

Valuation of Real Estate Investment Trusts (REITs): An Empirical Analysis - Singapore

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Abstract

This paper examines Real Estate Investment Trusts (REITs) and explores methods for their valuation. It introduces various REIT types and analyses the Singaporean REIT (S-REIT) market. The research then investigates the effectiveness of Distribution Per Unit (DPU) as a metric for REIT performance evaluation. Employing logistic regression, the study analyses a sample of 19 S-REITs over a ten-year period. The findings suggest a positive association between DPU and exceeding benchmark returns, although not statistically significant at conventional levels. The research highlights the limitations of the model and emphasizes the importance of DPU in REIT performance assessment. It recommends incorporating DPU alongside other financial metrics and economic considerations for informed real estate investment decisions.

Keywords: Real Estate Investment Trusts, Singaporean REIT, S-REIT, REIT performance evaluation, Valuation of REIT

Introduction

In the dynamic landscape of investment opportunities, Real Estate Investment Trusts (REITs) provide a distinct investment option that differs from investing directly in real estate. By owning and managing real estate assets, these organisations function as vertically integrated businesses that provide individual investors with the chance to partake in income-producing portfolios without having to directly purchase capital-intensive properties.

REITs serve as platforms that expose investors to a wide range of real estate assets that generate income. With the ease and advantages of investing in publicly traded securities, this investment vehicle opens up access to large-scale real estate projects. The underlying properties that make up REIT portfolios include a wide range of real estate industries, including hotels, retail establishments, office buildings, residential complexes, and resorts.

REITs are particularly well-known in the financial markets of Singapore, Japan, and the United States. Their accessibility and potential for high returns have made them quite popular. Investors get the chance to take part in the real estate market without having to shoulder the obligations of managing and acquiring properties, hence making them a desirable option for investors looking to gain exposure to real estate assets that generate income since they provide ease, diversity, and liquidity all inside the confines of an investment vehicle that is publicly traded.

Types of REITs

Within the realm of REITs available at an investor's disposal, each differ with respect to the unique opportunities and risk profile that they offer. Understanding the intricacies of them, helps an investor build a durable investment portfolio.

1. **Equity REITs:** Equity Real Estate Investment Trusts (REITs) are the most common type of REIT. They own and operate income-producing real estate properties across various sectors such as residential, commercial, industrial, retail, and hospitality. Equity REITs generate income primarily through leasing space and collecting rents from

tenants. These REITs typically distribute a significant portion of their income to shareholders in the form of dividends. Equity REITs provide investors with the opportunity to invest in real estate without directly owning or managing properties, offering diversification across different property types and geographic regions.

2. **mREITs:** Mortgage Real Estate Investment Trusts (mREITs) invest in mortgages and mortgage-backed securities rather than physical properties. These REITs provide financing for real estate transactions by purchasing mortgages and mortgage-related assets, including residential and commercial mortgage-backed securities (MBS). mREITs earn income primarily through the interest payments on these investments. They may also use leverage to enhance returns but carry higher risks compared to equity REITs, particularly due to sensitivity to changes in interest rates and credit risk associated with mortgage loans.
3. **PNLRs:** Public Non-Listed REITs (PNLRs) are registered with the Securities and Exchange Commission (SEC) but do not trade on national stock exchanges. These REITs offer investors access to real estate investments but with limited liquidity options compared to publicly traded REITs. Liquidity options for PNLRs may include share repurchase programs facilitated by the REIT itself or transactions through secondary marketplaces. However, investors may face challenges in selling their shares at fair market value due to limited liquidity. PNLRs typically target income-producing real estate assets similar to equity REITs but may have different fee structures and investment strategies.
4. **Private REITs:** Private REITs are real estate funds or companies that are exempt from SEC registration and do not trade on national stock exchanges. These REITs are typically available only to institutional investors such as pension funds, endowments, and high-net-worth individuals. Private REITs operate similarly to publicly traded REITs but are not subject to the same regulatory requirements and reporting standards. Investments in private REITs may offer potential advantages such as access to specialized real estate strategies and the ability to invest in properties not available in the public markets. However, they lack liquidity as shares are not traded on public exchanges, and redemption options are limited.

Sub-Sectors

1. **Diversified Real Estate Investment Trusts (REITs):** As the name implies, these trusts seek to reduce risk by holding a variety of real estate across various industries and geographical areas. These REITs aim to lessen the impact of downturns in any one market segment by diversifying their assets. Exposure to a range of real estate asset types, such as office buildings, retail establishments, residential complexes, industrial warehouses, and hotel sites, confers benefits to investors.
For diversified real estate investment trusts (REITs), the fundamental challenge is establishing and maintaining a balance among these various properties and efficiently managing these portfolios to optimise returns.
2. **Industrial REITs:** Industrial REITs is comprised of properties like warehouses, distribution centres, and industrial facilities that are essential to the transportation and distribution of goods. Industrial features are becoming increasingly important in contemporary supply chains due to the growth of e-commerce and the rising need for speedier shipping and delivery services. The stability that comes from the assets' necessity-driven character and long-term leases with creditworthy tenants are two advantages enjoyed by industrial real estate investment trusts. Nonetheless, businesses run the danger due to seasonality of being negatively impacted by cyclical industrial real estate markets, shifts in consumer behaviour, and downturns in the economy.
3. **Hotel and Resort Real Estate Investment Trusts (REITs):** These entities hold and manage assets in the hospitality industry, such as resorts, hotels, and recreational areas. Room rents, food and beverage services, and event hosting are the means by which these REITs generate revenue. Travel patterns, tourism activities, and macroeconomic factors each have a significant impact on the profitability of hotel and resort REITs. While economic expansion and rising demand for travel might be advantageous to them, they are also vulnerable to shifts in consumer preferences, fluctuations in the hospitality sector, and competition from other alternatives to hotels like home-sharing services and vacation rentals available on Air-Bnb.

4. **Office REITs:** These investment trusts invest in real estate that is largely leased to companies to be utilised as offices. High-rise skyscrapers in core business districts and suburban office parks are two examples of these types of assets. Long-term leases provide office REITs with steady income streams, but they are susceptible to changes in the economy, tenant market demand, and corporate real estate plans. Additionally, office landlords face difficulties in updating their buildings to satisfy present-day tenant needs due to technology breakthroughs and changing work preferences, particularly flexible office hours and remote work.
5. **Healthcare REITs:** These are REITs that are comprised of healthcare properties like, skilled nursing facilities, medical office buildings, senior housing complexes, and hospitals. These facilities meet communities' fundamental health care needs as well as the ageing population's demographic with their ever-expanding healthcare requirements. The consistent need for healthcare services is advantageous for health care REITs, but they also have to deal with operational difficulties induced by the safety and standard of the facility being maintained and regulatory issues, and other difficulties being paid for their specialised assets and healthcare facilities.
6. **Retail REITs:** Retail REITs own and manage properties that house retail businesses, such as shopping centres, malls, strip malls, and freestanding retail buildings. These properties make money by renting out space to retailers and taking in rent. Changes in customer purchasing patterns, the expansion of e-commerce, and competition from internet merchants provide difficulties for retail REITs. To be competitive in the constantly evolving retail sector, they must adjust to shifting retail trends, carefully choose their tenant combinations to draw foot traffic, and improve the shopping experience.
7. **Residential REITs:** These are focused on assets intended for residential use, such as apartment complexes, single-family homes, student housing, and manufactured home communities. These homes offer housing options for single people, couples, and families from a range of socioeconomic backgrounds. Trends towards urbanisation, population expansion, and stable demand for rental housing all benefit residential REITs. They are, nevertheless, susceptible to shifts in occupancy rates, rental markets, and legal issues that have an impact on policies and landlord-tenant interactions.
8. **Specialised REITs:** These types of trusts span a broad spectrum of specialty real estate markets that don't fall into conventional categories. These REITs may make investments in specialised real estate, including infrastructure assets, forest land, data centres, self-storage facilities, and specialty real estate markets with distinct features and investment possibilities. Through exposure to various asset classes and specialised industries, specialised REITs give investors chances for diversification and possibly higher returns. However, the dynamics of market niches, operational difficulties, and the need for specialised knowledge to assess and manage investments in these industries could provide difficulties.

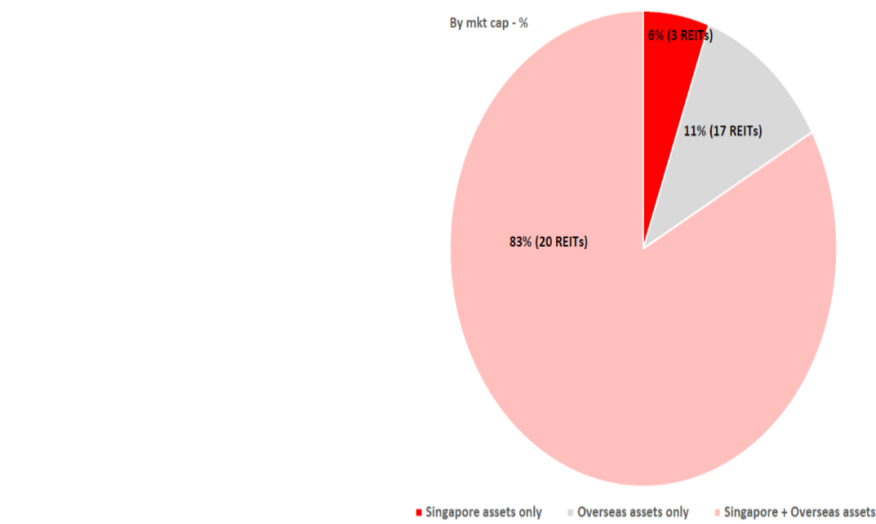
Singaporean REITs (S-REITs)

A brief introduction and overview of Singaporean REITs and its performance over time analysed by metrics like total returns, distribution yields, and sector-wise allocation.

Singapore Real Estate Investment Trusts (S-REITs) stand out as a cornerstone of Singapore's financial landscape, boasting the largest REIT market in Asia excluding Japan. As of January 31, 2024, the combined market capitalization of 41 S-REITs and property trusts is estimated to be worth \$100 billion, or nearly 12% of the market capitalization of the Singapore Exchange.

Fig. 1 – Over 90% of S-REITS own properties outside Singapore

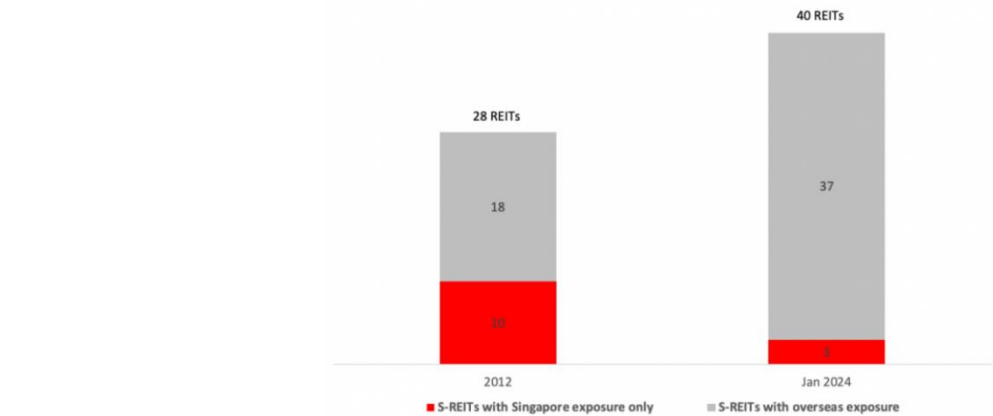
Over 90% of S-REITS own properties outside Singapore



Source: Company reports, SGX as at January 2024
Excludes one REIT whose trading is currently suspended

Fig. 2 – S-REITS increasingly investing in overseas properties

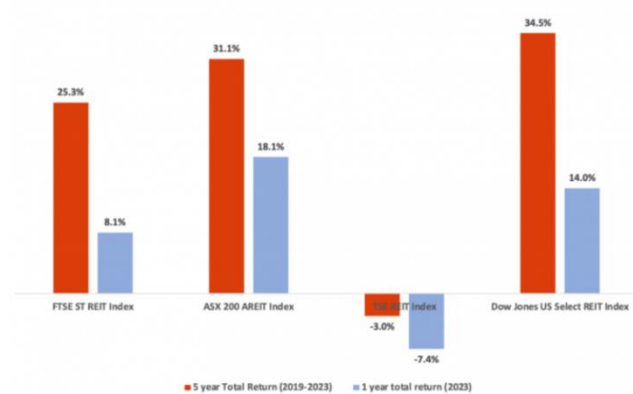
S-REITS increasingly investing in overseas properties



Source: Company reports, SGX as at January 2024
Excludes one REIT whose trading is currently suspended

The significance of them goes well beyond Singapore's boundaries as more than 90% of S-REITs and property trusts are preferred by investors looking to gain exposure to foreign real estate markets because they own properties in a variety of global locations. S-REITs owning Singapore properties must adhere to stringent distribution requirements, ensuring that at least 90% of taxable income derived from these properties is disbursed to unitholders. The Monetary Authority of Singapore has imposed strong corporate governance rules which benefit the industry by promoting investor trust and drive market stability.

Fig. 3 – Returns Comparison for 5 years vs 1 year



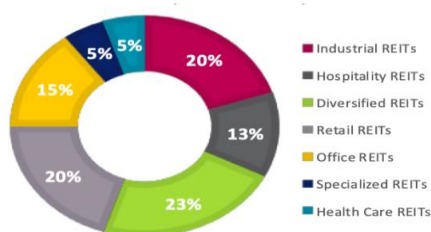
Source: SGX Research

The performance of global Real Estate Investment Trusts (REITs) indices across different regions reveals varied trends. In the Asian region, the FTSE ST REIT Index in Singapore demonstrates steady growth with an annual return of 8.1% and a 5-year total return of 25.3%. On the other hand, difficulties in the Japanese real estate sector are reflected in the TSE REIT Index in Tokyo, which has negative yearly returns and a marginally negative 5-year total return. As for Australia, the ASX 200 AREIT Index has grown well over the past five years, with an annual return of 18.1% and a total return of 31.1%. This indicates that investors are confident in the Australian real estate sector and that performance has been excellent. Comparably, the US Dow Jones US Select REIT Index shows strong growth, returning 14% annually and a remarkable 34.5% over the course of five years, indicating a robust US real estate market supported by a favourable economic environment. The broad environment of the global REITs business is illustrated by the fact that non-Asian countries also demonstrate robust development, even though Asian REIT indices generally show stability and favourable performance like S-REIT.

Fig. 4 – Choice of sub-sectors

Choice of Sub-sectors

The S-REIT market is well-diversified across different sub-sectors. Lately, the trend has been of REITs diversifying to more than one asset class with the result that "diversified" REITs now account for more than half of all S-REITs.

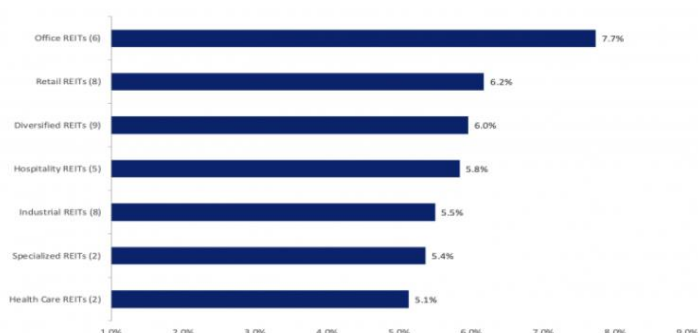


Source: Company reports, SGX Research as at February 2024

As of January 2024, S-REITs' sector-wise allocation demonstrates a diverse portfolio composition. With the largest allocation of 23%, diversified REITs take the lead. This is in line with their strategy of investing in a variety of property types to reduce risks unique to the industry. With 20% of the allocation going to each, Industrial REITs and Retail REITs are closely behind, demonstrating the importance of these industries in the S-REIT market. The market's importance for commercial and hospitality properties is reflected in the sizeable allocations held by office REITs (15%) and hotel REITs (13%). Targeting specialised markets like healthcare facilities or particular property types like data centres, specialised REITs and healthcare REITs account for lesser shares of the allocation, at 5% apiece.

Fig. 5 – Average Distribution yields by Sector

Average Distribution yields by Sector



Source: SGX Research, as at January 2024.

The yields of S-REITs distributed by sector as of January 2024 offer investors looking to generate income from real estate investments significant data. At 7.7%, office REITs have the highest average distribution yield among the group, making them a desirable choice for investors looking for income. Retail real estate investment trusts (REITs) come in second, with an average yield of 6.2%, and diversified real estate investment trusts (REITs), which combine different property types and offer a yield of 6.0% that balances risk and return. Despite industry difficulties, 5.8% yields from hospitality REITs and 5.5% from industrial REITs, which focus on warehousing and transportation buildings, are still respectable. 5.4% yields are a little lower for specialised REITs, which concentrate on specialised markets like data centres or healthcare facilities. Lastly, with a 5.1% yield, Health Care REITs provide a more cautious option. When diversifying among different sectors, investors should carefully assess their investing objectives and risk tolerance in order to maximise the income potential and stability of their portfolio.

Furthermore, the favourable tax transparency treatment from Singapore properties and certain tax exemptions on overseas income enhance the allure of investing in S-REITs. Particularly notable for offering competitive returns are S-REITs, whose dividend yields and durable total returns often outperform those of other well-established REIT markets in Asia. Additionally, a trend towards diversification across many asset classes to accommodate varying investor inclinations and risk tolerances is reflected in the S-REIT market's vast spectrum of sub-sectors.

Valuation Metrics for REITs

1. **Net Asset Value (NAV):** This is the most commonly used method that calculates the value per share of a REIT by subtracting its liabilities from its assets and dividing the remaining amount by the total number of outstanding shares. The market value of the REIT's properties is usually what makes up as its assets, whereas its liabilities are debts and other commitments. Investors can gauge the underlying assets' net worth by looking at NAV.
2. **Funds From Operations (FFO):** Funds from operations is again a commonly used indicator to evaluate the operating success of a REIT. Depreciation and amortisation are added to net income by FFO, which is then divided by the total number of outstanding shares. Since FFO does not include non-cash expenses and corrects for certain accounting procedures, it offers a more accurate view of a REIT's cash flow from its core operations.
3. **Price to Earnings (P/E) ratio:** With respect to REITs, the current stock price of the REIT is compared to its Funds from Operations (FFO) per share. Investors frequently use this statistic to evaluate the shares of a REIT in relation to its earnings. However, due to variations in capital structure and accounting treatment, P/E ratios for REITs might not be as illuminating as those for other businesses.
4. **Discounted Cash Flow (DCF):** The present value of a REIT's future cash flows is estimated using the Discounted Cash Flow (DCF) method of valuation. With this approach, future cash flows from the REIT's properties are

projected, including rental revenue after capital and operational expenses are subtracted. Subsequently, using a discount rate that takes into account both the investment risk and the time value of money, these cash flows are discounted back to their present value.

5. **Dividend Discount Model (Gordon Growth Model):** The Gordon Growth Model, or Dividend Discount Model (DDM), is based on the notion that investors evaluate REITs primarily on the income that they provide in the form of dividends to their shareholders. This model determines the present value of future dividend payments on the assumption that dividend growth will be constant. DDM is less complex than DCF, but because it only considers dividends and ignores potential fluctuations in asset value, it might not accurately reflect a REIT's underlying value.
6. **Comparable Companies Analysis (CCA):** Comparable Companies Analysis (CCA) compares financial metrics such as P/E ratios, FFO multiples, and dividend yields of a REIT to those of similar companies within the same sector or market. Analysts can determine whether a REIT is overvalued or undervalued in relation to its industry peers by benchmarking versus peers. CCA, however, is dependent on the availability of comparable businesses and might not take special considerations that are particular to each REIT into account.

Financial Metrics for REITs

1. **Gearing Ratio:** Gearing Ratio, also known as the Debt-to-Equity Ratio, measures the proportion of a REIT's capital structure financed by debt relative to equity. The computation involves dividing the REIT's total debt by its entire equity. The ratio shows how much debt financing a REIT uses to buy and operate its assets. Greater financial leverage can boost returns during expansionary times but raise the possibility of financial difficulty during recessions and this is implied by a greater gearing ratio. On the other hand, a lower gearing ratio denotes a less dependent capital structure on debt financing and a more conservative capital structure.
2. **Yield:** Yield is often referred to as Dividend Yield or Distribution Yield, represents the annual income distributed by a REIT to its investors relative to its share price. It is determined as a percentage by dividing the REIT's current share price by the annual dividend or distribution per unit (DPU). For income-seeking investors who want consistent cash flow from their investments, yield is a crucial indicator. A higher yield suggests a potentially more alluring income stream, but investors should also take the REIT's underlying fundamentals and distribution sustainability into account.
3. **Distribution per Unit (DPU):** A REIT's per-unit income from its underlying properties is measured and expressed by Distribution per Unit (DPU). It is the amount of net property income that each unit holder receives after expenses and taxes are subtracted. DPU is computed by dividing the total number of outstanding units by the total payout announced by the REIT for a certain period. DPU is a crucial metric for assessing the REIT's capacity to produce revenue and give investors a return. In order to evaluate the REIT's financial performance and the sustainability of its payouts, investors frequently track variations in DPU over time. Furthermore, a steady or increasing DPU can be a sign of the REIT's capacity to sustain or raise distributions in the long run.

Literature Review

1. **Why does price deviate from net asset value? The case of Singaporean infrastructure REITs authored by Kumala, Ye, and Zhu (2024)**

Kumala, Ye, and Zhu (2024) investigate the factors driving premiums to Net Asset Value (NAV) in infrastructure Real Estate Investment Trusts (REITs) listed in Singapore. The research examines 11 Singaporean Real Estate Investment Trusts (S-REITs) as a sample from 2017 to 2021. They discover that S-REITs with infrastructure typically trade above their net asset values. The data shows that REIT premiums are positively correlated with REIT size (market capitalization) and institutional ownership percentage, but negatively correlated with dividend yield. Nevertheless, it is discovered that variables like liquidity, ROE, trading volume, and volatility have little bearing on the explanation of price and NAV disparity. In addition, the research supports the Noise theory by

indicating that there may be a greater percentage of ignorant (noise) traders during times when infrastructure S-REIT prices and NAV vary.

2. Finding Superior Returns in Green Portfolios: Evidence from Singapore REITs authored by Joseph T.L. Ooi and Dang D.Q. Dung. (2019)

The paper "Finding Superior Returns in Green Portfolios: Evidence from Singapore REITs" by Joseph T.L. Ooi and Dang D.Q. Dung, published in 2019, investigates the relationship between the proportion of green real estate in the portfolios of Singaporean Real Estate Investment Trusts (SREITs) and their operating performance.

The study employs the Green Mark certification as a measure of portfolio greenness and examines data spanning from 2005 to 2017. The authors find a notable increase in the portfolio greenness of SREITs over the study period, with the proportion rising from 3% in 2005 to 34% in 2017. Additionally, they observe that by the end of 2017, approximately 81% of SREITs had at least one Green Mark certified property in their portfolio. The primary focus of the paper lies in evaluating whether it is advantageous for REITs to invest in green portfolios. The findings reveal a significant correlation between the greenness of a portfolio and its operating performance. Specifically, SREITs with a higher proportion of green assets demonstrate superior return on assets and operating margins compared to those with fewer green assets. However, despite the positive association between portfolio greenness and operating performance, the study does not find evidence of any positive abnormal returns (alpha) associated with green portfolios. The research contributes to the literature on sustainable investing by providing empirical evidence on the financial implications of incorporating green assets into REIT portfolios. The study underscores the importance of environmental considerations in real estate investment decisions and highlights the potential benefits of sustainable practices for REITs in Singapore.

3. The significance and performance of Singapore REITs in a mixed-asset portfolio authored by Newell, Pham, and Ooi (2015)

The paper by Newell, Pham, and Ooi (2015) delves into the significance and performance of Singapore Real Estate Investment Trusts (REITs), commonly referred to as S-REITs, within the context of mixed-asset portfolios in Singapore, spanning the period from 2003 to 2013, with a particular emphasis on their recovery following the Global Financial Crisis (GFC). Through an analysis of monthly total returns data, the study endeavours to assess both the risk-adjusted returns and diversification benefits offered by S-REITs. The findings reveal that S-REITs emerged as the best-performing asset class over the specified timeframe, demonstrating robust risk-adjusted returns. However, the study also indicates that S-REITs provided limited diversification benefits within mixed-asset portfolios during the same period. Despite this limitation, S-REITs exhibited resilience, showcasing significant contributions across the risk spectrum, particularly in the aftermath of the GFC. The research underscores the strategic importance of S-REITs within mixed-asset portfolios and their evolving role as a pivotal hub for REITs in the broader Asian landscape.

By offering empirically validated insights into S-REIT performance and portfolio construction dynamics post-GFC, the study contributes to more informed property investment decision-making practices.

4. Diversification as a Value-Adding Strategy for Asian REITs: A Myth or Reality? authored by Shan Min Charmaine Cheok, Tien Foo Sing, I-Chun Tsai (2011)

The study conducted by Cheok, Sing, and Tsai (2011) investigates the impact of diversification strategies on the financial performance of Real Estate Investment Trusts (REITs) in Asia, focusing on cash flows, expenses, risks, and returns. Using Hirschman-Herfindahl indices (HHI) based on property type and geographical region diversification data from 63 Asian REITs owning 2281 properties over the period from 2002 to 2007, the research aims to discern the effectiveness of diversification as a value-enhancing approach for Asian REITs. Through weighted least square regressions, the study evaluates the associations between diversification strategies and various financial metrics, controlling for country factors and simultaneity between cash flows, expenses, risk, and return variables. Drawing from previous research in the US, the authors discuss conflicting findings regarding the

impact of diversification on REIT performance. While some studies suggest no significant effects on economies of scale and synergy values, others hint at liquidity discounts in REITs with diversified portfolios. Against this backdrop, the study sets out to empirically test the effects of diversification on Asian REIT performance, both by property type and geographical region. The findings of the study reveal nuanced insights into the impact of diversification on Asian REITs. While diversification by property type shows no significant effects on cash flows, expenses, and risk premiums, geographical diversification presents notable variations. REITs with assets spread across different countries tend to incur higher expenses and risk premiums, suggesting potential trade-offs associated with global diversification strategies. Moreover, after controlling for various factors, including simultaneity between cash flows and risk-return variables, the study confirms the enduring negative impact of geographical diversification on REIT returns. In conclusion, the paper contributes valuable empirical evidence on the efficacy of diversification as a value-enhancing strategy for Asian REITs. By shedding light on the complexities of diversification effects, the study offers important implications for investors seeking to leverage REITs in diversified portfolios, emphasizing the need for careful consideration of both property type and geographical factors in investment decisions.

5. REIT-Specific and Macroeconomic Determinants of REIT Returns: Evidence from Singapore. Authored by Parvinder Arora, Robert Killins, Prameela Gangineni (2019)

In their study, Arora, Killins, and Gangineni (2019) investigate the determinants of Real Estate Investment Trust (REIT) returns within the context of Singapore's highly developed trade-oriented market economy. Focusing on the period from 2004 to 2013, the researchers employ panel data analyses to examine the impacts of both REIT-specific characteristics and macroeconomic factors on the returns of Singapore's Real Estate Investment Trusts (S-REITs). The findings reveal that while certain REIT-specific factors such as the book-to-market value significantly influence S-REIT returns, variables like earnings per share, debt-to-equity ratio, and dividend yield do not exhibit significant associations with returns.

Moreover, from a macroeconomic perspective, the study identifies significant relationships between S-REIT returns and various local and international economic indicators, including gross domestic product (GDP), inflation rate, exchange rate, and money supply. This suggests that the S-REIT market operates within an imperfectly integrated framework, where both domestic and global economic conditions play pivotal roles in shaping REIT returns. Overall, the research underscores the complex interplay between REIT-specific characteristics and broader macroeconomic factors in driving the performance of Singapore's Real Estate Investment Trusts, offering valuable insights for investors and policymakers navigating the dynamic landscape of the REIT market in Singapore.

6. Factors Affecting the Performance of REITs: An Evidence from Different Markets of REITs authored by Khan and Siddiqui (2019)

In their paper titled "Factors Affecting the Performance of REITs: An Evidence from Different Markets of REITs," Khan and Siddiqui delve into the examination of factors influencing the performance of Real Estate Investment Trusts (REITs) across various markets, including nascent, emerging, and developed economies. The study focuses on a sample of 21 listed REITs from five countries—Pakistan, Malaysia, Thailand, Singapore, and Hong Kong—spanning a period of 10 years from 2008 to 2018, encompassing a total of 350 observations. Utilizing Net Asset Value (NAV) as a proxy for REITs' performance, the researchers investigate both internal and external factors impacting NAV. Internally, the study explores the effects of dividend yield, net income, and size on REITs' performance, while externally, it examines the influence of stock index, inflation, and interest rates.

Employing multiple regression analysis, the findings of the study reveal several significant associations. Positive relationships are observed between NAV and dividend yield, net income, size, inflation, and stock index, indicating that higher dividend yields, net incomes, larger sizes, and favourable stock market conditions contribute to increased REITs' performance. Conversely, a negative correlation is found between NAV and interest rates, suggesting that rising interest rates may adversely affect REIT performance. The implications of the study's results extend to investors and portfolio managers, offering valuable insights into market-specific factors that impact the

performance of REITs. By enhancing understanding of these influential factors across different markets, investors and portfolio managers can make informed decisions to optimize their investment strategies and mitigate risks associated with REIT investments.

7. Efficiency Gains for Larger Asian REITs: An Empirical Study authored by Sham, Sing, and Tsai (2009)

In their paper titled "Efficiency Gains for Larger Asian REITs: An Empirical Study," Sham, Sing, and Tsai aim to investigate whether real estate investment trusts (REITs) in Asia can achieve positive economies of scale as their asset bases expand. The study focuses on examining the impact of asset size on operating expenses, revenue, and equity return of Asian REITs over the period from 2001 to 2007.

Using three different functional models—translog, semi-log quadratic, and simple quadratic—the researchers assess the relationship between asset size and squared asset size of REITs with expense variables. The findings reveal significant positive economies of scale effects in various expense categories, except for property management fees, after controlling for exogenous factors such as country, year, diversification strategy, and growth. However, the study does not find significant scale advantages in revenue, operating income, and equity costs for larger Asian REITs.

Acknowledging the limitations associated with a small sample size and potential inconsistencies in financial reporting across sample countries, the paper emphasizes the importance of focusing on asset growth strategies that can generate scale efficiency to yield positive wealth effects for shareholders. The study contributes to the literature by filling the gap in empirical research on scale economies in the context of emerging Asian REIT markets, offering insights into the operational and performance efficiency of Asian REITs.

8. The Performance of Externally Managed REITs in Asia: Further Evidence from Free Cash Flow and Agency Costs authored by Chong, Ting, and Cheng (2017)

In their paper titled "The Performance of Externally Managed REITs in Asia: Further Evidence from Free Cash Flow and Agency Costs," Chong, Ting, and Cheng aim to investigate the impact of free cash flow (FCF) on agency costs and how these factors affect the performance of real estate investment trusts (REITs) in Asia. Unlike previous studies that primarily focus on conventional publicly listed companies and non-regulated industries, this study explores the Asian REIT industry, which operates in a highly regulated environment, providing a new context for research.

The study utilizes REIT data from four major Asian REIT countries—Japan, Singapore, Hong Kong, and Malaysia—covering the period from 2002 to 2012 using panel data analysis. Employing the Generalized Method of Moments (GMM) method, known for its robustness compared to traditional methods like pooled ordinary least squares (OLS), the researchers analyse the persistence of FCF and agency costs over time in Asian REITs.

The findings reveal that FCF and agency costs persist in Asian REITs despite the regulatory framework governing the industry. The study highlights the dynamic nature of agency costs, indicating that REIT managers face significant challenges in adjusting to the equilibrium level of agency costs, which is influenced by various determinants over time. These persistent agency costs significantly impact the performance of REITs in Asia, affecting metrics such as return on assets, return on equity, REIT value, and REIT return.

While the study acknowledges limitations in data availability, particularly regarding selling, general, and administrative expenses, it suggests avenues for future research to explore issues related to the adjustment speed of agency costs in Asian REITs. From a practical standpoint, the findings offer valuable insights for REIT regulators, managers, and practitioners in Asia, informing policy planning, corporate governance initiatives, and management structures. The study underscores the importance of considering internalized REIT management structures to mitigate persistent agency costs and enhance overall efficiency in the industry.

9. Introducing REITs (Real Estate Investment Trusts) to Enhance the Risk Adjusted Returns of the Risky Direct Real Estate Portfolio authored by David Ho, Kim Hin, Justin Wong (2016)

In their paper titled "Introducing REITs (Real Estate Investment Trusts) to Enhance the Risk Adjusted Returns of the Risky Direct Real Estate Portfolio," Ho, Hin, and Wong aim to explore whether incorporating Real Estate Investment Trusts (REITs) into a pan-Asian real estate portfolio can optimize risk-adjusted returns. The study introduces a dynamic, ex ante Analytic Hierarchy Process-Strategic Asset Allocation (AHP-SAA) model and a dynamic Markowitz Quadratic Programming Tactical Asset Allocation (QP TAA) model to achieve this objective. The research focuses on constructing an efficient frontier of risk-adjusted returns for a direct real estate portfolio comprising Pan Asian office and industrial real estate markets across 13 major Asian cities, supplemented with Asian REITs. Notably, the study utilizes de-smoothed data for REITs, employing a 1st and 4th order autoregressive model, while direct real estate total return data remains in its smoothed form. The dynamic SAA model, incorporating the AHP approach, is used to construct the efficient frontier, while the dynamic Markowitz QP TAA model aims to achieve a geographically and sector-diversified portfolio.

The findings of the study indicate that introducing REITs enhances the efficient frontier of risk-adjusted returns, with de-smoothed data yielding higher total returns for every corresponding standard deviation compared to smoothed data. Specifically, the TAA for de-smoothed returns achieves a maximum Sharpe ratio of 1.44, with a total return of 15.30% and a standard deviation of 7.31%, outperforming the TAA for smoothed returns. Practically, the paper offers valuable insights for asset managers and investors, suggesting an alternative asset allocation process that incorporates expert opinions on both a long-term dynamic SAA model and a short-term dynamic Markowitz QP TAA model. The study provides guidance for practitioners and researchers seeking to refine their asset allocation strategies, particularly in the context of incorporating REITs into real estate portfolios.

10. The Dynamics of Returns and Volatility in the Emerging and Developed Asian REIT Markets authored by Anh Khoi Pham (2012)

In the paper titled "The Dynamics of Returns and Volatility in the Emerging and Developed Asian REIT Markets," Anh Khoi Pham investigates the dynamic nature of return and volatility spillovers across REIT markets in both emerging and developed Asian economies. The study spans from June 2006 to May 2011 and focuses on seven Asian REIT markets: Japan, Singapore, Hong Kong, Malaysia, Taiwan, Thailand, and South Korea.

The research findings suggest that while emerging REIT markets offer lower returns compared to their developed counterparts, they also exhibit lower levels of risk. Interestingly, the emerging REIT index outperformed the developed REIT index on a risk-adjusted basis during the study period. Additionally, the analysis reveals relatively low correlations among Asian REIT markets, ranging from 0.14 to 0.42 over the full-sample period. Notably, correlations among emerging REIT markets are found to be lower than those among developed markets, although they increased during the Global Financial Crisis. Moreover, the study employs EGARCH models to examine the transmission of REIT returns and volatility across markets. The results indicate a strong tendency for REIT returns to transmit from developed markets (e.g., Japan and Singapore) to emerging REIT markets. Regarding volatility transmission, the mechanism appears to be multidirectional, suggesting complex dynamics within the Asian REIT markets. Pham's paper contributes valuable insights into the interplay of returns and volatility in both emerging and developed Asian REIT markets. By highlighting the dynamics of return and volatility spillovers, as well as the varying correlations among markets, the study enhances our understanding of the interconnectedness and risk characteristics of Asian REITs. Published in June 2020, this research provides timely insights into the behaviour of Asian REIT markets during a significant period of economic and financial turbulence.

11. Top of Form

Research Gap

There is a noticeable lack of quantitative research on alternate techniques for evaluating Real Estate Investment Trusts (REITs), despite the fact that the majority of research on REITs typically focuses on the six classic valuation methodologies, which frequently rely on interdependent metrics. Financial parameters provide another often-overlooked option for assessment and are easily extracted from REIT databases. The Distribution Per Unit (DPU), Yield, and Gearing Ratio are a few examples of metrics that offer important insights into the performance and financial health of REITs. Nevertheless, despite their importance in evaluating REITs, these indicators haven't garnered sufficient consideration in the academic literature. Consequently, to improve our comprehension of REIT performance and valuation, it is evident that more investigation and analysis of these financial measures is essential. Investors and analysts would be able to make better decisions if such research provides a more thorough and nuanced understanding of the REIT market.

Research Methodology

Research Objectives

- To evaluate the Net Asset Value (NAV) Compound Annual Growth Rate (CAGR) of Real Estate Investment Trusts (REITs) over a ten-year time frame in order to assess their performance.
- To determine if REITs beat a benchmark, which is the 10-year Singapore Government Bond Yield (2.7%).
- To ascertain the degree to which metric influences the probability of REITs exceeding the benchmark.

Research Design

Applying logistic regression methodology using Jamovi, the study employs a quantitative research design to investigate the relationship between REIT performance and DPU. The dependent variable is coded as 1 in the analysis if the NAV CAGR is greater than the benchmark and 0 in the other case. The independent variable is DPU. To guarantee a thorough examination of REIT performance in comparison to the benchmark, the data is gathered over the course of ten years.

Data Collection

The data utilized for conducting the statistical analysis was sourced from Reitdata.com for the time periods of both 2014 and 2023. Using data from Bloomberg, a systematic cross-verification procedure was carried out to guarantee the dataset's dependability and accuracy. The exhaustive process of verifying was carried out in order to guarantee the accuracy and consistency of the data utilised in the research. Given the gap of almost a decade between two time period (2014) and (2023), data was evaluated and chosen manually as REITs get listed and de-listed throughout time. Through cross-referencing data from several reliable sources, the study sought to improve the validity and robustness of the statistical test findings.

Variable Selection

Dependent Variable: The dependent variable is a binary indicator that shows whether or not a real estate investment trust's 10-year NAV compound annual growth rate (CAGR) exceeds the benchmark, denoted by a code of 1.

Independent Variable: Distribution Per Unit (DPU) is the independent variable that is used to predict REIT performance.

Hypothesis Formulation

Null Hypothesis (H0): The probability of REITs beating the benchmark and DPU do not significantly correlate.

Alternative Hypothesis (H1): The probability that REITs will outperform the benchmark is significantly correlated with DPU.

Data Analysis

The research methodology employed in this study involves analysing the performance of Real Estate Investment Trusts (REITs) using logistic regression. If the computed CAGR of Net Asset Value (NAV) over a 10-year period surpasses the benchmark, which is set at the 10-year Singapore Government Bond Yield of 2.7%, the dependent variable in the regression model is coded as 1.

If not, it's assigned a code of 0. Distribution Per Unit (DPU), a performance predictor of REITs, is the independent variable. Since logistic regression can be used to predict binary outcomes, it is a suitable statistical tool for determining if REIT performance above the benchmark.

The significance level is set to 15% as the sample size for the test is 19, which is a small set of data. Increasing the significance level can compensate for the reduced statistical power induced by a small dataset. The study attempts to ascertain the degree to which DPU affects the probability of REITs beating the benchmark by regressing performance against DPU. This methodology offers insights into the relationship between DPU and NAV growth and enables the identification of important elements influencing REIT performance.

Interpretation of Results

The analysis of the logistic regression model predicting REIT performance based on Distribution Per Unit (DPU) reveals several noteworthy findings and limitations, indicating both potential insights and areas for further scrutiny.

Table. 1 – Results of Binomial Logistic Regression

Results

Binomial Logistic Regression

Model Fit Measures						
Model	Deviance	AIC	R ² _{McF}	Overall Model Test		
				χ ²	df	p
1	17.1	21.1	0.125	2.44	1	0.118

Model Coefficients - Dummy Variable						
Predictor	Estimate	95% Confidence Interval		SE	Z	p
		Lower	Upper			
Intercept	-3.178	-6.2210	-0.135	1.553	-2.05	0.041
DPU	0.215	-0.0771	0.508	0.149	1.44	0.149

Note. Estimates represent the log odds of "Dummy Variable = 1" vs. "Dummy Variable = 0"

Assumption Checks

Collinearity Statistics		
	VIF	Tolerance
DPU	1.00	1.00

Model Fit:

The deviance value of 17.1 and AIC of 21.1 suggest a moderate fit of the model to the data, neither exceptionally strong nor poor.

With an R^2 McF of 0.125, the model explains only a small portion of the variance in the dependent variable, indicating limited explanatory power.

The chi-square test, yielding a p-value of 0.118, falls marginally above the chosen significance level of 0.15, suggesting potential significance at a more lenient threshold.

Coefficients:

The positive coefficient for DPU (0.215) indicates a positive association with exceeding the benchmark CAGR, albeit not statistically significant at the chosen significance level of 0.15.

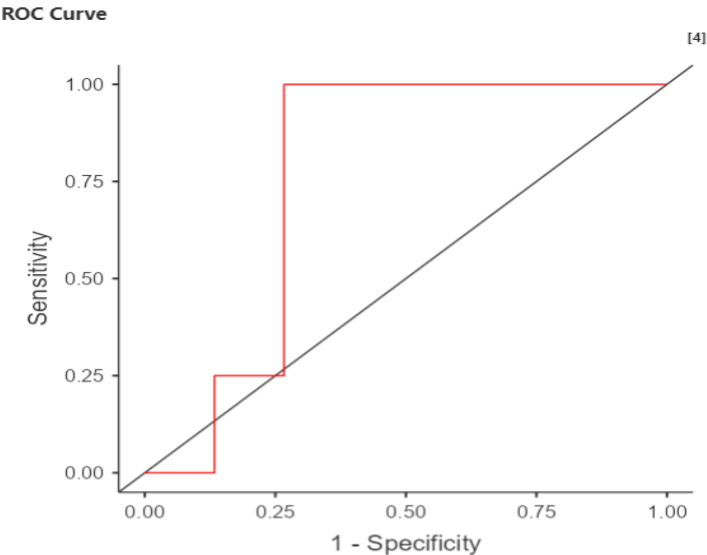
Multicollinearity:

The independent variable should not be collinear and for that we need to run an assumption check. We check the Variance Inflation Factor (VIF) for each variable. Here, a VIF of 1 for DPU suggests no issues with multicollinearity.

Fig. 6 – Predictive Measures of AUC (Area under Receiver Operating Characteristic (ROC) Curve)

Predictive Measures
AUC
0.767

Note. The cut-off value is set to 0.5



Interpretation using ROC Curve:

An AUC value of 0.767 suggests a moderate discriminatory ability of the model in distinguishing between exceeders and non-exceeders.

While the model suggests a positive trend between DPU and exceeding the benchmark CAGR, the evidence for statistical significance is weak at the conventional 5% level. Using a more lenient 15% significance level shows a potential trend, but

the model's explanatory power remains limited, and it exhibits a bias towards predicting non-exceeders. Further investigation and refinement of the model may be warranted to enhance its predictive accuracy and explanatory capability.

Limitations

The analysis is subject to several limitations that warrant consideration in interpreting the results. Primarily the model does not explicitly take into consideration non-quantifiable factors that can have a significant impact on S-REIT performance, such as Singapore's current interest rate environment. Additionally, there may be some variability introduced by the dynamic nature of the S-REIT market, which is defined by REITs listing and delisting over a ten-year period, which caused elimination of certain REITs while conducting the statistical analysis, further limiting the sample size from 41 to 19. Furthermore, this comparatively smaller dataset of 19 REITs may restrict the findings' generalizability and raise the possibility of Type I errors; in order to address this worry, a significance level of 15% was adopted.

Conclusion and Recommendations

Among the REITs that outperformed the benchmark, there is a notable diversity in asset type mix and geographical exposure. Resilience and adaptation in the face of market fluctuations are demonstrated by such substantial diversity. The data centre-focused Keppel DC REIT has a substantial presence in Singapore in addition to holdings in Malaysia, Australia, and the United Kingdom. With diverse holdings, Mapletree Commercial Trust continues to grow in Hong Kong, China, Japan, and South Korea, while holding a sizable stake in Singapore. On the other hand, Mapletree Industrial Trust is an industrial property specialist that primarily concentrates on Singapore while also having some exposure to the US market. Likewise, with a focus on industrial assets, Mapletree Logistics Trust has a broad presence in Singapore, Hong Kong, China, Vietnam, South Korea, Japan, and Australia.

From the quantitative analysis one can conclude that ultimately, the research highlights the importance of Distribution Per Unit (DPU) in relation to other critical parameters like yield and gearing ratio. DPU maintained its significance at the selected threshold of 15% rejecting the null hypothesis, however Yield and Gearing Ratio had significance levels of 68% and 42%, respectively, making them statistically unfit for testing in our study and hence are excluded from our analysis. This highlights the significance of DPU as a trustworthy indicator of REIT performance, indicating that it should be considered in quantitative evaluations and decision-making procedures related to real estate investing along with accounting for the macro and micro economic factors for further assurance.

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Appendix - 1

Data Sample used for testing- for the period Sep-23

REIT	Mkt	DPU	Yield (in %)	NAV (in \$)	Gearing (in %)	Assets Type	CAGR	Dummy Variable
Ascendas Reit	2.720	15.644	0.05751	2.310	0.3720	Industrial, 70% SG, AU 14%, 6% UK, 10% US	0.01103	0
Ascott Trust	0.905	6.111	0.06752	1.120	0.352	Hospitality, 16% SG, 8% China, 1% Malaysia, 4% Vietnam, 1% ID, 3% SK, 20% JP, 3% ROA, 14% Australia, 7% UK, 13% ROE, 12% US	-0.0185	0
Capitaland Mall Trust	1.930	10.660	0.05523	2.070	0.408	Diversified, 96% SG, 4% ROE	0.016356	0
Capitaland Retail China Trust	0.735	7.140	0.09714	1.330	0.424	Retail, 100% China	-0.00996	0
CDL Htrust	0.960	6.100	0.06354	1.390	0.384	Hospitality, 66.0% SG, 3% JP, 5% ROA, 3% Australia, 7% NZ, 7% UK, 9% ROE	-0.01397	0
Far East HTrust	0.605	3.650	0.06033	0.906	0.322	Hospitality, 100% Singapore	-0.00741	0
First REIT	0.240	2.520	0.105	0.303	0.39	Health Care, 96% ID, 3.0% SG, 1.0% KR	-0.10984	0

Frasers Cpt Tr	2.180	12.150	0.05573	2.320	0.393	Retail, 100% SG	0.022896	0
IREIT Global	0.350	2.350	0.06714	0.750	0.344	Office, 100% GER	-0.00391	0
Keppel DC REIT	1.700	10.216	0.06009	1.360	0.372	Specialized, 60% SG, 1% Malaysia, 12% Australia, 5% UK, 23% ROE	0.045688	1
Keppel Reit	0.855	5.850	0.06842	1.310	0.395	Office, 76.0% Singapore, 4.0% SK, 21% Australia	-0.00591	0
Lippo Malls Tr	0.015	0.040	0.02667	0.078	0.43	Retail, 100% ID	-0.15393	0
Mapletree Com Tr	1.300	9.090	0.06992	1.750	0.407	Diversified, 52% SG, 27% HK, 11% CN, 9% JP, 1% SK	0.041977	1
Mapletree Ind Tr	2.280	13.430	0.0589	1.880	0.379	Industrial, 76.0% SG, 24.0% US	0.045918	1
Mapletree Log Tr	1.460	9.268	0.06348	1.420	0.389	Industrial, 29.0% SG, 30% HK, 8% CH, 2% Vietnam, 6% SK, 13% JP, 8% Australia	0.041014	1
ParkwayLife Reit	3.510	14.610	0.04162	0.750	0.437	Health Care, 62.0% SG, 37.7% JP, 0.3% MY	-0.07297	0
Sabana REIT	0.365	3.070	0.08411	0.530	0.338	Industrial, 100% SG	-0.06697	0
StarhillGbl Reit	0.470	3.800	0.08085	0.710	0.374	Diversified, 77.0% SG, 16.0% AU, 7.0% UK	-0.02558	0
Suntec Reit	1.110	7.259	0.0654	2.090	0.427	Diversified, 77.0% SG, 16.0% AU, 7.0% UK	0.002769	0