# Inflation Hedging Abilities of Residential Properties in Selected areas of Ibadan Metropolis, Nigeria

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## Abstract

For long, investors perceived returns on real estate investments as a hedge against inflation; recently, while various empirical studies undertaken in some countries have produced varying results. In this study, the inflation hedging capacities of returns on residential property investments between the year 2002 and 2014 in selected areas in metropolitan Ibadan, Nigeria were empirically examined to ascertain the uncertain inflation hedging abilities in the areas. The study employed the Ordinary Least Squares regression model to regress the rates of returns of the considered residential property investments against actual, expected and unexpected inflation. The inflation hedging capacities of real estate investments were found to vary across geographical sub-markets and return components. Residential properties did not hedge against actual inflation in all the considered areas. However, with regards to expected inflation, the capital and total returns of residential properties in Akobo sub-market completely hedged; while for Bodija estate, it was the income and total returns that hedged against inflation completely and partially respectively. The study therefore recommends that in determining the real estate investments and the geographic locations to integrate in residential property portfolio, property investors should concentrate more in the mentioned geographical areas where residential property investments have shown to be hedging against inflation.

**Keywords:** Ibadan, Inflation hedging capacity, Investments, Residential properties

## Introduction

Inflation has been defined as a persistent rise in the general price level of goods and services in a country over a long period of time. It can be described as a decline in the value of money; or an increase in the quantity of money in circulation, leading to a decline in the purchasing power of existing money.

To say that inflation status in most advanced economies is moderated to a single digit level is to restate the obvious. Considering the emerging economies, inflation is mostly in 2-digit figure (Nwude, 2012). For instance, in Nigeria which is the concern of the present study, inflation rate averaged 12.34% from 1996 until 2014, reaching an all-time high of 47.56% in the beginning year of 1996 and a record low of -2.49% in the beginning year of 2000 (Trading Economics, 2014). According to Tenigbade (2011), there is risk that the inflation rate in Nigeria is outstripping the rate of return on property.

The nature of investment decision making is about the risk-return profile investors will want to maintain at a given point in time. It is therefore common for any rational investor to devise strategies that will minimise risk of loss of real returns on investments. For instance, inflation risk is of great concern to investors who hold assets for long term returns because inflation can erode the real rate of return components of the nominal rate of assets' returns. Peyton (2011) observed that inflation erodes the value of corporate earnings and irritates stock investors; favours borrowers as debt repayments are made in lower value dollars; and batters consumers (especially those on fixed incomes) by reducing the purchasing power of their incomes. According to Zou, Gong and Zeng (2011), inflation can lead to disorder, social and economic instability. Persistent inflation can reduce confidence in the currency of a country; hinder business; and can even lead to the collapse of the economy (Sing &Low, 2000). These calamitous and undesirable effects of inflation suggest carefulness and wise decisions on real return driven investors when deciding on the integration of various assets and particularly residential property investments. Inflation effects on asset returns have generated various studies in Fama & Schwert, 1977; Gyourko & Linneman, 1988; Newell & Boyd, 1995; Mile, 1996; Liu, Hartzell &Hoesli, 1997; Bello, 2004; Arnason & Persson, 2012.

An asset is said to be a hedge against inflation if investing in such assets protects the investors' returns against the loss of purchasing power. Property has traditionally been seen as a hedge against inflation but doubts have been expressed recently about this position considering the economic volatility that has characterized the Nigerian economy in recent times. Inflation today, is a terrible phenomenon which most investors have been battling with and its risk on real estate investments cannot just be wished away. The inflation-hedging characteristics of real estate investments all over the world are of special interest to individual or portfolio investors in order to avoid the risk of inflation eroding investments' real income streams. As a result, studies by Bello, 2005; Odu, 2011; Anyakora, Idowu, Osagie, & Omirin, 2012; Ogunba,

Obiyomi & Dugeri, 2013; Dabara, 2014, have attempted to ascertain whether different forms of real estate hedges against inflation in Nigeria. However, Bello, (2005) and Dabara, (2014) appear to be the only empirical studies so far that focused on the inflation hedging capacities of residential property investment. Compared to United Kingdom, United States, Australia, Switzerland, and Canada, where many studies by Limmack and Ward, 1988; Rubens, Bond and Webb (1989); Brueggeman, Chen and Thibodeau, 1984; Liu, Hartzell and Hoesli, 1997; Miles, 1996; Fama and Schwert, 1977; Newel, 1995; Hoesli, 1994; and Voigtländer and Demary (2009) have been carried out; there are few empirical studies on inflation hedging capacities of real estate returns in Nigeria. These few studies have only concentrated on Lagos. This as well as other highlighted points was the reason for considering a study on inflation hedging capacities of residential properties in selected areas of Ibadan, Nigeria. The aim of this study is to investigate the inflation hedging capacities of residential properties in selected areas of Ibadan with a view to providing sound guide in investment decisions to real estate investors.

## Review of Related Literature

Inflation or the actual inflation is the rate of increase in prices over a given period (Oner, 2012); while expected inflation refers to changes in price levels that are expected as at the starting time of an asset, or when the asset is appraised (Appraisal Institute, 2008). The difference between the actual inflation and expected inflation is referred to as unexpected inflation. The most commonly used measure of actual inflation is the Consumer Price Index. In situations where inflation rates of some individual assets are higher than the Consumer Price Index, it suggests that those assets are hedges against inflation. The Fama and Schwert (1977) while studying the inflation hedging abilities of some assets such as common stocks, government bonds, treasury bills, labour income and private residential real estate during the period between 1953 and 1971 in the United States of America exemplified how the Fisher's (1930) proposal could be used to test the inflation hedging characteristics of investment assets. The authors split actual inflation rate into its expected and unexpected components. The Fisher (1930) equation was adjusted such that the nominal return of an asset is a function of real return, expected and unexpected inflation. The authors used Consumer Price Index (CPI) as a proxy for actual inflation; while nominal rate of United States 90-day Treasury bills was employed as a proxy for expected inflation. Ordinary Least Square regression model was used to test the inflation hedging capacities of the assets. Returns on private residential real estate were the only asset that completely hedged against both expected and unexpected inflation; while labour income hedged partially against expected and unexpected inflation. In addition, returns on government debt instruments exhibited a complete hedge against expected inflation; while for common stocks they were perverse hedges against expected and unexpected inflation.

Also in the United States, Rubens, Bond and Webb (1989) investigated the

inflation hedging-abilities of residential, commercial and farmland. The author used CPI as a proxy for actual inflation and Livingstone survey data (based on Livingstone forecasts) were used for expected inflation. Unexpected inflation was computed as the difference between actual and expected inflation. The real estate returns were also decomposed to the income and capital appreciation components to allow for better examination of the hedging effectiveness. Ordinary Least Squares model was used to regress the inflation components against the returns. The result of the study was that returns on residential properties are complete hedge against actual inflation and unexpected inflation; but poorly hedged against expected inflation. In addition, returns on commercial properties hedged completely against expected inflation, but perform poorly against actual and unexpected inflation. For farmland, the return completely hedged against expected inflation; perversely hedged against unexpected inflation; but did not hedge against actual inflation. Their study shows that residential real estate performs better than commercial real estate against actual inflation and unexpected inflation; while commercial real estate fared better than residential with respect to expected inflation.

Following Fama and Schwert (1977), many studies have overtime sprung up to determine the inflation hedging characteristics of some real estate investments in other developed economies. For example, Limmack and Ward (1988) used the Fama and Schwert (1977) framework to analyse a set of quarterly data spanning through 1976-1986 at the property sector level in United Kingdom using Treasury bill rates as a measure of expected inflation. They found out that all commercial property sectors hedge against inflation and that only the industrial sector hedged against unexpected inflation.

Also, Newell (1995) examined the inflation-hedging characteristics of Australian commercial property between 1984 and 1995 and found that both office and retail property provide a good hedge against actual, expected and unexpected inflation in 10 Australian cities studied.

Voigtländer and Demary (2009) while studying the inflation hedging properties of real estate in Canada, USA, Finland, France, Germany, Ireland, the Netherlands, Sweden and the United Kingdom, found out that investment in real estate equities did not protect the investor against inflation. Considering studies from Asia, commercial properties in Singapore did not only hedge against inflation, but they also increased at a faster rate than the increase in the inflation rate (Sing & Low, 2001). Sim and Choe (2002) while studying the inflation hedging capacities of housing and stock returns in Korea found out that housing provides effective hedge against inflation but stock does not.

Quingping (2008) in his study concluded that the housing sector plays an important role in Taiwan's economy as it is able to hedge against inflation in the long-run. Xiarong and Sherwood (2010) investigated the inflation hedging ability of real estate in China from 2000-2008 using an autoregressive distribution lag (ARDL) co-integration technique. The study reveals that there is no long-run equilibrium relationship between real estate price changes and inflation

rate; and it was concluded that Chinese real estate is not an effective hedge against inflation.

Considering studies from Nigeria, Bello (2004) investigated the inflation hedging characteristics of residential property investment, ordinary shares and savings account in Nigeria for the period of 1996 to 2000 using the Ordinary Least Square (OLS) regression model. Inflation was split into its actual, expected and unexpected components. The results showed that ordinary shares have high inflation hedging capacity; saving account has low hedging; while residential property does not hedge against actual inflation but is a strong hedge against expected inflation. The study has dated long, and was only based on Lagos property market. Considering the time and area of this study, there is high probability that the inflation hedging abilities of the considered property investment type in Ibadan may produce a different result.

Odu (2011) in the study of inflation hedging attributes of commercial properties in prime areas of Lagos state, Nigeria employed Ordinary Least Square model to regress real estate rates of returns against actual, expected and unexpected inflation rates. The results show that, for prime locations around Victoria Island and Ikoyi, returns on commercial properties perversely hedged against actual inflation; while commercial properties within Ikeja and environs completely hedged against actual inflation. A study carried out by Anyakora, Idowu, Osagie and Omirin (2012) in Lagos metropolis (Ikoyi, Victoria Island, Lagos Island, Apapa and Surulere) revealed that rents from commercial real estate

investment grew year by year at rates higher than inflation. Inferences to be drawn from the studies are that inflation hedging capacities vary: across different neighbourhoods, different time, as well as with property types within the same city and country. A property type that is a hedge against inflation in an area may not be so in another.

Ogunba, Obiyomi and Dugeri (2013) examined the inflation hedging characteristics of office and shop property investments in Ibadan metropolis in Nigeria. The Nigerian Consumer Price Index was used as proxy for actual inflation; while the Nigerian 91-day Treasury bill rates were used as proxy for expected inflation. Data on rental values and capital values of commercial properties were obtained from sampled estate surveying and valuation firms in Ibadan over the period 2000 to 2010. The Ordinary Least Square (OLS) proposed by Fama and Schwert (1977) was also used in analysing the collected data. The results showed that commercial property returns were poor hedge against actual inflation, a partial hedge against unexpected inflation, and almost a complete hedge against expected inflation. However, this study only focused on office and shop property investments but did not consider residential property types.

In the most recent of the mentioned studies, Dabara (2014) investigated the inflation-hedging characteristics of residential property investments in Gombe metropolis from 2003 to 2012. His findings showed that residential property returns completely hedged against expected inflation, partially hedged against actual inflation, but a perversely hedged against unexpected

inflation.

It must be pointed out that different results have emerged from various studies carried out on the ability of investments on residential properties to hedge against inflation. Studies by Gyourko and Linneman (1988), Sing and Low (2000), Huang and Hudson-Wilson (2007) and Zhe (2010) concluded that returns on residential properties provide a hedge against both expected and unexpected inflation. This conclusion is however refutes finding of Ruben, Bond and Webb (1989) which shows that returns on residential property investment is a poor hedge against expected inflation. The findings of Bello (2004) and Dabara (2014) agree that returns on residential properties hedge against expected inflation and not against unexpected inflation. However, while Bello (2004) found that residential property investments provide returns that did not hedge against actual inflation in Lagos; Dabara (2014) revealed that returns hedged against actual inflation in Gombe. The variance in results of the above studies suggests the need to constantly investigate the inflation hedging capacities of real estate investments from time to time and across different regions or areas. The latter two studies (Bello, 2004 & Dabara, 2014) appear to be the only empirical studies in Nigeria so far on the inflation hedging capacities of real estate that focused on residential property investment.

## Research Methods

The choice of the four residential locations in this study, namely: Bodija, Akobo, Eleyele and Oluyole Estate sub-markets are predicated upon the result of field observation that shows that large concentrations of modern residential properties exist in the selected areas. Owing to the country's poor culture of keeping and releasing records, the data obtained was restricted to the time frame of 2002 to 2014. The secondary data on inflation rates (actual and expected) were obtained from the Central Bank of Nigeria over a period of 10 years ranging from 2002 to 2014. This present study adopted Consumer Price Index CPI which has become a common measure of actual inflation; and 90-day Treasury bill rate obtained online from the website of the Central Bank of Nigeria (CBN) and National Bureau of Statistics as proxies for both actual and expected inflation respectively. Afterwards, unexpected inflation was calculated as the difference between actual inflation and expected inflation.

Although there are different residential properties types in the selected areas of Ibadan, this study is however, limited to 3-bedroom flats. The reason for selecting 3 bedroom flats is that this sub-type is the most common type of accommodation in the study areas. Annual rents and capital values were sourced from the records of estate surveying and valuation firms that are operating in the selected areas. Average rental and capital values of the series of rental and capital values obtained from the 51 estate surveying and valuation firms were then calculated using arithmetic mean. These resultant average values were used to calculate the income returns, capital returns and total returns of residential properties in the considered areas. The income return is given as:

$$IR_t = \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1)$$

Where:

$IR_t$ represents Income Return for period t

$NI_t$ represents Net Income received in period t

$CV_{t-1}$ represents Capital Value at the end of period t-1

Capital return is expressed as:

$CR_t =$ ………………………… (2)

Where:

$CR_t$ represents Capital return for period t

$CV_t$ represents Capital value at the start of measurement period

$CV_{t-1}$ represents Capital value at the end of period t-1

Total return is expressed as

$TR_t =$ ………………………………… (3)

Where:

$TR_t$ represents Total return

$CV_{t-1}$ represents Capital value of direct property at the beginning

$CV_t$ represents Capital value of direct property at the end

$NI_t$ represents Income of direct property received during the holding period

This study like most previous studies adopted the Ordinary Least Square regression model expressed as:

$R_{jt} = \alpha_j + \beta_j E(\Delta_t \mid \emptyset_{t-1}) + y_j[\Delta_t - E(\Delta_t \mid \emptyset_{t-1})] + \mathcal{E}_{jt}$ ................(4)

Where:

$R_{jt}$ is the nominal return on asset j from period t-1 to t;

$\alpha_j$ is the intercept term in the regression model, it reflects the real return on asset j from period t-1 to t;

$\beta_j$ is the slope coefficient for expected inflation for asset j;

$E(\Delta_t \mid \emptyset_{t-1})$ is expected inflation rate in time t, $\Delta t$ based on the information set available up to time t-1, denoted as $\emptyset_{t-1}$;

$\Delta_t$ is the actual inflation rate from period t-1 to t;

$y_j$ is the slope coefficients for unexpected inflation for asset j;

$\Delta_t - E(\Delta_t \mid \emptyset_{t-1})$ is used to measure unexpected inflation rate which is the difference between actual and expected inflation;

$\mathcal{E}_{jt}$ is the error term

The following regression equations were adopted in this study to assess the inflation hedging capacities of income, capital and total returns of residential properties:

$R_{pt} = \alpha_p + \beta_1(AI_t) + \mathcal{E}_{pt}$          (5)

$R_{pt} = \alpha_p + \beta_2(EI_t) + \mathcal{E}_{pt}$          (6)

$R_{pt} = \alpha_p + \beta_3(AI - EI)_t + \mathcal{E}_{pt}$      (7)

Where:

$R_{pt}$ is the average nominal return (residential property investment return) on the property type p at time t;

$\alpha_p$ is the intercept term, it represents the real rate of return on the property type p;

$\beta_1 - \beta_3$ are the coefficients of actual inflation of the property type p, which can be for income return, capital return or total return;

$AI_t$ is the actual inflation rate from period $t-1$ to t;

$EI_t$ is the expected inflation from period t-1 to t;

$(AI - EI)_t$ is the unexpected inflation from period t-1 to t;

$\mathcal{E}_{pt}$ is an error term which is assumed to be randomly distributed.

The nominal return (income, capital or total return) of an asset is a complete hedge against

inflation (actual, expected or unexpected) if $\beta_1$, $\beta_2$ or $\beta_3$ is not statistically different from +1. That is, when inflation beta or regression coefficient is between 0.500 and 1.00, the property investment is said to be a complete hedge. If the regression coefficient ($\beta_1$, $\beta_2$ or $\beta_3$) is significantly different from 0 and +1 (i.e beta is between 0.01 and 0.499), the asset is said to be a partial hedge against inflation. When the regression coefficient has a negative sign, the asset is said to be a perverse hedge against inflation i.e the asset does not hedge

against inflation. However, when the inflation beta or regression coefficient is not statistically significant at either 5% (p-value of 0.05) or 10% (p-value of 0.10), the property investment return is said to provide no hedge or zero hedge against inflation.

**Data Presentation and Analysis**

Table 1 shows the average annual rates of income, capital and annual returns of residential properties in the four selected residential locations in Ibadan.

**Table 1:** *Average Annual Rate of Returns (%) of 3 B/R Flat (Residential) from 2002 to 2014 in Ibadan*

| Income/ Capital/ Total Returns | Property Location | Year | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| **Income Returns** | Akobo | 2.67 | 2.74 | 2.13 | 2.40 | 2.40 | 3.43 | 5.00 | 5.65 | 6.67 | 5.66 | 6.40 | 6.29 | 6.67 |
| | Bodija | 5.56 | 4.00 | 3.33 | 3.00 | 3.00 | 3.23 | 3.33 | 3.13 | 3.33 | 2.50 | 2.33 | 2.14 | 2.22 |
| | Oluyole | 2.67 | 2.74 | 3.20 | 2.88 | 3.20 | 3.43 | 6.00 | 5.65 | 6.67 | 6.55 | 6.40 | 6.67 | 7.50 |
| | Eleyele | 3.00 | 2.86 | 2.67 | 2.40 | 1.95 | 3.20 | 2.48 | 3.53 | 4.00 | 4.00 | 4.88 | 6.15 | 5.93 |
| **Capital Returns** | Akobo | 20.00 | 16.67 | 28.57 | 11.11 | 20.00 | 16.67 | 14.29 | 6.25 | 5.88 | 17.78 | 17.92 | 12.00 | 7.14 |
| | Bodija | 12.50 | 66.67 | 50.00 | 11.11 | 20.00 | 3.33 | 20.97 | 6.67 | 12.50 | 33.33 | 25.00 | 16.67 | 2.86 |
| | Oluyole | 15.38 | 16.67 | 28.57 | 11.11 | 20.00 | 16.67 | 14.29 | 6.25 | 5.88 | 22.22 | 13.64 | 20.00 | 6.67 |
| | Eleyele | 17.65 | 5.00 | 7.14 | 33.33 | 23.33 | 21.62 | 28.89 | 17.24 | 17.65 | 25.00 | 23.00 | 5.69 | 3.85 |
| **Total Returns** | Akobo | 22.67 | 19.41 | 30.70 | 13.51 | 22.40 | 20.10 | 19.29 | 11.90 | 12.55 | 23.44 | 24.32 | 18.29 | 13.81 |
| | Bodija | 18.06 | 70.67 | 53.33 | 14.11 | 23.00 | 6.56 | 24.30 | 9.80 | 15.83 | 35.83 | 27.33 | 18.81 | 5.08 |
| | Oluyole | 18.05 | 19.41 | 31.77 | 13.99 | 23.20 | 20.10 | 20.29 | 11.90 | 12.55 | 28.77 | 20.04 | 26.67 | 14.17 |
| | Eleyele | 20.65 | 7.86 | 9.81 | 35.73 | 25.28 | 24.82 | 31.37 | 20.77 | 21.65 | 29.00 | 27.88 | 11.84 | 9.78 |

The analysis in Table 1 shows a steady increase in the income returns of residential properties in Akobo, Oluyole Estate and Eleyele, except in Bodija Estate where the income returns declined over the period studied. The reason for the decline in the income returns of Bodija Estate may be due to

less demand for 3 Bedroom flats in Bodija resulting from the flats in Bodija Estate being very old. Also, the observed volatility of total returns on residential properties is consistent with the findings of Lu and Mei (1999) that property returns in emerging markets are volatile.

Regression analysis was employed to determine the inflation hedging capacities of the residential property investments in each location. Using the regression equations (5, 6 and 7) presented in the previous section, the hedging capacities are indicated by the weight and sign of the regression coefficients. The results of the regression analysis are presented in tables.

*Table 2:* *Hedging Capacities against Actual Inflation (2002-2014)*

| Location & Return | Beta Coefficient | p-value | R-Square | Type of Hedge |
|---|---|---|---|---|
| Akobo IR | -0.288 | 0.340 | 0.083 | No hedge |
| Akobo CR | 0.057 | 0.854 | 0.003 | No hedge |
| Akobo TR | -0.031 | 0.921 | 0.001 | No hedge |
| Bodija IR | 0.323 | 0.282 | 0.104 | No hedge |
| Bodija CR | 0.380 | 0.201 | 0.144 | No hedge |
| Bodija TR | 0.392 | 0.186 | 0.153 | No hedge |
| Oluyole IR | -0.299 | 0.321 | 0.089 | No hedge |
| Oluyole CR | -0.075 | 0.809 | 0.006 | No hedge |
| Oluyole TR | -0.170 | 0.580 | 0.029 | No hedge |
| Eleyele IR | -0.375 | 0.207 | 0.140 | No hedge |
| Eleyele CR | 0.186 | 0.543 | 0.035 | No hedge |
| Eleyele TR | 0.143 | 0.642 | 0.020 | No hedge |

From table 2, it can be observed that residential properties did not hedge against actual inflation in the four residential sub-markets. All the inflation betas are not statistically significant as the p-values are above 5% and 10% alpha levels and the $R^2$ (coefficients of determination) are also too low. The result of this study is not in consensus with that of Dabara (2014) in Gombe which shows that residential properties hedge against actual inflation. The differences in the results of the two studies may be due to the differences in geographical locations.

**Table 3:** *Hedging Capacities against Expected Inflation (2002-2014)*

| Location & Return | Beta Coefficient | p-value | R-Square | Type of Hedge |
|---|---|---|---|---|
| Akobo IR | -0.303 | 0.314 | 0.092 | No hedge |
| Akobo CR | 0.524* | 0.066 | 0.274 | Complete hedge |
| Akobo TR | 0.517* | 0.070 | 0.267 | Complete hedge |
| Bodija IR | 0.585** | 0.036 | 0.342 | Complete hedge |
| Bodija CR | 0.465 | 0.110 | 0.216 | No hedge |
| Bodija TR | 0.488* | 0.090 | 0.238 | Partial hedge |
| Oluyole IR | -0.337 | 0.261 | 0.113 | No hedge |
| Oluyole CR | 0.322 | 0.283 | 0.104 | No hedge |
| Oluyole TR | 0.246 | 0.418 | 0.060 | No hedge |
| Eleyele IR | 0.002 | 0.994 | 0.000 | No hedge |
| Eleyele CR | -0.463 | 0.111 | 0.214 | No hedge |
| Eleyele TR | -0.492* | 0.088 | 0.242 | Perverse hedge |

* Significant at 10%, ** Significant at 5%

From table 3, the annual capital returns of residential properties in Akobo hedges better (complete hedge with beta of 0.524) against inflation than the total returns and income returns with beta of 0.517 and -0.303 respectively. While the income returns did not hedge against expected inflation; the capital and the total returns in Akobo are statistically significant at 10% level with $R^2$ of 0.274 and 0.267 indicating that expected inflation attributes 27.4% and 26.7% to increase in capital and total returns of residential properties. The beta coefficient (0.585) of the income returns in Bodija is significant at 5% level and the $R^2$ of 0.342 means that 34.2% of the variation in the income returns of residential properties in Bodija is contributed by expected inflation; while 75.2 is contributed by other extraneous variables. Among the components of returns, annual income returns are best hedge against expected inflation; while capital return is the least hedge against inflation. As regards Oluyole sub-market, none of the return components hedged against expected inflation. The total returns of residential properties in Eleyele perversely hedged against expected inflation; while the income and capital returns did not hedge against inflation. The total returns are significant at 10% level with 24.2% explanatory power even though the hedge is perverse.

In summary, the total returns of residential sub-markets, Akobo and Bodija completely hedged and partially hedged against expected inflation respectively and are both significant at 10% level; while for residential sub-markets in Oluyole estate did not hedge against expected inflation. In the case of Eleyele, residential property investments reveal a perverse hedge against expected inflation and it is significant at 10%.

***Table 4:*** *Hedging Capacities against Unexpected Inflation (2002-2014)*

| Location & Return | Beta Coefficient | p-value | R-Square | Type of Hedge |
|---|---|---|---|---|
| Akobo IR | 0.08 | 0.795 | 0.006 | No hedge |
| Akobo CR | -0.47 | 0.106 | 0.22 | No hedge |
| Akobo TR | -0.528* | 0.063 | 0.279 | Perverse hedge |
| Bodija IR | -0.221 | 0.467 | 0.049 | No hedge |
| Bodija CR | -0.152 | 0.621 | 0.023 | No hedge |
| Bodija TR | -0.161 | 0.6 | 0.026 | No hedge |
| Oluyole IR | 0.079 | 0.798 | 0.006 | No hedge |
| Oluyole CR | -0.408 | 0.167 | 0.166 | No hedge |
| Oluyole TR | -0.415 | 0.159 | 0.172 | No hedge |
| Eleyele IR | -0.272 | 0.36 | 0.074 | No hedge |
| Eleyele CR | 0.481* | 0.096 | 0.231 | No hedge |
| Eleyele TR | 0.472 | 0.104 | 0.223 | No hedge |

* Significant at 10%

Table 4 shows that the three types of returns on the residential property investments did not hedge against unexpected inflation. Total returns in Akobo which shows the highest beta did not hedge against unexpected inflation but perversely hedged with -0.528. It is only in Eleyele that property returns nearly hedged against unexpected inflation.

## Summary and Conclusion

There was steady increase in the income returns of residential property investments in Ibadan; while the capital and total returns of property investments varied. Capital returns were higher than income returns in majority of the sub-markets. All the returns of residential properties in the four locations did not statistically hedge against actual inflation. However, statistically significant hedges are recorded under expected inflation for capital and total returns in Akobo, and for income returns in Bodija. Residential properties did not hedge against unexpected inflation in all the locations. In Eleyele where beta is 0.481 hedge, it beta value indicates that capital returns nearly hedged against unexpected inflation. This finding agrees with the conclusion of Sing and Low (2001) in their review of several studies on inflation hedging of real estate in many countries (particularly in United States, United Kingdom, Australia etc.) that real estate significantly hedge against expected inflation but not against unexpected inflation. The analysis of the residential sector shows that for investors who desire total and capital returns that hedges against expected inflation, the can consider investing in Akobo; while for those desiring protection of income return against expected returns should consider Bodija as a preferable residential sub-markets.

In conclusion, this study has shown that real estate is not an all-time hedge against inflation and the return components of property investments perform differently against the components of inflation in different geographical sub-markets. The findings of this study have practical implications for investors and prospective investors in Ibadan. Empirical evidences in the study have shown the importance of considering the inflation hedging capacities of specific sub-markets so as to make efficient investment decisions.

Therefore, generalization should no longer be made about the inflation hedging attributes of real estate in choosing residential property investments; but attention should be drawn to specific sub-markets and return components. In this way, this study has contributed to knowledge.

## References

Anyakora, M., Idowu, O., Osagie, J. & Omirin, M. (2012) Inflation Hedging Capacity of Commercial Real Estate Investment (Case Study of Lagos-Nigeria Property Market). *Journal of Contemporary Issues in Real Estate, 2(1),* 1-12.

Appraisal Institute. (2008). The Appraisal of Real Estate, Appraisal Institute.

Arnason, O. & Persson, S. (2012). *Swedish Real Estate as a Hedge against Inflation-with Comparison to Stocks, Bonds and Gold.* A Master of Science thesis submitted to the Department of Real Estate and Construction Management. KHT Architecture and the Built Environment. Retrieved on 30/10/2014 from http://www.kth.se/polopoly_fs/1.340467!/M enu/general/columncontent/attachment/174.pdf.

Bello, M. O. (2004). The Inflation Hedging Characteristics of Nigerian Residential Property Investment. *Journal of Property Research and Construction 1(1),* 40-55.

Brueggeman, W. B., Chen, A. H. & Thibodeau, T. G. (1984). Real Estate Investment Funds: Performance and Portfolio Considerations. *Journal of the American and Urban Economics Association, 12,* 333-354

Dabara, D. I. (2014). Inflation Hedging Performance and Risk-Return Characteristics of Residential Property Investments in Gombe, Nigeria. *Advances in Research, 3(1),* 71-83.

Fama, E. F. & Schwert, G. W. (1977). Asset Returns and Inflation. *Journal of Financial Economics, 5 (1977)*, 115-146.

Fisher, I. (1930). *The Theory of Interest.* Macmillan, New York.

Gyourko, J. & Linneman, P. (1988). Owner occupied Homes, Income producing Properties and REITs as Inflation Hedges: Empirical findings. *Journal of Real Estate Finance and Economics, 1(4),* 347-372.

Hoesli, M. (1994). Real Estate as a Hedge against Inflation: Learning from the Swiss Case. *Journal of Property Valuation and Management, 12(3)*, 51-59.

Huang, H., Hudson-Wilson, S. (2007). Private Commercial Real Estate Equity Returns

and Inflation. *The Journal of Portfolio Management, 33(5),* 63-73.

Limmack, R. & Ward, C. (1988). Property Returns and Inflation. *Land Development Studies, 5,* 47-55.

Liu, C., Hartzell, D. & Hoesli, M. (1997). International evidence on real estate securities as an inflation hedge (Electronic version). Retrieved (10 October, 2014), from Cornell University, SHA School site: http://scholarship.sha.cornell.edu/articls/276

Loungani, P. & Swagel, P. (2001). Sources of Inflation in Developing Countries. *International Monetary Fund.*

Lu, K & Mei, J. (1999). The Return Distributions of Property Shares in Emerging Markets. *Journal of Real Estate Portfolio Management, 1999, 5(2),* 145–60.

Miles, D. (1996). Property and Inflation. *Journal of Property Finance, 7(1),* 6-20.

Newell, G (1995). Is Canadian Real Estate a Hedge against Inflation? *The Canadian Appraiser, 39(1),* 25-27.

Newell, G. & Boyd, T. (1995). Inflation Hedging Attributes of New Zealand Commercial Property. *New Zealand Valuers' Journal,* 50-54

Nwude, C. (2012). Inflation-Hedging Potential of Nigerian Brewery Stocks. *Journal of Economics and Sustainable Development, 3(11),* 64-71.

Odu, T. (2011). An Analysis of Relative Inflation Hedging Capacities of Prime Commercial Properties in Lagos. *Global Journal of Human Social Science, 11(10),* 42-51.

Ogunba, O., Obiyomi, O. & Dugeri, T. (2013). The Inflation Hedging Potential of Commercial Property Investments in Ibadan, Nigeria. West Africa Built Environment Research (WABER) Conference Accra, Ghana, 1101-1111.

Oner C. (2010, March). *What is inflation?* Finance and Development, pp. 44 -45.

Peyton, M. S. (2011). Is Commercial Real Estate an Inflation Hedge? *Real Estate Issues, 36(3),* 37-43.

Quingping, N. T. (2008). *Can Real Estate Returns Hedge Against Inflation?* Feng Chia University Business School Research Institute PhD thesis.

Rubens, J., Bond, M. & Webb, J. (1989). The Inflation-Hedging Effectiveness of Real Estate. *Journal of Real Estate Research, 4(2),* 45-56.

Sim, S. & Choe, J. (2002). An Investigation of the Inflation-Hedging Ability of Housing Stock Returns in Korea. Retrieved on 18/06/2014 from: www.kahps.org/study/10-1/jt10106.PDF

Sing, T. F. & Low, S. H. (2001). A Comparative Analysis of Inflation-Hedging Characteristics of Property and Non-Property Assets in Singapore. 1-24

Trading Economics (2014). Nigerian Inflation Rate from 1996-2014. Retrieved on 16/10/2014 from: http://www.tradingeconomics.com/nigeria/inflation-cpi.

Voigtlander, M. & Demary, M. (2009). The Inflation Hedging Properties of Real Estate: A Comparison between Direct Investments and Equity Returns. http://www.eres2009.com/papers/5Dvgt

laender.pdf

Xiaorong, Z. & Sherwood, C. (2010). The Inflation Hedging Ability of Real Estate in China. J*ournal of Real Estate Portfolio Management: 2010, 16(3),* 267-277.

Zhe, L. (2010). Short-term Inflation-Hedging Characteristics of Real Estate in Hong Kong. A dissertation submitted to the faculty of Architecture for the award of Bachelor of Science in Surveying, The University of Hong Kong.

Zou, H., Gong, L. & Zeng, X. (2011) Inflation Aversion. *Annals of Economics and Finance, 12(1)*, 1-11.