A Test for the Efficiency of Nigerian REITS Stocks

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ABSTRACT

In this paper, we have examined the time series properties of three Nigerian REITS stocks**.** Our results, based on fractional integration methods, indicate that two of the REITS series -Skye Shelter Fund (SFSREIT) and Union Homes (UHOMREIT- display a mean reverting pattern, though with a very different rate of reversion, being much faster in the case of UHOMREIT and are consequently inefficient. For UPDC REIT, however, we cannot reject the null hypothesis of a unit root, thus supporting market efficiency in this case, and implying permanency of shocks. For the rest of the series examined (Brent, S&P500, US REITS and the Nigerian Exchange All Share Index), mean reversion is only found for the S&P500 if the errors are uncorrelated. Policy implications of the results obtained are reported at the end of the manuscript.

Keywords: REITS; long memory; fractional integration

JEL Code: C22; G14; G15

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1. Introduction

Real estate investment trusts (REITs) are publicly traded organizations that invest in and manage commercial real estate assets and whose stock is listed on one of the main stock exchanges. They provide an alternative to direct property investing for individual and institutional investors interested in adding real estate assets in their portfolios. Given that there is no significant correlation between the real estate and financial markets, REIT markets provide investors alternatives for diversification. Real estate has also been promoted as a tool for hedging against inflation. According to Liow & Adair (2009), REITs are a hybrid investment structure between stocks and fixed-income securities They have been defined as closed-end investment firms that manage portfolios of real estate, real estate-related initiatives, and capital market products based on real estates (Mandaci et al., 2014). Furthermore, REITs provide investors with a direct asset investing alternative and are becoming an increasingly essential aspect of investors' diversified portfolios.

Over the years, the real estate market has proven vital to the success and failure of economies. Its contribution to business cycles, in terms of inflation-adjusted returns, diversification benefits, relevance to the housing system, human capital formulation, and ultimately its impacts on economic growth cannot be overemphasized. Likewise, its potential to be catastrophic, as evident in the 2007/2008 global financial crisis, partly precipitated by the housing market crash cannot be ignored. In addition, global events such as the COVID-19 pandemic that have triggered unprecedented shocks to the real estate industry, in terms of high vacancy rates and property sales drop, reemphasize the relevance of the industry.

Nigeria, being the largest economy in Africa, has witnessed a rising demand for real estate. This demand has triggered rapid real estate development and growth, from a low of -21.99 per cent in 2020Q2, to 4.42 per cent in 2022Q2. The resulting growth accounts for 0.23 per cent of the total GDP in 2022Q2, from -1.41 per cent in the corresponding quarter of 2020,

ranking as the seventh largest contributor to growth vis a vis the 46 subsectors of the economy. Albeit the development of the subsector, a mismatch remains between demand and supply, with a total housing deficit of about 28 million housing units in 2022, according to the Federal Mortgage Bank of Nigeria. Despite the urgency of bridging Nigeria's housing gap, the current inflationary trend of high and persistent inflation (see Ebuh et al., 2021, with headline inflation rising from 12.13 per cent in 2020, to 21.09 per cent in October 2022), has resulted in high housing and construction costs, thus eroding the purchasing power of investors and rendering direct investment far-fetched. Buying property in Nigeria, much less managing developments and enhancing rent, takes a significant amount of capital, is fraught with illiquidity, and necessitates a high level of experience in the field. In addition, certain inadequacies such as lack of market transparency, information asymmetry, and limited access to real estate professionals negate the growth of the sector (Akinbogun et al., 2014). Therefore, it becomes imperative to explore alternative forms of direct real estate investments, their apparent efficiencies, and ultimately their sustainability for growth.

In doing this, Real Estate Invest Trusts (REITs) have gained traction, as alternatives forms of direct real estate investments, providing diversification benefits with minimal capital requirements for small investors. REITs are publicly traded companies that own, finance, and in some cases, develop income-producing real estate across a range of property sectors (Malinda and Jo-Hui, 2022). These companies are required to derive at least 75 per cent of their income from real estate, invest at least 75 per cent of their assets in real estate, and distribute 90 per cent to 100 per cent of their taxable earnings to investors. The benefits provided by REITS in terms of liquidity, transparency, income stability, tax advantage, and professional management, have contributed to the increase in the market size of REITs (Block, 2011; Haslam et al., 2015; Coşkun et al, 2017; Dabara and Ogunba, 2019 and Marzuki and Newell, 2020). Specifically, the largest market for REITs is held in North America, followed by Asia

Pacific which holds less than half the market share in North America (see Table 1). Meanwhile, the Middle East and Africa hold the least percentage of market share, at 0.1 per cent, given the novelty of REITs in the region (see table 1). Notwithstanding the limited integration of REITS in Africa, Nigeria boasts of the second largest REIT market in Africa, after South Africa (EPRA, 2020; Dabara et al., 2018,). In terms of widespread implementation, real estate investment trusts (REITs) are still a relatively new idea in Africa. There are just a few number of African nations that have adopted REITs as a form of investment.

Table 1: Percentage of market value of publicly traded real estate equity securities (REITs and REOCs)

REGION	PERCENTAGE MARKET VALUE
NORTH AMERICA	**56.7**
ASIA PACIFIC	**26.4**
EUROPE	**16.8**
MIDDLE EAST, AFRICA	**0.1**

Sources: www.ftserussell.com and www.epra.com. Based on data from the FTSE EPRA Nareit Developed Index.

The REITs market in Nigeria is still at the nascent stage. Notably, the evolution of REITs in Nigeria began in 2007, upon the establishment of Skye Shelter Fund (SFS), listed on the Nigerian Stock Exchange (NSE) with an initial public offer (IPO) of 20 million shares, and a current market capitalization of ₦1.54billion. This was closely followed by Union Homes REIT, established in 2008, with 250.02million shares outstanding, and a current market capitalization of ₦9.15billion. The third and currently the last REIT in Nigeria is the UPDC REIT, which has 2.67 billion shares outstanding, and a market capitalization of ₦6.67billion. Given the potential of REITs to address constraints related to direct real estate investment and their relevance to economic growth amid the current economic space of rising prices, high real estate demand, and housing deficit, this study evaluates the efficiency of Nigerian REITs in

sustaining the growth of the industry and economy as a whole. To do this, we employ a fractional integration approach to test the hypothesis of whether or not Nigerian REITs are efficient. Our chosen method allows for more flexibility than unit root testing (Gil-Alana et al., 2018) and outperforms unit root tests during periods of regime-switching and structural breaks (Perron, 1989; Campbell and Perron, 1991; Nelson et al, 2001;). In addition, it aligns closely with the vast literature on efficient market hypothesis (Ojah and Karemera., 1999**;** Salisu et al., 2020; Gil-Alana et al., 2018; Yaya et al., 2021; Usman &Nduka , 2022) as championed by Fama (1965, 1970) to examine potentials for arbitrage opportunities particularly in fast growing markets.

The literature on REITs is finely balanced between their efficiency (Anoruo and Braha, 2010; Ijasan et al., 2017; Kuhle and Alvayay, 2000; Ojah and Karemera, 1999; Nelling and Gyourko, 1998), return and diversification benefits (Kuhle, 1987; Chandrashekaran, 1999; Lee, 2010; Block, 2011; Ntuli and Akinsomi, 2017; Boudry et al., 2020;) as well as their evolution and performance (Joseph et al., 2006; Newell et al., 2010; Newell and Marzuki, 2018; Dabara, 2021). Studies on efficiency are found on the efficient market hypothesis developed by Fama (1970), which categorized efficiency into three forms- weak, semi-strong and strong. While the weak form of efficiency implies that price patterns are predictable and fully reflect all past information, the strong form of efficiency aligns with random walk hypothesis and suggests that prices are reflective of both private and public information. Meanwhile, the semi-strong form is skewed towards publicly available information. Consequently, findings related to efficiency of REITs widely differ. For instance, while a number of studies found REITs returns to be inefficient (Anoruo and Braha (2010); Kuhle and Alvayay, 2000; Topuz et al., 2005; Chung et al., 2012; Liu et al., 2019), and efficient (Liu, 2022; Chuweni et al., 2017), findings were mixed for others (Ryu et al., 2021; Jirasakuldech and Knight, 2005; Highfield et al., 2021). Some researches investigate other elements that may affect shifts in market efficiency

for a more thorough examination. Time is a factor that Jirasakuldech and Knight (2005) use to get the conclusion that the REITs market is becoming more efficient. Both Jirasakuldech and Knight (2005) and Zhou and Lee (2013) show that price level, tax reform, and the amount of market development are major determinants of efficiency differences in the market. Lee et al. (2014) found that climate change was the primary driver of REITs' market efficiency adjustments.

Our study contributes to the literature, being the first to examine the efficiency of REITs market in Nigeria, using a fractional integration approach. The fractional integration approach has the advantage of allowing for far more richer dynamics than the standard I(0)/I(1) model. Nonstationary unit root tests were traditionally employed in econometrics to determine the order of series integration. It is well known, however, that conventional methods of unit root testing (e,g., Dickey and Fuller, ADF, 1979; Phillips and Perron, PP, 1988; Kwiatkowski et al., KPSS, 1992; etc.) have weaker statistical power than their fractional counterparts (see, Diebold and Rudebusch, 1989; Hassler and Wolters, 1994; Lee and Schmidt, 1996 and others).

Few studies have looked at long memory in REIT return series. Liow (2009) conducts a global analysis using data from 20 regional and national real estate indexes and finds evidence in favour of long memory in a number of nations. When the samples are divided into sub-samples, however, long-memory evidence no longer holds for the Asian REITs market. Zhou (2011) likewise reveals a long memory for 10 REIT markets, albeit there is conflicting evidence to support the attribution of the persistence to the presence of structural fractures. Assaf (2015), on the other hand, investigates long memory and level changes in the returns and volatility of REITs for five nations. The long-memory test used in the study implies that volatility has a high long memory, although the evidence in the returns is minimal. Furthermore, the modified GPH estimator supports a short memory model with a level shift over a long memory model for three countries: Hong Kong, Japan, and the United States.

The efficiency of the REITs market might assist investors in making investing decisions. Simultaneously, market efficiency reflects market information efficiency. The greater the degree of efficiency, the greater the efficiency of information transmission, and the faster the government implements regulatory policies. As a result, studying the efficiency of the REITs market may give accurate information for regulators to successfully control the REITs market, which can then be utilized as the foundation for the government to enact real estate policy, which would lead to infrastructure development. Furthermore, analyzing the efficiency of the REITs market may improve the REITs market's research system and give an essential theoretical basis for REIT asset pricing. To the best of our knowledge, this is the first study of its kind on the efficiency of REITS, particularly from the perspective of a small open economy like Nigeria.

Our hypothesis posits market inefficiency against the alternative hypothesis of efficiency in the context of unit roots. Thus, evidence of an order of integration equal to 1 in the return series may satisfy the hypothesis of market efficiency, with uncorrelated errors. That is, if prices follow a random walk I(1) model, the market should be efficient at least in its weak form. Any departure from this, either with values of d above (below) 1 in prices or above (below) 0 in returns would indicate that profits can be obtained from the past information of the data.

The rest of the paper is structured as follows: Section 2 presents the data and methodology, Section 3 presents the discussion of results, and Section 4 presents the conclusions and policy recommendations.

2. Data source

This study examines the efficacy of the Nigerian real estate investment trust (REIT) market by drawing on data from the Nigerian stock market and the three REITS indices (Skye shelter

Fund, Union Homes, and UPDC). Starting on January 2, 2014, and ending on September 9, 2022, we compile each day's closing price of the three (3) REITS chosen for this study. The data was sourced from Bloomberg.

Table 2, provides summary statistics on REIT indices. Mean values are relatively close to the median value for each index, and minimum and maximum values are quite different from one another. To the contrary, the Skye shelter fund index has the highest standard deviation value and the case UPDC has the lowest. All REITs indices have a negative skew, with the kurtosis having low peaks and thin tails (platykurtic). Furthermore, in all three cases, the statistics of the Jarque-Bera (JB) test are significant at the 5% level, indicating that the respective REITS series are not normally distributed. Neither the Augmented Dickey Fuller (ADF) nor the Philips-Perron (PP) classical unit root tests reject the null hypothesis for the respective series.

Table 2: Data description and Unit Root test

Summary Statistics			
	SFSREIT	UHOMREIT	UPDC
Mean	89.12011	42.97644	7.621475
Median	95.00000	45.20000	9.065000
Maximum	100.0000	50.00000	11.02000
Minimum	61.75000	0.500000	3.100000
Std. Dev.	13.11050	3.786140	2.700761
Skewness	-0.668606	-1.131184	-0.405194
Kurtosis	1.703407	9.023542	1.427216
Jarque-Bera	**323.8004**	**3864.127**	**292.1686**
ADF	**-38.57977[1]**	**-23.40819[9]**	**-48.15519[0]**
PP	**-49.34571[8]**	**-338.4098[195]**	**-48.52814[15]**

Significant tests at the 5% level are highlighted in bold. The optimal lag length for augmentation in the case of Augmented Dickey-Fuller (ADF) test and bandwidth number in the case of Phillips and perron (PP) test are shown in square brackets.

3. Methodology

The examined model is the following one,

$$x_t = \alpha + \beta t + z_t, \qquad (1 - L)^d z_t = u_t, \qquad t = 1,2,\ldots, \qquad (1)$$

where x_t is the time series we observe (in logs), α and β are unknown coefficients referring respectively to a constant and a linear time trend, L is the lag-operator, i.e., $Lz_t = z_{t-1}$, and the regression errors, z_t are I(d), so that u_t is an I(0) process that will be assumed first to be uncorrelated (white noise) and later, weakly autocorrelated. The parameters are estimated using the Whittle function in the frequency domain (Dahlhaus, 1989) by using a simple version of the testing approach developed in Robinson (1994) widely used in numerous empirical applications (see, e.g., Gil-Alana and Robinson, 1997; Gil-Alana and Moreno, 2007; Abbritti et al., 2016; etc.).

Table 3 displays the results in terms of the estimates of d under the assumption of white noise errors. Three different specifications are used: i) with no deterministic terms (i.e., α = β = 0 in (1)), ii) with an intercept (β = 0), and iii) with an intercept with a linear time trend. Table 4 reports the estimated coefficients of the selected specification for each series. Tables 5 and 6 are similar to Tables 3 and 4 but based on autocorrelated errors.

Table 3: Estimates of the differencing parameter. White noise errors

SERIES	NO TERMS	AN INTERCEPT	AN INTERCEPT AND A LINEAR
SFSREIT NL	1.00 (0.97, 1.03)	**0.94 (0.90, 0.97)**	0.94 (0.90, 0.97)
UHOMREIT NL	0.73 (0.71, 0.76)	0.23 (0.22, 0.25)	**0.13 (0.11, 0.15)**
UPDC NL	1.00 (0.97, 1.03)	**1.01 (0.98 1.05)**	1.01 (0.98, 1.05)
BRENT	1.00 (0.97, 1.03)	**1.01 (0.98, 1.04)**	1.01 (0.98, 1.04)
S&P 500	1.00 (0.97, 1.03)	0.92 (0.89, 0.95)	**0.92 (0.89, 0.95)**
NGXINDX INDEX	1.00 (0.97, 1.03)	**1.21 (1.17, 1.26)**	1.21 (1.17, 1.26)

RMZ INDEX (US)	1.00 (0.97, 1.03)	**0.97 (0.95, 1.01)**	0.97 (0.95, 1.01)

The values in parenthesis refer to the 95% confidence bands of the non-rejection values of d. The values in bold correspond to the selected specification for each series.

We observe across Tables 3 and 4 that the hypothesis of a unit root, i.e., d = 1, cannot be rejected in the cases of UPDC NL Equity, Brent and RMZ Index (US REITS). Thus, for these three series, the results support the weak version of the Efficient Market Hypothesis. Evidence of mean reversion (i.e., d < 1) and thus transitory shocks is found in the cases of UHOMREIT NL Equity (d = 0.13), and in a lesser extend S&P 500 (d = 0.92) and SFSREIT NL Equity (0.94). For NGXINDX Index, the estimate of d is significantly higher than 1. We also noticed in Table 4 that the time trend coefficient is significantly negative in case of the UHOMREIT NL Equity, and positive for the S&P500. Focusing on the REITS, it is remarkable the difference in the degree of persistence among the three indices. Thus, mean reversion is found in the first two cases (SFSREIT and UHOMREIT) though the level of persistence is very different in the two cases, being very low for UHOMREIT and very large in case of SFSREIT. On the other hand, for UPDC the unit root null hypothesis cannot be rejected and thus shocks will be expected to be permanent in this case, supporting the random walk hypothesis and thus market efficiency.

Table 4: Estimated coefficients of the selected models in Table 3.

SERIES	NO TERMS	AN INTERCEPT	AN INTERCEPT AND A LINEAR
SFSREIT NL EQUITY	0.94 (0.90, 0.97)	4.605 (654.21)	---
UHOMREIT NL	0.13 (0.11, 0.15)	3.894 (421.19)	-0.00012 (-18.20)
UPDC NL EQUITY	1.01 (0.98, 1.05)	2.302 (130.68)	---
BRENT	1.01 (0.98, 1.04)	4.680 (181.83)	---
S&P 500	0.92 (0.89, 0.95)	7.513 (677.96)	0.00037 (2.88)
NGXINDX INDEX	1.21 (1.17, 1.26)	10.625 (130.72)	---
RMZ INDEX (US	0.97 (0.95, 1.01)	6.792 (516.60)	---

The values in parenthesis in columns 3 and 4 refer to the associated t-values of the intercept and time trend coefficients respectively.

Table 5: Estimates of the differencing parameter. Autocorrelated errors

SERIES	NO TERMS		AN INTERCEPT		AN INTERCEPT AND A LINEAR	
SFSREIT NL	1.00	(0.95, 1.06)	0.89	(0.85, 0.94)	**0.89**	**(0.85, 0.93)**
UHOMREIT NL	0.91	(0.87, 0.95)	0.32	(0.29, 0.34)	**0.20**	**(0.17, 0.23)**
UPDC NL	1.00	(0.96, 1.05)	**0.97**	**(0.92 1.03)**	0.97	(0.92 1.03)
BRENT	1.00	(0.95, 1.06)	**1.01**	**(0.97, 1.07)**	1.01	(0.97, 1.07)
S&P 500	1.00	(0.95, 1.05)	**1.05**	**(0.98, 1.12)**	1.05	(0.98, 1.12)
NGXINDX INDEX	1.00	(0.95, 1.06)	**1.09**	**(1.04, 1.13)**	1.09	(1.04, 1.13)
RMZ INDEX US	1.00	(0.96, 1.06)	**1.08**	**(1.01, 1.14)**	1.08	(1.01, 1.14)

The values in parenthesis refer to the 95% confidence bands of the non-rejection values of d. The values in bold correspond to the selected specification for each series.

Allowing for autocorrelation errors, the results are reported across Tables 5 and 6. We observe that the evidence of unit roots (d = 1) is now found in the cases of UPDC NL Equity, Brent and S&P500. Mean reversion takes place UHOMREIT NL Equity (d = 0.20), SFSREIT NL Equity (0.89) and a value of d significantly above 1 is found for RMZ Index (US REITS) and NGXINDX Index. The time trend coefficient is now significantly negative in the cases of SFSREIT and UHOMREIT rates. Thus, similarly to the previous case, two of the REITS series display mean reversion though with a very different rate of decrease, being much faster the process of reversion in case of UHOMREIT compared with SFSREIT. For UPDC shocks are expected again to be permanent.

Table 6: Estimated coefficients of the selected models in Table 5

SERIES	NO TERMS	AN NTERCEPT	AN INTERCEPT AND A LINEAR TIME TREND
SFSREIT NL EQUITY	0.89 (0.85, 0.93)	4.605 (660.70)	-0.00013 (-2.01)
UHOMREIT NL	0.20 (0.17, 0.23)	3.894 (296.66)	-0.00012 (-11.77)
UPDC NL EQUITY	0.97 (0.92 1.03)	2.302 (130.88)	---
BRENT	1.01 (0.97, 1.07)	4.680 (181.83)	---
S&P 500	1.05 (0.98, 1.12)	7.513 (679.78)	---
NGXINDX INDEX	1.09 (1.04, 1.13)	10.626	---
RMZ INDEX (US	1.08 (1.01, 1.14)	6.791 (520.91)	---

The values in parenthesis in columns 3 and 4 refer to the associated t-values of the intercept and time trend coefficients respectively.

5. Conclusions and Policy Recommendations

The primary purpose of this work is to apply the fractional integration long-memory approach to the study of REITs in Nigeria with the hopes of gaining insight into the persistence of REITs series and, by extension, the efficiency of the Nigerian REITs market. As was said before, the fractional integration method was chosen above other common methods because it is more flexible that the standard (unit root) methods based on integer degrees of differentiation.

Our results indicate first a different pattern for each of the three Nigerian REITS stocks. Specifically, for SFSREIT and UHOMREIT, the unit root null hypothesis is rejected in favor of mean reversion, implying transience of shocks, though the degree of reversion and thus persistence is very different in the two series, being much faster in case of UHOMREIT. For the UPDC, however, the results indicate evidence of unit roots and permanency of shocks, as is the case with the rest of the variables examined in the paper, namely, Brent, S&P500, NGXINDX and RMZ indices.

The results show that UPDC is efficient, and there are no opportunities for the traders to gain on the buying or selling of the stocks, however, SFSREIT and UHOMREIT are inefficient, therefore investors in those REITs equities may see higher-than-average gains if they choose to trade those stocks. In order to draw useful policy recommendations, the Nigerian stock exchange group and other regulatory bodies must investigate the cause of this peculiar pattern of stock price movements. There is a pressing need to implement innovations that facilitate the rapid dissemination of information and the development of electronic trading platforms that enable prices to respond instantly to new information, and consequently promote market efficiency. We propose that, in an effort to resuscitate the REITs industry in Nigeria, policies instituted should be growth-oriented, taking into account the specific characteristics of the REITs sector.

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