Acta Commercii - Independent Research Journal in the Management Sciences
ISSN: (Online) 1684-1999, (Print) 2413-1903

Real estate investment trusts: A price-based risk-adjusted performance study in South Africa

Authors:
Jonathan Tembo[1]
Chioma Okoro[1]

Affiliations:
[1]Department of Finance and Investment Management, College of Business & Economics, University of Johannesburg, Johannesburg, South Africa

Corresponding author:
Jonathan Tembo,
jtembo@uj.ac.za

Dates:
Received: 14 Mar. 2025
Accepted: 18 June 2025
Published: 16 Oct. 2025

How to cite this article:
Tembo, J. & Okoro, C., 2025, 'Real estate investment trusts: A price-based risk-adjusted performance study in South Africa', *Acta Commercii* 25(1), a1418. https://doi.org/10.4102/ac.v25i1.1418

Orientation: The study examined the price-based, risk-adjusted return performance of South African real estate investment trusts (REITs) relative to alternative benchmark investments.

Research purpose: To assess the risk-compensation ability of REIT investments on a capital-return basis compared with other asset classes, thereby informing tactical asset-allocation decisions for short-term investors.

Motivation for the study: Limited attention has been given to how South African REITs perform on a capital-return basis when dividend income is excluded, particularly during periods of economic instability.

Research design, approach and method: Daily price-based risk-adjusted returns for the leading REITs were benchmarked against the Johannesburg Stock Exchange (JSE) All Share Index, JSE Oil and Gas Index, South African Bond Index, and the NewGold Exchange-Traded Fund using the Treynor, Sharpe, Sortino, Jensen Alpha and Information Ratio measures.

Main findings: REITs showed superior capital-return performance under the Treynor measure but underperformed alternative investments under the Sharpe, Sortino, Jensen Alpha and Information Ratio measures. Results reflect capital performance only, excluding income distributions.

Practical/managerial implications: On a capital-gains basis, REITs may underperform alternatives, influencing liquidity and short-term allocation decisions for investors seeking capital stability.

Contribution/value-add: The study contributes to ongoing discussions on asset-class performance by providing South African evidence of REITs' capital-return sensitivity to multiple risk-adjusted metrics and their interaction with other assets such as bonds, oil and gold, thereby enhancing understanding of their tactical-allocation role.

Keywords: South Africa; REITs; risk-adjusted returns; investments; capital return.

Introduction

Background

The quest for alternative investments has seen investors and fund managers adjust their portfolios from traditional stock and bond investments to other investment vehicles such as real estate investment trusts (REITs). The REITs are pooled investment funds that invest in real estate securities such as real estate stock, construction and mortgage loans, or acquire income-generating real estate assets (Carstens & Wesson 2019; Naidoo 2014). Real estate investment trusts represent a form of closed-end fund that is listed and traded on organised exchanges, just like ordinary stocks. The origins of REITs date as far back as the 1960s when the United States (US) passed legislation that allowed small-time investors to pool funds for real estate investment (Lee 2020). Before that, real estate investment was a preserve of wealthy individuals and financial intermediaries, excluding large sections of society (Lee 2020). By pooling funds, small-time investors could hold fractional shares in the trust, and their ownership of the fund would be proportional to the amount they have invested in the trust. All income generated by the trust, such as rental, would then be paid as dividends to the shareholders through the trustees. However, in their formative years, REITs investments were restricted to loans as legislation did not allow real estate ownership and management under the same trust (Nareit 2022b). After further changes to US legislation in 1986, ownership and management under the same trust were then made possible (Lee 2020; Nareit 2022b).

Over time, the REITs market has grown and spread across the globe, and a total of 41 countries have since embraced the US REITs listing system (Nareit 2022a). In this regard, the total global market capitalisation of listed REITs currently stands at USD 2.5 trillion (Nareit 2022a). On the African continent, the REITs market is dominated by South Africa, which currently has 33 REITs listings on the Johannesburg Stock Exchange (JSE) (Bertoldi & Viruly 2021). While it had its first listing in 1969, the REITs listings for South Africa are remarkable in that South Africa only adopted the US-based REITs concept in 2013, although other African nations such as Ghana and Nigeria already had established REITs markets but without the same number of listings.

In South Africa, REITs are seen as alternative investments that allow for portfolio diversification and are a stable source of income that adjusts according to inflation levels (Bertoldi & Viruly 2021). Further, the regulatory transparency of REITs makes them an attractive alternative investment vehicle for fund managers. The legislation allows REITs to pay dividend income without incurring tax, and any property sales do not attract capital gains tax (Barnard 2021). In addition, REITs in South Africa must make 75% of their subject-to-tax earnings available as dividends to investors (JSE 2024). Real estate investment trusts listed on the JSE are also required to have a risk committee for monitoring risk in real estate investments, thus safeguarding the interests of investors and maintaining the stability and resilience of the real estate portfolio (JSE 2024). With these advantages, the REITs market in South Africa has been able to attract both local and international investors (Ntuli & Akinsomi 2017). As a result, the total market capitalisation for REITs rose from R50 billion in the year 2005 to a high of R450 billion in 2018 (Anderson 2023). However, the emergence of the coronavirus disease 2019 (COVID-19) pandemic and other factors such as inflation and rising interest rates saw the market capitalisation drop to R180 billion by 2023 (SA REITs Association 2023). The SA REITs price index has followed a similar pattern over the same period, rising from 200 in the year 2005 to 1100 in 2018 before declining to 400 by 2023 (Anderson 2023). While the REITs market has become a key component of the South African economy, making up 5.8% of the JSE in 2018 ahead of sectors such as healthcare and retail, COVID-19 and rising interest pressures have seen its Financial Times Stock Exchange/Johannesburg Stock Exchange (FTSE/JSE) Allshare composition reduce to around 2.5% (Moneyweb 2023). These fluctuations over time point to highly active REITs markets.

Numerous studies have been carried out on REITs from a South African context. These studies have covered different dimensions such as REITs corporate governance, determinants of residential REITs stock, comparison of South African REITs market against international markets and foreign investment and REITs performance (Carstens, Freybote & De Villiers 2018; Nosipho & Omokolade 2020; Ntuli & Akinsomi 2017; Nurick et al. 2018). However, none of these studies have looked at how REITs perform as alternative investments compared to benchmark investment vehicles such as equities, bonds, oil, and gas from a price-based risk-adjusted basis. Moreover, the previous studies have not shown if REITs investments adequately compensate for the capital risk undertaken by investors. Therefore, this study essentially makes three contributions. Firstly, it compares REITs capital risk-adjusted returns to benchmark investments to determine if South African REITs underperform or outperform traditional benchmark investments on a capital return basis. Secondly, the study assesses the capital risk compensation abilities of REITs investments which is essential for tactical asset allocation under volatile economic conditions. Thirdly, the study makes use of different risk-adjusted metrics to show how the use of each metric impacts investment performance evaluation.

Literature review

Real estate investment trusts have become a popular investment vehicle globally, offering investors exposure to real estate assets without direct ownership. This literature review critically examines existing research on REITs and financial performance, drawing on a range of studies conducted in various markets. There are studies that have examined the performance of REITs investments from a specialisation perspective to assess if focusing on a certain sector, country or sector of real estate influences REITs performance. For instance, Fuerst, Mansley and Wang (2021) probed the effects of the specialisation of REITs using non-listed funds. Using the Morgan Stanley Capital International (MSCI) measures of return and ordinary least squares (OLS) regressions, their study proved that country and sector specialisation achieve superior returns than non-specialised real estate funds. However, the weak point of the study was that it concentrated on non-listed real estate funds only. Mansley, Tse and Wang (2020) looked at the same aspect, but used Asian real estate funds and classification of the funds according to risk strategy. The study findings showed no significant differences in fund performance despite the different risk classifications. In addition, Mansley et al. (2020) also revealed that real estate funds carrying higher risk have greater specific or unsystematic risk and more volatile returns, proving that there is no reward for higher levels of specific risk. Aroul, Sabherwal and Villupuram (2022) took a different approach and focused on specialisation in the context of Environment, Social and Governance (ESG) investment. With the aid of OLS models, Aroul et al. (2022) found a positive association between REITs carrying high ESG scores and performance in terms of operational efficiency.

The study was, however, carried out in the context of American REITs investments; therefore, the findings may not be applicable to a context in a different country. On the other hand, Omokhomion, Egbu and Robinson (2018) observed that when REITs are examined according to management structure, internally managed REITs are seen to perform better than externally managed ones. Similarly, Abdul Jalil, Sarrazin Mohammad and Chai Ping (2018) considered the influence of management structure and added other aspects

such as type of property, property location and capital structure on REITs performance. Their findings showed that location aside, all the other factors have an influence on REITs performance. While Omokhomion et al. (2018) based their findings on a systematic review of previous literature, Abdul Jalil et al. (2018) adopted a correlation approach in the examination of REITs performance, implying that they only looked at the extent of linear association without verifying the causation. In addition, Abdul Jalil et al. (2018) based their findings on sample data from the Malaysian REITs market and did not consider the influence of a risk-adjusted approach to the examination of returns. Another study done by Azhar and Mohamad (2016) differentiated REITs performance based on Conventional REITs and Shariah REITs using measures such as earnings per unit, dividend yield and net asset value. Accordingly, findings from the study showed Shariah REITs had superior performance when compared to Conventional REITs.

There is also literature which has looked at REITs performance in terms of integrated performance between international financial markets. Among these are studies conducted by Ji, Marfatia and Gupta (2018), Mensi et al. (2023), Liow and Song (2022), Ijasan et al. (2021) and Armah and Amewu (2024). The main findings from the integrated performance studies revealed significant transmission of REITs returns information between REITs markets across countries. The transmissions can be static or time-varying, as suggested by Ji et al. (2018), and can be influenced by risk events such as pandemics, geopolitical tensions and economic policy uncertainties. On the other hand, Armah and Amewu (2024) noted that REITs markets do not just transmit return information but also transmit risks across countries, while Caporin, Gupta and Ravazzolo (2019) argued that the contagion from the REITs markets also spread to other markets such as the equities markets. Liow and Huang (2018) concurred that REITs market performance is interconnected and went a step further to assess the extent of interconnectedness. From this study, it was noted that in spite of the interdependence with REITs markets, the extent of linkage is moderate and the markets require a longer integration period. Similar observations were obtained from Ijasan et al. (2021) in their examination of the South African REITs market. While the integrated performance studies focused on one aspect, the connectedness of REITs markets, they differed in their methodological approach to the problem. Armah and Amewu (2024), Caporin et al. (2019) and Mensi et al. (2023) used a quantile regression approach, while Liow and Huang (2018) and Liow and Song (2018, 2022) applied Garch models and Granger causality tests. On the other hand, Ijasan et al. (2021) used a Wavelet coherence model, and Ji et al. used an Entropy-based approach. However, the integrated studies failed to capture the comparative capital return performance of the REITs markets relative to markets for traditional investment vehicles such as equities, bonds, oil, gas and gold.

Additional studies have explored real estate sector returns and their causal links with internal and external factors. Among these are studies by Albulescu et al. (2020) and Muigai, Mutea and Rintari (2022), who investigated the link between REITs returns and bank returns, and proved the existence of a bi-directional causality effect between the two. Conversely, Wu and Wang (2024) looked at macroeconomic variable determinants of REITs returns and uncovered a positive relationship between unemployment, gross domestic product (GDP), interest rates and REITs returns. In the same context, Doan and Nguyen (2018) examined board activity as a determinant of REITs returns and observed that greater levels of board activity are associated with higher returns and reduced leverage levels in post-financial crisis periods. In examining internal determinants, Azhar et al. (2014) noted positive associations between REITs returns, net asset values and size of the REIT portfolio, while risk was observed to have negative impacts. In addition, Bossman, Umar and Teplova (2022) and Zhang, Li and Roca (2023) looked at the resilience of REITs returns in the face of a crisis using the COVID-19 pandemic as a crisis measure. While Bossman et al. (2022) found a weak association between COVID-19 and REITs returns, Zhang et al. (2023) observed a consistent momentum of COVID-19 on returns. Whereas the abovementioned studies examined causality, they fell short of focusing on REITs returns from a capital risk-adjusted or comparative basis to show where REITs returns stand in relation to other investment vehicles.

Yousaf, Assaf and Demir (2024) addressed this oversight by investigating the connectedness of real estate tokens and REITs to other assets such as stocks, gold, bitcoin, and oil, and unearthed low connectedness in terms of mean and median, but higher levels with bitcoin. Sharma and Malhotra (2022) and Arnold, Ling and Naranjo (2021) went further to compare the returns of private equity real estate and listed REITs from the US market, but the studies came up with contrasting perspectives on which assets underperform against the other. In line with the current study, Petris and Alexakis (2020), Phoo and Samsudin (2018) and Hodoshima (2021) adopted a risk-adjusted returns approach and used the Sharpe, Treynor, Sortino and Jensen Alpha to compare the performance of REITs against market benchmarks.

From a European perspective, Petris and Alexakis (2020) found that REITs underperformed the benchmarks, while in the context of Malaysia, Phoo and Samsudin (2018) observed that REITs perform better than the benchmark. Emmerling, Liu and Yildirim (2017) attributed the superior performance of REITs over stocks to their easy access to debt and equity finance. In the same context, Hodoshima (2021) noted that Japanese REITs do not perform well on a risk-adjusted basis, suggesting that REITs' performance is sensitive to the country or region. Khairulanuwar and Chuweni (2020) compared REITs' performance from an efficiency perspective using operating, leverage and debt ratios, and noted that for all the measures, Islamic REITs perform better than conventional REITs, while Malhotra and Maholtra (2018) observed that for the US market, there are REITs which operate at maximum efficiency and some which operate below optimum efficiency levels.

Despite extensive research on REITs and financial performance, there is a notable gap in the literature concerning the South African context. While studies have examined REITs in various global markets, including Europe, Asia and the US, there is limited research specifically focusing on the South African REIT market. Reviewed studies have shown that REIT performance can be influenced by country context. Therefore, it is important to find out how the REIT market in South Africa performs on a risk adjusted capital return basis when compared to benchmark indicators. Empirical studies have also not yet shown if REITs provide better capital returns than the traditional asset classes from a South African context. Thus, there is need to empirically ascertain the performance of REITs in relation to traditional investments taking into account the market dynamics of South Africa. Previous studies have also not shown if REITs investments fully compensate investors for the capital risk undertaken by investors. The current study addresses this gap by using multiple risk-adjusted metrics of assessing risk compensation for SA REITs investments, providing understanding of their attractiveness as capital return assets.

Research design and methodology

The study adopted a quantitative approach to examine the price-based risk-adjusted return performance of South African REITs relative to alternative investment vehicles over a 10-year period running from March 2014 to March 2024. The period includes years when South Africa was adversely affected by economic slowdown and recession, geopolitical crises, leadership changes, the COVID-19 pandemic and an energy crisis. These events introduced volatility into the financial markets thus making the selected period ideal for assessing how REITs performed on a capital return basis relative to traditional benchmarks under conditions of market stress.

Data sources

The study used secondary quantitative data from Refinitiv Eikon Data Stream. Daily returns data for the top 5 publicly traded REITs investments from the South African market were collected with selection of the REITs based on market capitalisation statistics as of November 2023 (Anderson 2023). The selected REITs and their respective market capitalisations are presented in Table 1.

Table 1 shows selected REITs and their market capitalisations. The market capitalisation of the selected REITs makes up approximately 60% of the total market capitalisation of publicly traded REITs investments in South Africa. The performance of each REIT was benchmarked against the Johannesburg Stock Exchange (JSE) All Share Index, JSE Oil and Gas Index, South African Bond Index, and the NewGold Exchange Traded Fund (ETF). Daily returns on the benchmarks were also sourced from Refinitiv Eikon Data Stream, while the risk-free rates represented by the Repo (repurchase agreement) rates were sourced from the South African Reserve Bank (SARB). The daily return data used for REITs and benchmarks were based on price movements and excluded dividend income. As such, the performance assessment reflects only the capital appreciation component of returns. While this represents a limitation for income-oriented assets such as REITs, the findings still provide insights into capital return volatility and risk-adjusted trends relative to benchmarks.

TABLE 1: Selected real estate investment trusts and market capitalisation.

REIT investment	Market capitalisation (R Millions)
GrowthPoint	36 000
Redefine	24 000
Fortress	23 000
Resilient	14 500
Vukile	14 000

Source: SA REITs Association, 2023, *SA REITs returns likely to outperform cash, bonds in the long-term*, SA REIT, viewed from https://sareit.co.za/sa-reits-returns-likely-to-outperform-cash-bonds-in-the-long-term/

REIT, real estate investment trust.

Data analysis

The data were initially summarised through descriptive statistics such as the mean, standard deviations, minimum, maximum and skewness. The descriptive statistics gave an indicator of the dispersion and distribution of the data. Time-series plots were done to identify trends and check for fluctuations in the returns overtime, while correlation analysis was done to determine the extent of linear association between the returns and the benchmarks. The final stage of the analysis involved computing risk-adjusted returns to compare the performance of REITs relative to the benchmarks. The following risk-adjusted measures were applied (Equation 1):

Treynor ratio

$$T_p = \frac{r_p - rfr}{B_p} \quad \text{[Eqn 1]}$$

The Treynor ratio was used to compare returns in terms of excess return per unit of unique risk. In this equation, T_p represents the Treynor ratio of the investment and r_p the price-based return of the portfolio, while *rfr* is the risk-free rate of return and B_p the portfolio Beta. A positive Treynor ratio indicates superior performance over the benchmark. The Treynor ratio along with other risk-adjusted measures such as the Sharpe ratio (Equation 2), and Sortino ratio (Equation 3), Jensen's alpha and the Information Ratio (IR), have been applied in previous studies by Stakić, Singh and Kuzevski Lunnemann (2021), Stefanus and Robiyanto (2020), Anchalia (2020), Phoo and Samsudin (2018) and Hodoshima (2021).

Sharpe ratio

$$S_p = \frac{r_p - rfr}{\delta_p} \quad \text{[Eqn 2]}$$

The Sharpe ratio measured the excess return from the investments per unit of total risk (diversifiable and

undiversifiable). A positive Sharpe ratio indicates superior performance. In the equation, S_p represents the Sharpe ratio while δ_p is a measure of the standard deviation of the portfolio. The excess returns calculation remains the same as that of Treynor.

Sortino ratio

$$S_r = \frac{r_p - rfr}{\delta_d} \quad \text{[Eqn 3]}$$

The Sortino ratio is a derivation of the Sharpe ratio, but different in that instead of using the normal standard deviation, the Sortino uses the standard deviation of downside risk δ_d as the denominator. A positive Sortino ratio against a benchmark is the desired outcome.

Jensen alpha

$$\alpha_p = r_p - [rfr + B(r_m - rfr)] \quad \text{[Eqn 4]}$$

The Jensen alpha (Equation 4) was used to measure the excess return above that estimated by the Capital Asset Pricing Model (CAPM). In equation 4, α_p represents the Jensen alpha and r_p the price-based portfolio return while B is Beta measuring the market sensitivity of the portfolio, r_m is a measure of the market return and rfr the risk free rate of return. A positive alpha implies the investments have generated excess return above that predicted by the CAPM.

Information ratio

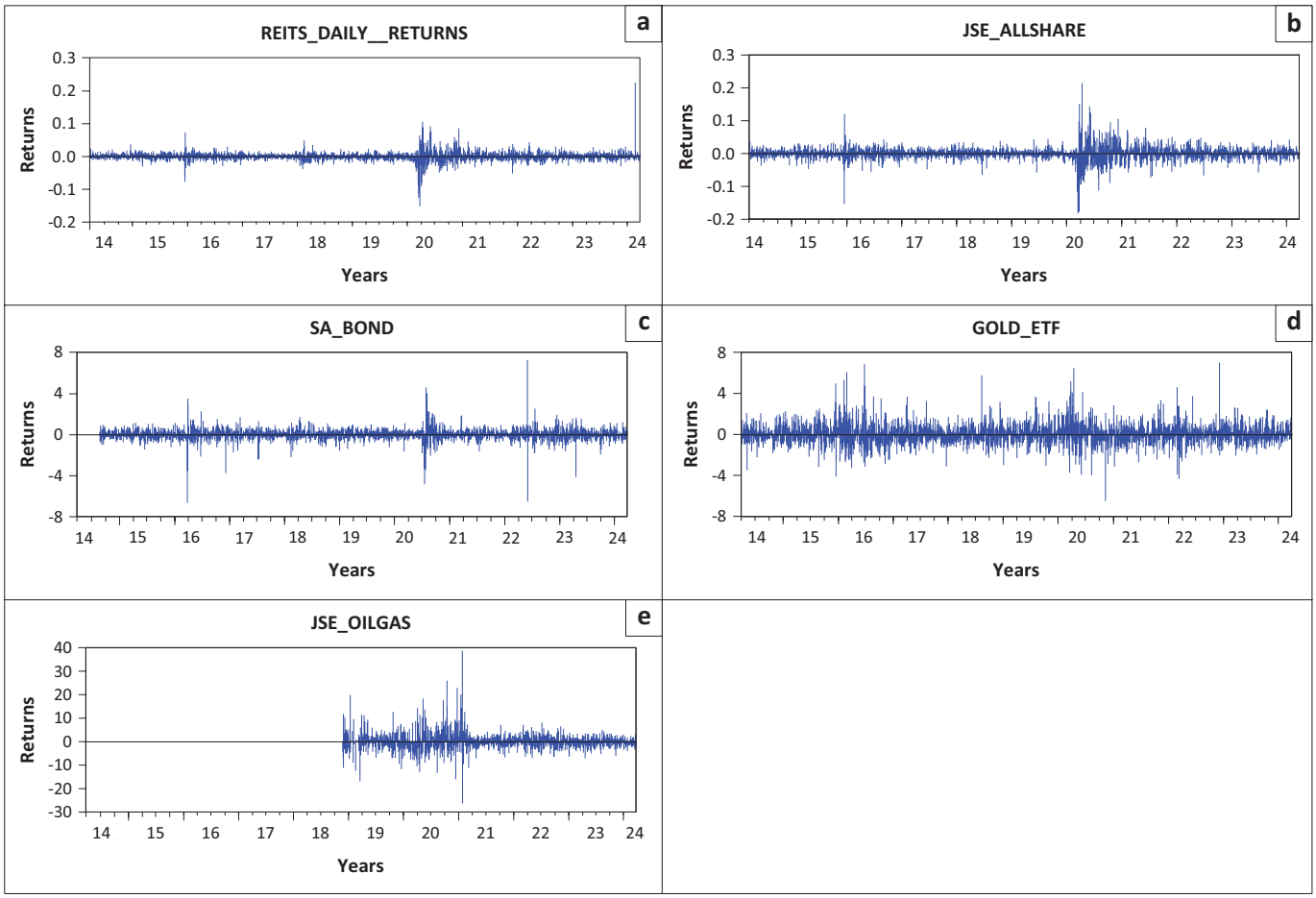
$$I_r = \frac{r_p - Br}{T_e} \quad \text{[Eqn 5]}$$

The performance of REITs investments against benchmarks was also captured using the Information Ratio (Equation 5). In the equation, I_r represents the information ratio and r_p the price-based return, while B_r is the benchmark portfolio return and T_e is the tracking error of the portfolio. The information ratio was used to compare the excess returns of the REITs against the benchmarks and consistency in attaining the excess returns through the tracking error.

Results and discussion

Trend analysis of returns

Figure 1 depicts REITs and corresponding alternative investment unadjusted daily asset price returns for the observed study period from 2014 to 2024. The returns show volatility clustering for all the assets with mean reversion. All the asset returns exhibited huge fluctuations as the year 2020 approached, a possible indicator of the response to the COVID-19 pandemic shocks. The volatility of REITs returns



JSE, Johannesburg Stock Exchange; REITs, real estate investment trusts; ETF, exchange traded fund.

FIGURE 1a-e: Real estate investment trusts and alternative investments returns.

followed an almost similar trend to that of the JSE AllShare index, suggesting co-movement in the returns of the two assets. The Gold ETF showed greater volatility than other assets, exhibiting greater fluctuation between calm and wild periods. Relative to REITs returns, the FTSE South African Bond index showed intermittent extreme swings, while the returns of the Oil and Gas index did not show much resemblance to REITs performance, suggesting significant differences in return performance between the assets.

Descriptive statistics

Table 2 shows the descriptive statistics for the selected REITs and alternative investment vehicles. For the period under study, Growthpoint had a negative daily mean price return of –0.0001 and a standard deviation of 0.018, while Redefine had a mean daily price return of 0 and a standard deviation of 0.026. The mean daily price REIT return was 0.0002, implying that average daily REIT returns were almost close to zero for the observed period. The standard deviations for the identified REITs ranged from 0.0110 to 0.0360, suggesting varying levels of capital return volatility for the studied REITs. Growthpoint, Resilient and Vukile had skewness values of -0.2310, -0.2050 and -0.05, indicating distributions with longer left tails and more frequent negative daily capital returns.

On the other hand, Redefine and Fortress had positive skewness values of 0.7030 and 9.8300, suggesting more occurrences of positive price returns. Similar to the mean returns of the REITs, the mean capital return for the JSE All Share Index (0.0002) was close to zero. Its standard deviation of 0.0210 was also close to that of the REITs, suggesting comparable volatility and confirming assertions by Caporin et al. (2019) and Liow and Huang (2018) that REITs markets spread contagion to the equities markets.

In contrast, the JSE Oil and Gas Index had a notably higher mean capital return of 0.0750 compared to the REITs and the JSE All Share Index. It also exhibited much higher volatility, as indicated by its larger standard deviation of 2.713. The South African Bond Index also had a positive mean capital return of 0.0280, significantly higher than the average REITs mean daily return of 0.0002. On the other hand, the South African Bond also reflected high volatility with a standard deviation of 0.5980 and was also negatively skewed, pointing to more occurrences of negative returns than positive ones. The Gold ETF had a mean positive return of 0.0480, which again exceeded the average daily REIT return and carried a higher standard deviation of 1.1020. The results seem to point to a better capital return performance of alternative investment vehicles such as the JSE Oil & Gas Index, South African Bond Index, and Gold ETF relative to REITs on a non-risk adjusted return basis. However, the findings also showed that REITs have lower volatility through lower standard deviations; therefore, performance assessment on a risk-adjusted was carried out to give a complete picture of REITs capital return performance relative to investment alternatives.

TABLE 2: Descriptive statistics.

Investment	Obs	Mean	SD	Min	Max	Skew.	Kurt.
Growthpoint	2497	-0.0001	0.0180	-0.1710	0.1430	-0.2310	19.3150
Redefine	2497	0.0000	0.0260	-0.2640	0.2770	0.7030	30.9300
Resilient	2497	0.0002	0.0110	-0.0970	0.0950	-0.2050	11.0540
Fortress	2497	0.0008	0.0360	-0.3560	1.0550	9.8300	296.4710
Vukile	2497	0.0002	0.0210	-0.1800	0.2140	-0.0590	19.4950
REITs daily returns	2497	0.0002	0.0140	-0.1500	0.2240	0.9730	42.7190
JSE allshare	2497	0.0002	0.0210	-0.1800	0.2140	-0.0590	19.4950
JSE oil gas	2497	0.0750	2.7130	-26.0470	38.6830	2.0090	35.8930
South African bond	2497	0.0280	0.5980	-6.6050	7.2630	-0.6480	30.4780
Gold ETF	2497	0.0480	1.1020	-6.4870	6.9990	0.5390	6.9320

Note: Returns reflect price movements only and do not include dividend distributions.
JSE, Johannesburg Stock Exchange; REITs, real estate investment trusts; ETF, exchange traded fund; SD, standard deviation; Skew, Skewness; Kurt, Kurtosis.

TABLE 3: Pairwise correlations.

Investment	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10
(1) Growthpoint	1	-	-	-	-	-	-	-	-	-
(2) Redefine	0.620*	1	-	-	-	-	-	-	-	-
(3) Resilient	0.455*	0.409*	1	-	-	-	-	-	-	-
(4) Fortress	0.003	-0.029	-0.005	1	-	-	-	-	-	-
(5) Vukile	0.547*	0.569*	0.340*	0.001	1	-	-	-	-	-
(6) REITs daily returns	0.715*	0.742*	0.521*	0.502*	0.698*	1	-	-	-	-
(7) JSE allshare	0.547*	0.569*	0.340*	0.001	1.000*	0.698*	1	-	-	-
(8) JSE oil gas	0.007	-0.013	-0.02	-0.006	0.001	-0.009	0.001	1	-	-
(9) South African bond	-0.009	-0.026	-0.025	-0.01	0.011	-0.018	0.011	0.017	1	-
(10) Gold ETF	-0.242*	-0.189*	-0.088*	-0.015	-0.158*	-0.199*	-0.158*	-0.047*	0.01	1

JSE, Johannesburg Stock Exchange; REITs, real estate investment trusts; ETF, exchange traded fund.
*, $p < 0.10$; **, $p < 0.05$; **, $p < 0.01$.

Real estate investment trusts and alternative investments return correlations

Table 3 shows the correlations between the price returns of REIT institutions and traditional alternative investments. The REIT returns exhibited high and significant correlations with each other suggesting a high degree of co-movement in price returns. Redefine returns had correlations of 0.620 and 0.569 with Growthpoint and Vukile returns, respectively. A strong correlation of 0.547 was also observed between Vukile and Growthpoint returns. Moderate linear associations of 0.409 and 0.340 were also observed between Resilient, Redefine and Vukile. The high and significant correlations suggest that the returns of REIT investments in South Africa move in tandem, possibly because of exposure to similar market conditions and factors. The high correlation values such as 0.715. 0.742, 0.698 and 0.521 between the individual REIT returns and the REIT market daily returns suggest that the individual returns are highly sensitive to overall sector movements in the REIT market. The observed high correlations imply that there may be limited diversification benefits for an investor holding investments in the REITs at the same time. On the other hand, weak correlations were also noted between some REITs. For instance, Fortress returns had an extremely low correlation of 0.001 with Vukile and a negative low correlation of -0.005 with Resilient, possibly indicating strategic investment differences between Fortress and other REITs.

In the context of broader market indices, the correlation findings also showed high correlations of 0.547 and 0.569 between the JSE Allshare index and Growthpoint and Redefine, while Vukile had a perfect correlation with the market index, confirming the strong links between these REITs and the equities market in terms of price behaviour. The JSE Oil and Gas Index and the South African Bond Index returns exhibited weak correlations with the REITs market (0.007, –0.013, –0.02, –0.009, –0.026, –0.025), suggesting that the capital returns in these markets move independent of the REITs market. The two indices also had weak correlations with other broad market indicators, such as the JSE Allshare (0.001 and 0.011) and the Gold ETF (0.017 and 0.01). Such observed weak correlations between the JSE Oil and Gas Index and the South African Bond Index with the REITs market and the broad market indicators make them good investments to hold for risk reduction and diversification purposes as their returns are uncorrelated with other market returns. The Gold ETF was observed to have negative correlations with the REITs market (Growthpoint = –0.242, Redefine = –0.189, Resilient = –0.088, Vukile = –0.158), showing that there is an inverse relationship between Gold and REIT returns. The inverse relationship may benefit risk-averse investors within the REIT market who may want to protect their portfolios against REIT market downturns and reduce portfolio volatility.

TABLE 4: Real estate investment trusts risk-adjusted performance.

Investment	Treynor	Sharpe	Jensen	Sortino	IR
Real estate investment trust risk-adjusted returns with JSE All Share Index as benchmark					
Growthpoint	-0.0003	-0.8672	-0.0001	-1.5004	-0.0233
Redefine	-0.0002	-0.7714	0.0000	-1.1688	-0.0099
Fortress	0.01268	-0.6456	-0.0002	-0.9922	0.0146
Resilient	-0.0003	-0.8399	-0.0001	-1.3505	-0.0060
Vukile	-0.0004	-0.8231	-0.0001	-1.3317	-0.0024
JSE All share	-0.0002	-1.85191	0.0000	-1.9938	0.0000
Real estate investment trust risk-adjusted returns with JSE Oil and Gas Index as benchmark					
Growthpoint	-4.6694	-0.8163	-0.0002	-1.2616	-0.0380
Redefine	1.7779	-0.6738	-0.0002	-0.9171	-0.0379
Fortress	2.3969	-0.5427	-0.0002	-0.8205	-0.0377
Resilient	-7.6146	-0.8133	-0.0002	-1.2745	-0.0379
Vukile	-19.5982	-0.7495	-0.0002	-1.0885	-0.0379
JSE OilGas Index	0.0012	0.03203	0.0000	0.0580	0.0000
Real estate investment trust risk-adjusted returns with South African Bond Index as benchmark					
Growthpoint	-0.1830	-0.8666	-0.0002	-1.4885	-0.0453
Redefine	-0.2891	-0.7661	-0.0002	-1.1503	-0.0478
Fortress	-0.2216	-0.7174	-0.0002	-0.9892	-0.0473
Resilient	-0.2614	-0.8369	-0.0002	-1.3279	-0.0477
Vukile	-0.3875	-0.8188	-0.0002	-1.3070	-0.0475
South African Bond Index	0.0001	0.01035	0.0000	0.0158	0.0000
Real estate investment trust risk-adjusted returns with Gold ETF as benchmark					
Growthpoint	0.0596	-0.8672	-0.0002	-1.5004	-0.0437
Redefine	0.0518	-0.7714	-0.0002	-1.1688	-0.0435
Fortress	0.4508	-0.6456	-0.0002	-0.9922	-0.0430
Resilient	0.0846	-0.8399	-0.0002	-1.3505	-0.0435
Vukile	0.0760	-0.8231	-0.0002	-1.3317	-0.0434
Gold ETF	0.0003	0.02275	0.0000	0.0409	0.0000

JSE, Johannesburg Stock Exchange; REITs, real estate investment trusts; ETF, exchange traded fund; IR, information ratio.

South African real estate investment trusts risk-adjusted return performance

Table 4 shows South African REITs risk-adjusted return performance relative to the benchmark indices over the examined period.

South African real estate investment trusts performance relative to the Johannesburg Stock Exchange All Share Index

Comparison of the risk-adjusted capital return performance of South African REITs relative to the benchmark revealed a consistent pattern of REITs underperformance across most measures. Growthpoint, Redefine, Resilient and Vukile had negative Treynor ratios (–0.0003, –0.0002, –0.0003, –0.0004) along with the JSE All Share (–0.0002), suggesting that the REITs investments generated capital returns lower than the risk-free rate when adjusted for systematic or market risk. Therefore, the REITs investment and the benchmark JSE All Share capital returns did not compensate for the risk undertaken relative to the market.

A similar trend was observed for the Sharpe and Sortino measures. Estimated Sharpe ratios showed the REITs and the JSE benchmark returns failed to compensate for the total risk (volatility) the assets carried on a capital return basis, while

the Sortino measures indicated that even when only the downside risk was considered, the REITs capital returns and the JSE Benchmark still generated capital returns less than the risk-free rate. Negative Jensen Alphas were also observed across all REITs, indicating that none of the REITs achieved returns above those generated by an equilibrium model represented by the CAPM.

The REITs capital returns negative information ratios (IRs) were consistent with these findings, which indicated that the investments had underperformed the benchmark when considering the volatility of the excess capital returns (tracking error). Fortress capital returns stood out among the REITs with a slightly positive Treynor ratio (0.01268) and a positive IR (0.0146), indicating the ability to manage systematic risk better than other REITs and outperforming the benchmark JSE All Share when considering the tracking error. However, like other REITs, Fortress fell short on other risk-adjusted indicators on a capital return basis. Such consistent negative risk-adjusted capital returns across all the REIT investments including the benchmark JSE All Share may have implications for tactical asset allocation decisions. For instance, short-term investors or portfolio managers with liquidity constraints, withdrawal needs, or mark-to-market reporting requirements may fail to compensate for risk through capital returns. Because of this, investing in REITs may not be a good capital-sensitive strategy in the short term when dividend income has not been paid out. This could be because of unfavorable economic conditions that affect both the overall market and particular industries, like the real estate market. These factors may include rising interest rates in the South African market, which may significantly increase borrowing costs, negatively impacting the real estate market and high volatility from global economic instability as observed during the COVID-19 pandemic and geopolitical risks. The findings contradict Phoo and Samsudin's (2018) assertion that REITs achieve superior returns than benchmarks and are consistent with Mansley et al.'s (2020) view that REITs carry high risk and offer no reward to the added volatility. However, it is important to note that dividend income was excluded from the above estimations; hence, if total investor return is included, the results may differ.

South African real estate investment trusts performance relative to the Oil and Gas Index

In the second stage of the analysis, the South African REITs were compared to the JSE Oil and Gas Index. The Benchmark Oil and Gas Index exhibited positive risk-adjusted capital returns with a Treynor ratio of 0.0012 and Sharpe and Sortino ratios of 0.0320 and 0.0580. The findings reflect that the oil and gas investments generated price-based returns in excess of risk-free returns and compensated for the risks undertaken within the market. In contrast, the REITs investments reflected mixed performance regarding the Treynor ratio performance. While Fortress and Redefine outperformed the benchmark Oil and Gas Index on a Treynor ratio basis (2.39 and 1.77), the remaining REITs investments exhibited negative price-based performance, with Growthpoint and Resilient having Treynor ratios of -4.6694 and -7.6146 respectively. The superior performance by Fortress and Redefine on a Treynor basis suggests better management of systematic real estate sector-specific risks for the specified REITs. When the risk-adjusted performance measures were altered to include the Sharpe and Sortino ratios, the risk-return performance showed extreme underperformance of the REITs investments on a price return basis. Therefore, the REITs investments did not compensate for the total risk, including the downside risk on a price return basis. The poor performance was also reflected in negative Jensen Alpha ratios and the IR. These findings resonate with the work of Yousaf et al. (2024), who observed that REITs exhibited low connectedness with the performance of more stable asset classes such as oil and gas. The difference in performance can be because of the fact that the volatility of oil and gas may lead to high returns during periods of rising prices with supply constraints and high demand significantly pushing prices up. On the other hand, REITs are more stable and provide steady but lower returns compared to the boom periods of the Oil and Gas markets. **From a tactical asset allocation perspective,** the findings suggest that oil and gas investments may serve as a source of short-term **capital appreciation.**

South African real estate investment trusts performance relative to the South African Bond Index

The South African REITs were also benchmarked against the performance of the South African Bond Index. The bond index risk-adjusted capital returns were positive, with a Treynor ratio of 0.0001, Sharpe ratio of 0.0103, and Sortino ratio of 0.0158, which indicates superior performance in excess of the risk-free rate. However, the Treynor ratios for all the REITs investments were negative, indicating capital return underperformance relative to the bond market. The negative performance suggests that South African REITs were not effectively managing the interest rate and credit risk dynamics inherent in the South African bond markets. The REITs' underperformance relative to the bond market was also confirmed when volatility and downside risk were taken into account in the Sharpe and Sortino ratios. All the REITs investments had negative Sharpe and Sortino ratios, suggesting that the investments could not adequately compensate investors for the capital risk undertaken for the examined period. The same was observed for the REITs Jensen alpha and IR, which were also negative. This shows that the capital returns generated by the REITs were lower than expected based on the CAPM and the tracking error of excess returns.

The divergence in risk-adjusted capital return performance between the benchmark South African Bond Index and South African REITs investments could be attributed to differences in capital market conditions. It is noted that REITs are part of the equities market and are susceptible to high volatility and bearish market conditions, which are

negatively impacted by increases in interest rates. Consequently, this may lead to lower REIT prices, which may contribute to lower returns. On the contrary, the bond market is relatively less volatile and is seen as a safe investment, providing consistent returns. It thrives when interest rates increase, leading to higher returns than the REITs market. Thus, from a tactical asset allocation view, bonds may offer a more stable source of capital return than REITs for liquidity-driven investors and those with short-term withdrawal needs. The findings align with Petris and Alexakis's (2020) findings that REITs investments tend to underperform against market benchmarks.

South African real estate investment trusts performance relative to the Gold ETF

In comparison to the Gold ETF, the REITs exhibited mixed risk-adjusted capital return performance. All the REITs investments had positive Treynor ratios led by Fortress with 0.4508, followed by Resilient with 0.0846 and Vukile, GrowthPoint and Redefine with 0.0760, 0.0596 and 0.0518, respectively. In terms of the Treynor measure, the REITs investments outperformed the Gold ETF, which had a lower ratio of 0.0003, indicating some ability to manage systematic risk better relative to gold, based on capital return sensitivity. On the other hand, REITs Sharpe and Sortino ratios remained negative while the Gold ETF maintained positive values of 0.02275 and 0.0409, again indicating the failure of the real estate sector to compensate for total and downside volatility in capital returns. Therefore, while some REITs can leverage certain market risk conditions better than gold, they still face substantial total and downside risk conditions. The Jensen alphas and IR were also consistently negative, giving further evidence of REITs' inability to generate excess capital return.

The findings further confirm the assertions by Hodoshima (2021) that REITs do not perform well on a risk-adjusted basis and are sensitive to country or region. In the same context, the results also give further proof of the differences in REITs and returns of other assets, as alluded to by Yousaf et al. (2024). Such differences in performance between REITs and Gold may be attributed to the assets' response to market stress. During periods of economic uncertainty, real estate values may decline because of reduced consumer spending and higher vacancy rates. At the same time, gold is seen as a safe haven during such periods, and investors tend to invest in gold, resulting in higher prices and returns. Therefore, for investors with short-term withdrawal needs or liquidity constraints, REITs may not provide sufficient capital stability, whereas gold offers better downside protection. However, as indicated earlier on the computations did not include REITs dividend income, hence the picture may be different when such income is considered.

Conclusion

The study examined the risk-adjusted capital return performance of South African REITs relative to alternative benchmark investments using a sample of the top five publicly listed REITs investments on the JSE. Daily price-based returns of the REITs were benchmarked to the JSE All Share Index, JSE Oil and Gas Index, South African Bond Index and the NewGold ETF with the aid of the Treynor, Sharpe, Sortino, Jensen Alpha and the Information Ratio. The findings showed that when the JSE All Share Index was used as the benchmark, all the REITs failed to generate sufficient capital returns to compensate for market risk across all five risk-adjusted return measures.

Replacement of the JSE All Share with the JSE Oil and Gas Index as the benchmark resulted in some of the REITs investments exhibiting superior positive capital return performance over the benchmark on the Treynor basis. When the risk-adjusted performance measures were altered to include the Sharpe and Sortino ratios, the risk-adjusted capital return performance relative to the JSE Oil and Gas Index showed underperformance of the South African REITs investments. Similar results were obtained when the REITs investments were benchmarked to the South African Bond Index, which, in contrast, had positive risk-adjusted capital returns. The divergence in risk-adjusted performance between the benchmark South African Bond Index and South African REITs investments points to the susceptibility of REITs capital investments to high volatility and adverse market conditions. In comparison to the Gold ETF, the REITs investments exhibited mixed risk-adjusted performance. All the REITs investments had positive Treynor ratios, indicating the ability to compensate for sector-specific risk relative to the benchmark. However, the rest of the risk-adjusted indicators still showed capital return underperformance of the REITs market relative to the Gold ETF when aspects such as volatility and downside risk were considered. The finding confirms the perception that gold is more of a safe haven than real estate investment, especially under economic downturns and adverse market conditions.

Recommendations

Based on these findings, investors should adopt tactical asset allocation strategies which take into account the unstable capital return characteristics of REITs. While REITs may play a strategic income generation role in long-term portfolios, they appear less suitable for investors seeking capital stability or short-term liquidity. Given their vulnerability to drawdowns during periods of economic stress, REIT allocations should be balanced with more stable assets such as bonds, oil, and gold, which showed superior capital return performance on both total and downside risk-adjusted measures. The negative Sharpe and Sortino ratios across the REITs indicate that the volatility and downside risk involved in these investments are not sufficiently compensated by their capital returns. Consequently, investors must monitor changes in macroeconomic indicators such as interest rate, inflation and credit market conditions which are likely to affect REIT valuations and volatility.

Furthermore, the mixed performance results across different risk-adjusted measures emphasise the importance

of using multiple approaches when assessing asset performance. Relying on a single indicator may not adequately capture the risk and return dimensions involved. As such, an integrated approach which takes into account systematic, total, and downside risk measures will allow for more informed tactical asset allocation decisions regarding REIT exposure. However, this study is limited by its use of price return data which excludes dividend distributions that constitute a portion of REIT investor returns. While the findings provide insights into capital return risk-adjusted performance, future studies should incorporate total return data to assess REITs' full risk return potential. Accordingly, the findings should be interpreted with caution, as incorporating dividend income in future analyses may yield different outcomes.

Acknowledgements

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

J.T. and C.O. contributed equally to the article, discussed the results and approved the final version for submission and publication.

Ethical considerations

Ethical approval to conduct this study was obtained from the University of Johannesburg College of Business and Economic Ethics Committee. The ethical clearance number is 23SOM21.

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

The data that support the findings of this study are available from the corresponding author, J.T., upon reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and are the product of professional research. The article does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The authors are responsible for this article's results, findings and content.

References

Abdul Jalil, R., Sarrazin Mohammad, I. & Chai Ping, T., 2018, 'The dynamic of location attributes toward Malaysian real estate investment trust performance', *International Journal of Engineering & Technology* 7(2.29), 1121. https://doi.org/10.14419/ijet.v7i2.29.15140

Albulescu, C.T., Bouri, E., Tiwari, A.K. & Roubaud, D., 2020, 'Quantile causality between banking stock and real estate securities returns in the US', *Quarterly Review of Economics and Finance* 78, 251–260. https://doi.org/10.1016/j.qref.2020.03.005

Anchalia, H.K., 2020, 'Performance evaluation of select exchange traded funds and its benchmark in India', *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3642663

Anderson, I., 2023, *SA REIT Association chart book: November 2023*, SA REIT Association, Johannesburg.

Armah, M. & Amewu, G., 2024, 'Quantile dependence and asymmetric connectedness between global financial market stress and REIT returns: Evidence from the COVID-19 pandemic', *Journal of Economic Asymmetries* 29, e00352. https://doi.org/10.1016/j.jeca.2024.e00352

Arnold, T.R., Ling, D.C. & Naranjo, A., 2021, 'Private equity real estate fund performance: A comparison to REITs and open-end core funds', *Journal of Portfolio Management* 47(10), 107–126. https://doi.org/10.3905/jpm.2021.1.276

Aroul, R.R., Sabherwal, S. & Villupuram, S.V., 2022, 'ESG, operational efficiency and operational performance: Evidence from Real Estate Investment Trusts', *Managerial Finance* 48(8), 1206–1220. https://doi.org/10.1108/MF-12-2021-0593

Azhar, N.E. & Mohamad, B., 2016, 'The performance of Shariah Real Estate Investment Trust and Conventional Real Estate Investment Trust in Malaysia', *Indonesian Capital Market Review* 8(1), 1. https://doi.org/10.21002/icmr.v8i1.4844

Azhar, N.E., Mohamad, B., Ariefin, I. & Zolkifli, B., 2014, 'The determinant factors of Real Estate Investment Trust (REIT)'s performance: Evidence from Asian REITs', *Indonesian Capital Market Review* 6(1), 5. https://doi.org/10.21002/icmr.v6i1.2987

Barnard, L., 2021, *SA REITs: Tax benefits for investors – SA REIT*, SA REIT Association, viewed 03 October 2024, from https://sareit.co.za/sa-reits-tax-benefits-for-investors/.

Bertoldi, A. & Viruly, F., 2021, *Role of residential real estate investment trusts (REITs) in sub-Saharan Africa*, University of Cape Town, Urban Real Estate Research Unit, Cape Town.

Bossman, A., Umar, Z. & Teplova, T., 2022, 'Modelling the asymmetric effect of COVID-19 on REIT returns: A quantile-on-quantile regression analysis', *Journal of Economic Asymmetries* 26, e00257. https://doi.org/10.1016/j.jeca.2022.e00257

Caporin, M., Gupta, R. & Ravazzolo, F., 2019, *Contagion between real estate and financial markets: A Bayesian quantile-on-quantile approach*, Working Papers, Preprint REPEC, viewed 04 October 2024, from https://ideas.repec.org/p/pre/wpaper/201913.html.

Carstens, M., Freybote, J. & De Villiers, J.U., 2018, *Foreign investment and South African real estate investment trusts (REITs)*, Stellenbosch University, viewed 04 October 2024, from https://scholar.sun.ac.za.

Carstens, R. & Wesson, N., 2019, 'The impact of South African real estate investment trust legislation on firm growth and firm value', *South African Journal of Economic and Management Sciences* 22(1), a2257. https://doi.org/10.4102/sajems.v22i1.2257

Doan, T. & Nguyen, N.Q., 2018, 'Boards of directors and firm leverage: Evidence from real estate investment trusts', *Journal of Corporate Finance* 51, 109–124. https://doi.org/10.1016/j.jcorpfin.2018.05.007

Emmerling, T.J., Liu, C.H. & Yildirim, Y., 2017, *The hybrid nature of real estate investment trusts*, Nareit, viewed 05 October 2024, from https://www.reit.com/media/nareit-media/reits-continue-provide-.

Fuerst, F., Mansley, N. & Wang, Z., 2021, 'Do specialist funds outperform? Evidence from European non-listed real estate funds', *Research in International Business and Finance* 58, 101434. https://doi.org/10.1016/j.ribaf.2021.101434

Hodoshima, J., 2021, 'Evaluation of performance of stock and real estate investment trust markets in Japan', *Empirical Economics* 61(1), 101–120. https://doi.org/10.1007/s00181-020-01869-5

Ijasan, K., Owusu Junior, P., Tweneboah, G. & Adam, A.M., 2021, 'How does South Africa's real estate investment trusts integrate with major global REITs markets? A time-frequency approach', *Scientific African* 14, e00993. https://doi.org/10.1016/j.sciaf.2021.e00993

Ji, Q., Marfatia, H. & Gupta, R., 2018, 'Information spillover across international real estate investment trusts: Evidence from an entropy-based network analysis' *North American Journal of Economics and Finance* 46, 103–113. https://doi.org/10.1016/j.najef.2018.04.002

Johannesburg Stock Exchange (JSE), 2024, *Real estate investment trusts (REITs)*, JSE, viewed 05 October 2024, from https://www.jse.co.za/trade/equities-market/equities/real-estate-investment-trusts-reits.

Khairulanuwar, A.J. & Chuweni, N.N., 2020, 'The significance and performance analysis of Malaysian real estate investment trusts', *International Journal of Law and Management* 63(4), 417–430. https://doi.org/10.1108/IJLMA-01-2020-0022

Lee, A., 2020, *The history of REITs*, Money Inc., viewed 06 October 2024, from https://moneyinc.com/the-history-of-reits/.

Liow, K.H. & Huang, Y., 2018, 'The dynamics of volatility connectedness in international real estate investment trusts', *Journal of International Financial Markets, Institutions and Money* 55, 195–210. https://doi.org/10.1016/j.intfin.2018.02.003

Liow, K.H. & Song, J.S., 2022, 'Frequency volatility connectedness and market integration in international real estate investment trusts', *Finance Research Letters* 45, 102174. https://doi.org/10.1016/j.frl.2021.102174

Malhotra, R. & Malhotra, D.K., 2018, 'An empirical analysis of the performance of residential real estate investment funds', *Applications of Management Science* 19, 21–35. https://doi.org/10.1108/S0276-897620180000019002

Mansley, N., Tse, T.C.M. & Wang, Z., 2020, 'Risk classification of Asian real estate funds and their performance☆', *Pacific Basin Finance Journal* 63, 101400. https://doi.org/10.1016/j.pacfin.2020.101400

Mensi, W., Gubareva, M., Teplova, T. & Kang, S.H., 2023, 'Spillover and connectedness among G7 real estate investment trusts: The effects of investor sentiment and global factors', *North American Journal of Economics and Finance* 66, 101919. https://doi.org/10.1016/j.najef.2023.101919

Moneyweb, 2023, *Big five SA Reits have lost over R100bn in value*, Moneyweb, viewed 06 October 2024, from https://www.moneyweb.co.za/investing/big-five-sa-reits-have-lost-over-r100bn-in-value/.

Muigai, P.W., Mutea, F. & Rintari, N., 2022, 'Relationship between real estate investment trusts (REITs) and financial performance of selected investment banks in Nairobi County, Kenya', Master's thesis, Kenya Methodist University, Kenya Methodist University Repository, viewed 06 October 2024, from http://repository.kemu.ac.ke/handle/123456789/1423.

Naidoo, H., 2014, 'The introduction of REITs to the South African property market: Opportunities for fund managers', Master's thesis, University of the Witwatersrand, Wits Institutional Repository, viewed 07 October 2024, from http://wiredspace.wits.ac.za/handle/10539/15061.

Nareit, 2022a, *Global real estate investment*, Nareit, viewed 07 October 2024, from https://www.reit.com/investing/global-real-estate-investment.

Nareit, 2022b, *History of real estate investment trusts (REITs) in the United States*, Nareit, viewed 07 October 2024, from https://www.reit.com/what-reit/history-reits.

Nosipho, M. & Omokolade, A., 2020, 'Corporate governance and REITs performance', in A.E. Oke, C. Aigbavboa & W.D. Thwala (eds.), *The construction industry in the Fourth Industrial Revolution*, pp. 205–214, Springer Nature, Cham.

Ntuli, M. & Akinsomi, O., 2017, 'An overview of the initial performance of the South African REIT market', *Journal of Real Estate Literature* 25(2), 365–388. https://doi.org/10.1080/10835547.2017.12090463

Nurick, S., Boyle, B., Morris, G., Potgieter, J. & Allen, O., 2018, 'An investigation into the relatively low uptake of residential stock within South African Real Estate Investment Trusts', *Journal of African Real Estate Research* 3(1), 61–80. https://doi.org/10.15641/jarer.v1i1.491

Omokhomion, I., Egbu, C. & Robinson, H., 2018, 'Real Estate Investment Trusts (REITs): Management structure and performance', *RELAND: International Journal of Real Estate & Land Planning* 1, 143–154. https://doi.org/10.15641/jarer.v1i1.491

Petris, N. & Alexakis, C., 2020, 'Risk-adjusted performance of European real estate investment trusts', in A. Morano, F. Tajani & D. Di Ludovico (eds.), *Smart and sustainable planning for cities and regions*, pp. 495–508, Springer Nature, Cham.

Phoo, L. & Samsudin, S., 2018, *Performance of real estate investment trusts in Malaysia*, Universiti Utara Malaysia Press, Sintok.

SA REITs Association, 2023, *SA REITs returns likely to outperform cash, bonds in the long-term*, SA REIT Association, viewed 07 October 2024, from https://sareit.co.za/sa-reits-returns-likely-to-outperform-cash-bonds-in-the-long-term/.

Sharma, M. & Malhotra, K., 2022, 'Performance and volatility analysis of real estate private equity index and listed REIT index: A USA-based study', *ECS Transactions* 107(1), 7469–7476. https://doi.org/10.1149/10701.7469ecst

Stakić, S., Singh, A. & Kuzevski Lunnemann, P., 2021, *Investment trusts*, University of Luxembourg, Department of Finance, Luxembourg.

Stefanus, A.C. & Robiyanto, R., 2020, 'Performance evaluation of exchange traded fund in the Indonesia Stock Exchange', *International Journal of Social Science and Business* 4(4), 499–505. https://doi.org/10.23887/ijssb.v4i4.29422

Wu, M.C. & Wang, C.M., 2024, 'Revisiting the nexus of REITs returns and macroeconomic variables', *Finance Research Letters* 59, 104837. https://doi.org/10.1016/j.frl.2023.104837

Yousaf, I., Assaf, A. & Demir, E., 2024, 'Relationship between real estate tokens and other asset classes: Evidence from quantile connectedness approach', *Research in International Business and Finance*, 69, 102238. https://doi.org/10.1016/j.ribaf.2024.102238

Zhang, W., Li, B. & Roca, E., 2023, 'Moments and momentum in the returns of securitized real estate: A cross-country study of risk factors driving real estate investment trusts before and during COVID-19', *Heliyon* 9(8), e18476. https://doi.org/10.1016/j.heliyon.2023.e18476