | 0.3430 | 3  |
| 9    | 2.314480 | 0.6781 | 3.338220   | 0.5029 | 4  |
| 10   | 2.564550 | 0.7667 | 3.866146   | 0.5688 | 5  |
| 11   | 2.688557 | 0.8468 | 4.160662   | 0.6549 | 6  |
| 12   | 2.744514 | 0.9076 | 4.312546   | 0.7432 | 7  |

*The test is valid only for lags larger than the VAR lag order. df is degrees of freedom for (approximate) chi-square distribution, *df and Prob. may not be valid for models with exogenous variables
Table 4. Residual Normality Test Results

| Component | Skewness | Chi-sq | Df | Prob. |
|-----------|----------|--------|----|-------|
| 1         | 0.138533 | 0.060773 | 1  | 0.8053|
| Joint     | 0.060773 | 1       |    | 0.8053|
| Component | Kurtosis | Chi-sq | Df | Prob. |
| 1         | 3.745195 | 0.439625 | 1  | 0.5073|
| Joint     | 0.439625 | 1       |    | 0.5073|
| Component | Jarque-Bera | Df | Prob. |
| 1         | 0.500398 | 2 | 0.7786|
| Joint     | 0.500398 | 2 | 0.7786|

P-value > 0.05 indicates acceptance of null hypothesis of normality distribution of residuals

Table 5. Variance Inflation Factors Test Results

| Variable | Coefficient | Uncentered |
|----------|-------------|------------|
| G        | 0.533416    | 4.509002   |
| FIN      | 0.058737    | 2.269091   |
| CR       | 3.059704    | 1.379408   |
| IC       | 0.032969    | 3.613613   |
| M        | 0.094902    | 5.695087   |
| OS       | 0.138377    | 3.018795   |
| PAS      | 0.038195    | 1.746900   |
| Q        | 0.083494    | 2.710212   |
| TS       | 0.017991    | 1.653458   |
| T        | 0.061217    | 4.502410   |
| RE       | 0.210054    | 1.695105   |

VIF > 10 indicates presence of multicollinearity

Table 6. Breusch-Pagan-Godfrey Heteroscedasticity Test Results

| Test                | Statistic  | Prob. |
|---------------------|------------|-------|
| F-statistic         | 1.557035   | 0.2290|
| Obs*R-squared       | 14.11240   | 0.2268|
| Scaled explained SS | 6.060477   | 0.8693|

Obs*R-squared with prob. > 0.05 implied acceptance of null hypothesis of no heteroscedasticity

Table 7. Stationarity Test Results

Null Hypothesis: Unit root (individual unit root process)

| Method               | Statistic | Prob.** |
|----------------------|-----------|---------|
| ADF - Fisher Chi-square | 187.435   | 0.0000  |
| ADF - Choi Z-stat     | -11.6788  | 0.0000  |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality

Intermediate ADF test results UNTITLED

| Series | Prob. | Lag | Max Lag | Obs |
|--------|-------|-----|---------|-----|
| FIN    | 0.0000| 0   | 4       | 23  |
| G      | 0.0000| 0   | 4       | 23  |
| HS     | 0.0000| 0   | 4       | 23  |
| IC     | 0.0001| 0   | 4       | 23  |
5. CONCLUSION AND RECOMMENDATIONS

This was an investigative study on affordable housing in the wake of global pandemics: A reality or a mirage the Kenyan perspective? From the results it can be concluded that some macroeconomic factors, time trend and global pandemics like COVID-19 influence housing prices in Kenya. Specifically, professional, administrative and support services, time trend, transport and storage, information and communication, real estate and housing prices at lag 1 had a significant positive influence on housing prices in Kenya at 5% level of significance. Housing prices at lag 1 and 4, COVID-19, other services and tax on products had a significant negative influence on housing prices in Kenya at 5% level of significance. Economic growth, financial and insurance activities and previous housing prices at lag 5 had no influence on housing prices in Kenya. The study therefore recommends that to realize the objective on achieving affordable housing so that it is not a mirage, the government of Kenya needs to put more emphasis on influencing the relevant macroeconomic variables in the appropriate direction rather than focusing on house specific factors to reduce housing prices. In the wake of pandemics like COVID-19 it is also necessary for the government to come up with measures that can raise disposable incomes of citizens so that the demand for houses may not be affected and lower prices to levels that might discourage investors.

CONSENT

All authors declare that no written informed consent was required for the study.

ETHICAL APPROVAL

All authors hereby declare that Ethical approval was not needed for the study based on time series data.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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