Inflation-Hedging Capabilities of Real Estate Investment Portfolios

Subjects: Business, Finance

Contributor: Akuakanwa Eziukwu Nwosu , Victoria Amietsenwu Bello , Abiodun Kolawole Oyetunji , Chiemela Victor Amaechi

Inflation is a term used to describe a purely monetary rate of upward movement in the prices of goods during a specific time frame. There has been a wide belief that real estate is a source of good investment portfolios because it has a hedge against inflation.

expected return (ER) inflation dynamics inflation hedge investment property market portfolio property price real estate return on investment (ROI)

1. Introduction

Inflation is a term used to describe a purely monetary rate of upward movement in the prices of goods during a specific time frame [1][2][3]. In a layman's view, inflation is defined as a large amount of money chasing fewer goods, resulting in an increase in product prices [4][5]. Inflation is commonly misinterpreted as a gain in real value; however, it is a growth in the amount of credit and money that leads to a rise in the general level of prices, resulting in a loss of purchasing power, according to the Appraisal Institute [6]. In real estate, the inflation-hedging capability can first be assessed against actual inflation while, in a more detailed analysis, actual inflation can be decomposed into two components (expected and unexpected inflation). Expected inflation describes the level of inflation investors anticipate will occur in future time periods while unexpected inflation results from a reaction caused by new market information not initially considered [7]. Although, different studies have investigated inflation based on the hedging factors of various resources in diverse economies [8][9][10][11][12][13]. In most developed countries, the rate of inflation is managed to a one-digit rate; however, in developing countries like Nigeria, it is mostly in two digits. Some recent studies have confirmed that Nigeria has a high rate of inflation and found different impacts of inflation; although, they have not considered inflation hedging capabilities [14][15][16][17]. During periods of inflation, the prices of goods and services increase as it also erodes people's purchasing power.

The pressure of inflation in Nigeria is worrisome and the nation is yet to proffer a solution to break out from the problem [17][18]. Following the data from CBN Bulletin [19], the rate of inflation in Nigeria rises on a year-on-year basis, as it was at 13%, as of December 1991. This rose to 46% by December 1992, was at 72.8% as of December 1995, and progressively declined to 6.9% in 2000 but rose to 10.8% as of December 2011 [19]. As of July 2016, the rate of inflation rose to 16.5% and was at 18.5% in October 2016 [20]. In 2017, the inflation rate dropped to 16.5% and further dropped to 12.4% in 2018. Later, in 2018, it fell slightly to 12.09% and, in 2019, it fell

further to 11.701% and later increased to 15.7% in February 2022 [17][21]; however, the increase in inflation is a global phenomenon. It is noteworthy to add that the month of data projection is important. For instance, Statista presented two projection reports for Sub-Saharan Africa, including Nigeria, which covered this same issue on inflation by considering perceived inflation to have upward trends that are relatively close figures though differently reported for the same year in 2022 at 12.2% and 14.47%, respectively [22][23]. The low output, quick growth of liquidity, growing cost of funds, ongoing depreciation of local currency (Naira), and rising cost of transportation brought about by higher adjustments to fuel pump prices and related tariffs were identified as the drivers of inflation [24]. The scenario has been exerting a negative effect on the quantity and quality of real returns on most investment assets, including real estate in most of Sub-Saharan Africa.

Even though Africa only provides for 2% of the world's total manufacturing output, the urbanisation rate in Sub-Saharan Africa was roughly 41.83% in 2021 [25][26]. It holds true, despite the fact that there is a gap in Africa's industrial output globally, that there is a need to have an interest in digitalization and manufacturing as these elements could help in reducing the inflation rate in Sub-Saharan Africa in the long run. There is an inference here that migration and urban surge, in the quest for economic opportunity, have resulted in issues, such as high inflation rates, high demand for property, high waste generation, pollution, and high unemployment rates. According to the World Economic Forum [27], more than half the world's population resides in urban areas and cities continue to attract people in search of a better life and greater job prospects and services, as of 2017. Cities address the immediate needs of migrants and respond to a number of challenges brought on by integration. In that light, particularly in Nigeria, globalization, innovation, and urbanisation have led to the need for more houses. There is also an increasing demand for smart buildings in developing nations, as well as an increase in the Nigerian real estate sector. Various data have shown that, while inflation is unstable in Nigeria, CBN is struggling with ways to hedge it [28][29][30]. However, the crux of the analysis is that the current increase in the inflation rate in Nigeria has also affected the price index of housing properties.

Real estate investment is gaining popularity among investors worldwide as an investment option whose real terms profits increase, even in difficult economic times [31][32][33]. Real estate's return characteristic gives a buffer through annual cash flow and knowledgeable investors can generate a return from real estate investment by implementing an efficient plan for a certain portfolio at a specific moment [34][35][36].

2. Inflation Hedging in Real Estate Investments

It is pertinent to present a literature review on the concept of inflation hedging in real estate investments. In monetary terms, hedging is a technique for reducing exposure to danger in a specific market circumstance [37][38][39]. For real estate investors who typically invest for the long term, inflation hedging is a big concern [40][41][42]. It is the ability to protect an asset against the erosion of an increase in prices. An asset with nominal returns is said to have a positive relationship with inflation [7]. During instances of excessive inflation, it has been seen that some financial instruments not only shield the investor from price increases but also provide perfect and perverse hedges in some cases [43].

In developed economies, several authors have carried out investigations on inflation and property returns. For instance, Brueggeman and Fisher [44] provide a comprehensive overview of real estate investments, highlighting the inflation hedging and role of real estate in value preservation during inflationary periods. Bodie, et al. [45] offer insights into various investment strategies, including those related to hedging against inflation. The study notes that it can provide a broader understanding of how different assets, including real estate, can play a role in managing inflation risk. Baum [46] offers insights into the strategies and implications of real estate investment, including the role of real estate as an inflation hedge. DiPasquale and Wheaton [47] also provide a deeper understanding of the economic principles underlying real estate markets, which can help contextualize the findings of the reviewed studies. Ball et al. [48] offer insights into commercial real estate markets, helping to understand the intricacies of property types' inflation-hedging potentials. Another scholarly contribution on inflation and real estate investment returns by Ibbotson and Siegel [49], the paper delves into the historical relationship between inflation and various asset classes, shedding light on the performance of real assets.

There are three main inflation components: actual, expected, and unexpected inflation. Actual inflation can be broken down into categories: expected and unexpected inflation. Expected inflation refers to the level of inflation that investors expect to occur in the future; whereas, unexpected inflation occurs as a result of the reaction to new market information that was not previously considered [7]. The Consumer Price Index (CPI), which is an official measure of inflation around the world, is frequently used as a proxy or benchmark for determining actual inflation [39][50]. The 90-day treasury note rate is frequently used as a proxy for inflation expectation [51]. Actual inflation is frequently subtracted from expected inflation to obtain unexpected inflation [39][52].

It is noteworthy to state that Fama and Schwert [50] were among the earliest researchers on inflation and real estate returns. Although Fisher's [53] hypothesis in 1930 was used to assess the ability of investment assets to hedge against inflation in the United States. The ordinary least square method was employed for the data analysis and it was found to hedge against the expected and unexpected components of the inflation rates. Rubens et al. [54] investigated the efficiency of residential, rural, and commercial real estate inflation hedging in the United States from 1960 to 1986. As a proxy for expected inflation, the Livingston price expectation was used. The hedging qualities of actual, expected and unexpected inflation on asset returns were investigated using Cochran–Orcutt regression analysis. For both individual assets and portfolios, the study found that the hedging effectiveness of various asset classes differed by varying asset and inflation types. Farmland and residential estates were perfect hedges against unexpected inflation. The findings are consistent with Fama and Schwert's [50] findings that residential properties provided a complete positive hedge. The study also found that commercial real estate provides a partial positive inflation hedge, as well as a complete inflation hedge when compared to expected inflation.

Sing and Low [55] investigated the inflation-hedging properties of Singapore assets using Pearson correlation coefficients to determine property returns and inflation rates. The property provides a more complete inflation hedge than non-property investments, according to the study's findings. When the tests were expanded to look at the inflation-hedging characteristics of assets in both high-inflation and low-inflation environments, it was discovered that residential property offered a partial hedge against unexpected inflation in low inflation

circumstances, but industrial property was a complete hedge against inflation in high-inflation circumstances. This finding is in line with Li [56], who discovered that the ability of real estate to hedge against inflation is generally greater when there is high inflation but reduces relevance during periods of low inflation. Stevenson [57] re-examined the existing relationship between the British residential property market and inflation. The study reveals that residential property type and inflation display similar long-period trend relationships and no strong existing relationship during the long term.

Chu and Sing [58] looked into the inflation-hedging attributes of real estate in the Chinese market. The authors investigated how four major Chinese cities (Beijing, Chengdu, Shanghai, and Shenzhen) dealt with short-term inflation hedging in real estate markets. The residential, commercial, and office buildings in each city were evaluated. The ordinary least square and co-integration models were used to examine the data. The results of the conventional least square model show that real estate, in any form, is a poor hedge against both predicted and unexpected inflation in all four locations. According to Wurtzebach et al. [51], office and industrial property returns do not provide a significant buffer against unexpected inflation. However, Chu and Sing's [58] findings contradict the findings of other authors [50][54][59] who claimed that real estate is a solid hedge against predicted and unforeseen inflation. More crucially, their study found that the Chengdu real estate provides a significant, although negative, inflation hedge. Chen and Sing [60] studied the inflation-hedging ability of the Hong Kong, Tokyo, Singapore, Taipei, and London housing markets. The study found that there is the existence of variations in the results of inflation hedging across the five housing markets.

Zhe [39] re-examined the efficacy of real estate and inflation hedging in Hong Kong. The rate of return on real estate was regressed against actual, expected and unexpected inflation rates in the research area using Fama and Schwert's [50] proposed ordinary least square regression model. According to the study, private domestic property and office property in Hong Kong were hedged against predicted and unexpected inflation, rather than retail and industrial property, between 1993 and 2000. Residential and commercial income returns were fully hedged against inflation every quarter; whereas, retail and industrial assets were nearly fully hedged on an annual basis. The result differs from that of Sing and Low [55], who concluded that industrial property is a good hedge. The findings possibly differed because the procedures used were different. In addition, Zhou and Clements [61] looked into real estate's potential to hedge inflation between 2000 and 2008. The Chinese Consumer Price Index was used as a proxy for inflation rates, Auto Regressive Integrated Moving Average as a proxy for expected inflation, and unexpected inflation as the difference between actual and predicted inflation.

Park and Bang [62], in Korea, studied the inflation hedging of commercial real estate investment using the autoregressive integrated moving average and co-integration model. The research paper revealed that Korean commercial real estate shows a positive short-run co-movement for expected and unexpected inflation, respectively. Lee [63] looked into Malaysia's inflation hedging of the residential property market. Fama and Schwert's [50] 1977 model was employed to analyze the inflation hedging in a short-run period and the dynamic ordinary least square method was used to analyze the data in the long-run term. The Fama and Schwert's [50] analysis shows that the residential property in the short run provides reasonable evidence against expected inflation in the Malaysian market while the DOLS model result shows strong proof that residential property is a

perfect hedge in the long run. Kuang and Liu [64] employed panel data between 1996 and 2010 among 35 Chinese major cities to examine the inflation-hedging strength of housing prices. The study found that housing prices performed well across the 35 Chinese major cities that were considered. Terahni, et al. [65] examined the short- and long-term inflation-hedging capability of residential real property investment returns in selected countries. The data were analyzed using the co-integration test. The research paper found out that in the third world populace, small- and medium-size residential real property is a good hedge against inflation. Aqsha and Masih [66] re-examined whether residential property is a full-time hedge against inflation in Malaysia. The nonlinear autoregressive distributed lag model was utilized to analyse data from 1986 to 2018. The study concludes that the residential property type portrayed a good hedge against inflation in the Malaysian real estate market.

In contrast to the conclusion of Fama and Schwert [50], there are recent works which concluded that real estate provides good inflation hedges [39][55][61][62][64][65][66][67]. Although these studies focused on the Asian property markets, its conclusion cannot be used to draw a definite conclusion for the African property markets.

In the context of Nigeria, Bello [7] looked into the inflation-hedging characteristics of residential properties in Lagos. Fama and Schwert's [50] model was used to examine the inflation and return rates of the data for the study. Residential properties have a complete inflation hedge against projected inflation, according to the research. The findings contradict those of Fama and Schwert [50], who concluded that domestic property was not a perfect hedge against the unexpected. It does, however, support the findings of Zhou and Clement [61], that real estate is ineffective as a hedge against both predicted and unanticipated inflation.

Odu [5] examined the relative hedging capacities of key commercial properties in Lagos covering the periods of 1999 and 2010. To regress real estate returns against inflation rates, Fama and Schwert's [50] ordinary least square model was employed. According to the findings, commercial properties in prime locations, such as Victoria Island and Ikoyi, give a paradoxical hedge against actual inflation; however, commercial assets in Ikeja and its environs provide a complete hedge against actual inflation. Ogunba et al. [68] studied the hedging attributes of office and shop investments in Ibadan from 2000 to 2010. The data on the returns of offices and shops were acquired from estate surveyors and valuers' firms; then, they were decomposed into income, capital, and total return components. The ordinary least square regression model proposed by Fama and Schwert [50] was employed in the study. Office/shop properties were found to be a weak hedge against actual inflation, a moderate hedge against unexpected inflation, and a complete hedge against predicted inflation, according to the study's findings. The findings support Odu's [5] conclusions that real estate was a thorough hedge against actual inflation. It is possible that the study's methodology contributed to the result's consistency.

In the bid to know whether property could hedge against inflation, Nwosu [69][70] investigated the hedging ability of private student hostels in the Akure area. Data for both studies were analyzed using ordinary least square regression. The findings show that private student hostel investment does not always have a hedge against inflation because, depending on other factors, it does provide a perverse or partial hedge against inflation. Nwosu [70] investigated the degree of connection between returns in hostel investment and inflation rates in Akure, Nigeria. Using the Philip Perron unit root method, results show the data sets exhibit different combination orders in terms of

the integrations. The autoregressive distributed lag regression method was used to examine the existing degree of the relationship. The study found that there is a varying relationship between the hostel and inflation rates. In some instances, some hostels show a positive relationship while, in others, there exists a negative relationship with the inflation component.

Boubaker and Larbi [71] looked at the interdependencies of the inflation hedging of oil minerals against the stock market of BRICS countries, which are, namely, Brazil, Russia, India, China, and South Africa; however, the study did not include the real estate analysis. In another study, Umeh and Omisore [72] looked at the possibility of residential income to hedge inflation in Ibadan for the period of 2002 to 2014, employing ordinary least square regression. It revealed that the hedging ability of residential income varies across geo-political sub-markets; residential property return shows a perverse hedge against actual inflation while total return on residential properties provides complete inflation. The rental and total returns were discovered in the Bodija estate to give complete and partial hedging against inflation. In contrast, Bello [7] finds that income and total return of residential property are at least partially hedged against inflation. Wahab et al. [52] examine the inflation hedge potential of house price returns in Abuja. According to the fully modified OLS analysis, housing is not a good inflation hedge in the short run. However, the findings of Bello [7] are consistent with the conclusion that the housing sector does not have strong inflation across the board. Umeh and Oluwasore [72] looked at residential property returns in Ibadan; whereas, Wahab et al. [52] examined the inflation hedging of Abuja property.

In another study, Essafi Zouari and Nasreddine [73] investigated the impact of inflation hedge on housing in Paris, France against some inconsistent components and found that, when it comes to unanticipated inflation, stocks offer a hedge in the opposite direction but they do not provide much of a hedge when it comes to expected inflation. In addition, the authors found that indirectly listed real estate has a weak link with inflation, which leads investors to discount its capacity to hedge against price increases; this is in contrast to residential real estate that is physically located [72]. Dabara et al. [74] analyzed the possibilities for real estate investment to diversify and hedge against inflation from 2005 to 2014. The data were analyzed by employing descriptive and inferential statistics. The study found that direct real estate investment was seen to have the highest return of 22.48%, with a risk of 8.7155%, during the period of study. In addition, the study discovered that direct real estate provided complete hedging attributes, with a beta of 0.082, while indirect real estate investment exhibited a perverse hedging attribute of −0.126.

3. Metrics of Inflation in Real Estate Investment

One of the key findings of the present study is the importance of the Central Bank in the economy of Nigeria, based on various data on inflation hedging, which reflect the inflation volatility index in Nigeria as a developing nation [73][75][76]. In the Nigerian property market, Ekemode [77] (2021) re-examined the inflation-hedging qualities of residential property assets. With an overall mean return of 18.786%, Lagos property outperformed the Abuja and Port Harcourt residential properties. The results of Fama and Schwert's [50] regression show that blocks of flats in Abuja, Lagos, and Port Harcourt have a complete hedge against actual and expected inflation, a partial hedge for the three components of inflation on a detached property in Abuja, but a perverse hedge against real inflation on a

detached property in Port Harcourt. A long-term link between residential property assets and actual inflation was also discovered using the Johansen and Juselius co-integration test.

In economic theory, the foundations of inflation are grounded in diverse concepts, each offering unique perspectives on the causes and consequences of rising prices. One such theoretical framework is the quantity theory of money, which posits that changes in the money supply significantly impact the price level within an economy. Demand-pull inflation, another prominent theory, highlights the role of aggregate demand surpassing aggregate supply, causing upward pressure on prices. In contrast, cost-push inflation underscores the influence of rising production costs, often driven by factors such as increasing wages or volatile commodity prices. Additionally, built-in inflation emphasises the self-fulfilling nature of inflationary expectations, where anticipated future inflation prompts actions that perpetuate rising prices.

Central to understanding inflation is the measurement of its magnitude and impact on everyday life. Among the widely recognized metrics, the Consumer Price Index (CPI) stands as a key instrument for gauging the average change in the prices of goods and services purchased by urban consumers. Alongside the CPI, the Producer Price Index (PPI) offers insights into price shifts at the wholesale level, an early indicator of potential downstream price adjustments. The Gross Domestic Product (GDP) deflator provides a broader perspective, assessing inflationary pressures across an entire economy, while the Personal Consumption Expenditures Price Index (PCEPI) offers a more comprehensive view of consumer inflation trends. Core inflation, an index excluding volatile food and energy prices, helps policymakers isolate underlying inflationary forces.

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