

## **Structure and conduct of risk returns-characteristics of residential property investment in Kaduna metropolis, Nigeria.**

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### **Abstract**

Residential property investment is one of the most subscribed investments in the world. However, its risk-return characteristics is least understood especially in the Nigeria context. Though past studies have critically established the performance of mostly isolated residential and commercial properties in southern regions of Nigeria. Disentangling and identifying empirically risk-return characteristic of residential property in Kaduna metropolis Northwest Nigeria is an unresolved challenge. This paper presents an empirical analysis of the performance of residential properties to gain a better understanding of the property market dynamics in Nigeria, survey research approach was employed to collect quantitative data required for the study. To determine residential property returns and asset risk, descriptive (weighted means, standard deviation and percentages) and inferential statistics were utilised. The outcome demonstrated that residential properties have diverse total returns and risk-return characteristic. Furthermore, this study established that total returns from residential properties ranged between 7.93% to 12.68 % and the risk features ranged from 2.37% to 6.81% among the classes of properties. The result demonstrates a direct positive relationship between total returns and risk profile. Hence, recommends that Malali market is the most desirable location for risk-averse investors.

**Keywords:** *Risk- return analysis, residential investment, total return, portfolio, property*

## Introduction

An investment simply connotes a conscious act of a person or entity that entails exploitation of assets intending to obtain a targeted net return within a specific time frame or period (Sayce, *et al.*, 2006). Globally, resources for investment at the disposal of investors are limited as compared to varieties of investment opportunities. Consequently, Marquard and Von-Eije (2006) opine that investment decisions are crucial, and are made owing to assumptions, predictions and expectation of the future.

Dabara *et al.* (2016) believed there are intrinsic doubts about potential returns and risk complexities. Hence, it is an undeniable fact that potential investor, new /old long-term investor both foreign and local will like to unveil the risk-return features of an investment asset before entrusting or continuing to entrust his scarce funds to the same type or any potential investment opportunity.

Real estate property/investment property are interchangeably used and connotes property purchased with the intent of earning a return on the investment through rental income or resale of the property in the future, or both. In Nigeria, residential

investment is a primary type of investment portfolio (Mfam & Kalu, 2012). Real estate investment decision centred on risk-return approaches provides an investor with varieties of benefits (Fiorilla & Halle, 2011; Steinke, 2011). Most especially if it is strategically based on the total return approach because it embraces both the income and capital returns strategies, hence the best measure of hereditament performance over time (Dabara, 2015; Umeh & Oluwasore, 2015).

The risk-return features of real estate investment are indicators for decision-making and are tied to individual real estate market in varying locations, this buttresses the need to isolate and compare risk-return features of investment options in the real estate market to unearth their peculiarities. Therefore, this study aimed at assessing the structure of total returns and risk-return pattern of residential real estate investment in Kaduna metropolis, Nigeria.

To accomplish the aforementioned, it becomes imperative to seek answers to the following research questions: What were the trends of total returns feature of residential properties in the study locale between 2010-2019? What were the variations in total returns within the study locale? What were the risk features of

residential properties in the study locale between 2010-2019? Also, is there any association between risk and total returns in residential properties in the study locale?

The rationale for the choice of the study locale Malali, Barnawa, Unguwan-Rimi(U/rimi) and Sabon-Tasha(S/tasha) neighbourhoods were owing to their strategic accommodation of residential property and a better-off data on rental and capital value of residential property within ten years in comparison to other residential neighbourhoods. Also, the persistent influx of people as a result of conflicts within the Kaduna-south region in search of more secured housing make this study locale suitable.

### **Literature Review**

Despite the existence of a vast body of literature on risk-returns features of residential real estate properties, little consensus has emerged on the type of property under study by various scholars. There has been less attention towards isolating total returns and risk-return of one (self-contain), two and three-bedroom residential properties especially within Kaduna metropolis Nigeria were these type of property are the primary residential property investment. Establishing risk-return features of these categories of properties will improve the forecast of

investment returns in the Nigeria property market. Thus, it is fundamental to understand the movement of this class of property investment risk–returns features to be able to make better real estate policy and investment decisions in the study areas.

Taking the social, economic and political terrain of Nigeria into context some literature has been established to help in explaining the performance of residential real estate. For instance, Mfam and Kalu, (2012), Oyewole (2013), Udobi *et al.* (2018), Kingsley and Chukwuemeka (2019), provided a comparative analysis of residential properties and commercial property in the study areas and found out that commercial property investment returns outperformed residential property.

In some instances, details of the type of sampling technique utilised in selecting the properties and the number are overlooked by the study only the number of estate surveying and valuation firms that provide the information are provided in detail. Similarly, Wahab *et al.* (2017); Nwankwo *et al.* (2018), Nissi *et al.* (2019) centred their study on residential property, provided the sampling technique utilised for the study and concluded that location of residential property has varying investment returns. Though overlooked a parlour and bedroom (self-contain) in their study, which is a major

type of residential property investment in Kaduna metropolis. While Dabara (2015) centred on the inflation hedge performance and risk-return characteristics of residential flat and though the study did not isolate the types of residential flats.

In this study, we carry out Phillip-Perron unit root test to test for the stationarity of the data before predicting total returns of residential property investment returns which have been largely neglected. Trendlines analysis was employed to graphically demonstrate trends from 2010 to 2019 and assist in easing future prediction of trends. Thus, unit root test exists in few studies, which might have improved risk-return forecast in other diverse property asset market. There are quite some papers where risk-return features of residential investment are studied. However, research

on total risk-returns features of residential real estate in North-western Nigeria is still limited.

### The Study Locale

The study area is Kaduna metropolis, the Administrative capital city of Kaduna state. It lies between latitude  $11^{\circ} 3' N$  and longitude  $7^{\circ} 25' E$ , located in the Northwestern region of Nigeria and shares boundary with Niger, Bauchi, Kano, Zamfara and Katsina state. The locale is a megacity made of Kaduna North and South with heterogeneous primary ethnic groups that include Gbagyi, Hausa, Fulani, Kataf, Kagoro and Jaba extractions amongst some other secondary groups. Below is the map of Nigeria (Figure 1) depicting Kaduna state, from which the map of Kaduna metropolis is extracted Figure 2.



Figure 1. Map of Nigeria showing Kaduna State



size of 644 properties was used for the study (Krejcie & Morgan, 1970) and was well thought out to be adequate. Therefore, it is the aggregate average rental and capital value of these properties that were employed for analysis and generalization. The quantitative data was analysed using both descriptive (weighted means, standard deviation and percentages) and inferential statistic (Analysis of variance (ANOVA) and Honesty Significant Difference post hoc test).

The aggregate average data on rental and capital values were calculated for each year from a questionnaire filled by the respondent (estate surveyors and valuers only) and was then transformed into total return with the aid of Hoesli and MacGregor, (2000) formula expressed below as:

$$\text{Total return } TR_t = \frac{(CV_t - CV_{t-1}) + NI}{CV_{t-1}}$$

Where:

$CV_t$  = capital value is at end of the year,

$CV_{t-1}$  = capital value beginning of the year (end of period t-1)

NI = represents net income or rental value.

First, the transform data (total return data) was put to the inferential test to see if there was variation in total returns across the study

neighbourhoods (analysis of variance and honesty significant difference post hoc test- 'HSD-Tukey' Table 3 to 6). Which aided in showing if any, an overall statistically significant difference in total return exist among the neighbourhoods.

Second, the transformed data was also, put to Phillips-Perron test of unit root to test for the data stationarity and ability to make a prediction, since it is a financial time series fractional data, where the data was not stationary the difference of the data was taking to make it stationary to be able to make an accurate prediction. Thus, test regression for the Phillips-Perron tests is

$$\Delta y_t = \beta'D_t + \pi y_{t-1} + U_t \dots \dots \dots \text{Equation 2}$$

Where  $U_t$  is  $I(0)$  which is the different level and may be heteroskedastic. Phillips-Perron Stationarity tests take the null hypothesis that  $y_t$  is trend stationery. As said earlier if  $y_t$  is not stationary, the study takes the first difference to make the data becomes stationary at a point.

Rule of thumb: if there is a unit root problem (stationarity features of the data set) to accept or reject the Null hypothesis at 10%, 5% and 1% significant level for total returns.

**Table 1: Phillips-Perron Stationarity test for all neighbourhood Kaduna State**

location	Test	Test Statistic	1% Critical	5% Critical Value	10% Critical Value	MacKinnon approximate p-value for Z(t)
U/rimi	Z(rho)	-8.943	-17.2	-12.5	-10.2	0.0004
	Z(t)	-4.329	-3.75	-3	-2.63	
Malali	Z(rho)	-10.441	-17.2	-12.5	-10.2	0.0064
	Z(t)	-3.568	-3.75	-3	-2.63	
Barnawa	Z(rho)	-11.251	-17.2	-12.5	-10.2	0.0692
	Z(t)	-2.729	-3.75	-3	-2.63	
S/tasha	Z(rho)	-3.251	-17.2	-12.5	-10.2	0.5753
	Z(t)	-1.414	-3.75	-3	-2.63	

Computed from Table 2

Test results presented in Table 1 suggest that the study should reject the null hypothesis, that is the total returns from U/rimi and Malali contain no unit root (is stationary). Similarly, test results for Barnawa and S/tasha, indicates that the study will accept the null hypothesis that is the data for total returns is not stationary. Hence, the study takes the first difference of the data to ascertain stationarity, before predicting total return using the trend equation (Dabara *et al.*, 2015).

Third, the standard deviation of the total return values calculated aid to measure the level of volatility of the total returns which fundamentally indicate the risk of investing in a parlour and bedroom, two-bedroom and three-bedroom residential properties in the

study areas express as:

$$\text{Asset risk/standard deviation} = \sqrt{\frac{\sum(x_i - \bar{x})^2}{(n-1)}} \dots \dots \text{Equation 3}$$

Where n-1 =df

- $x_i$  = asset period return
- $\bar{x}$  = the mean return
- n = number of observation

Decision rule: neighbourhoods with a higher risk coefficient indicate the hereditament is less secured whilst those with lower risk coefficient depict a more secured investment.

Fourth, trend lines analysis was employed to graphically demonstrate trends from 2010 to 2019 and assist in easing the future prediction of trends. Similarly, the R<sup>2</sup> coefficient was used to establish the

goodness of fit of the total return trends and the accuracy of the predictions. The rule of thumb is that a trend line is most precise if the  $R^2$  coefficient is closer or at 1 or 0.5. Also, the trend line regression equation was generated for forecasting future total returns values.

To demonstrate the trend line equations, the steps encompass dictating the line that produces the least coefficient for the sum of the squares of the vertical difference between the data line and points.

The equation is expressed as:

$$y = mx + b \dots\dots\dots \text{Equation 4}$$

where:

- $y$  = dependent variable (total returns)
- $m$  = slope of line, this equals the  $\Delta$  in the  $y$  coefficient divided by the  $\Delta$  in

the  $x$  coefficient;

$x$  = the dependent variable (year);

$b$  = the  $y$ -axis intercept of the line.

Lastly, return –risk features of residential investment (a parlour and bedroom, two and three bedrooms) were comparatively analysis to establish their peculiarities.

### Analysis and Discussion

The result of the analysis conducted on the data obtained are presented in this section. The average total returns of a parlour and bedroom (self-contain), two and three bedrooms residential property investment are presented from 2010 to 2019. Table 2 for total returns was arrived at by calculating for each year correspondingly, the aggregate total averages of the respondent response on rental and capital value per property type and employing Hoesli and MacGregor (2000) formula for total returns.

**Table 2:** Average total returns (%) for a parlour and bedroom (self-contain), two and three bedroom residential investment within Kaduna metropolis

location	Ppty type	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Barnawa	One	20.7	9.09	10.0	10.3	12.77	17.93	16.83	8.86	13.71	6.55
	Two	14.5	6.49	19.8	8.64	23.26	14.48	18.73	6.63	8.95	6.37
	Three	19.3	7.34	9.65	10.2	6.31	12.8	12.4	17.1	7.06	6.14
<b>Mean</b>		<b>18.17</b>	<b>7.64</b>	<b>13.15</b>	<b>9.71</b>	<b>14.11</b>	<b>15.07</b>	<b>15.99</b>	<b>10.86</b>	<b>9.91</b>	<b>6.35</b>
Malali	One	20.1	6.80	4.49	12.2	16.4	16.7	12.1	10.5	8.56	6.85
	Two	13.6	8.72	5.52	12.6	7.57	9.92	8.66	14.3	9.97	6.35
	Three	15.9	4.34	10.2	7.13	9.05	11.3	5.83	5.96	4.39	5.13
<b>Mean</b>		<b>16.53</b>	<b>6.62</b>	<b>6.74</b>	<b>10.6</b>	<b>21.01</b>	<b>12.64</b>	<b>8.86</b>	<b>10.25</b>	<b>7.64</b>	<b>6.11</b>
S/ tasha	One	16.6	19.14	10.3	8.03	15.0	10.9	5.99	8.82	7.00	7.10
	Two	13.0	10.9	7.64	11.4	11.8	10.7	8.45	6.31	7.22	7.05
	Three	11.2	11.1	12.0	9.56	16.5	7.43	9.74	5.92	7.58	7.91
<b>Mean</b>		<b>13.6</b>	<b>13.71</b>	<b>9.98</b>	<b>9.66</b>	<b>14.43</b>	<b>9.67</b>	<b>8.06</b>	<b>7.02</b>	<b>7.27</b>	<b>7.35</b>
U/Rimi	One	18.9	7.64	8.61	11.0	14.7	5.92	14.1	9.87	7.06	6.64
	Two	16.19	11.46	8.24	8.86	6.01	13.57	9.92	9.51	7.80	7.05
	Three	24.7	9.11	12.1	13.3	14.7	10.6	10.1	9.77	9.33	5.22
<b>Mean</b>		<b>19.93</b>	<b>9.40</b>	<b>9.65</b>	<b>11.1</b>	<b>11.80</b>	<b>10.03</b>	<b>11.37</b>	<b>9.72</b>	<b>8.06</b>	<b>6.30</b>

Source: Authors field survey, 2019

Table 2 demonstrate the aggregate mean scores of total returns, which is intended to provide at a glance the differentials in the residential investment trend/performance from years to years for the various location in Kaduna metropolis. For a parlour and bedroom(self-contain) the highest (performance) total returns (20.7%) is at Barnawa and lowest (4.49) at Malali while for two-bedroom total returns are highest (19.8%) at Barnawa and lowest (5.52%) at Malali respectively. Similarly, for three-bedrooms the highest total returns (24.7%) is at Unguwan-Rimi and lowest (4.34%) at Malali.

The result from Table 3 depicts the analysis of variance on the total return of a Parlour and bedroom (self- contain), two bedrooms and three bedrooms property. The result revealed that the F-statistics (0.441, 1.063 and 1.593) are not significant at p-value (0.725, 0.377 and 0.208) greater than 0.05 level of significance, this indicates that variation in the returns across the study locations in Kaduna metropolis is not statistically significantly different. This insignificant difference across the locations might be associated with location factors (low, medium and high-density neighbourhood).

**Table 3:** Analysis of variance in total returns on residential property investment in Kaduna Metropolis.

Type of property	Source of variation	Sum of square	df	Mean square	F-statistic	p-value
A Parlour & room (self- contain)	Within groups	760.465	36	21.124		
	Between groups	27.949	3	9.316	0.441	0.725
	Total	788.414	39			
Two-bedroom	Within groups	634.495	36	17.625		
	Between groups	56.215	3	18738	1.063	0.377
	Total	690.709	39			
Three bedroom	Within groups	636.660	36	17.685		
	Between groups	84.513	3	28.171	1.593	0.208
	Total	721.173	39			

Computed from table 2

These insignificant differences can be examined through the results of the honesty significant difference post-hoc test (HSD Tukey) in multiple comparison Table 4, 5 and 6. It demonstrates where the insignificant difference of the data computed in the table truly existed within the study locales. The multiple comparison table

shows that only three-bedroom property in Malali and Unguwan-Rimi have significant difference (P-value 0.043), insignificant difference in terms of total returns could not be found within other locations. This buttress the earlier findings in Table 2 for three-bedroom properties.

**Table 4:** Multiple comparison table for a parlour and bedroom (self-contain), two bedroom and three bedroom investment (Tukey HSD)

(I) Location	(J) Location	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Barnawa	Malali	1.21300	2.05543	.559	-2.9556	5.3816
	S/tasha	1.79000	2.05543	.390	-2.3786	5.9586
	Ung.Rimi	2.22600	2.05543	.286	-1.9426	6.3946
Malali	Barnawa	-1.21300	2.05543	.559	-5.3816	2.9556
	S/ tasha	.57700	2.05543	.781	-3.5916	4.7456
	Ung.Rimi	1.01300	2.05543	.625	-3.1556	5.1816
S/tasha	Barnawa	-1.79000	2.05543	.390	-5.9586	2.3786
	Malali	-.57700	2.05543	.781	-4.7456	3.5916
	Ung.Rimi	.43600	2.05543	.833	-3.7326	4.6046
Ung. Rimi	Barnawa	-2.22600	2.05543	.286	-6.3946	1.9426
	Malali	-1.01300	2.05543	.625	-5.1816	3.1556
	S/tasha	-.43600	2.05543	.833	-4.6046	3.7326

Computed from table 2. The mean difference is significant at the 0.05 level.

**Table 5:** Multiple comparison table for two-bedroom investment (Tukey HSD)

(I) Location	(J) Location	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Barnawa	Malali	2.67100	1.87749	.163	-1.1367	6.4787
	S/tasha	2.94700	1.87749	.125	-.8607	6.7547
	Ung. Rimi	2.52900	1.87749	.186	-1.2787	6.3367
Malali	Barnawa	-2.67100	1.87749	.163	-6.4787	1.1367
	S/ tasha	.27600	1.87749	.884	-3.5317	4.0837
	Ung.Rimi	-.14200	1.87749	.940	-3.9497	3.6657
S/tasha	Barnawa	-2.94700	1.87749	.125	-6.7547	.8607
	Malali	-.27600	1.87749	.884	-4.0837	3.5317
	Ung.Rimi	-.41800	1.87749	.825	-4.2257	3.3897
Ung. Rimi	Barnawa	-2.52900	1.87749	.186	-6.3367	1.2787
	Malali	.14200	1.87749	.940	-3.6657	3.9497
	S/tasha	.41800	1.87749	.825	-3.3897	4.2257

Computed from table 2. The mean difference is significant at the 0.05 level.

**Table 6:** Multiple comparison table for three-bedroom investment (Tukey HSD)

(I) Location	(J) Location	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Barnawa	Malali	2.89400	1.88069	.133	-.9202	6.7082
	Sabon tasha	.93200	1.88069	.623	-2.8822	4.7462
	Ung.Rimi	-1.05900	1.88069	.577	-4.8732	2.7552
Malali	Barnawa	-2.89400	1.88069	.133	-6.7082	.9202
	Sabon tasha	-1.96200	1.88069	.304	-5.7762	1.8522
	Ung.Rimi	-3.95300*	1.88069	.043	-7.7672	-.1388
S/tasha	Barnawa	-.93200	1.88069	.623	-4.7462	2.8822
	Malali	1.96200	1.88069	.304	-1.8522	5.7762
	Ung.Rimi	-1.99100	1.88069	.297	-5.8052	1.8232
Ung.Rimi	Barnawa	1.05900	1.88069	.577	-2.7552	4.8732
	Malali	3.95300*	1.88069	.043	.1388	7.7672
	Sabontasha	1.99100	1.88069	.297	-1.8232	5.8052

\*. The mean difference is significant at the 0.05 level.

The total return- risk performance profile of residential real estate in Unguwan-Rimi, Malali, Barnawa and Sabon-Tasha discusses below in Table 7. This was arrived at with the aid of equation 3, and subsequently, rank and compared across the study areas. The return-

risk attributes of residential investment are critical justification for a well-informed investor's decision making to maximize profit and spread, as well as minimize investment risk in a mixed residential type asset portfolio.

**Table 7:** Summary statistics showing the weighted return, risk-return of residential properties in four locations of Kaduna metropolis (2010-2019)

Property type	Min	Max	Weighted Return	Rank (Weighted)	Std. Deviation	Rank (Std. Deviation)
A parlour and bedroom (self- contain)	5.92	18.93	10.4570	4 <sup>th</sup>	4.23346	1 <sup>st</sup>
2Bedroom	6.01	16.19	9.6210	3 <sup>rd</sup>	3.23135	3 <sup>rd</sup>
3Bedroom	5.22	24.71	11.8820	1 <sup>st</sup>	5.19211	4 <sup>th</sup>
<b>ATR U/Rimi</b>			31.9600	2 <sup>nd</sup>	10.94642	3 <sup>rd</sup>
A parlour and bedroom (self- contain)	4.49	20.13	11.4620	2 <sup>nd</sup>	5.04101	4 <sup>th</sup>
2Bedroom	5.52	14.30	9.7190	2 <sup>nd</sup>	2.98136	2 <sup>nd</sup>
3Bedroom	4.34	15.91	7.9300	4 <sup>th</sup>	3.71115	2 <sup>nd</sup>
<b>ATR Malali</b>			29.1110	4 <sup>th</sup>	9.70932	1 <sup>st</sup>
A parlour and bedroom (self-contain)	6.55	20.66	12.6750	1 <sup>st</sup>	4.56043	3 <sup>rd</sup>
2Bedroom	2.37	23.26	12.3900	1 <sup>st</sup>	6.80687	4 <sup>th</sup>
3Bedroom	6.14	19.32	10.8240	2 <sup>nd</sup>	4.56781	3 <sup>rd</sup>
<b>ATR Barnawa</b>			35.8890	1 <sup>st</sup>	12.14755	4 <sup>th</sup>
A parlour and bedroom (self-contain)	5.99	5.99	10.8850	3 <sup>rd</sup>	4.50916	2 <sup>nd</sup>
2Bedroom	6.31	6.31	9.4430	4 <sup>th</sup>	2.36622	1 <sup>st</sup>
3Bedroom	5.92	5.92	9.8920	3 <sup>rd</sup>	3.02447	1 <sup>st</sup>
<b>ATR Sabon-Tasha</b>			30.2200	3 <sup>rd</sup>	10.55345	2 <sup>nd</sup>

\*\*\*ATR= Aggregate total return

The result from Table 7 represents the descriptive statistics of the TRs and risk profile of residential rental properties in Unguwan-Rimi, Malali, Barnawa and Sabon-Tasha in Kaduna metropolis.

neighbourhoods and a corresponding third level (4.56%) of risk-return profile, while the least TR for the same type of property is (10.46%) at U/rimi with a corresponding lowest risk-return profile at (4.23%).

Based on a parlour and bedroom (self-contain), the highest level of TRs (weighted return) is Barnawa (12.68%)

For 2 Bedroom, Barnawa neighbourhood generated the highest TR with a coefficient of (12.39%) having the upmost level of risk

at (6.81%), equally S/tasha generated the most minimal rate of return with a coefficient of (9.44%) and a low risk of (2.37%).

Also, for 3 Bedroom, TRs for the U/Rimi neighbourhood demonstrate a high coefficient of (11.88%) and a proportionate highest risk-return of (5.9%). In addition, Malali has a minimum TR of (7.93%) with a proportionate second place (3.71%) risk for the same type of property.

Similarly, the aggregate weighted TRs in Barnawa area is rank first with an aggregate TRs coefficient of (35.89%) and a proportionate risk-return coefficient of (12.15%) while Malali is the least scored in terms of aggregate TRs with a value of (29.11%) and a second-level risk-return profile at (9.71%). The risk-bearing behaviour of residential property investment establishes an exclusive opportunity for investors to safeguard their investment portfolio from risk complexities and intrinsic uncertainties associated with

residential real estates. Moreso, the returns profile establish the quantum of income that has been generated over time and aid in the subsequent forecast.

Likewise, Table 7 illustrate the comparative analysis of the risk profile of the various properties. A parlour and bedroom in Unguwan-Rimi neighbourhood have the lowest risk coefficient of (4.23%) indicating the most secured investment location for this class of property and highest risk at Malali (5.04%) demonstrating the least secured investment location for this type of property.

For 2 Bedroom apartment, Sabon-Tasha neighbourhood has the least risk coefficient of (2.37%) and the highest risk at Barnawa with a coefficient of (6.81%) depicting a low secured investment. Equally, for 3 Bedroom properties, the study unearths that Sabon-Tasha is having a low-risk coefficient of (3.02%) and Unguwan-Rimi with an uttermost risk coefficient of (5.19%) indicating a least secured investment.

**Table 8:** Comparative analysis of aggregate risk profile on total returns of one, two and three Bedroom properties of four locations in Kaduna metropolis (2010-2019)

Location	Std. Deviation	Rank (Std. (Deviation))
ARP U/Rimi	10.94642	3 <sup>rd</sup>
ARP Malali	9.70932	1 <sup>st</sup>
ARP Barnawa	12.14755	4 <sup>th</sup>
ARP Sabon-Tasha	10.55345	2 <sup>nd</sup>

Source: extracted from table 3 \*\*\*ARP= aggregate risk profile

Table 8 shows the aggregate comparative analysis of risk factor of investment in residential properties (total returns 'TRs') in Unguwan-Rimi, Malali, Barnawa and Sabon-Tasha in Kaduna metropolis. From the least to the highest for a parlour and bedroom (self-contain), two and three bedrooms properties. Aggregate risk factor

for the entire four locations was calculated and established that Malali has the least risk with a coefficient of (9.71%) demonstrating the best-secured location for this classes of residential investment while Barnawa has the highest risk with a coefficient of (12.15%) indicating a least secured investment location respectively.

**Figure 3** demonstrate trends analysis of aggregate total returns in U/rimi, Malali, Barnawa and Sabon-Tasha neighbourhoods of Kaduna metropolis

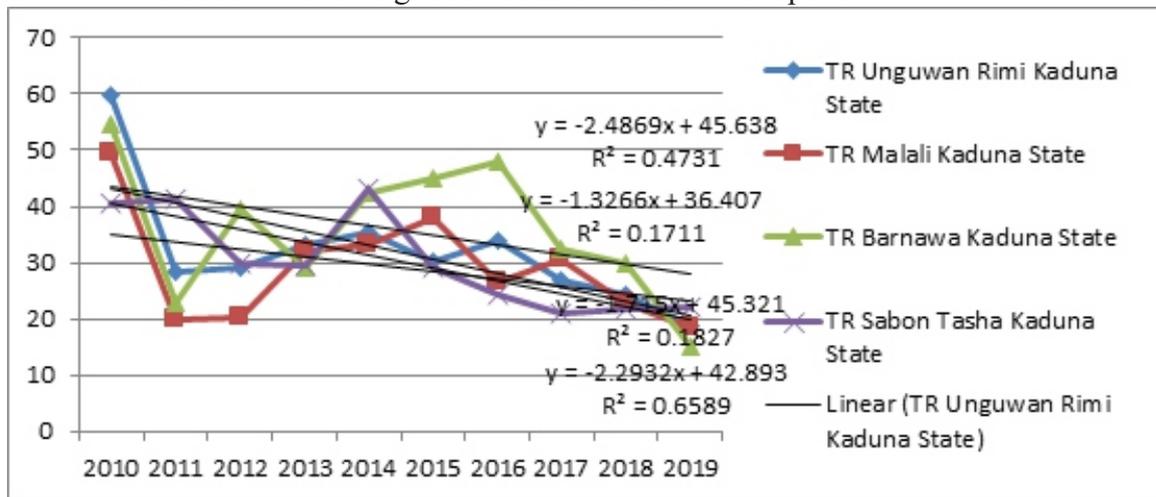


Figure 3: Trend graph showing aggregate TRs in various locations of Kaduna metropolis. Source: computed from Table 2

The graphical result from Figure 3 shows the trend analysis of TRs of residential properties in the study area. The graph demonstrated that Unguwan-Rimi have the highest total returns in 2010 and the least is in Barnawa in 2019, hence the income flow is volatile. Although the point of assessing these fluctuations are positive by nature. The trend equations for different locations being studied in the area is shown in the graph

while the R<sup>2</sup> values show the model goodness of fit though the rule of thumb is the closer the R<sup>2</sup> value to 1 the better the predictability. The zenith of the predictability is at 66%. Below are the trendline equations predictions for 2020 and 2021. The trend equation was employed because the past performance of a residential property returns is the basis for future decision making though not absolute.

Using the trend line equations in the graph, the following TRs were forecasted.

- a) Total return trend equation for Unguwan-rimi =  $-2.4869x + 45.638$ .

Using total return trendline equation =  $-2.4869(11) + 45.638$ , predicted values is 18.28% for 2020. Similarly, for 2021 trendline equation for total return =  $-2.4869(12) + 45.638$  and predicted value is 15.80%.

- b) Total return trendline equation for Malali =  $-1.3266x + 36.407$

Also, using the total return equation =  $-1.3266(11) + 36.407$ , forecast coefficient is 21.81%. Equally, for 2021 total return equation =  $-1.3266(12) + 36.407$ , predicted coefficient is 20.49%.

- c) Total return trendline equation for Barnawa =  $-1.715x + 45.321$

Employing the total return trendline equation =  $-1.715(11) + 45.321$ , predicted value is 26.46% in 2020. For 2021 total return trendline equation =  $-1.715(12) + 45.321$  forecast is 24.74%.

- d) Total return trendline equation for Sabon-tasha =  $-2.2932x + 42.893$

In addition, utilising total return trendline equation =  $-2.2932(11) + 42.893$ , forecast =

17.67% for 2020. Moreover, for 2021 total return trendline equation =  $-2.2932(12) + 42.893$ , prediction stance is 15.37% in 2021. This prediction will aid in making the decisive decision on the chosen location with higher investment returns. However, the study acknowledges that the prediction falls short of capturing other socio-political variables that are present in the study area and are not included in this study.

### Conclusion

This paper assessed the structure of total returns and return-risk features of residential investment in Kaduna metropolis, North-western Nigeria. Findings from the study demonstrate that investing in a parlour and bedroom (self-contain), two and three-bedroom residential properties provide a continuous positive rate of total returns over the study timeframe corroborating the findings of Nwankwo *et al.* (2018) in South-Eastern Nigeria and Nissi *et al.* (2019) in Enugu.

Unguwan-Rimi property market performed better at (24.7%) in term of three-bedroom residential investment property as compared to other locations and volatile with a mean score ranging from 6.30% to 19.93%. The highest aggregate of total returns for all the classes of residential

property is in Barnawa (35.89%) and lowest at Malali (29.11%) respectively. Equally, the aggregate least secured property investment portfolio is located at Barnawa (risk factor 12.15%) but with a high return factor (35.89) most favourable location for risk-taking investors and the most secured investment at Malali (risk factor 9.71%). Consequently recommended as the most desirable location for risk-averse investors.

The aggregate trend line forecast of residential property (a parlour and bedroom 'self-contained', two & three bedrooms) investment total returns in all the neighbourhoods for 2020 and 2021 will range from 15.38% to 26.46%. By implication the study, unveil that total returns have been persistently volatile and positive with minimal risk capacity within the study period.

Equally, the study expanded the scope of residential investment performance literature to include North-Western Nigeria (Kaduna metropolis). The implication of the information provided in this literature embraces both local and foreign residential property developer desiring to invest in the Nigeria property market. In terms of residential investment predictions and decision on residential asset types to include

in a company portfolio, this serves as the remedy for spreading real estate investment risk. Hence, expanding residential investment portfolio performance by securing maximal returns with marginal risk.

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