

Residential Real Estate Investment Performance Evaluation in an Emerging Economy: A Look at North-Central Nigeria's Real Estate Submarket

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Abstract

This study analysed the performances of residential real estate investment in Minna property submarket of north-central Nigeria with a view to guiding real estate investors in decision-making. The study adopted a survey research design to collect residential property transaction data and information from estate surveying and valuation firms as well as reputable estate agent offices in the study area. Index number, holding period return, modified value-at-risk and modified Sharpe ratio models were adopted for data analysis. The study found a progressive movement in rental and capital values of residential real estate in the study area within the study period (2007-2021). Residential real estate also showed positive performance in terms of total and risk-adjusted returns within the study period. The average combined mean total return on residential real estate investment across property categories and neighbourhoods in Minna metropolis for the period averaged 11.47% per annum. Investing in residential real estate investment in the study area was found worthwhile because there was a progressive growth in both rental and capital values. Returns on investment equally indicated positive performance when compared with risk-free investment asset in Nigeria. Thus, investors could include residential apartment in their investment portfolio for purpose of diversification. Study in this topic is conspicuously absent in Minna metropolis of north-central Nigeria and this is the first known study to adopt the Cornish Fisher modified value-at-risk and modified Sharpe ratio in analyzing real estate investment returns performance in Nigeria.

Keywords: Investment Performance, Modified Sharpe Ratio, Nigeria, Property Index, Real Estate, Residential

Introduction

The number of investment assets is increasing globally with a wide range of alternatives on which funds can be committed in anticipation of future benefits. Blackledge (2009) gave a list of investment options on which investors could choose to place their monies to include but not limited to goods and chattels, savings accounts and saving schemes, insurance policies, unit trusts and investment trusts, works of art and

collections of rare objects, currency and commodities, stocks and shares, and real estate (property). From the list, real estate is just one among the enormous investment assets open to investors. Shapiro *et al.* (2013) considered every purchase of real estate asset as an investment; whether it is meant to secure an income to the owner in the form of periodic rent or for owner occupation. The benefit in the case of owner occupation would be the annual value of the

occupation. Real estate investment forms an essential part of many instructional portfolios. Real estate provides a source of relatively high risk-adjusted returns to investors (Garay, 2016). An investor is usually faced with a choice from among the enormous number of investment assets. When one considers the number of possible assets and the various possible proportions in which each can be held, the decision process seems overwhelming (Elton *et al.* 2014). The ultimate goal of any investors is usually to optimise investment returns while minimising investment risks and to achieve this goal, investment performance analysis becomes significant (Hargitay and Yu, 1993). Oyewole (2014) submitted that the significance of real estate investment measurement has become important due to the increasing quest for efficient investment decision-making and the need to protect investment returns against the ravage of risks.

Investment performance measurement is the quantification of the results achieved by investing in an asset and it is an important component of the body of knowledge for anyone involved in investing because the information emanates from performance analysis is fundamental to the investment decision-making process (Feibel, 2003). As important as real estate investment performance analysis is, majority of investors in Nigeria real estate sector still rely heavily on mere intuitions from sales comparison to make investment decisions. Oyewole (2013) recommended that the decision to invest in real estate should be guided by objective, quantifiable evidence and sound analytical procedures rather than mere intuitions. The performance evaluation of investment has been globally discussed in the field of finance. While the performance of real estate as an investment asset has been extensively examined for the real estate markets of developed economies, its development in Nigeria is still emerging. In fact, Agava *et al.* (2021) found that studies in this field are still limited in Nigeria and the available ones have focused majorly on southern Nigeria's real estate market, leaving the northern (especially

north-central) Nigeria's real estate market less researched. Even the few related studies conducted in the northern Nigeria focused largely on Abuja's real estate submarket. It has therefore become imperative to expand the existing body of knowledge on this topic for wider inclusions while paying more attention to other regions in northern Nigeria at large. Georgiev *et al.* (2003) argued that since real estate is not directly traded on a centralised exchange, the physical real estate market is characterised by a relative lack of liquidity, large purchase size, and high transaction costs for properties that are fixed at some location and heterogeneous.

The low transparency of real estate market results in potential poor information thus making performance measurement more challenging when compared to liquid assets. Due to the heterogeneity, localisation, and lack of national index for benchmarking real estate investment performance, the measurement and analysis of real estate investment performances are better done at local level rather than state or national level (Owusu-Ansah, 2018). However, investment decisions are still based on mere intuitions or rule-of-thumb in the study area. Aliero *et al.* (2022) noted that the dearth of reliable and efficient source of real estate market information especially in a developing economy such as Nigeria has been attributed to the imperfect nature of the real estate market. Thus, potential investors often rely on information based on speculations for decision-making. The potential danger of this approach to investment decision-making is the non-achievement of the desired result or even loss of investment. Investors are expected to be equipped with the requisite information that would guide them towards making efficient investment decisions. This information can be derived through investment performance analysis. In this regard, Kalu (2001) has suggested that in order to ensure a sound investment strategy, investment performance analysis should be conducted on a regular basis towards gaining insight into the actualisation or otherwise of the investor's investment

goal(s). Specifically, Domian *et al.* (2015) noted that whereas residential real estate is a substantial investment for most individual investors, the assessment of risk and return of residential real estate investment has not been well explored especially in the developing economies.

This study is conducted to examine the performance of residential real estate investment in Minna metropolis in the north-central Nigeria. Minna is the administrative centre of Niger state. The state shares a substantial geographical boundary with Abuja (the Federal Capital Territory) through Suleija local government area of the state. A conurbation is developing due to the expansion of Niger state and Abuja. As a result, many people whose workplaces are in Abuja now reside in Madala, Suleja and by extension Minna all in Niger state due to their proximity to Abuja and the fact that the cost of residential accommodation in Abuja is higher compared to these proximate towns. Consequently, this push-pull phenomenon has created and attracted investment opportunities in residential real estate in Madala, Suleja and Minna, all in Niger state. As real estate investment continues to attract attention in the city of Minna, the usefulness of performance analysis in real estate investment decision-making to existing and potential real estate investors cannot be overemphasised.

The aim of this study, therefore, is to analyse the historic performance of residential real estate investment in terms of rental and capital value growths, total return and risk-adjusted return performances in the study area so as to benefit real estate investors, practitioners and researchers. The outcome of the study provides firsthand information to real estate investors in making investment decisions. The specific objectives of the study are to: (i) *analyse the trends in rental and capital value performances of residential real estate in Minna from 2007 to 2021 and (ii) evaluate the total and risk-adjusted returns performances of residential real estate investment in the study area.* This approach

is partly informed by one of the Penny (1980)'s recommendations that, in order to adequately evaluate investment performance, the level of risk must be considered with the investment return and to achieve this, there is need for an index of performance which incorporates both risk and return in a single number.

Such index used in this study to measure the risk-return performance of residential real estate investment is the modified Sharpe ratio. The use of this index is due to the non-normality nature of real estate returns distribution, as confirmed by Favre and Galeano (2002); Gregoriou and Gueyie (2003) and Amedee-Manesme *et al.* (2017). According to Penny (1980), since real estate is a long-term investment, performance measurements should cover a period of at least five (5) years. Thus the study period for this research is fifteen years (2007-2021). This study is structured into five sections. Following this introductory section is the literature review which provides information on the concept of real estate investment performance analysis. Section three is the research methodology, followed by the results and a discussion of findings of the research. Section five presents the conclusion and recommendations of the study.

Literature Review

Investment performance analysis is not new because to it has been carried out on investments such as gilts and equities for several decades now. However, its application in the field of real estate investment is still emerging especially in developing economies such as Nigeria (Agava, *et al.* 2021). This section provides an understanding of investment performance generally and real estate in particular. It gives an overview of real estate investment performance measurement techniques and then reviews some related studies on the topic.

Concept of investment performance analysis

The operational definition of investment performance analysis used in this study is

adapted from Feibel (2003) to mean 'the quantification, interpretation and evaluation of the results achieved by investing in an asset as well as the level of the risk associated with the achievements to aid decision-making.' It is concerned with the assessment of past performance in order to shape future investment strategies. The rationale for investment performance analysis generally stem from the need to examine the investor's past achievements to aid future strategies. Kalu (2001) stated that real estate investment performance analysis is needed for effective communication among portfolio managers or trustees and investors, ensuring accountability, measuring actual performance of investment against goal and a basis for future action. Ogunba (2013) added that investment performance measurement or analysis is required for comparison purpose, that is, to compare the performance of different categories of real estate assets with each other and to compare real estate investment performance with the performance of other investment assets such as stocks and shares. The analysis of historic performance of investment is expected to play a vital role within the investment process and to provide a potentially powerful tool with which to take more informed investment decisions. According to Morrell (1991):

Performance analysis is analogous to the doctor who records information from a patient on heart rate, blood pressure and so on. The data collected provides some assessment of the patient's health; it helps to diagnose what is wrong and thus provides an input to the choice of treatment; and it helps to measure the effectiveness of any medicine prescribed. Similarly, the analysis of past investment returns can provide an assessment of the well-being of a portfolio or asset; it can diagnose the reasons for good or poor performance, and it can help to measure the impact of any corrective action.

The results of historic performance analysis often reveals invaluable information on the

risk and/or return characteristics of an investment asset or portfolio and such information is particularly instructive for a relatively illiquid asset such as real estate because of its long-term nature. Finlay and Tyler (1991) reported that the analysis of the performance of portfolios held by investors in the United States became a serious concern during the 1950s and 1960s leading to the first research on the topic by the Bank Administration Institute (BAI). The BAI's study recommended the use of Time-weighted return (TWR) as performance measurement index and the variability (variance) of TWR as measure of investment risk. Subsequently in 1970, the Society of Investment Analysts (SIA) in the United Kingdom (UK) set up a working group to study the report of BAI on the subject for adoption (Bain, 1996). The report of the working group set up by SIA however expressed concern on the complexity of the TWR computation thus recommended that Money-weighted return (MWR) be used to measure investment performance. These earliest studies on investment performance measurement focused solely on pension funds and other financial investment assets excluding real estate. It was not until three decades after when attention was been given to the need for real estate investment performance measurement and analysis (Agava *et al.* 2021). This setback was attributed majorly to the absence of reliable index of real estate market values at this early development in investment performance measurement techniques (Bain, 1996).

Real estate investment performance measurement techniques

Many techniques of measuring investment performance have been identified in literature. Useful reviews of these techniques, in real estate context, are given by Finlay and Tyler (1991), Morrell (1991), Kalu (2001) and Ogunba (2013). Finlay and Tyler (1991) grouped these techniques into three classes viz.: those that measures investment returns only such as income return, capital return, money-weighted return, time-weighted return, and internal rate of return (IRR); techniques that

measure investment risk only such as historic risk factor, variance, standard deviation and Beta coefficient; and combined measure of return and risk techniques such as coefficient of variation, Sharpe ratio, Sortino ratio, Treynor ratio, and Jensen ratio. In this study, four investment performance measurement techniques are adopted to analyse the performance of residential real estate investment in the study area. The first is rental/capital value index which shows the performance of investment on the bases of the observed trends in rental value growth and capital appreciation. Second technique is the time-weighted return, used to proxy the total return on investment. The level of investment risk is measured by the third technique which is the modified value-at-risk model. Finally, the risk-adjust return performance of investment is measured using the modified Sharpe ratio. Higgins (2016) noted that residential real estate has become a popular investment option and has historically attracted Australian private investors with debt financing lowering the initial equity component, favourable tax structure and past evidence of good returns. Higgins (2016) however expressed concern about the traditional approach to risk calculation which may not fully reflect extreme downside volatility of returns and suggested that the analysis of extreme downside risk should be separated from traditional standard deviation risk calculation.

A review of studies on residential real estate investment performance

This subsection reviews some selected studies on residential real estate investment performance conducted within and outside the shore of Nigeria. This is aimed at furnishing the readers with information on the works that have been done in this field, the authors, locations, methodologies, findings and some recommendations. Thus, this study attempts to answer the question arising from the review regarding what is left undone with a view to expanding the existing literature on real estate investment performance analysis. Agava *et al.* (2021) attempted a classification of previous

studies on real estate investment performance into: studies that compared the performances of direct real estate investment on the basis of property types, studies that compared the performances of direct real estate with indirect (securitised) real estate investments and those that compared the performances of real estate investments (direct or indirect) with investment in stocks and shares. The focus of this study is on direct residential real estate investment performance. As such, the studies reviewed are those related to residential real estate investment.

Related studies outside Nigeria

In the developed economies such as the UK, US, China, and Australia, from the available literatures in this field, lesser attention has been given to the analysis of residential real estate investment performance as researchers focused majorly on commercial real estate investment or REITs. Few of such studies are reviewed in this subsection. A comparative analysis of the performance of US real estate investments (securitised and unsecuritised), socks, bonds, and bills was carried out by Kerrigan (2014). The surveyed data used for the study covered a time period of 29 years (1983-2012). A number of performance metrics were used to analyse the data collected. The cumulative wealth index was used to compare the total return of each investment asset, Treynor and Sharpe ratios were used to evaluate the risk-adjusted returns of the assets and correlation analysis performed to examine the relationship between the assets' performances. The results of the study revealed that although equity real estate investment trusts (REITs) outperformed all other assets on the basis of average annual return, on a risk-adjusted return basis both private retail and residential real estate outperformed all other assets. The study further found a trend in increased correlation between common stocks and REITs. The study recommended, among others, that investors with sufficient resources should diversify their portfolio with private direct real estate to ensure return maximisation while reducing risk. Shao *et al.* (2015) investigated the house

price returns and risks characteristics in Sydney, Australia using individual property sales data to develop a hybrid model for measuring the aggregate house price growth. The study found that residential real estate in the central business areas (CBDs) with three or more bedrooms outperformed other types of residential properties as well as the aggregate residential real estate market.

Similarly, Hill and Melser (2017) analysed the return, risk and diversification benefits of residential real estate in Sydney, Australia. The study used large data set of home prices and rents for Sydney, from 2002 to 2014 to estimate flexible spline hedonic models. These models were further used to estimate total returns, capital gains and rental yield for the time period. The findings revealed that there was variation in returns and their volatility and that residential real estate exhibited a significant diversification potential. An assessment of the risk and return performance of residential real estate in 10 selected cities in the United States was carried out by Domian *et al.* (2015). The study used the capital asset pricing models (CAPM), Jensen's model and Market model to estimate excess return and beta. The study found significant variations in return and risk characteristics of residential real estate across the selected cities. The total return and risk to residential real estate investments in Paris and Amsterdam were analysed by Eichholtz *et al.* (2021). The study estimated the total returns to rental housing using over 170,000 hand-collected archival prices and rents for private homes in the study areas. The findings showed that the net annualized real total return was 4% for Paris and 4.8% for Amsterdam, which came entirely from rental yields. The study submitted that yield risk has become an increasingly important component of property-level risk for long-term investment such as real estate.

Some related studies in Nigeria

Mfam and Kalu (2012) the return and risk characteristics of residential and commercial real estate investment in Calabar, Nigeria. Ex post returns from

market and appraisal data were analysed and the implied risk determined. The study concluded that commercial real estate investment outperformed residential real estate investment both on the bases of return and investment risk within the study period. Similarly, Oyewole (2013) carried out a comparative performance of residential and commercial real estate investment performance in Ilorin metropolis. The study used property transaction-based data to analyse the performances of these categories of real estate. Real estate investment performances were measured on the bases of average property values, holding period returns, risk-adjusted returns, rental growth and capital value appreciations. The study found that commercial real estate performed better than residential real estate both on the bases of annual total return and risk-adjusted return. In terms of rental value growth and capital appreciation, commercial real estate also outperformed residential real estate within the study period.

Dabara (2014) investigated the inflation-hedging potential and risk-return characteristics of residential real estate investment in Gombe, Nigeria. A questionnaire survey was carried out to retrieve property value transaction data from estate surveyors and valuers practicing in the study area. Total returns were calculated using the holding period return model. The ordinary least square regression analysis was used as analytical tool to determine the inflation-hedging characteristic of residential real estate. The study found that residential real estate investment return provided a partial hedge against inflation within the period under assessment. It recommended that investors should always seek professional advice when making real estate investment decision to safeguard against the havoc of inflation on investors' earnings. Dabara *et al.* (2015) expanded the study to examine the diversification and inflation-hedging potential of residential real estate and REITs in Nigeria. The study showed that only residential real estate indicated portfolio

diversification potential compared to REITs.

Study on the performance of residential real estate investment returns in selected neighbourhoods of Ado-Ekiti, Nigeria was conducted by Ade (2015) with a view to providing potential real estate investors with requisite information for decision-making. A questionnaire survey research design was adopted to collect rental and capital value data from real estate practitioners in Ado-Ekiti. The study used capital appreciation and total returns as the performance measurement indices. The findings of the study revealed highest capital growth and total returns on residential investment in the low density area of the city. The study, however, did not examine the risk of investing in residential real estate in the study areas. Wahab, *et al.* (2017) examined the performance of residential property market in Abuja on the bases of return and associated risk. A survey research approach was used for collection of property transaction data from 3 and 4 bedroom accommodations in 12 different locations within the FCT. The average rates of returns on investment were determined and coefficient of variation used to analyse the risk levels. The study found that while 3 and 4 bedroom properties performed better in Gwarimpa than other selected locations in Abuja in terms of risk-return, as measured by coefficient of variation, they performed better in Maitama in terms of total return and risk-adjusted return as revealed by the calculated Sharpe index.

The risk-return performance of residential real estate investment in Lagos property sub-market was investigated by Okonu *et al.* (2019) using the apartments of the 1004 residential estate as case study. The study ascertained the returns and risks status of these apartments and the findings revealed that a high risk was associated with the returns in these apartments. They suggested that these apartments were not good portfolio diversifiers thus should not be included in portfolio diversification by investors. Mbah and Chinedu (2019) carried out a comparative evaluation of return and

risk performance of residential and commercial real estate investment in Awka in Anambra state of Nigeria. Using returns, standard deviation and coefficient of variation as the analytical tools, the study found that commercial real estate performed satisfactorily better than residential real estate within the period of assessment on the bases of mean returns and capital appreciation. However, investing in residential real estate was found more secure in the study area. Similarly, Diala *et al.* (2019) and Nissi *et al.* (2019) carried out a comparative performance evaluation of residential and commercial real estate investments in Enugu, eastern Nigeria and found that commercial real estate investment performed better than residential real estate investment on total return, risk and risk-adjusted bases.

At regional level, Osa and Ekenta (2019) compared the performance of residential and commercial real estate investment in Lagos (South-west) and Port Harcourt (South-south) in Nigeria. The study adopted a cross-sectional survey research design and administered questionnaire on estate surveyors and valuers, practicing in the respective cities, to collect data on rental and capital values from 2011 to 2017. The collected data were analysed using geometric mean return, standard deviation and coefficient of variation. The computed investment performance indicators also showed that commercial property investments in Victoria Island Lagos and New GRA Port Harcourt outperformed residential property investments and are more secure. Awa *et al.* (2020) studied the trends in commercial and residential real estate investment performance in south-eastern Nigeria.

A survey research approach was adopted to collect annual rental and capital values in residential and commercial real estate. The study used regression model to generate forecasting models for rental and capital values for the selected cities in south-eastern Nigeria. The study found a progressive increase in rental and capital values of residential and commercial real estate

within the study period. The work of Effiong and Ogbuefi (2021) examined the risk-return performances of residential and commercial real estate investment in selected cities (Port Harcourt, Calabar and Uyo) of Southern part of Nigeria. Property rental and sales data were collected from estate surveying and valuation firms in the selected cities. The study found that residential real estate in Port Harcourt recorded the highest return compared to Calabar and Uyo while commercial real estate investments performed best in Uyo. The result further showed that the risk of investing in office premises is higher than retail shops across the study areas.

Gaps in literature

Two major research gaps have been identified from the literature reviewed and are thematically presented in this subsection. The first was gap in geographical scope. Most of the previous related studies on real estate investment performance in Nigeria focused more on the west and eastern Nigerian property markets. Only few of these studies examined the performance of real estate investment in the north-central Nigeria and Minna in particular. Even those that were carried out in northern Nigeria used Abuja property market as case study.

Secondly, there was gap in analytical tools. An important statistical assumption for applying the popularly used risk measures (variance, standard deviation, and coefficient of variation) is that the data set be normally distributed. Previous studies on real estate investment performance relied heavily on standard deviation as a measure of investment returns variability or risk. Thus, a major assumption (normality of data set) for adoption of standard deviation is often violated. Meanwhile, an alternative measure of risk (the Cornish Fisher modified value-at-risk) has been suggested for measuring real estate investment risk due to non-normality characteristic of real estate investment return data (Favre and Galeano, 2002; Gregoriou and Gueyie, 2003 and Amedee-Manesme *et al.*, 2017).

From the literature reviewed, no previous study in Nigeria that had adopted this modified value-at-risk as an analytical tool for gauging investment risk neither had any of the studies used the modified Sharpe Ratio for analysing risk-return of real estate investment. This study has attempted to fill the above identified gaps by focusing on the performance of residential real estate investment in Minna property market of north-central Nigeria using the Cornish Fisher value-at-risk and modified Sharpe ratio as against the conventional standard deviation often used to measure risk and simple Sharpe ratio used for measuring risk-adjusted returns performance.

Data and Methodology

This subsection discusses the methodology adopted to achieve the objectives of the study. Specifically, it highlights the research design, the population of study, sampling frame, sample size, sampling technique, data requirements and sources, method of data collection, and method of data analysis. It concludes by giving a brief background of the study area. This research adopted a survey research design using primary data collected through questionnaire survey. The study population were residential real estate solely for investment purpose in the selected neighbourhoods of Minna metropolis. The neighbourhoods in Minna, residential real estate with the required characteristics, estate firms and offices of estate agents in the study area were the sampling units. The target residential properties were room-self-contain, 1-bedroom, 2-bedroom and 3-bedroom residential apartments. The choice of these categories of residential property was guided by the fact that they are the dominant residential real estate types in the study area. Both probability and non-probability sampling techniques were used to determine the various sample sizes. For the purpose of this study, stratified and simple random sampling techniques were adopted in selecting the neighbourhood real estate submarkets included in this study. First, the metropolis was divided into strata of high density, medium density, low density and suburb neighbourhoods with the aid of the neighbourhood map of Minna

(See Figure 2). Thereafter, one neighbourhood was randomly picked from each stratum. Thus, four neighbourhoods were selected for the study. The selected neighbourhoods are F-Layout (low density), Bosso Town (medium density), Minna-central (high density) and Chanchaga (suburb) neighbourhoods. The heads of the selected estate surveying and valuation firms and estate agent offices were the respondents who assisted in completing the research questionnaires. The list of registered estate firms in Minna was retrieved from the firm directory of the Nigeria Institution of Estate Surveyors and Valuers (2021 update). The list of estate agent offices in Minna was generated through field survey. A total enumeration of the twelve (12) registered estate surveying and valuation firms and ten (22) estate agent offices in Minna metropolis was carried out using structured questionnaire. The questionnaire was designed and used to collect property rental and sales transaction data (that is, annual rental values and capital values/sales prices) on the residential real estate categories in the study area for 15 year period (2007 to 2021).

The specific data required to calculate the rental value index, capital value index and total returns on residential real estate investment were the average annual rental values and capital values or sales prices of the purposively sampled residential properties. The collected data were transformed into property value indices and total returns. Rental value index was calculated using equation 1 as follows:

$$RVI_t = \left[\left(\frac{RV_t - RV_{t-1}}{RV_{by}} \right) \times 100 \right] + 100 \quad (1)$$

Where RVI_t is the rental value index of the current year; RV_t is the average rental value for the current year; RV_{t-1} is the average rental value for the preceding year and CV_{by} is the average rental value for the base year (2007).

While capital value index was computed with equation 2 as follows:

$$CVI_t = \left[\left(\frac{CV_t - CV_{t-1}}{CV_{by}} \right) \times 100 \right] + 100 \quad (2)$$

Where CVI_t is the capital value index of the current year; CV_t is the average capital value for the current year; CV_{t-1} is the average capital value for the preceding year and CV_{by} is the average rental value for the base year (2007).

The holding period return (HPR) model was used to determine the annual total returns and the average total returns for the period across property types and neighbourhoods. The total return model is given in Equation 3 below:

$$\text{Total Return (TR)} = \left[\frac{(CV_t - CV_{t-1}) + NI_t}{CV_{t-1}} \right] \times 100 \quad (3)$$

The data required for determining the risk and risk-adjusted total return performance of residential real estate investment across the selected neighbourhoods were the average annual rental values and capital values/sales prices of the sampled residential properties as well as the average yield on Nigerian Treasury Bill (N-TB). The modified value at risk (mVaR) formula and modified Sharpe ratios (mSR) were then computed as measures of risk and risk-adjusted returns respectively using Equations 4 and 5 as follows:

$$mVaR_\alpha = R_a + \left[z_c + \frac{1}{6}(z_c^2 - 1)S + \frac{1}{24}(z_c^3 - 3z_c)K - \frac{1}{36}(2z_c^3 - 5z_c)S^2 \right] \sigma \quad (4)$$

Where:

$Z_c = -1.65$ with 95% confidence level

R_a = expected total return on asset

S and K are skewness and kurtosis respectively

σ = standard deviation.

$$mSR = \frac{(R_a - R_f)}{mVaR_\alpha} \quad (5)$$

Where:

R_a is the average return of the asset;

R_f is the risk-free rate (N-TB rate), and

$mVaR_\alpha$ is a modified way of computing value at risk, taking into account skewness and kurtosis of the returns distribution.

In order to test the null hypothesis, that is, whether there is a statistically significant difference in the calculated average mean total returns on residential real estate investment across the selected neighbourhoods of study area within the study period, the Analysis of Variance (ANOVA) was adopted. The statistical package for social scientists (SPSS) was used as the analytical tool for ANOVA.

The study area

Minna is the capital city of Niger state as shown in Figure 1. It became the administrative headquarters of Niger State in 1976. The state is bordered with Abuja, Kwara, Zamfara, Kebbi and Kaduna states. Given its present status and continuous movement of people and businesses into the capital city, it has grown from its initial small population of 12,810 in 1953 to 189,200 in 1991, and to 348,788 in 2006 (Shuaibu *et al.*, 2018). The Population figure of Minna metropolis for year 2006 was 348,788 according to the Niger State Department of Budget and Planning; National Population Commission. With annual population growth rate of 3.2% for Nigeria in 2006, this figure is projected to about 600,000 people by year 2021. The relocation of the Federal capital of Nigeria to Abuja further influenced the growth of Minna due to its proximity and the heterogeneity of its population. Residential land use forms the major coverage of land in Minna. Minna metropolis comprises of 26 neighbourhoods as shown in Figure 2.

Prior to its present status as the state capital, it was a small railway town inhabited mainly by Gwari natives, rail workers and civil servants of the old Niger province. The town spanned along the main spine road that separates the city into West and East. This road is from Chanchaga in the South to Maikunkele in the North, covering a distance of about 20 km. The West-East pattern, spanned from Gidan-Kwano along Bida axis in the West, to Maitumbi to Gwada axis, in the East, over a distance of 15 km (Idowu *et al.*, 2020). The spatial coverage of Minna now covers areas from River Chanchaga to the South-east, Upper River Basin Development Authority

Headquarters to the north and Maitumbi to the east. The land use identified in Minna includes; Residential, Agricultural, institutional, commercial, industrial, and recreational land uses. Today, few industries have started to emerge, and quite a number of banks have equally spread their tentacles to Minna recently. As the commercial nerve of Niger state, Minna accommodates the greatest percentage of commercial activities in Niger state. There are networks of roads, which include the two dual carriage roads, that criss-cross at two ends of the towns and few tarred roads link some areas. Minna is connected to neighbouring cities, Bida, Suleja, Abuja, and Kontagora by road.

Minna is also connected by railroad to both Kano in the north and Ibadan and Lagos in the south which is also boarder by Ilorin city. The city is served by Minna International Airport. Facilities such as airport, railway lines, stadium, hotels, trade fair complex, institutions of higher learning, making thus Minna an emerging commercial centre in Northern Nigeria. It comprises of over a century old buildings of little modernisation, found at the interior parts of the city and the not-too-old buildings located at the periphery which indicates the spatial growth of metropolitan Minna. This study divides the city of Minna into low density, medium density, high density and suburb areas. Four locations were then randomly drawn each from these zones. They are F-Layout (Low density), Bosso Town (medium density), Minna-central (high density) and Chanchaga (suburb). These areas formed the real estate sub-markets where data on residential real estate transactions were collected and analysed for this study.

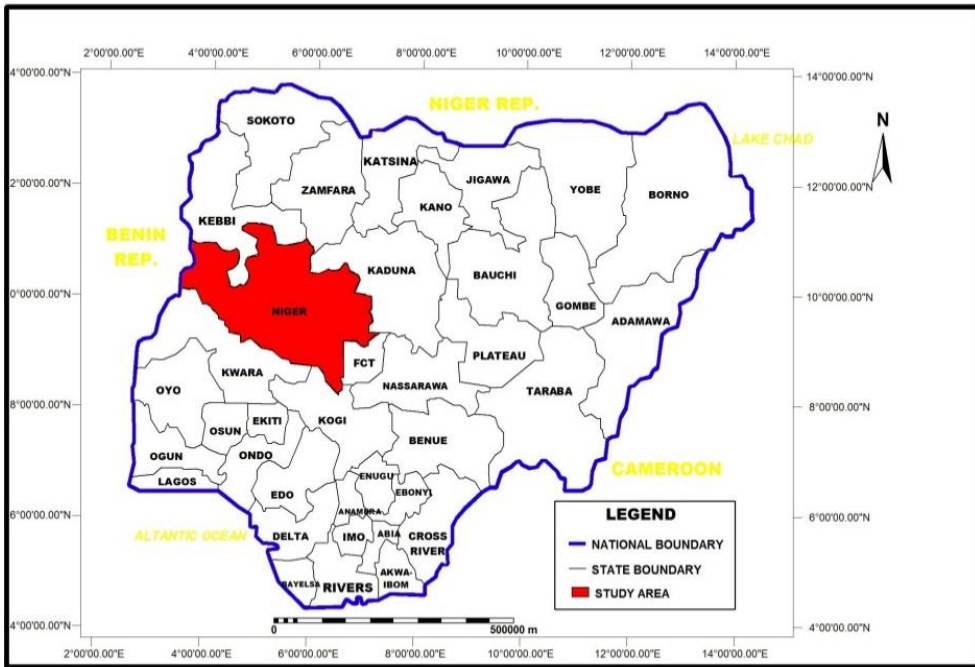


Figure 1: Nigeria showing Niger state.
 Source: Niger State Urban Development Board, Minna (2022)

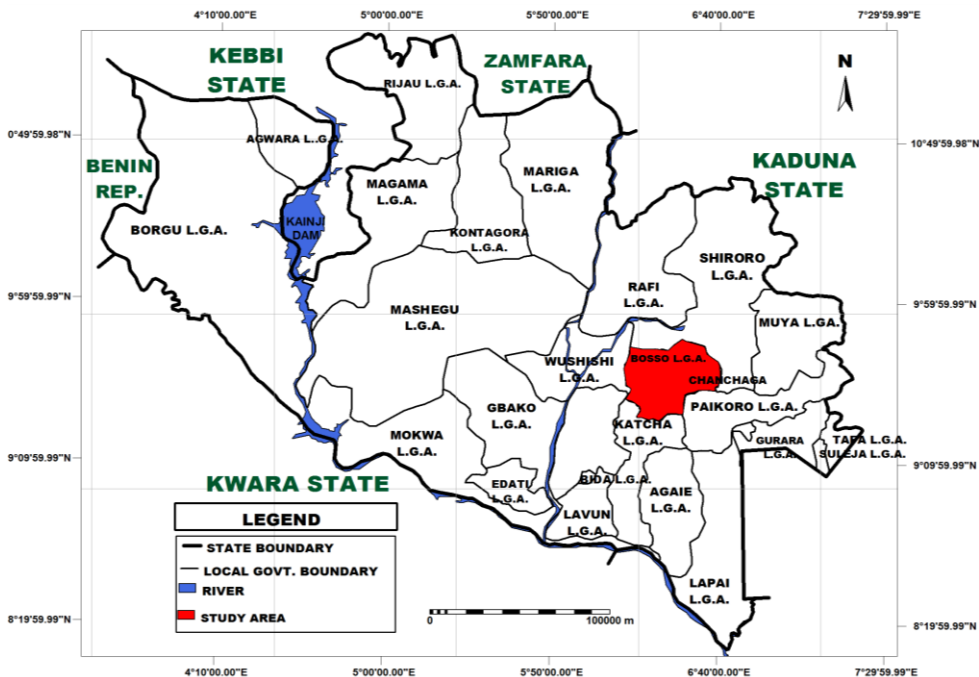


Figure 2: Niger State showing Minna metropolis.
 Source: Niger State Urban Development Board, Minna (2022)

Analysis and results

This section presents and discusses the results of the data analysis in line with the research objectives. It begins with the presentation of the numbers of sampled residential real estate and characteristics of the respondents in Tables 1 and 2 respectively. The results of the rental and capital value indices constructed are presented in Table 3. Thereafter, the results of total returns, risks and risk-adjusted return performances of residential real estate on the bases of property category and location are presented in Tables IV and V respectively.

Response rate and sampled residential real estate by location and category

A total of 34 questionnaires were correctly completed and returned for analysis: 12 by the heads of the sampled estate surveying and valuation firms and 22 by the sampled estate agents in the study area. At the end of the questionnaire administration exercise, an aggregate of 507 residential properties, comprising 122 room self-contained apartments, 126 1-bedroom apartments, 124 2-bedroom apartments and 135 3-bedroom apartments, were purposively sampled. The breakdown by property category is presented in Table 1.

Characteristics of respondents

The respondents were the partners or senior valuers of the sampled estate firms and

experienced estate agents in the study area. The educational backgrounds, years of experience or practice and the professional cadres of the respondents are presented in Table 2. The results show that about 65% of the respondents hold a minimum of Bachelor degree in Estate Management course. The experience of the respondents is crucial to obtaining reliable data/information required for this study. Thus the result of the analysis in this regard revealed that about 70% of the respondents have over 10 years' experience in real estate practice.

The last section shows the distribution of professional cadre of the respondents. Two professional grades of the Nigerian Institution of Estate Surveyors and Valuers (NIESV) were identified for this study; Associate and Fellow. These were further subdivided into the following: Associate below 10 years, Associate above 10 years, Fellow below 10 years and Fellow above 10 years. Other classification was estate agent (non-registered valuer). Generally, the results of the analysis revealed that the respondents understood the contents of the research questionnaire and the topic of the research. The respondents equally have good understanding of the operation of the real estate market in the study area since majority of them have over 10 years experience in real estate practice in Minna metropolis.

Table 1: Sampled residential real estate by location and category

Location	Room self-contained	1-Bedroom	2-Bedroom	3-Bedroom	Total
F-Layout	28	30	32	41	131
Bosso Town	33	31	35	36	135
Minna-central	40	43	29	34	146
Chanchaga	21	22	28	24	95
Total	122	126	124	135	507

Source: Authors' field survey, 2022

Table 2: Characteristics of respondents

Characteristic	Frequency/percent
Education background	
O'Level	0 (0%)
OND	7 (20.6%)
HND	5 (14.7%)
BSc./BTech.	10 (29.4%)
PGD	4 (11.8%)
MSc./MTech	6 (17.6%)
PhD.	2 (5.9%)
Total	34 (100%)
Year of experience	
Below 5	4 (11.9%)
5-10	6 (17.6%)
10-15	8 (23.5%)
15-20	10 (29.4%)
Above 20	6 (17.6%)
Total	34 (100%)
Professional cadre	
Associate below 10 years	3 (8.8%)
Associate above 10 years	6 (17.6%)
Fellow below 10 years	2 (5.9%)
Fellow above 10 years	1 (2.9%)
Estate agent	22 (64.8%)
Total	34 (100%)

Source: Authors' field survey, 2022

Trends in rental and capital value performances of real estate investment in Minna

The first objective of this research is to assess the performance of residential real estate investment in the study area on the basis of the trends in rental and capital values of the residential property categories. To achieve this, the rental and capital value data collected were transformed into rental value and capital value indices. These indices were constructed using Equations 1 and 2 respectively, taking year 2007 as the base year (that is, 2007 = 100). These indices served as proxies for changes in rental and capital values within the study period. The results of the combined rental value index and capital value index constructed for Minna property markets are presented in Table 3.

The results of the analysis show that a room self-contained apartment investment recorded the highest growth in terms of rental value while 1-bedroom apartment recorded the highest growth in terms of capital value growth with the period under evaluation. As indicated, rental and capital

values of a room self-contained apartment grew by 115% and 151% respectively from 2007 to 2021; representing 7.6% and 10.1% per annum respectively. While 1-bedroom apartment investment recorded 97% and 164% growth in rental and capital values respectively at an annual growth rates of 6.5% and 10.9% respectively. Among the residential real estate categories, 2-bedroom apartment investment underperformed other categories with an annual rental growth rate of 5.3% and capital growth rate of 7% per annum.

Generally, the trends in rental and capital value showed positive progressive growths throughout the study period in the study area. This finding collaborates the submissions of many real estate studies such as Oyewole (2013), Udoekanem *et al.* (2014), and Ade (2015) that the values of real estate increase with time. Also, it implies that the 2015-2018 economic recessions that ravaged the Nigeria economy and the 2020 COVID-19 global pandemic may not have affected residential property market values in the study area significantly. Thus it can be concluded that residential property investment in the study

area is worthwhile in terms of rental and capital value growths or appreciations. However, the effect of economic recession and COVID-19 pandemic on residential property investment performance in the study area is beyond the scope of this study.

Residential real estate investment performance on the bases of total and risk-adjusted returns

The performance of residential real estate investment in Minna on the basis of total returns and risk-adjusted returns across the selected neighbourhoods is the second objective of this study. The nominal total return and risk-adjusted return performances both on property category and neighbourhood bases were analysed and the results presented in Table 4 and Table 5 respectively. It can be inferred from Table 4 that investing in a room self-contained residential property commanded the highest total returns on investment at 12.20% per annum. This was closely followed by 1-

bedroom property with average mean total return of about 12.00%. 3-bedroom property came third with an average annual total return of 11.37% while 2-bedroom apartment underperformed other categories with an average total return of 10.33% per annum within the period under assessment.

On the basis of risk, the modified value-at-risk model was used as the risk assessment tool. In this regard, 2-bedroom apartment recorded the highest risk with a modified value at risk of 7.18 while 1-bedroom recorded the least risk with an mVaR of 5.86 thereby making it the safest. A room self-contained recorded an mVaR of 5.87; almost tie with 1-bedroom apartment in terms of risk exposure. However, on the basis of risk-adjusted total return performance, a room self-contained outperformed other categories of residential real estate with an mSR of 0.69 while 2-bedroom apartment underperformed other categories with an mSR of 0.30.

Table 3: Rental and capital value indices for residential real estate investment in Minna

Year	A Room Self-Contained		1 Bedroom Apartment		2 Bedroom Apartment		3 Bedroom Apartment	
	Rental Value Index	Capital Value Index	Renta l Value Index	Capital Value Index	Renta l Value Index	Capital Value Index	Renta l Value Index	Capital Value Index
2007	100	100	100	100	100	100	100	100
2008	108	108	104	107	108	104	102	105
2009	117	113	110	119	115	110	107	122
2010	122	117	119	128	123	113	112	131
2011	130	122	124	136	126	115	118	135
2012	134	145	132	148	137	119	129	145
2013	138	158	134	152	141	124	137	158
2014	145	179	136	154	148	129	142	162
2015	152	185	146	169	158	142	149	168
2016	161	194	152	177	161	150	157	180
2017	165	200	157	187	164	155	162	187
2018	177	209	165	198	169	162	164	196
2019	191	222	175	241	172	190	177	213
2020	201	236	181	245	176	198	180	225
2021	215	251	197	264	180	205	188	246
Growth (%)	115	151	97	164	80	105	88	146
Growth p.a. (%)	7.6	10.1	6.5	10.9	5.3	7.0	5.9	9.8
Av. Rental Growth p.a. (%)	6.3							
Av. Capital Growth p.a. (%)	9.4							

Source: Authors' analysis, 2022

Table 4: Total and risk-adjusted returns on residential real estate investment in Minna on property category basis

Year	Return on N-TB	A room Self-contained	1-Bedroom apartment	2-Bedroom apartment	3-Bedroom apartment	Combined total return
2007	6.80	5.92	5.47	4.99	5.55	5.48
2008	8.20	14.10	13.39	9.50	10.31	11.82
2009	3.80	11.11	16.50	10.85	22.19	15.16
2010	3.80	10.23	13.91	8.55	12.60	11.32
2011	9.70	10.40	11.70	7.79	8.33	9.56
2012	13.60	26.99	13.72	9.13	12.19	15.51
2013	10.80	15.59	7.60	10.37	15.00	12.14
2014	10.50	19.11	6.56	9.40	7.68	10.69
2015	9.40	9.01	15.85	16.47	9.27	12.65
2016	10.10	9.94	10.06	10.62	11.95	10.64
2017	12.30	7.75	10.35	8.32	8.38	8.70
2018	10.10	8.82	11.17	9.76	9.52	9.82
2019	9.60	11.22	26.20	22.24	13.88	18.38
2020	1.60	11.63	6.13	8.25	10.37	9.09
2021	2.20	11.22	11.25	8.72	13.36	11.14
Mean	8.17	12.20	11.99	10.33	11.37	11.47
Rank		1st	2nd	4th	3rd	
mVaR		5.87	5.86	7.18	6.70	6.40
Rank		2nd	1st	4th	3rd	
mSR		0.69	0.65	0.30	0.48	0.53
Rank		1st	2nd	4th	3rd	

Source: Authors' analysis, 2022

The total return and risk-adjusted return performances of residential real estate investment in Minna on the basis of neighbourhood are shown in Table 5. The analysis revealed that residential real estate investment performed best in Minna-central within the study period with an average mean total return of 14.47% per annum. This was followed by Bosso Town with an annual mean total return of 12.63%. Residential real estate investment in F-Layout underperformed other selected residential real estate neighbourhoods with an average mean total return of 8.57% per annum. However, in terms of risk performance, F-Layout outperformed other neighbourhoods followed by Chanchaga with respective modified values-at-risk of 3.90 and 5.17. Investing in residential property in Minna-central was found to be

the most risky with an mVaR of 7.67 followed by Bosso Town with an mVaR of 5.29.

These average mean total returns were adjusted for risk and the results revealed that residential real estate investment in Bosso Town outperformed other neighbourhoods in Minna with a modified Sharpe ratio of 0.93 within the study period while Minna-central came second with an mSR of 0.79. Residential real estate investment in F-Layout was found to underperform other areas in Minna with an mSR of 0.17. The average combined mean total return on residential real estate investment across neighbourhoods in Minna within the study period was found to be 11.47% per annum.

Table 5: Total and risk-adjusted return performance of residential property investment across neighbourhoods

Year	Return on N-TB	F-Layout	Bosso Town	Minna Central	Chanchaga	Combined total return
2007	6.80	4.29	4.79	6.98	5.88	5.48
2008	8.20	7.28	9.04	17.40	13.58	11.82
2009	3.80	14.04	24.04	12.25	10.31	15.16
2010	3.80	6.86	12.58	14.67	11.18	11.32
2011	9.70	10.57	8.14	9.71	9.82	9.56
2012	13.60	9.39	31.65	10.80	10.19	15.51
2013	10.80	12.23	6.68	14.12	15.52	12.14
2014	10.50	5.52	10.90	17.55	8.78	10.69
2015	9.40	12.09	12.64	11.52	14.36	12.65
2016	10.10	7.36	12.42	11.77	11.02	10.64
2017	12.30	8.36	10.45	8.80	7.20	8.70
2018	10.10	6.86	14.02	11.07	7.34	9.82
2019	9.60	9.97	11.93	42.02	9.62	18.38
2020	1.60	5.78	7.01	13.97	9.62	9.09
2021	2.20	8.01	13.17	14.40	8.96	11.14
Mean	8.17	8.57	12.63	14.47	10.23	11.47
Rank		4th	2nd	1st	3rd	
mVaR		3.90	5.29	7.67	5.17	5.51
Rank		1st	3rd	4th	2nd	
mSR		0.17	0.93	0.79	0.42	0.58
Rank		4th	1st	2nd	3rd	

Source: Authors' analysis, 2022

Verification of the null hypothesis (H0)

A null hypothesis was formulated to find out whether there was statistically significant variation in the mean total returns on residential real estate investment in Minna metropolis both on property category basis and neighbourhood basis. The result of the homogeneity test of variances is presented in Table 6 while Table 7 shows the result of the analysis of variance (ANOVA) of total returns on property investment categories in Minna.

Table 6: Test of homogeneity of variances in total returns on residential real estate investment on the basis of property category

Levene Statistic	df1	df2	Sig.
0.453	3	56	0.716

Source: Computed from Table 4

The result of the homogeneity of variance test indicated that there is no statistically significant difference in the mean total returns of residential property investment in Minna on the basis of property category. This is because the calculated p-value of 0.716 was not statistically significant at a 0.05 level of significance.

Table 7: ANOVA of mean total returns on residential real estate categories in Minna

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	31.73	3	10.58	0.49	0.69
Within Groups	1208.20	56	21.58		
Total	1239.93	59			

Source: Computed from Table 4

The result of the ANOVA in Table 7 showed that the variations in mean total returns among the property categories within the study period were not statistically significant at a 0.05 level significant because the p-value of 0.69 is greater than the 0.05 level of significance. Since there was no enough evidence to reject the null hypothesis in both cases, the null hypothesis is accepted and inferred that on the basis of property category there was no statistically significant difference in the mean total returns of residential real estate investment in Minna within the study period. This hypothesis was further verified on the basis of neighbourhoods and the results of the homogeneity of variances test presented in Table 8 while the ANOVA test is presented in Table 9.

Table 8: Test of homogeneity of variances of total returns on residential real estate in Minna

Levene Statistic	df1	df2	Sig.
1.39	3	56	0.26

Source: Computed from Table 5

The result of the homogeneity of variances test presented in Table 8 shows that there was statistically significant variation in the mean total returns on residential real estate

investment across the four selected neighbourhoods in Minna within the study period. The analysed p-value of 0.26 is greater than the 0.05 level of significance. However, the result of the ANOVA presented in Table 9 revealed otherwise.

As indicated in Table 9, the p-value of the ANOVA test was 0.03; meaning that there was a statistically significant difference in mean total returns on residential real estate investment across the selected neighbourhoods in Minna metropolis. As a result, a multiple comparison was carried out using the Post Hoc test to determine the Tukey honesty significant difference (HSD) level. The result is presented in Table 10 below. Even though the differences in mean total returns among some neighbourhoods were not statistically significant, according to the homogeneity test of variances above, the Tukey HSD statistics revealed that variation in mean total returns existed between F-Layout and Minna-central neighbourhoods. Thus the null hypothesis was rejected and concluded that there was a statistically significant variation in mean total returns on residential real estate investment across the selected neighbourhoods of Minna metropolis within the period under investigation.

Table 9: ANOVA of mean total returns on residential real estate investment in Minna

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	304.13	3	101.38	3.15	0.03
Within Groups	1804.26	56	32.22		
Total	2108.39	59			

Source: Computed from Table 5

Table 10: Tukey HSD of mean total returns on residential real estate investment in the selected neighbourhoods of Minna

(I) NeighborhoodMin	(J) NeighborhoodMin	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
F-Layout	Bosso Town	-4.06	2.07	0.21	-9.54	1.43
	Minna-central	-5.89*	2.07	0.03	-11.38	-0.41
	Chanchaga	-1.65	2.07	0.86	-7.14	3.84
Bosso Town	F-Layout	4.06	2.07	0.22	-1.43	9.54
	Minna-central	-1.83	2.07	0.81	-7.33	3.65
	Chanchaga	2.41	2.07	0.65	-3.08	7.89
Minna-central	F-Layout	5.89*	2.07	0.03	0.41	11.38
	Bosso Town	1.84	2.07	0.81	-3.65	7.33
	Chanchaga	4.24	2.07	0.18	-1.24	9.73
Chanchaga	F-Layout	1.65	2.07	0.86	-3.84	7.14
	Bosso Town	-2.41	2.07	0.65	-7.89	3.08
	Minna-central	-4.24	2.07	0.18	-9.73	1.24

The mean difference is significant at the 0.05 level.
Computed from Table 5

Conclusion and Recommendations

This study was conducted to evaluate the historic performance of residential real estate investment in Minna metropolis of north-central Nigeria with a view to guiding real estate practitioners and researchers as well as investors on real estate investment decision-making. The aim of the study has been achieved through two main objectives; examined the trend in the rental and capital value performances of residential real estate investment and the total return and risk-adjusted return performances of residential real estate investment in the study area from 2007 to 2021. The finding of this study revealed that a room self-contained apartment outperformed other residential real estate categories in the study area in terms of rental value growth while 1-bedroom outperformed other categories in terms of capital value appreciation. Overall, rental and capital values of residential real estate grew progressively across the selected neighbourhoods within the study period.

On the bases of total return and risk-adjusted return performances, investing in a room self-contained residential property was found to be the best having a total return of 12.20% per annum and risk-adjusted return of 0.69% while 2-bedroom apartment

underperformed other categories in terms of total return, risk and risk-adjusted return with an average total return of 10.33%, mVaR of 7.18 and risk-adjusted return of 0.30%. On basis of location, residential real estate investment performed best in Minna-central followed by Bosso Town while F-Layout underperformed other selected residential real estate neighbourhoods in terms of total return. The study further found that residential real estate investment in Bosso Town outperformed other neighbourhoods in Minna on the basis of risk-adjusted return while F-Layout underperformed other locations on this basis. The average combined mean total return on residential real estate investment across property categories and neighbourhoods in Minna metropolis averaged 11.47% per annum within the study period. The study found no statistically significant variation in total return among residential real estate categories but found a significant variation in total returns on residential real estate in two of the selected neighbourhood (Minna-central and F-Layout) property submarkets.

Generally, residential property investment exhibited positive performance in terms of value growths and returns on investment. Based on the research findings, this study recommends that real estate investors should see site and location as strong

determinants of residential property investment performance. This is due to the fact that residential property investment performed best in the high and medium density areas compared to low density areas and suburbs of Minna metropolis. Also, in terms of the categories of residential property that perform favourably in the study area, the study recommends a-room-self-contained and 1-bedroom apartments to existing and potential real estate investors whose ultimate aim is to maximise investment returns and minimise the risk associated with property investment. In conclusion, because a scanty number of the studies conducted on real estate investment performance in Nigeria focused on north-central Nigeria real estate submarkets, this study should be expanded to cover other major cities in the region and beyond.

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