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Assessment of Inflation and Exchange Rate Hedge Attributes of Listed Property Assets in Africa

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ABSTRACT

Inflation and exchange rates are key macroeconomic indicators that affect the economic growth and development of every country. The importance of these indicators cannot be overemphasised in determining the Gross Domestic Product (GDP) of all sectors in a country. This study analyses the inflation and exchange rate hedge attributes of Africa-listed real estate properties which include, Nigeria, South Africa, and Egypt. The paper aimed to examine the risk-return characteristics of listed indirect real estate assets to determine the effects of macroeconomic factors such as inflation and exchange rates on the assets. Secondary data was used between the period of year 2008 to 2023. The study utilized quantitative data analysis such as holding period returns, trend lines, percentage changes, unit root tests, and cointegration tests. The F-bound cointegration results indicate that Nigeria-listed property assets provide a hedge against exchange rate risk in the long run but not against inflation rate risk. Furthermore, it shows that Egypt's listed property assets have a statistically significant long-run hedge against exchange rate and inflation rate movements. Also, it indicates that South Africa-listed property assets display a long-term hedge against exchange rate movements but not against inflation. The study concluded that Nigeria and South Africa-listed property assets offer long-run hedging benefits against exchange rate risk. However, Egypt-listed property assets provide statistically significant long-term hedges both against exchange and inflation rate risk. The study therefore recommends that investors should consider Egypt-listed property assets for long-run hedging against both exchange and inflation rates risk.

1.0 INTRODUCTION

Holistically, investment is seen as the act of giving up a certain amount in the present with the expectation of receiving a future return (Tukur and Shehu, 2019). Given this, every rational investor's goal is to maximize profit by achieving a greater return, higher than the investment cost. To achieve this goal, investors are often confronted with an array of investments from which it is expected to make investment decisions. Owing to this, scholars over the years have reiterated that investing in real estate is an attractive opportunity that offers the potential to achieve returns that surpass the associated investment and as such, it garners substantial interest from global investors (Emele and Umeh, 2013). However, the primitive approach to real estate investment was perceived to be limited to bricks and mortar (Amidu and Aluko, 2006) and hence, this approach is thenceforth referred to as direct real estate investment. In furtherance, with the emergence of managed funds and financial instruments related to real estate, such as Real Estate Investment Trusts (REITs), Listed Property Companies, and Listed Property Trusts, among others (Woychuck, 2019), the indirect real estate investment came into existence.

The indirect real estate assets are designed to grant investors all kinds of access to the internationalization and globalization of the real estate market, hence, enhancing diversification (Tukur & Shehu, 2019). Olaleye and Ekemode (2014) explain that diversification is a strategic option that many portfolio managers use to improve assets' performance. The study further explains that achieving improvement in assets' performance is best made possible by reducing indirect real estate investment risk and

achieving an increase in returns. However, to achieve the aforesaid, certain militating factors have been identified to affect the optimization of indirect real estate returns and one of such factors is the fluctuations of the macroeconomic factors (Pavlov, Steiner, & Wachter, 2012; Pavlov et al., 2015). The macroeconomic factors such as inflation, exchange rate, GDP, unemployment rate, and interest rate, among others, constitute the systematic risk, otherwise called the undiversifiable or unavoidable risk.

Given an emerging economic continent like Africa, indirect real estate investment is often confronted with unstable macroeconomic fluctuations which in turn increases the potential risk of the investment and mitigates the investors' motive of maximizing profit (Nguyen, 2017). Notable among the unstable macroeconomic factors in Africa is the exchange rate which significantly contributed to the intermittent rise in the inflationary rates in the continent (Bacchetta & van Wincoop, 2009; Yaya, 2015). The study further attributed the economic phenomenon to the fact that the African economy is very much dependent on importation and as such, creates an unstable hike in exchange rates and in turn leads to inflation (Eregha, 2021). Considering the adverse effects of the aforementioned macroeconomic factors on investment, this has prompted indirect real estate investors to opt for international diversification. Owing to this, investors interested in the African market are often on the lookout for thriving listed property markets across Africa. Data gathered by Thompson Reuters DataStream (2015) revealed that the major listed property markets in Africa are, Algeria, Botswana, Egypt, Kenya, Mauritius, Morocco, Nigeria, South Africa, Tunisia, Zambia, and Zimbabwe.

However, this paper considered four out of the aforementioned countries, the countries considered include South Africa, Egypt, Algeria and Nigeria. According to Business Day report 2024, the first four countries deals with both direct and indirect real estate are South Africa, Ethiopia, Egypt and Nigeria. The choice of these countries is premised on the fact that the countries are the first four major thriving economies in Africa in terms of GDP with South Africa having $373 billion GDP; Egypt having $347 billion GDP, Algeria has $266 billion GDP and Nigeria, $252 billion (Business Day Report, 2024). In addition, the aforementioned countries are not exempted from the unstable nature of the exchange and inflation rates bedeviling African countries. Also, the study period is from 2008 to 2023, the choice of the study base year, 2008 is chosen because the year marks the year of the global economic recession.

However, studies in the past have inquired about the inflationary hedge of direct real estate investment (Lee & Hong, 2011; Park & Bang, 2012; Obi-Aso, 2021). While these studies premised their investigations on different case studies such as residential and commercial real estate, the common result obtained from the studies is that direct real estate assets had a hedge against inflation. Contrarily, aside from having a dearth of research on the inflationary hedge attributes of listed properties, there is no consensus from the few available research. One of such studies was a study by Gyuorko and Linneman (1988) whose study established that REITs might protect against anticipated inflation but not against unforeseen inflation. In contrast, Park et al. (1990) discovered that equity REITs showed a negative correlation with both expected and unexpected inflation. Also, Titman and Warga (1989) proposed that REITs served as a paradoxical hedge against inflation, as they act as catalysts rather than responders to changes in inflation rates. However, results from these primitive studies cannot be used to conclude what is obtainable in the current dispensations.

A very recent study by Muckenhaupt, Hoesli and Zhu (2023) established that in stable periods, listed property assets proved effective in guarding against inflation. However, in the long run, the listed property assets provided a good hedge against expected inflation and showed a superior inflation hedging ability than stocks. However, the results best described what was obtainable in the study case studies, USA, Australia, UK and Japan and results from such developed countries cannot be used to describe what is obtainable in emerging economic countries within Africa. On this basis, the study intends to answer the following research questions: What are the holding period returns of the selected listed property assets from 2008 to 2023?, What are the effects of selected macroeconomic factors on the listed property assets? Hence, this study.

2.0 LITERATURE REVIEW

Several review has been done concerning the macroeconomic indicators, however, this study review these indicators on real estate transaction. A study was carried out by Harrami and Paulsson (2017) examined rent modeling for office market in Swedish and found that GDP is a key factor for the prediction of real estate market direction. Macroeconomic indicators including inflation rates, consumer confidence, unemployment and bond yields was noted as the cause of risk downtowns in real estate prices in USA (Buehler and Almeida, 2016). For direct real estate, a study undertaken by Namnso, Ighalo and Sanusi (2015) examined the drivers of office rent in three districts in Abuja, Nigeria and found that real GDP growth and the vacancy rate significantly determine rental growth. Karakozova (2004) identified the drivers and the best methods for modelling and forecasting property returns in Finland and found that the leading indicators to predict commercial rents are growth in service-sector, employment, GDP and output from financial and business services. The authors studied the direct real estate while there are also study that examined indirect real estate. However, Umeh and Oluwasore (2015) noted that the difference between actual inflation and expected inflation is unexpected inflation.

The ability of listed real estate (LRE) companies to hedging against inflation is examined by Muckenhaupt, Hoesli, and Zhu (2023) in three different economies: the UK, Japan, and Australia, and the US from 1975 to 2023. The study discovered that during turbulent times, the short-term hedging ability tends to be negative or zero. LRE, however, offers strong inflation protection during the stable period. Long-term inflation hedging performance of LRE is better than that of stocks, making it a strong hedge against anticipated inflation. It also find portfolios that hedge against inflation by minimizing the expected shortfall. The portfolio allocation

methodology for inflation-hedging implies that listed real estate stocks ought to hold a substantial position in the portfolios of investors. The ability of equities and housing to hedge against inflation is examined by Fehrle (2023). The study concluded that there is a strong time dependence of the hedging ability. The study also points out that, when it comes to the ability to hedge against inflation, housing is slightly better than equity. Akinsomi, Mhkabela and Taderera (2018) examined the macroeconomic drivers of direct real-estate returns in South Africa and found the GDP, interest rate and unemployment as significant drivers of real estate returns. However, the study noted that despite the macroeconomic variables playing substantial role in understanding the growth and performance of real estate. Also, there is a challenge in modelling this relationship. Lee and Lee (2012) show that only following a structural break in 1993—a tax reform that increased institutional investors' desire for large-scale REIT investments—do REITs begin to function as a hedge against expected inflation. Additionally, they highlight that large capitalization is what drives REITs' ability to hedge, suggesting that small-cap REITs are unable to do so once they are freed from the influence of large REITs. The long-term ability of real estate stocks in developing East Asian nations to fend off inflation is examined by Lee, Lee, Lai and Yang (2011). They state that LRE was not able to provide long-term inflation hedging. Ng and Higgins (2007) examined the critical determinants of the commercial real estate market performance and found that GDP, unemployment rate, office finance, insurance and real-estate services employment are the leading indicators of performance.

3.0 METHODOLOGY

This section explicitly explains the methods through which the study objectives are achieved. The study used secondary data collection method. This implies that the study used existing data for the objectives to be achieved. Owing to this, data for this study were obtained from the listed real estate companies in South Africa, Egypt, and Nigeria. The top listed property companies consider in South Africa are, Growthpoint Properties Limited (GP), South Africa Corporate Real Estate Limited Johannesburg (SACJ), Vukile Property Fund Limited (VKEJ), Emira Property Fund Limited, and Hydro Property. In Nigeria, the three listed property companies are considered: UACN Property Development Company Real Estate Investment Trust (UPDC REIT), Skye Shelter and Union Homes. For Egypt, the listed property assets to be considered are, October Development and Investment Company (OCDI), Palm Hill and Talaat Moustafa Group Holding Company (TMGH).

Data on the daily price transactions of the indirect listed property assets were obtained from the official stock exchange markets websites of the respective countries. Data on the selected macroeconomic factors were obtained from the publications of the Central Banks of respective countries. Also, the study bank on the data from the World Bank. Also, yearly data on the selected macroeconomic factors, inflation and exchange rates was used. To calculate the asset returns, the study made use of the holding period return, presented as follows:

$HP_r = \frac{I_{n+(P_{n+1}-P_n)}}{P_n}$ …….. (1)

In which,

HP_r = Holding Period Return

P_n= price per unit share of the asset at inception

P_{n+1}= price per unit share of the asset at the end

I_n= Earnings from a share's dividend throughout its holding period

Subsequently, the investigation ascertain the average return for each asset, computed in the following manner:

$\bar{x} = \frac{\sum x_i}{n}$ ……. (2)

Where:

$the\ \sum x_i$= Aggregation of individual asset returns.

n = periods

Furthermore, the study adopted percentage changes and trend lines for the inflation and exchange rates of each country. The formula are given below:

INFL = $\frac{INFL_t - INFL_{t-1}}{INFL_{t-1}}$…….. (3)

Where:

$INFL_t$ = Inflation rate in period t

$INFL_{t-1}$= Gross Domestic in the period preceding t

EXCH = $\frac{EXCH_t - EXCH_{t-1}}{EXCH_{t-1}}$…….. (4)

Where:

$EXCH_t$ = Exchange rate in period t

$EXCH_{t-1}$= Gross in the period preceding t

4.0 ANALYSES AND FINDINGS

The analyses and findings are divided into three major sections, the first section centres on the risk-return characteristics of the listed indirect real estate assets in the selected countries, the second section focuses on the trends of the selected macroeconomic, and the third section comprises unit root test and cointegration tests.

Table 1: Returns of Indirect Real Estate (IRE)

Years	Skye-Shelter (%)	Union Home (%)	UPDC REITs (%)	UAC-PROP (%)	$\bar{X}$ OF N-IRE	GP (%)	SACJ (%)	VKEJ (%)	Emira (%)	Hydro Prop (%)	$\bar{X}$ OF S-IRE	OCDI (%)	TMGH (%)	Palm Hill (%)	$\bar{X}$ OF E-IRE
2008															
2009	8.49	**5.29**		**0.80**	4.86	2.59	-5.28	0.33	-7.12	89.48	16.00		-35.86		-11.95
2010	9.57	**3.30**		**7.45**	6.77	16.86	13.95	27.30	19.67	-28.52	9.85		47.88		15.96
2011	5.04			9.41		12.52		39.58	34.71					-	-45.20
		0.06			4.84		53.84			3.36	28.80	-31.37	-44.00	60.22	
2012				**3.93**		27.07	-	-58.86	-47.18		-			-6.82	-14.84
	22.39	3.31			9.88		53.77			19.66	22.62	-43.13	5.43		
2013				**8.67**		77.81	-	-2.70	-6.41					-3.41	62.56
	20.31	-3.80			8.39		19.41			14.78	12.81	184.67	6.43		
2014			0.8	9.87		55.48	-	9.78	15.59			-		68.18	-3.45
	8.32	1.44			5.11		13.13			14.01	16.35	176.49	97.97		
2015			0.6	-0.42		65.69		13.19	-0.98			-		-	-47.19
	-10.81	-3.60			-3.56		7.25			40.08	25.05	115.16	-7.78	18.62	
2016			**2.98**	-1.97		45.06		-4.63	-12.89			-		-6.27	-68.58
	-2.76	1.62			-0.03		9.67			0.79	7.60	171.35	-28.11		
2017	5.08	0.00	**4.71**	-5.57	1.06	60.56	20.49	12.05	22.98	-2.23	22.77	592.46	39.43	28.74	220.21
2018	7.00	0.00	25.00	**3.37**	8.84	61.87	10.08	1.10	2.01	-29.94	9.02	36.66	27.18	10.09	24.64
2019				**8.71**		45.73		2.73	20.53			-		-	-68.04
	7.15	0.00	-6.47		2.35		19.17			-31.23	11.39	164.15	-4.13	35.83	
2020				**0.83**		13.13		20.73	6.82					-	-35.66
	6.71	9.86	47.77		16.29		10.40			-47.71	0.67	-26.03	-38.97	41.99	
2021				1.2		96.42		11.23	4.35			-		38.81	-
	3.64	57.11	139.20		50.29		15.07			25.18	30.45	356.63	13.33		101.50
2022				0.9	-	86.72		30.97	24.19			-		-	-39.98
	4.04	-36.35	-37.15		17.14		22.38			31.98	39.25	127.05	18.47	11.36	
2023				1.41		67.40		4.88	13.93					-	8.57
	7.32	26.64	158.90		48.57		-2.65			-3.71	15.97	26.02	59.9	60.22	
Mean	**6.77**	**4.33**	**33.63**	**3.24**		**48.99**	**5.87**	**7.18**	**6.01**	**6.40**		**-28.50**	**10.48**	**-7.61**	

This dataset provides the annual performance percentages of Nigerian, Egyptian and South African Real Estate Investment companies. To begin with, the Nigerian Real Estate companies comprise, Skye Shelter, Union Home, UPDC REITs, and UAC Property (UAC-PROP) from 2008 through 2023. Column "$\bar{X}$ OF N-IRE" provides the mean percentage return for the Nigerian real estate market (N-IRE) for each year based on data availability for that year. An examination of the figures provides insights into trends in market volatility and growth over the years.

To begin with, Skye Shelter, between 2009 and 2013, recorded rapid increase with a very high return of 22.39% in 2012. This suggests that there was a period of high performance during this time, perhaps driven by supportive economic conditions or recovery in Nigeria's real estate sector. Union Home, however, records much lower returns compared to this, even dipping into negative returns in 2013, a sign of either sectoral challenges or financial difficulties in the company. The best year for the Union Home REIT during this period was a paltry 5.29% in 2009, which, though different from Skye Shelter's volatility, is mostly stagnant or negative. The period 2014-2016 reflects a trough for most REITs, and this corresponds to economic downturn in Nigeria that would have negatively affected real estate investments. Skye Shelter experienced a sharp negative return of -10.81% in 2015, in tandem with UAC-PROP's slim negative performance and Union Home's continued struggles. This bearish streak is reflected in the negative 2015 sector average ($\bar{X}$ OF N-IRE) and near-zero return in 2016, illustrating how macroeconomic issues, such as Nigeria's oil crisis and inflationary pressures, may have impacted these investments. However, UPDC REITs that debuted in 2014 posted modest returns initially but began to outperform others in subsequent years.

In 2017, the N-REITs market witnessed mixed performances as Skye Shelter recovered to 5.08%, but UAC-PROP dipped to -5.57%. UPDC REITs posted positive growth with a return of 4.71%, being a steadying influence in a quite volatile market. UPDC REITs continued to gather momentum in subsequent years, with outstanding growth in 2018 and a record return of 47.77% in 2020. This trend indicates how UPDC REITs may have been enhanced by strategic asset acquisition, quality management, or market conditions peculiar to its portfolio during these years.

In the latter years, particularly 2021 and 2023, it was noticed that UPDC REITs posting phenomenal returns of 139.20% and 158.90%, respectively, which significantly boost the overall sector average ($\bar{X}$ OF N-IRE). These returns are reflective of UPDC's strong market position and possibly a recovery phase in Nigeria's real estate industry. Conversely, Union Home portrays very high volatility with a high of 57.11% in 2021, followed by an acute decline to -36.35% in 2022, reflecting potential risks or volatile performance determinants specific to Union Home's portfolio.

The 15-year mean values provide an insight into the long-run performance of each REIT. UPDC REITs, with a mean return of 33.63%, outperforms other entities, resonating its overall profitability and dominance of Nigeria's real estate market. Skye Shelter and Union Home, with 6.77% and 4.33% averages, respectively, post modest but consistent returns. UAC-PROP's average return of 3.24% is lower, suggesting more conservative or less volatile investment in its portfolio. The sector average of 16.29% and highs reached in 2020 also suggest that enormous growth potential exists in the Nigerian REIT sector, though it remains exposed to economic and market volatility.

In South Africa, by observing the performance over the period of 2009 to 2023, the result reveals the trends among various properties and indices represented by GP, SACJ, VKEJ, Emira, and Hydro Prop, where mean returns as well as the calculated average of S-IRE are taken as determining factors. The results for 2009 present mixed performances across the board, with GP posting a modest growth of 2.59% while SACJ and Emira lost significantly at -5.28% and -7.12%, respectively. Hydro Prop was the exception with its runaway gain of 89.48%, which single-handedly pulled the overall S-IRE average to 16.00%. This year marks the beginning of a trend of volatility and divergence in performance among the different property indices.

Furthermore, 2010 witnessed GP increasing tremendously, peaking at 16.86%, an increase from the last year. SACJ and VKEJ also increased tremendously, with SACJ rising by 13.95% and VKEJ by a staggering 27.30%. The year was characterized by its relatively high positive returns across indices, with Emira also registering a high growth rate of 19.67%. Hydro Prop, by contrast, experienced a very steep drop of -28.52%, reflecting sectoral issues for this property index. Despite this, the overall S-IRE average remained positive at 9.85%, demonstrating an overall favourable investment environment.

The year 2011 was one of the extremely rapid expansion, particularly for SACJ and VKEJ, which saw returns of 53.84% and 39.58%, respectively. GP also posted a decent performance at a growth rate of 12.52%, with Emira following closely with 34.71% growth. Hydro Prop, despite being positive at 3.36%, lagged behind its peers. The collective strong growth saw the S-IRE average closing high at 28.80%, reflecting a cheerful real estate investment market. This year registered one of the top annual averages within this period, reflecting high investor confidence and favorable market conditions for most industries.

In contrast, 2012 registered significant declines for most indices, with SACJ, VKEJ, and Emira losing big at -53.77%, -58.86%, and -47.18%, respectively. Hydro Prop, however, demonstrated resilience by registering a 19.66% increase. GP also managed to achieve a positive return of 27.07%, which stood in stark contrast to the across-the-board losses in other indices. The negative performance across a number of indices dragged down the S-IRE average to -22.62%, one of the worst years on record in terms of overall performance. This year demonstrates the potential risk and high volatility of the property sector as various external and internal incidents could have impacted these assets adversely.

Entering 2013, GP performed extremely well with a 77.81% return, while SACJ, VKEJ, and Emira still underperformed, albeit with fewer losses than in the previous year. Hydro Prop still registered a positive return of 14.78%, in line with an S-IRE average of 12.81%. This recovery phase represents a turnaround from the negative trend last year, led by GP, which propelled the gains for the period. The positive S-IRE average reflects a partial recovery in the real estate investment market, albeit it was marked by continued divergences among the indices.

In the following years, from 2014 to 2023, fluctuations in returns continued, with high returns in some years, such as GP in 2021 at 96.42% and Hydro Prop's rebound in 2022 at 31.98%. However, Hydro Prop also witnessed high losses in years such as 2020 at -47.71%, reflecting continued instability. In 2023, most indices had modest returns, with GP at 67.40%, and Hydro Prop negative at -3.71%, resulting in an S-IRE average of 15.97%, reflecting stabilization. GP and VKEJ had the best overall mean growth rates during the period, with 48.99% and 7.18%, respectively, reflecting relatively stable, high-yielding assets compared to others. This information highlights the volatility and potential in property indices, providing insights into investment strategies based on performance trends across various property segments.

The result further displays annual percentage changes of three listed property companies in Egypt – OCDI, TMGH, and Palm Hill – over a period of 2008 to 2023. The table also indicates the mean or average values for each column of E-IRE, which represents an overall or average performance measure of these indices. For the year 2009, there are just values recorded for TMGH and Palm Hill with TMGH faced a steep decline of 35.86%, while Palm Hill faced a modest decline of 11.95%. This disparity suggests TMGH might have been either more responsive to market direction or specific economic circumstances at this point. In 2010, TMGH made a spectacular recovery with a positive 47.88%, and Palm Hill also recovered, with a positive 15.96%. This recovery could either be a rebound from the previous year's downturn or the beginning of a period of growth in the industry this index represents.

The year 2011 was a steep fall for all the indices, with OCDI, TMGH, and Palm Hill dropping by 31.37%, 44.00%, and 60.22%, respectively. The average of E-IRE for that year was -45.20%, reflecting an overall drop in the performance of these assets or indices. The sharp decline can be reflective of macroeconomic problems or industry-specific falls, which must have impacted all

the assets or indices uniformly. Similarly, in 2012, all three indices experienced negative performance but not as extreme as in the previous year. OCDI, in particular, experienced a fall of 43.13%, while TMGH managed a modest gain of 5.43%, which could indicate resilience or recovery attempts.

The trend over the years also highlights high volatility in OCDI, TMGH, and Palm Hill with high gains as well as losses. For instance, during the year 2013, OCDI surged by 184.67%, as opposed to a moderate 6.43% increase in TMGH and a slight decrease of 3.41% in Palm Hill. The OCDI surge could have been precipitated by something particular to its underlying assets or sector, whereas the steady performance of TMGH suggests that it could be less volatile or responsive to the fluctuations in the markets compared to OCDI. Then, in 2014, OCDI saw another steep fall of 176.49%, against the high rise in TMGH (97.97%) and Palm Hill (68.18%). The difference between the indices might reflect differences in their underlying assets or market response to general conditions.

These wide fluctuations continued in later years, with particularly high figures for 2017, when OCDI recorded a huge increase of 592.46%, perhaps due to an unusual, extremely favourable event. TMGH and Palm Hill, on the other hand, had modest increases of 39.43% and 28.74%, respectively. The E-IRE mean for 2017 was 220.21%, which was significantly boosted by OCDI's record performance. Then once more in the years 2019 and 2020, there was another decline across the board, with OCDI, TMGH, and Palm Hill all posting negative percentages, reflecting another challenging period for these indices.

Recent years, particularly in 2021, OCDI faced a spectacular fall of 356.63%, while TMGH and Palm Hill had mixed performance with little gains. The mean for E-IRE for the year was -101.50%, reflecting overall negative performance. Then, by 2023, there is a good change of 26.02% for OCDI and 59.9% for TMGH, while Palm Hill had a very negative change of 60.22%, showing diverging performances. The averages over the entire duration are the overall trend, with OCDI standing at -28.50%, TMGH at a positive 10.48%, and Palm Hill at -7.61%. These averages confirm that TMGH had more stability and positive performance during the years, while OCDI had more volatility and averaged out to a negative return.

In conclusion, the comparative performance of Real Estate Investment from 2008 to 2023 in Nigeria, South Africa, and Egypt exhibits different growth patterns, volatilities, and resistances to distress in each nation. UPDC Nigerian REITs demonstrated strong long-term growth and sectoral dominance, while others like Union Home were not consistent. South Africa's property indices showed a mixture of high-yield years and deep troughs, with GP and VKEJ delivering the most consistent long-term returns despite sector-wide fluctuations. Egypt's property market, on the other hand, exhibited extreme volatility, especially with OCDI's erratic performance skewing the overall E-IRE trend, whereas TMGH showed relatively stable and positive average returns. In total, the statistics reveal that while investment in real estate in these markets holds tremendous potential for high returns, it is also exposed to macroeconomic fluctuations, portfolio management strategies, and country risks—denoting the imperative need for effective diversification and good risk analysis when property investment decisions are made.

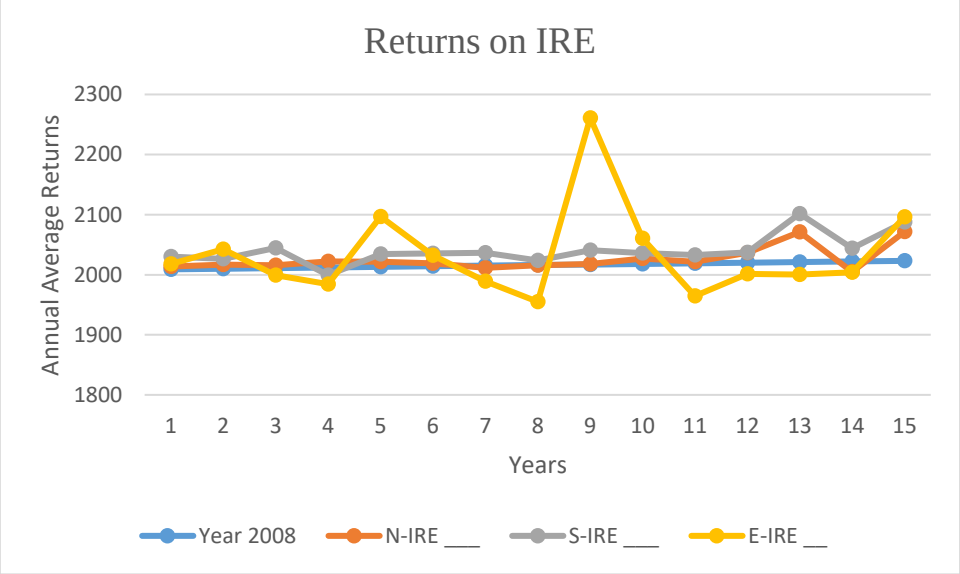

Figure 1: Returns on Indirect Real Estate Assets

Table 2: Percentage Changes in INFR of the Selected Countries

Years	SA INFR (%)	% Change in INFR (SA)	NGR INFR (%)	% Change in INFR (NGR)	EGYPT INFR (%)	% Change in INFR (EGYPT)
2008	9.34	-	11.6	-	18.3	-
2009	6.11	-34.58%	12.5	7.76%	11.8	-35.52%
2010	3.42	-44.03%	13.7	9.60%	11.3	-4.24%

2011	6.26	83.04%	10.8	-21.17%	10.1	-10.62%
2012	5.73	-8.47%	12.2	12.96%	7.1	-29.70%
2013	5.26	-8.20%	8.5	-30.33%	9.5	33.80%
2014	5.44	3.42%	8.0	-5.88%	10.1	6.32%
2015	5.16	-5.15%	9.0	12.50%	10.4	2.97%
2016	7.03	36.24%	15.7	74.44%	13.8	32.69%
2017	4.46	-36.56%	16.5	5.10%	29.5	113.77%
2018	4.51	1.12%	12.1	-26.67%	14.4	-51.19%
2019	3.97	-11.97%	11.4	-5.79%	9.2	-36.11%
2020	3.06	-22.92%	13.2	15.79%	5.00	-45.65%
2021	5.93	93.79%	17	28.79%	5.2	4.00%
2022	7.5	26.48%	18.8	10.59%	13.9	167.31%
2023	5.21	-30.53%	24.7	31.38%	33.9	143.88%
Mean	**5.52**	**2.78%**	**13.48**	**7.94%**	**13.34**	**19.45%**

Table 2 shows that from 2008 to 2023, South Africa's inflation rates fluctuated significantly. In 2008, the inflation rate stood at 9.34%, but it dropped drastically by 34.58% in 2009 to 6.11%. The downward trend continued into 2010 with a 44.03% reduction, resulting in an inflation rate of 3.42%. A recovery was observed in 2011 with an 83.04% increase, pushing the rate to 6.26%. However, the rate generally declined in subsequent years, with notable dips such as in 2012 (-8.47%) and 2013 (-8.20%).

From 2014 to 2020, the inflation rate showed marginal shifts. Highlights include a slight increase in 2014 (3.42%) and a notable jump in 2016 (36.24%) to 7.03%, likely indicating economic shocks or policy changes. However, a steep decline occurred in 2017 (-36.56%), dropping the rate to 4.46%. From 2018 to 2020, a persistent decrease culminated in a 22.92% fall in 2020 to 3.06%. This trend reversed dramatically in 2021, where a 93.79% surge brought the rate to 5.93%. Despite this rebound, 2023 saw a significant decline from -30.53% to 5.21%.

Furthermore, Nigeria's inflation rates during this period also showed variability. Starting at 11.6% in 2008, the rate increased slightly to 12.5% in 2009, reflecting a 7.76% rise. This upward trend continued in 2010 (9.60%), peaking at 13.7%. However, a sharp 21.17% reduction in 2011 led to a decline to 10.8%. After a rebound in 2012 (12.96%), the following years exhibited fluctuations. Notable declines occurred in 2013 (-30.33%) and 2014 (-5.88%), reducing the rate to 8.0%. A significant increase in 2016 (74.44%) drove the rate to 15.7%, reflecting economic challenges. From 2017 onward, inflation persisted at higher levels, peaking in 2023 at 24.7% following a 31.38% surge. Despite occasional declines, such as in 2018 (-26.67%), the general trend pointed to rising inflationary pressures in the Nigerian economy.

On the other hand, Egypt experienced pronounced volatility in inflation rates over the years. Starting at 18.3% in 2008, the inflation rate dropped significantly by 35.52% to 11.8% in 2009. This trend of decline continued in 2010 and 2011, reaching 10.1% by 2011 (-10.62%). In 2012, a substantial reduction (-29.70%) brought the rate down to 7.1%, but it surged by 33.80% in 2013, climbing to 9.5%. The inflation rate stabilized somewhat from 2014 to 2015, with minor increases of 6.32% and 2.97%, respectively. However, a sharp rise in 2016 (32.69%) escalated the rate to 13.8%, followed by a staggering 113.77% increase in 2017, reaching 29.5%. Although 2018 marked a dramatic decline (-51.19%), inflation resurged in 2022 and 2023, with rates climbing by 167.31% and 143.88%, respectively, culminating in an alarming 33.9% in 2023.

In conclusion, South Africa's inflation rates exhibited a relatively stable trend compared to the sharp fluctuations seen in Nigeria and Egypt. While South Africa's rates mostly stayed below 10%, Nigeria frequently experienced inflation above this threshold, and Egypt endured extreme volatility, especially post-2016, with rates exceeding 30%. These trends reflect underlying economic disparities, policy impacts, and external shocks across these economies.

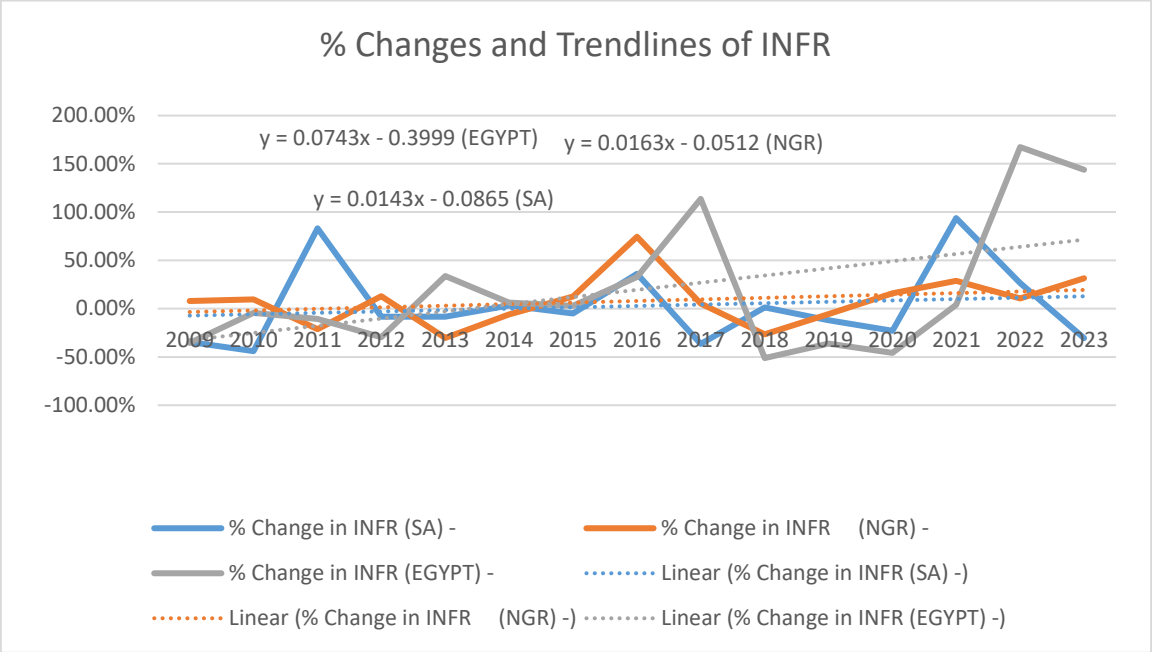

Figure 2: Trends in the INFR of the Selected Countries

Table 3: Percentage Changes in EXCH of the Selected Countries

Years	SA EXCH (%)	% Change in EXCH (SA)	NGR EXCH (%)	% Change in EXCH (NGR)	EGYPT EXCH (%)	% Change in EXCH (EGYPT)
2008	8.26		118.57		5.43	
2009	8.47	2.57%	148.88	25.57%	5.54	2.06%
2010	7.32	-13.60%	150.30	0.95%	5.62	1.40%
2011	7.26	-0.82%	153.86	2.37%	5.93	5.53%
2012	8.21	13.07%	157.50	2.36%	6.06	2.08%
2013	9.66	17.60%	157.31	-0.12%	6.87	13.45%
2014	10.85	12.40%	158.55	0.79%	7.08	3.02%
2015	12.76	17.57%	192.44	21.37%	7.69	8.67%
2016	14.71	15.29%	253.49	31.72%	10.03	30.35%
2017	13.32	-9.42%	305.79	20.63%	17.78	77.37%
2018	13.23	-0.67%	306.08	0.10%	17.77	-0.09%
2019	14.45	9.18%	306.92	0.27%	16.77	-5.61%
2020	16.46	13.92%	358.81	16.91%	15.76	-6.03%
2021	14.78	-10.21%	401.15	11.80%	15.64	-0.73%
2022	16.36	10.67%	425.98	6.19%	19.16	22.47%
2023	18.45	12.81%	638.70	49.94%	30.63	59.84%
Mean	**264.65**	**0.13%**	**12.11**	**0.14%**	**12.16**	**0.06%**

In Table 3, From the year 2008 to 2023, the South African exchange rate (SA EXCH) witnessed fluctuations in annual percentage changes. It started at 8.26% in 2008, increasing marginally by 2.57% in 2009. The rate decreased by 13.60% in 2010, and again decreased by 0.82% in 2011. It recovered in 2012 by an increase of 13.07%, and continued on to a big spike of 17.60% in 2013. This spike continued till 2016, and the exchange rate was at 14.71% with an increase of 15.29%. But in 2017, the country experienced a 9.42% decline in exchange rate, though later years also saw mixed movements. The largest increase, 17.57%, was seen in 2015, and 2023 saw another sharp increase of 12.81%, taking the SA EXCH to a rate of 18.45%. The average exchange rate for the period was 264.65% with an average annual change of 0.13%. Therefore, The South African exchange rate between 2008 and 2023 experienced significant volatility with alternating periods of sharp increases and declines, culminating in an overall moderate average annual change of 0.13%.

On the other hand, the Nigerian exchange rate (NGR EXCH) saw more drastic fluctuations. From 118.57% in 2008, it grew by 25.57% in 2009 but recorded a relatively low growth of 0.95% in 2010. In furtherance, the exchange rate registered modest annual growth percentages between 2011 and 2014. A whopping exchange rate growth of 21.37% occurred in 2015, consequently leading to an exchange rate of 192.44%. This upward trend continued with a faster rate in 2016 when there was a sharp 31.72% growth to 253.49%. The highest increase in the data set, 49.94%, occurred in 2023 and brought the exchange rate to 638.70%. This might be

due to the certain economic policies made by the current administration. Holistically, the total period exchange rate was 12.11%, and the average percentage change was 0.14%. Despite periods of sharp increases, particularly in 2015, 2016, and 2023, the Nigerian exchange rate exhibited significant volatility over the years, ultimately averaging a modest annual percentage change of just 0.14%. The exchange rate of Egypt started with 5.43% in 2008, and experienced moderate yearly changes for the next few years. Between 2009 and 2014, the growth rate varied between 2% and 13%. However, 2016 was the breakthrough with a 30.35% increase, which propelled the exchange rate to 10.03%. The trend followed in 2017, where a stunning 77.37% increase bumped the rate to 17.78%. Even though 2018 and 2019 registered negligible declines of -0.09% and -5.61%, respectively, another skyrocketing jump of 59.84% was seen in 2023, leaving the exchange rate at 30.63%. The average period exchange rate was 12.16%, and the average annual percentage change was 0.06%. The exchange rate of Egypt exhibited relative stability with moderate fluctuations until 2014, followed by dramatic surges in 2016, 2017, and 2023 that significantly increased the overall exchange rate despite minor declines in some years.

All three countries exhibited unique exchange rate patterns, Egypt showing the most volatility in percentage changes, especially in 2016 and 2017. On the other hand, Nigeria exhibited more increases in the exchange rate, with occasional peaks, such as in 2016 and 2023. South Africa experienced a smoother trend with fewer yearly swings but had major increases in 2015 and 2023. The numbers represent varied economic luck and stability of currencies across the three nations, with Nigeria and Egypt experiencing more dramatic movement than South Africa.

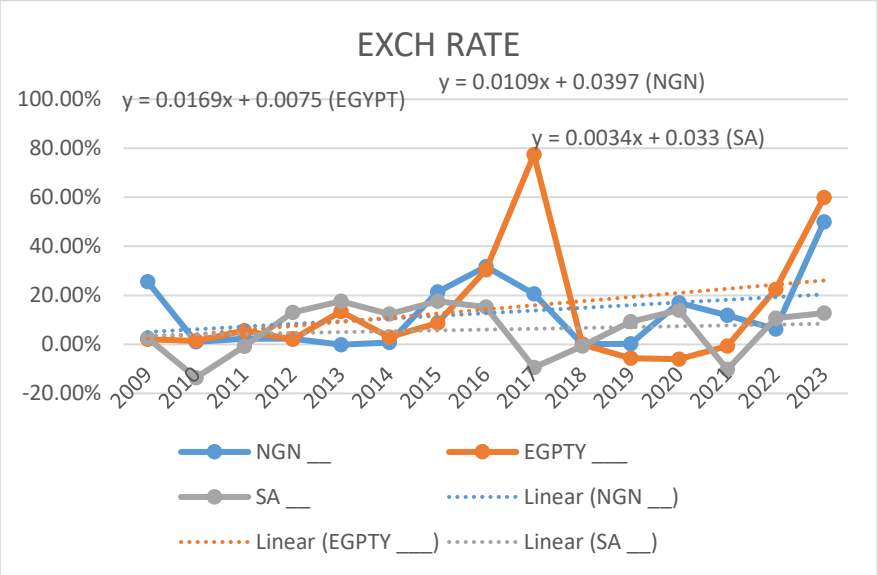

Figure 3: Trends in the EXCH Rate of the Selected Countries

Table 4: Unit Root Test

Variables	T-Statistic at Level	T-Statistic at First Difference	T-Statistic at Second Difference	Critical Value	Remarks
Egypt Exchange Rate	-0.292	-2.261	-3.604	-3.124	Stationary at Second Difference
Egypt Inflation Rate	-3.557			-3.144	Stationary at Level
Egypt RIET	-3.767			-3.099	Stationary at Level
Nigeria Exchange Rate	-3.829			-3.124	Stationary at Level
Nigeria Inflation Rate	-2.168	-3.726	-4.561	-4.008	Stationary at Second Difference
Nigeria REIT	-3.631			-1.974	Stationary at Level
SA Exchange Rate	-1.969	-3.374	-4.542	-3.76	Stationary at Second Difference
SA Inflation Rate	-3.523			-3.099	Stationary at Level
SA REIT	-3.891			-3.099	Stationary at Level

The results of the Unit Root Test in Table 4 determine macroeconomic variables and Real Estate Investment Trust (REIT) indicators' stationarity for Egypt, Nigeria, and South Africa. Non-stationarity is detected if a unit root exists, and differencing data can help achieve stationarity. A variable is regarded as stationary when its test statistic is less negative than its critical value.

For Egypt, the exchange rate at level and first difference is initially non-stationary since the test statistics of -0.292 and -2.261 are larger than the critical value of -3.124. At the second difference, the test statistic of -3.604 is larger than the critical value, and the variable is also stationary at this level. Compared to this, Egypt's inflation rate and REIT are constant at level with test statistics of -3.557 and -3.767, both less negative than their corresponding critical values (-3.144 and -3.099), indicating no differencing is required.

For Nigeria, REIT and exchange rate are stationary at level with test statistics of -3.829 and -3.631 respectively, both of which are greater than their respective critical values of -3.124 and -1.974. Whereas the inflation rate of Nigeria is non-stationary at level (-2.168) and first difference (-3.726), it becomes stationary at second difference with the test statistic of -4.561, which is greater than the critical value of -4.008.

In SA, exchange rate is non-stationary at level (-1.969) and first difference (-3.374) but stationary at the second difference with a value of -4.542, which is more negative than the critical value of -3.76. South African inflation rate and REIT are stationary at level with test statistics of -3.523 and -3.891, which are more negative than the critical value of -3.099.

Generally speaking, the variables across the three countries are level-stationary, particularly inflation and REITs, which means that they are mean-reverting and do not have to be differenced. Exchange rates tend to have to be second differenced to become stationary, which means that they are more volatile and persistent in their movement time series pattern.

Table 5: F-Bound Cointegration Result Showing if Nigeria REIT has a hedge over Exchange Rate and Inflation Rate

Variable	Co-efficient	t-statistic	probability	F-Statistic @5% sig. level	I (0)	I (1)
Nigeria Exchange Rate	0.715	2.817	0.037	9.511	3.16	4.11
Nigeria Inflation Rate	1.99	2.602	0.0481	2.025	3.15	4.44

The results enumerated in Table 5 identify whether Nigerian Real Estate Investment Trusts (REITs) serve as an inflation hedge and exchange rate volatility hedge via the application of the F-bound cointegration test. The cointegration test yields the existence of a long-run equilibrium relationship between the macroeconomic variables (exchange rate and inflation rate) and REITs.

First, for the exchange rate, the coefficient of 0.715 is positive, implying that a rise in the exchange rate (i.e., Naira depreciation) is positively related to Nigerian REIT performance. The t-statistic of 2.817 and a p-value of 0.037 imply this relationship is statistically significant at the 5% significant level. Interestingly, the computed F-statistic of 9.511 is greater than the upper critical value (I(1) = 4.11) at the 5% significance level, and this is an evidence of having strong support for a long-run cointegrating relationship. This implies that Nigerian REITs can hedge against exchange rate risk.

For inflation rate, the coefficient estimate is 1.99 and implies a positive association where increasing inflation is accompanied by greater Nigerian REIT returns. The t-statistic value of 2.602 and p-value value of 0.0481 are also measures of statistical significance at the 5% significant level. However, the F-statistic value of 2.025 falls short of both the lower limit (I(0) = 3.15) and upper limit (I(1) = 4.44), and this implies that there is no cointegration between Nigerian REITs and inflation. Hence, despite the positive and high short-run coefficient, Nigerian REITs are not demonstrated to offer a long-run hedge against inflation.

In conclusion, the results indicate that Nigerian REITs provide a long-run hedge against exchange risk, but not inflation.

Table 6: F-Bound Cointegration Result Showing if Egypt REIT has a hedge over Exchange Rate and Inflation Rate

Variable	Co-efficient	t-statistic	probability	F-Statistic @5% sig. level	I (0)	I (1)
Egypt Exchange Rate	1.317	11.2526	0.000	5.033	3.15	4.11
Egypt Inflation Rate	1.448	16.826	0.0000	13.799	3.15	4.11

The results in Table 6 indicate long-run relationship between the Real Estate Investment Trusts of Egypt (REITs), exchange rate, and inflation rate since they have passed the F-bound cointegration test, as evidenced by the fact that the F-statistics of both variables, 5.033 for exchange rate and 13.799 for the inflation rate, exceed the upper critical bound value of 4.11 at 5% significance level. This clearly suggests cointegration, which in turn signifies a long-run relationship between Egypt REIT and both macroeconomic variables.

Specifically, the coefficient estimate for the exchange rate is 1.317, with a t-statistic of 11.2526 and a p-value of 0.000, indicating a statistically significant and positive coefficient. This indicates that Egypt REIT value fluctuates as the exchange rate fluctuates in the same direction, evidencing that the REIT can be used as a hedge against exchange rate risk. Similarly, the inflation coefficient is 1.448 with a t-statistic of 16.826 and p-value of 0.0000, again claiming statistical significance. Being positive, this implies that Egyptian REIT values tend to rise when inflation increases, reflective of its potential use as a good inflation hedge.

Overall, the F-bound cointegration results firmly support the view that Egypt REITs can act as a hedge against exchange rate shocks and inflation and offer investors long-run insurance against such macroeconomic shocks.

Table 7: F-Bound Cointegration Result Showing if South Africa REIT has a hedge over Exchange Rate and Inflation Rate

Variable	Co-efficient	t-statistic	probability	F-Statistic @5% sig. level	I (0)	I (1)
South Africa Exchange Rate	2.787	7.286	0.000	4.455	3.15	4.12
South Africa Inflation Rate	2.150	2.763	0.1098	5.015	3.15	4.11

The F-Bound Cointegration test in Table 7 examines whether South Africa's Real Estate Investment Trusts (REITs) can serve as a hedge against exchange rate and inflation rate volatility. The test employs the bounds testing approach within the Autoregressive Distributed Lag (ARDL) framework that compares estimated F-statistics to critical values at the 5% significance level for the lower bound (I(0)) and upper bound (I(1)).

The first variable to be examined is that of the South Africa Exchange Rate. It has a coefficient of 2.787 and a highly significant t-statistic of 7.286 with a probability value of 0.000, showing a strong and statistically significant long-run relationship between South Africa REITs and the exchange rate. The computed F-statistic at 4.455 is greater than both the lower bound (3.15) and the upper bound (4.12) at the 5% level, indicating the presence of cointegration. This indicates that there is a long-run equilibrium relationship between South African REITs and the exchange rate, and therefore they can be used to effectively hedge against exchange rate volatility.

The second variable is South Africa Inflation Rate with a coefficient of 2.150 and t-statistic of 2.763. Its respective probability value is 0.1098, which is higher than the conventional 0.05 level, meaning that the relation is not statistically significant at the 5% level. Despite this, the F-statistic for inflation (5.015) is higher than the lower bound (3.15) and upper bound (4.11), indicating the existence of cointegration. This is an ambiguous interpretation: although the model suggests the presence of a long-run relationship between REITs and inflation, the marginal significance of the inflation coefficient is poor, possibly due to multicollinearity or the t-test's lack of power.

Briefly, the results demonstrate that South African REITs share a statistically significant long-run relation with exchange rates, in favor of their utilization as a hedge for currency risk. Although the F-statistics reveal a comparable long-run relation with inflation, the poor t-statistic for inflation brings into doubt the robustness of REITs as an inflation hedge.

5.0 CONCLUSION

The comparative analysis of Nigeria, South Africa, and Egyptian Real Estate Investment Trusts (REITs) from 2008 to 2023 reflects striking contrasts in performance, risk exposure, and macroeconomic linkages. UPDC Nigerian REITs, among others, demonstrated strong growth and resilience during the time span, albeit with intense market volatility and susceptibility to macroeconomic shocks. South African REITs also registered more stable but still very volatile returns, with some like GP and VKEJ being significant in their relatively higher mean yields. Egypt's REITs were also marred by volatility, with OCDI showing extremely unstable performance, while TMGH was the most stable and consistently positive Egypt index. These trends capture the diverse risk-return traits and domestic economic conditions' influence on real estate investment returns in these nations.

Macroeconomically, the analysis further confirms that REITs in all three countries react diversely to exchange rate fluctuations and inflation. Nigerian REITs were established to be an effective hedge against exchange rate movements, but not inflation. Egyptian REITs, however, exhibited both exchange rate and inflation hedging abilities, suggesting greater macroeconomic alignment. South African REITs, while also being an exchange rate hedge, did not show such weak or consistent inflation relationships. Such observations highlight the role of national economic conditions, policy regimes, and market institutions in shaping REIT effectiveness as vehicles of investment and inflation hedges, emphasizing the need for diversified investment strategies and solid economic forecasts.

6.0 DISCUSSION OF FINDINGS

In Nigeria, the F-bound test finds the existence of a cointegrated relationship between exchange rate and Nigerian REITs, with the estimated F-statistic (9.511) far higher than the critical value above 4.11. This finding agrees with empirical studies suggesting that real estate assets serve as partial currency hedges in emerging markets where exchange rate volatility is a persistent phenomenon (Stevenson, 2001; Lee & Lee, 2012). The positive coefficient (0.715) further indicates that Nigerian REITs are expected to increase as the Naira depreciates, further indicating that they are a good hedge against exchange rate risk. There is no such long-term cointegrating relationship between Nigerian REITs and inflation, however. Although the inflation coefficient is positive (1.99), the F-statistic (2.025) for it is below the lower bound of 3.15, and thus does not have cointegration. This opposes the assertion of Limmack and Ward (2008) that REITs are effective inflation hedges and highlights the uniqueness of Nigerian economic processes.

Furthermore, the Egyptian REIT market illustrates greater robust long-run hedging power, since both the exchange rate and inflation display cointegration with REIT returns. Both F-statistics for the variables (5.033 and 13.799 respectively) exceed the upper critical value of 4.11 and establish the existence of long-run relationships. The coefficients are also positive—1.317 for exchange rate and 1.448 for inflation—and suggest that REITs value up both in currency devaluation and rising inflation. As with Glascock et al. (2002), who argue that REITs in inflationary environments fare better than conventional equities, building a reservoir of value for

investors. The statistical significance of these relationships, evidenced by extremely low p-values, is a confirmation that Egyptian REITs are double hedges against macroeconomic risk. This is especially important in high economic volatility regimes, where such instruments are important for portfolio diversification.

The South African experience has mixed findings. South African REITs also exhibit a statistically significant long-term relationship with the exchange rate, as reflected by an F-statistic of 4.455 and significant coefficient (2.787, $p < 0.01$). International evidence supports that REITs in semi-developed nations respond to movement in exchange rates (Ling et al., 2014). However, although the F-statistic for inflation (5.015) is also larger than the upper critical value, the p-value for the inflation coefficient (0.1098) is greater than 5%. This indicates weak statistical evidence for an inflation hedge in the long term, as occurs with mixed results in research like that of Hoesli et al. (2008), with REITs' hedging ability for inflation varying by markets. Such uncertainty can be accounted for by South African inflation targeting policies or measurement errors inherent in time series inflation data.

Cumulatively, cointegration analysis lends credence to the hypothesis that REITs can serve as macroeconomic hedging instruments, though differentially efficient within country environments. Evidence suggests Egyptian REITs offer blanket hedging against inflation and currency devaluation. Nigerian REITs are generally effective against exchange rate risk but are lacking in inflation protection. South African REITs seem to hedge exchange rate fluctuations well but offer poor and statistically uncertain protection against inflation. These differences emphasize the impact of country-specific factors such as effectiveness of monetary policy, maturity of real estate markets, and structural stability of the economy.

7.0 RECOMMENDATIONS

Based on the evidence of cointegration presented in the paper, certain significant implications follow for financial analysts, policymakers, and investors contemplating Real Estate Investment Trusts (REITs) in Nigeria, South Africa, and Egypt. Nigerian REIT investors, to start with, should recognize that these investments provide a statistically significant long-term hedge against exchange rate changes, as indicated by the large F-statistic and t-statistic of the exchange rate variables. This implies that when there is a depreciation of the Naira, REITs in Nigeria can serve as a hedge. Nigerian REITs, however, do not make a good long-term inflation hedge because the F-statistic dropped below the critical values. Thus, investors with an inflation issue should diversify out of them. For policymakers, the findings highlight REIT exchange rate responsiveness to underscore currency stability as supporting the real estate investment climate.

For South Africa and Egypt, suggestiveness is understated. Egyptian REITs show long-run cointegration with the exchange rate and inflation rate variables, which contain highly significant coefficients and F-statistics higher than upper-bound values. This makes Egyptian REITs as effective hedging tools against macroeconomic volatility for which they can be advised to be included in a diversified portfolio. On the other hand, while South African REITs are effective in exchange rate risk hedging, their effectiveness as an inflation hedge is less convincing under a statistically insignificant inflation coefficient despite a supporting F-statistic. This signifies that investors need to be cautious when applying South African REITs as an inflation hedge. Analysts would do well to explore further whether multicollinearity or data constraints explain this uncertainty. Together, these findings support the appropriateness of country-specific investment approaches and prudent consideration of macroeconomic factors in portfolio positioning of REITs.

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