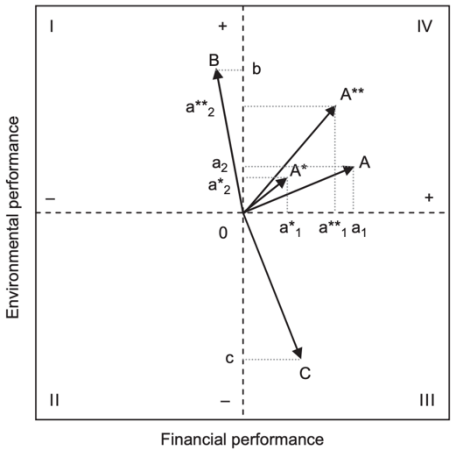
LE203_RE02_2022

1. **It has been conjectured that green real estate investors are limited in their financial performance by an inherent constraint to forgo potential investments with high IRRs but low environmental performance. This appears to be at odds with empirical studies that find consistent financial outperformance of green real estate investments against benchmarks. Discuss these seemingly opposing propositions and develop your own view, outlining any assumptions or conditions that you deem necessary.**

Financial institutions' behaviour has evolved in recent years as investors have become more aware of ESG and climate change risks in their decision-making process. The total AUM of signatories to the UN Principles for Responsible Investment has nearly doubled from US$59 trillion in 2015 to US$103 trillion in 2020 (UNPRI, 2015; UNPRI, 2020), illustrating the rapidly expanding importance of ESG in the financial sector. In fact, the real industry plays a crucial role in sustainable investment because it consumes 40% of the world's energy and accounts for 30% of greenhouse gas emissions (UNEPFI, 2016). This has led to the development of numerous ESG metrics to assess the non-financial environmental implications of investments. For individual properties, LEED, Energy Star, BREEAM, and Green Star are the leading voluntary environmental certifications. Meanwhile, for the ESG rating system, MSCI ESG, Eikon, and Green Real Estate Sustainability Benchmark (GRESB) are well-known indicators. Such indicators increase transparency, offer investors with information on sustainable assets to consider, and incentivize greener investments (USSIF, 2013). Most studies on the financial performance of green real estate investments explore the REITs market, and thus, this essay will mainly focus on empirical evidence based on REITs. In doing so, financial performance can be considered in two different ways: the operational performance and the stock market performance (Fuerst, 2015).

In theory, it has been conjectured that green real estate investors are limited in their financial performance by an inherent constraint to forgo potential investments with high IRRs but low environmental performance. Figge & Hahn (2012) captures this phenomenon through its diagram below.



For instance, when an investor is given an option between A* and C, green investors will choose A* even though C will give a higher financial performance since C causes negative environmental impact. However, when an option between A** and A is given, the decision among green investors may vary. Investors who consider environmental performance, but still have greater preference for financial outperformance will choose A. Meanwhile, those investors with strong preference for high environmental performance may choose A** despite the slightly lower financial performance. In this sense, the stronger the preference for green investment in the decision-making process, the stronger the constraint to forgo potential investments with high IRRs. This can also be explained through the logic of multi-asset portfolio optimization model. For instance, if the real estate investor has higher environmental criteria for REITs that he is allowed to invest in, the portfolio he can build will be further away from the MPT optimal portfolio that generates the highest Sharpe ratio.

Interestingly, empirical evidence indicates a different result. Studies have repeatedly found that green REITs outperform non-green REITs in terms of operational performance, which includes return on assets (ROA) and return on equity (ROE). Eichholtz et al. (2012) investigates a sample of US REITs from 2000 to 2011 using LEED and Energy Star data. The paper finds that green REIT portfolios outperform in terms of operating performance, including both ROA and ROE. Similarly, Fuerst (2015) analyzes GRESB data to examine global REITs from 2011 to 2014 and finds improved operational performance and lower risk exposure. Hin Ho et al. (2013) further investigate Singaporean REITs and come to a similar conclusion. However, they do discover that results differ depending on what their criterion on greenness is when evaluating REIT portfolios.

The reasons behind such improvement in operational performance can be explained by various factors. According to Newsham et al. (2009), LEED certified buildings consume 18% to 19% less energy on average, potentially saving tenants money on their utility bills. It is also considered that improved indoor environmental quality in green properties increases employee productivity (Kats and Capital, 2003). Such benefits can further be translated into increased demand for green buildings, benefiting the landlord as well. Indeed, compared to non-certified buildings, it is estimated that occupancy rates are 8% higher for LEED and 3% higher for Energy Star certified office buildings (Fuerst and McAllister, 2009). Eichholtz et al. (2010) further research Energy Star office properties and discover that the rent is greater by 3% and transaction price is greater by as much as 16% than non-certified buildings.

Green REITs have lower systematic risk, implying that greener property portfolios are less susceptible to fluctuations in stock market returns (Devine et al, 2017; Fuerst, 2015). Based on the standard finance theory, CAPM, investors should have a lower required rate of return if the portfolio has lowered its risk by being more sustainable. In this sense, green real estate investors will not outperform non-green investors. However, in terms of risk-adjusted performance, green investments may outperform. Indeed, empirical studies on

REITs divide stock performance into Jensen's alphas (outperformance) and betas (sensitivity to systematic risk). Green REITs will exhibit lower beta but may exhibit higher alpha compared to non-green REITs.

In contrast to papers on operating performance, results on the stock performance of green REITs vary. Sah et al. (2013) examine REITs that partnered with Energy Star from 2005 to 2010 in the US and discover that green REITs have outperformed non-green REITs by an annual abnormal return of 5.68%. Meanwhile, Eichholtz et al (2012) find no significant relationship between the greenness of portfolios and abnormal returns. The paper provides an explanation of this, suggesting that this is because stock prices have already reflected the higher cash flows generated from green real estate investments. Coën et al. (2018), on the other hand, use LEED and Energy Star data to compare the performance of green and non-green US REITs from 2010 to 2016, and discover that non-green REITs tend to outperform.

This essay believes that it is too early to tell whether green real estate investments financially outperform or not, as studies typically define "green" real estate based on its operational carbon. More recently, there has been greater emphasis on carbon lifecycle assessment where both embodied and operational carbon need to be assessed when measuring "greenness". Embodied carbon can account for half of the overall carbon emission of the total lifecycle when constructing a new property (UKGBC, 2020). Thus, only accounting for operational efficiency can potentially cause the problem of greenwashing. Indeed, Fairs (2021) gives the Bloomberg's European headquarters property based in London as an example. The building has received the highest-ever BREEAM rating for an office property in 2017 and is argued to use 35% less energy than a standard office building. However, the article criticizes that such rating is misleading as the property's embodied carbon will be a considerable multiple of that of a standard high-quality office structure, even when longevity is taken into account (ibid). The problem is that it was only recently in 2019 that BREEAM and LEED have modified their assessment to carry out lifecycle assessments and incorporate embodied carbon in their rating system (Fairs, 2021). Thus, one must ask whether recent study is sufficient to make any conclusions. For instance, construction materials are considered when calculating embodied carbon. Using environmental construction material like cross-laminated timber improves environmental performance but it also reduces the building's overall area efficiency (UKGBC, 2020). This means that it also decreases the total rent that the property can potentially generate, which in turn affects the financial performance.

However, this essay also believes that greener investments could achieve higher financial performance 'today'. As private real estate suffers from information asymmetry, different assessments on the future cash flow and discount rate are made by owners and buyers, leading to different reservation prices between the two groups (Fisher et al, 2003). Hence, in an informationally asymmetric market, just simply disclosing new information can

lead to an increase in equilibrium price without the fundamentals changing or the quality of the underlying stock improving (Fuerst & Warren-Myers, 2019). Indeed, Devine et al (2017) find that "in the US, a country without requisite reporting, REITs with a more sustainable portfolio experience higher rental income, higher operating expenses, and lower interest expenses, increasing cash flows available for distribution to shareholders" and "higher premiums to NAV" (pp.18). Meanwhile, the paper finds that such effects are less prominent in the UK where environmental reporting is mandatory.

Based on Milgrom (1981), this voluntary disclosure can further have an unravelling result. More specifically, top environmental rating properties will always seek to distinguish themselves by disclosing this information and achieve higher rents and prices. The properties with the second-tier environmental rating will also want to distinguish themselves from the other lower-tier properties and disclose their ratings as well. This disclosure continues until there is a complete unravelling of information asymmetry in the market regarding properties' environmental ratings. Nevertheless, there are two crucial assumptions in this thinking: firstly information must be verifiable and secondly disclosure must be costless. In reality, disclosing information is not costless with obtaining environmental rating incurring a cost. This indicates that such a process may be slow or those with lower-tier rating properties will not disclose at all. This further suggests that unless disclosure becomes mandatory, green real estate investors may financially outperform as suggested by Devine et al (2017).

Eventually, this essay believes that governments will introduce laws that will inevitably make green buildings mandatory in the end. The European Commission has enacted directives on energy performance on buildings, requiring all new builds to be operational net-zero by 2030. Carbon taxes are another potential piece of legislation. Kok et al. (2011) argue that increase in energy prices can accelerate the adoption of energy efficient technologies in buildings. As a result, governments can use carbon pricing or carbon cap as a tool to speed up the transition to sustainable energy sources (Pike, 2020). At the same time, option value to wait for energy efficient technology to become cheaper and more powerful will decline over time (van Soest and Bulte, 2001), indicating that more properties will eventually choose to become energy efficient. Once all properties achieve greenness to a certain extent and governments set environmental reporting requirements mandatory, financial outperformance will no longer depend on how green the property or the portfolio is. This is supported by Chegut, Eichholtz and Kok (2014) where they analyze rent and price premiums in London properties based on BREEAM rating scheme from 2000 to 2009. The paper finds that each additional green property in the neighbourhood reduces the marginal effect of certification on rental and transaction values by 2% and 5% respectively.

2. The old adage that "all real estate is local" is not true for the capitalisation rate. Discuss.

According to the conventional urban and real estate economic theory, the pricing of real estate is inherently specific to location. The demand for space is determined by "location", as users in the space market normally require a specific type of property in a specific location. The supply side of the space market is also location-specific in that properties cannot be physically moved. For instance, a vacant office building in Cambridge may be ideal for a consulting firm in London, but it is not in the right location. As real estate markets are highly segmented due to the fact that both supply and demand are location specific, real estate tend to be local rather than national. This means that there are no perfect substitutes; Even if the properties are physically identical, their rents and prices will differ widely based on their location. This is the reason why locality is such an important feature in real estate.

In traded securities market, the price to earnings ratio is the single most used metric about how an asset is perceived in the market. In private real estate, a measure that is inverse of this metric is used, which is known as the capitalization rate. The capitalization rate is simply the property's net operating income to the property's asset value. It can also be defined as the risk-adjusted required return (discount rate) minus the income-growth expectations. The required return can further be defined as the sum of risk-free rate and risk premium. In general, investors use cap rate in their decision-making process as it expresses the building's ability to generate income after deducting all expenses (Yu, 2004). Simultaneously, it expresses the risk and uncertainty of a given property as well as the expected returns for investors (Geltner et al, 2014).

Indeed, Sivitanidou and Sivitanides (1999) state that cap rate levels are determined by both space market fundamentals and capital market forces. The paper explains that the space market fundamentals can affect the cap rate through both the required return and the income-growth expectation. First, the risk premium, and hence required return, can be affected through both time-invariant and time-variant local factors. For time-invariant local factors, the sheer size of the market may potentially affect liquidity and business risk that will in return affect risk premium (ibid). All else being equal, properties in more central prime locations, like London, have significantly lower cap rates than those in more peripheral areas (Chuangdumrongsomsuk & Fuerst, 2017). Offices in London are more liquid as they have less informational asymmetry with more transparent data and active transactions, ranking first for the world's most transparent cities (JLL, 2020). Being in CBD also reduces business risk in that firms benefit from the agglomeration effect. It has long been argued that companies in urban areas gain higher productivity and increasing returns to scale from being close to each other (Puga, 2009). In terms of time-variant local factors,

risk premium can be shaped by absorption rates, vacancy rates, and the volatility of office demand (Sivitanides et al, 2001).

Second, the income growth expectations can be affected through local factors as well. The anticipated growth rate may be influenced mostly by views of the strength of the local real estate market. Potential investors will assess the amount of growth in the net rent that the property is anticipated to generate in the future (Geltner et al, 2014). Such assessment will depend on the future balance between demand and supply in the space market. Archer and Ling (1997) emphasize that the demand in the space market is far from static. For instance, the economic activities mirror the space market in that the demand for space will change accordingly as the economy undergoes secular changes, such as shift from manufacturing to service industries. Changed in technology also alters "frictions of space" where it changes the meaning of distances and urban location (ibid). This can be clearly seen today where the use of office space is changing where firms are finding more flexible office spaces with more workers working from home due to the advancement of technology like Zoom. It will also depend on the supply side where rental rates would remain relatively steady in the process of ongoing change if the supply of space is highly elastic (ibid). Overall, investors must try to take all these factors into account to forecast the future of space. The greater the anticipated income growth, more investors will be willing to pay for the asset today per GBP of current NOI, resulting in a lower cap rate.

Empirical studies further support the notion that capitalization rate depends on the local factors of real estate. Sivitanidou and Sivitanides (1999) study the office cap rates for 17 metropolitan markets in the US from 1985 to 1995. The paper finds that the time-invariant and time-variant "location-specific" factors plays a substantially stronger role than the national capital market in explaining the cap rate. Sivitanides, Southard, Torto, and Wheaton (2001) strengthen this finding by demonstrating that local features that affects the risk appetites or income growth expectations of investors vary across markets. Yu (2004) performs a similar investigation by studying office properties within the same metropolitan area located in the nine submarkets of Atlanta from 2000 to 2003 and finds that cap rate movements are significantly affected by local market factors, including space supply level, absorption rate and vacancy rate.

It is interesting to note that how investors form their income growth expectations differ by location as well. Literatures find that the real estate markets are mean-reverting and cyclical (Geltner & de Neufville, 2018), generating considerable predictability over time. In this sense, when rents are at record highs or lows, investors will have opposing expectations. Rational investors should be forward-looking where they forecast lower subsequent income growth when the market is high, leading to a higher capitalization rate. On the other hand, investors could be backward-looking where they would forecast higher subsequent income growth when the market is high, leading to a lower capitalization rate.

The studies of whether investors are forward-looking or backward-looking are mixed, although there are more papers that concluded that they are backward-looking such as Sivitanidou and Sivitanides (1999) and Sivitanides et al (2001). However, Dokko, Edelstein, Lacayo and Lee (1999) investigate metropolitan areas in the US from 1985 to 1995 and find that real estate is not local only in terms of location of the asset but in terms of investors' behaviour. In doing so, the paper adds a city specific adjustment, +/- ω, which reflects the efforts by local office market players to adjust their expectations about the future NOI based on the current market NOI. The sign +/- indicates whether the investors are forward-looking or backward-looking whilst the magnitude of ω reflects the speed of adjustment. Interestingly, the coefficients of ω differed widely across the metropolitan areas. For instance, the estimated ω for Charlotte (-0.467) implies that forward-looking investors will adjust their expected income growth relatively quickly to change in current NOI growth. When there is an increase in the current NOI growth, investors will expect lower future income growth, and thus, higher cap rate. Meanwhile, Los Angeles (0.354) and San Diego (0.234) illustrate that local investors in these areas are backward-looking and adjust their anticipated income growth more slowly. In this location, investors will expect higher future income growth when there is an increase in the current NOI growth, lowering the cap rate.

Meanwhile, more recent empirical research that studies the cap rate movement from 2000 to 2007 suggest a different result. This period is also known as the "great cap-rate compression" in the real estate industry (Chervachidze et al, 2009). In additional to the treasury rate and local market fundamentals (real rent ratio), Chervachidze and Wheaton (2011) includes two explanatory variables: general corporate risk premium and the amount of debt availability in the economy. They find that much of the secular decrease in cap rates during this period appears to be due to the three macroeconomic variables rather than the local market fundamentals. Local rent fundamentals account for only a minor portion of the explanation of cap rates and real estate investors are found to be backward-looking. In this particular study, the old adage that "all real estate is local" does not seem to be true for the capitalization rate.

Based on Modigliani and Miller proposition, the amount of debt available in the economy should not affect the asset price as there is an optimal leverage that maximizes tradeoff between the tax shield benefit and financial distress cost, and hence, maximizes the value of the asset. However, recently, this model has been called into question where economic theories now regard debt availability as a factor that inflates real estate price above its fundamentals, resulting in irrationally low cap rates. This can be further illustrated using Brunnermerier & Pedersen Asset loss spiral (2009). If there is an increase in income, backward-looking investors will expect further growth and lower the cap rate, which will increase the price and so on. Meanwhile, the credit market further feeds into this spiral. As banks observe rising value of assets and stronger position of the borrower, they will lend at lower interest rate with lower equity requirement, further causing more debt. Caballero,

Farhi, and Gourinchas (2008) also find that the surge of 'global' capital has further increased debt availability, which in turn pushed up the property prices and lowered the cap rate.

Furthermore, arbitrage is crucial in the financial market as it keeps the market efficient by bringing prices to its fundamental values. In theory, if prices rise above their market fundamentals, arbitrageurs can short real estate and signal the market that prices are below the fundamentals. However, in reality, investors cannot short sell private real estate, which prevents the sophisticated arbitrageurs from entering the market to eliminate mispricing. In such case, pessimists (arbitrageurs) exit the market and there happens to be an imbalance between pessimists and optimists, further driving up the real estate prices away from the fundamentals (Shleifer & Vishny, 1997). As a result, cap rates may be highly susceptible to sentiment-induced mispricing rather than reflecting the local fundamentals. Clayton et al (2008) investigate whether sentiment also plays a pricing role in commercial real estate in the US and finds that the decrease in capitalization rates from 2002 to 2007 reflected investor sentiment as well.

Overall, this essay continues to believe that the old adage that "all real estate is local" is true for the capitalisation rate. However, there are times when macroeconomic fundamentals, especially debt, and sentiment explain the cap rate relatively more than the local fundamentals. This is especially the case when investors are backward-looking, and rents are at historic lows or highs.

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