

INTERNATIONAL ARTICLES

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THE IMPACT OF SOUTH AFRICAN REIT PORTFOLIO COMPOSITION ON DIVERSIFICATION BENEFITS FOR FOREIGN REIT INVESTORS

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Abstract

We investigate the impact of the geographical investment focus of real estate investment trusts (REITs) in South Africa on their potential diversification benefits for foreign REIT investors. We focus on S.A. REITs as a laboratory as they vary in their geographical investment focus. In particular, some S.A. REITs predominantly invest in commercial real estate in South Africa while others predominantly invest in developed markets in Europe. Using the perspective of a foreign investor holding U.S. REITs, we find that S.A. REITs with foreign holdings have superior diversification benefits for foreign investors, in terms of portfolio variance and Sharpe ratio, than S.A. REITs with predominantly domestic holdings. Thus, while emerging market REITs provide diversification benefits to foreign investors, the exposure of these REITs to commercial real estate markets in developed countries further increases these benefits. Explanations include emerging country-specific risks.

Keywords

REITs, foreign REIT investors, REIT holdings, portfolio management, portfolio optimization

International REIT investments have diversification benefits for the portfolios of REIT investors (e.g., Liu and Mei, 1998; Ling and Naranjo, 2002). However, depending on the size of their domestic market, non-U.S. REITs are likely to invest not only domestically but also internationally (Brounen and De Koning, 2012; Gibilaro and Mattarocci, 2016). In the emerging country of South Africa, for example, REITs listed at the Johannesburg Stock Exchange (JSE) have a substantial non-emerging market exposure with Europe representing approximately 40% of S.A. REIT's asset value. The United Kingdom is of particular interest to S.A. REITs and represents 30% to 35% of a S.A. REIT's asset value. In comparison, properties in S.A. account for 35% to 45% of S.A. REITs' asset value.¹ Additionally, a number of European REITs have obtained secondary listings at the JSE and thus are considered S.A. REITs that foreign investors can invest in, even though these REITs have no holdings in S.A. Considering that foreign REIT investors purchase emerging market REITs to achieve diversification, the following question arises: How does the inclusion of developed

market holdings in emerging market REIT portfolios affect the diversification benefits for foreign REIT investors?

The purpose of this study is to investigate the implications of the geographic investment focus of REITs for diversification benefits received by foreign REIT investors. In particular, we assume the perspective of investors holding U.S. REIT stocks and investigate whether emerging market REITs in general have diversification benefits for investors who are already invested in a mature REIT market. We then assess whether the exposure of emerging market REITs to developed commercial real estate markets affects these diversification benefits. In our analysis, we compare the portfolios of U.S. REITs mixed with (1) S.A. REITs with holdings that are predominantly in S.A. and (2) S.A. REITs with considerable international holdings.

South Africa represents an excellent laboratory to investigate the implications of the geographical investment focus of REITs for the portfolios of foreign REIT investors due to the maturity of its listed property market, the varying degrees of exposure of S.A. REITs to different geographical property markets, and its established international REIT investor community (Roth and Kaspar, 2016). In our analysis, we assume the focus of a foreign investor holding U.S. REITs as firstly U.S. investors represent one of the most important investor groups in the South African stock market.² Secondly, considering that European and Asian investors are also heavily invested in real estate in the U.S. (Colliers International, 2017; Deloitte, 2017), along with the U.S. stock markets (Department of the Treasury, 2016), it is reasonable to assume that non-U.S. investors also hold U.S. REITs in their portfolios.

Using mean-variance portfolio optimization, we find that S.A. REITs in general provide diversification benefits to foreign investors holding U.S. REITs by minimizing portfolio risk and improving risk-adjusted returns. Interestingly, we find that combining U.S. REITs with S.A. REITs that have exposure to foreign commercial real estate markets offers superior diversification benefits for foreign investors compared to portfolios with U.S. REITs and S.A. REITs that predominantly have holdings in S.A. Thus, emerging market REITs with holdings in developed markets have superior diversification benefits for foreign investors with a portfolio of U.S. REITs. Explanations for our results include risks specific to emerging countries that affect the performance of domestic REITs and commercial real estate markets.

Our investigation is relevant to both academics and practitioners. Previous studies provide evidence that international real estate equities offer significant diversification benefits for foreign investors (Asabere, Kleinman, and McGowan, 1991; Liu and Mei, 1998; Ling and Naranjo, 2002; Worzala and Sirmans, 2003). However, the geographical investment focus of REITs is likely to have an impact on the diversification benefits received by foreign investors, particularly if they purchase equity interests in emerging market REITs that in turn invest in developed countries.

To our knowledge, no previous study has investigated the geographical investment focus of international REITs and the potential diversification benefits they may offer foreign REIT investors. Our study further stands out as we investigate the impact of a REIT investment focus on the potential diversification benefits for foreign investors

across different continents and economic development stages (developed and emerging countries). By showing that S.A. REITs with a home bias provide lower diversification benefits to foreign investors than geographically diversified REITs, we add to the home bias literature as it relates to REITs (Gibliaro and Mattarocci, 2016; Zhou and Sah, 2009).

Additionally, compared to foreign investments in developed REIT markets (Eichholtz, Huisman, Koedijk, and Schuin, 1998; Eichholtz, Gugler, and Kok, 2011; Liow, Zhou, and Ye, 2015), REIT markets in emerging countries in general and foreign investments in emerging REIT markets in particular are under-researched. As such, our study adds to the literature on emerging market REITs and real estate markets (Newell, Acheampong, and Du Plessis, 2002; Ooi, Newell, and Sing 2006; Akinsomi, Pahad, Nape, and Margolis, 2015). Considering that REITs in other emerging countries, for example, in Asia may also tilt their investment focus towards developed countries, we consider our findings relevant to other emerging REIT markets. However, we do not propose foreign investments in emerging market REITs that hold developed market assets as a strategy to invest in the commercial real estate markets in developed countries. Rather, we show that the geographic diversification of emerging market REIT portfolios, particularly with regard to developed countries, has implications for diversification benefits at the REIT investor level. Furthermore, our investigation is also relevant for foreign investors in REITs in developed countries such as Australia, which have a relatively small regional investment focus (Brounen and de Koning, 2012; Gibliaro and Mattarocci, 2016).

The remainder of this study is structured as follows. Next, we provide insights into the REIT market in S.A. in the context of foreign investments. Then we review the relevant literature and discuss our data and methodology. This is followed by the presentation of our results and the conclusion.

THE SOUTH AFRICAN REIT MARKET AND FOREIGN INVESTMENTS

Considering international trade and cross-border investments, global markets are becoming increasingly integrated, which leads to higher correlations of asset markets, particularly in developed countries (Temple, 2003; Kaminska, 2010). As a consequence, investors with holdings in mature REIT markets such as the U.S. are likely to search for investment opportunities in countries that have a lower correlation with the U.S. REIT market and thus offer investments that allow risk-adjusted returns beyond what is achievable in other developed markets. Bodie, Kane, and Marcus (2014) find that the inclusion of investments from emerging countries allows foreign investors to increase their Sharpe ratios. However, previous studies investigating international diversification benefits focus on developed countries such as the U.S., U.K. or Australia and neglect diversification benefits from investing, for example, in African listed property markets (Olaleye, 2011).

Prior to the introduction of the REIT structure in 2013, S.A. already had a mature listed real estate market, which differentiates it from other emerging countries (Roth and Kaspar, 2016; Carstens and Freybote, 2018). In recent years, the S.A. REIT

industry has grown tremendously and now is regarded as an emerging market on the verge of transforming into an established REIT market (Grinis and Kaspar, 2017). Additionally, the S.A. REIT market represents one of the two largest emerging REIT markets based on market capitalization, exceeding U.S.\$15 billion (Roth and Kaspar, 2016).

The international importance of the S.A. REIT market is evident from its inclusion in a number of global indices. First, S.A. is included in the S&P Global REIT Index representing the ninth largest market capitalization (S&P Dow Jones Indices, 2018). Second, within the FTSE EPRA/NAREIT Emerging Index, S.A. has the second largest market capitalization (FTSE Russell, 2018). As such, international REIT investors are likely to regard S.A. as a major emerging real estate market that offers international diversification potential to global investors (Akinsomi, Pahad, Nape, and Margolis, 2015; Ntuli and Akinsomi, 2017).

Capital inflows by foreign investors into a country such as S.A. contribute to economic growth and can consist of foreign direct investment (FDI), portfolio flows such as investments in REIT stocks, and other investments (De Beer, 2015; Kahn, 2015). South Africa differs from other emerging countries for which FDIs are the most important foreign capital inflow. In contrast, portfolio capital flows are most important for S.A. and FDIs have been decreasing over time (De Beer, 2015; Kahn, 2015). Carstens and Freybote (2019) find that foreign investments in S.A. REITs (i.e., portfolio flows into the REIT stock market) are not only driven by country-specific factors (pull factors), but also the performance of other asset markets and economic fundamentals in developed countries such as the U.S. (push factors). The drivers of foreign portfolio flows into the S.A. REIT market are important considerations as foreign investments have an impact on REIT market liquidity in S.A. (Carstens and Freybote, 2018).

While foreign investors invest directly or indirectly in commercial real estate markets in S.A., some South African REITs invest internationally. As a consequence, S.A. REITs differ in their geographical investment focus. Based on the financial statements of S.A. REITs and Nedbank data (Nedbank Property Sector Report, 2017), S.A. accounts for 35% to 45% of the asset value of S.A. REITs. On the other hand, European holdings account for 40% of S.A. REITs asset value with the U.K. alone accounting for a REIT asset value of 30% to 35%. Interestingly, approximately 1% of the asset value of S.A. REITs is invested in the rest of Africa. This suggests that S.A. REITs are not a vehicle for foreign investors to get exposure to commercial real estate markets in other African countries. It is noteworthy that S.A. REITs also invest in other listed companies, including local and international REITs, as a means to diversify their portfolios.

S.A. REITs invest in developed countries such as the U.K. for a number of reasons. First, poor macroeconomic conditions and other country-specific risk factors such as infrastructure or political risks may motivate S.A. REITs to explore offshore markets that provide better investment opportunities and diversify their portfolios to protect against these risks by investing in developed countries. Second, it provides a way for S.A. investors to invest in offshore property by means of S.A. REITs without concerns

about exchange controls. Third, emerging markets such as S.A. may have limited investment-grade properties available that align with the investment strategy of a particular REIT (de Wit, 2010). Lastly, developed markets such as the U.K. are likely to have financing opportunities that are not available in an emerging country such as S.A.

LITERATURE REVIEW

Previous studies provide evidence that international real estate equities have significant diversification benefits for foreign investors (Liu and Mei, 1998; Ling and Naranjo, 2002; Worzala and Sirmans, 2003) and U.S. investors in particular (Asabere, Kleinman, and McGowan, 1991). However, one shortcoming of previous studies on international REIT investments is that they ignore the impact of the geographical investment focus of international REITs on the diversification benefits for foreign REIT investors.

While U.S. REITs exhibit a strong home bias with regards to the geographical focus of their investments (Zhou and Sah, 2009; Gibliaro and Mattarocci, 2016), REITs from other developed countries differ in their geographical focus (Gibliaro and Mattarocci, 2016). REITs in smaller European countries or REITs in Australia have a relatively small regional investment focus (Brounen and De Koning, 2012) and exhibit a large degree of geographical diversification. However, internationally-diversified REITs, except Australian REITs, are less likely to invest in different continents (Gibliaro and Mattarocci, 2016). The diversification benefits to foreign investors in REITs from these countries are likely affected by the geographic focus of individual REIT portfolios, particularly with regard to different regions and continents. Eichholtz, Huisman, Koedijk, and Schuin (1998) show that real estate returns are driven by continental factors, except in the Asia Pacific region, which suggests that investments across continents have the largest diversification benefits for international REITs and foreign real estate investors.

A number of emerging countries have introduced REITs over the last decades (Brounen and De Koning, 2012; Das and Thomas, 2016). Emerging real estate and REIT markets provide foreign investors with diversification benefits. However, diversification benefits can vary over time as correlations between, for example, the U.S. NAREIT Index and emerging market property indices change (Lu and Mei, 1999). REIT and commercial real estate markets in emerging countries also exhibit more volatility (Lu and Mei, 1999) and are prone to higher levels of economic, political and other country-specific risks, as discussed by Lieser and Groh (2011).

We hypothesize an effect of the geographical investment focus of emerging market REITs on diversification benefits for foreign investors, albeit the direction is difficult to determine a priori. On the one hand, the inclusion of emerging market REITs with large holdings in developed countries in the portfolio of a foreign investor could negatively affect (i.e., reduce) diversification benefits as the exposure to developed commercial real estate markets may increase the correlations between these emerging market REIT investments and developed market assets in the portfolio. On the other

hand, the diversification of emerging country-specific risks within the REIT portfolio may provide foreign REIT investors with additional diversification benefits above the ones received from investing in REITs with predominantly emerging market holdings.

DATA

The majority of studies on international diversification and foreign REIT investments employ index data (e.g., Lu and Mei, 1999; Gallo and Zhang, 2010; Gallo, Lockwood, and Zhang, 2013). One shortcoming is that results based on index data represent investment in all index assets and not actual physical investments (Seiler and Seiler, 2005) (i.e., specific investments selected for portfolio inclusion). In diversifying their international REIT portfolios, we assume that foreign REIT investors select specific foreign REITs based on potential diversification benefits and not invest in all foreign country REITs. As a result, we decide against using index data and instead employ return data for selected REITs.

In our empirical analysis, we follow previous studies (Asabere, Kleiman, and McGowan, 1991; Conover, Friday, and Sirmans, 2002; Gallo and Zhang, 2010; Gallo, Lockwood, and Zhang, 2013) and assume the perspective of an investor with U.S. REIT holdings. In particular, we use return data for U.S. and S.A. REITs with the largest market capitalization. The focus on large cap REITs results from the preference of U.S. institutional investors for larger REITs (Below, Stansell, and Coffin, 2000). Considering that larger REITs are more liquid (Marcato and Ward, 2007), they are likely more attractive to foreign investors, particularly in emerging countries. In line with this argument, market capitalization is one of the most important drivers of share liquidity in S.A. (Belgove and Van der Merwe Smit, 2016).

We obtain monthly (ex post) return data for the 20 largest S.A. listed property firms/REITs and U.S. REITs for the January 2002 to December 2016 period. Our focus on the 20 largest U.S. and S.A. REITs is a result of methodological requirements and data limitations. The literature supports focusing on a small number of assets for mean variance portfolio optimization using quadratic programming (QT) analysis, which we employ in this study. This limitation results from the impracticality of using a large covariance matrix in solving the quadratic programming problem (Byrne and Lee, 1997; Viezer, 2000). Additionally, smaller developing REIT markets generally have fewer firms. For S.A., the 20 largest REITs by market capitalization represent approximately 40% of the S.A. REIT market during our sample period. Our focus on real estate stocks with the largest market capitalization is also in line with previous studies (e.g., Hamelink and Hoesli, 2004). Our sample includes listed property firms that converted to REITs and REITs that went public after May 2013. Exhibit 1 shows the S.A. REITs included in our investigation, the exposure of their property portfolio to commercial real estate markets in S.A., and the firm-specific market capitalization growth since the introduction of the REIT structure in 2013.

For our analysis, we derive the 20 largest S.A. REITs with (1) holdings predominantly in S.A. (S.A.REITSA) and (2) considerable non-S.A. holdings (S.A.REITFOR). The foreign holdings of S.A. REITs in our sample are predominantly in Europe, in

Exhibit 1
South African REITs Included in Sample

REIT Name	S.A. Exposure	Market Cap Growth
Equites Property Fund Ltd	80%	474.20
Rdi REIT P.L.C.	0%	41.74
Delta Emd Ltd	96%	-80.14
Arrowhead Properties Ltd	78%	484.12
Investec Property Fund	97%	126.44
Fortress REIT Ltd A and	52%	331.84
Fortress REIT Ltd B	52%	1,199.30
Vukile Property Fund Ltd	92%	70.80
Emira Property Fund Ltd	94%	4.42
Resilient REIT Ltd	45%	215.22
Growthpoint Properties Ltd	71%	52.56
Hyprop Investments Ltd	80%	76.04
Intu Properties Plc	0%	28.32
Octodec Investments Ltd	100%	166.43
Redefine Properties Ltd	74%	98.05
SA Corporate Real Estate Ltd	95%	76.39
Sycom Property Fund	>90%	-25.76
Fountainhead Property Trust	>90%	20.75
Acucap Properties Ltd	>90%	62.83
Capital Property Fund	>90%	1.94

Notes: The S.A. exposure represents the percentage of asset value of a particular REIT invested in S.A. Market capitalization growth represents the percentage growth in the market capitalization of the respective REITs from the introduction of the REIT structure in 2013 to December 2016 or until delisting due to mergers. The sources are Nedbank Property Sector Report, firm data, and IRESS database.

particular in the U.K., Poland, Romania, Germany, and Spain (Property Sector Report, 2017). We define S.A.REITSA as S.A. REITs with more than 90% of their assets located in S.A. S.A.REITFOR represents S.A. REITs with varying degrees of foreign investments, ranging from approximately 20% to 100%.

Accounting for exchange rate differences, we convert all S.A. Rand values to U.S. dollars, enabling the model to provide U.S. dollar results. We also leave returns unhedged as suggested by Hamelink and Hoesli (2004). Exhibit 2 provides the summary statistics for the returns of the 5,962 REIT-months included in our analysis. Overall, the average return for U.S. REITs is higher and displays more extreme minimum and maximum return values than S.A. REIT returns, which may be driven by the 2007–2009 financial crisis. S.A. REITs with an international investment focus have a higher mean return and slightly lower return standard deviation than S.A. REITs with a S.A. investment focus.

Exhibit 2
Summary Statistics for REIT Returns

	<i>N</i>	Mean	Std. Dev.	Min.	Max.
Full sample	5,962	0.0138	0.0578	-0.2741	0.3065
U.S. REITs	3,348	0.0153	0.0710	-0.2848	0.4349
All S.A. REITs	2,614	0.0124	0.0644	-0.2583	0.1909
S.A. REITs (S.A. Focus)	1,428	0.0114	0.0689	-0.2550	0.1868
S.A. REITs (International Focus)	1,186	0.0136	0.0619	-0.2733	0.1974

Notes: This exhibit presents the summary statistics for the 20 largest U.S. and S.A. REITs each month based on market capitalization for the January 2002 to December 2016 period.

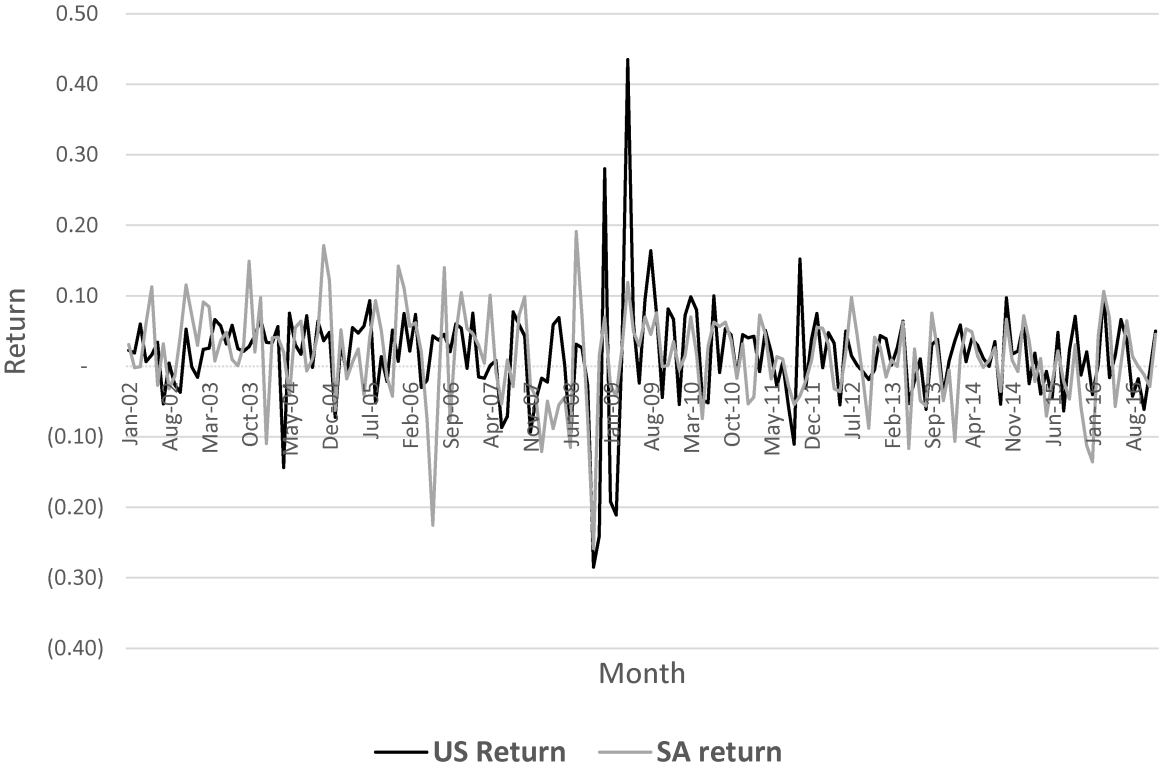
Exhibit 3 shows the return behavior of S.A. REITs and U.S. REITs over the 15-year sample period. With the exception of 2009–2011, S.A. REIT returns appear to be more volatile, which is in line with expectations of higher volatility in emerging markets (Lu and Mei, 1999; Ghysels, Plazzi, and Valkanov (2016). U.S. REIT return volatility over the 2007–2009 period demonstrates the substantial impact of the financial crisis and suggests that the mean U.S. return and standard deviation in Exhibit 2 are indeed affected by this period. Overall, relative to U.S. REITs, S.A. REIT returns appear to be higher prior to 2009. Interestingly, from 2013, REIT returns co-move in the same direction, which may be as a result of the increasing internationalization of REITs and more foreign investments following the introduction of REITs in S.A. (Carstens and Freybote, 2018).

METHODOLOGY

Our empirical investigation is structured as follows. First, we investigate whether investing in emerging market REITs in general has diversification benefits for investors holding U.S. REITs. Then, we investigate the impact of the geographical focus of a REIT on foreign investor diversification benefits by comparing portfolios with S.A. REITs predominantly focused on S.A. commercial real estate to portfolios with S.A. REITs focused on commercial real estate in developed countries in Europe. We conduct our analysis for two periods. First, we distinguish our sample into the pre-REIT period (January 2002 to April 2013) and the REIT period (May 2013 to December 2016) in S.A. Carstens and Freybote (2019) find that determinants of foreign REIT investments in S.A. changed from the pre-REIT period to the REIT period, while Carstens and Freybote (2018) find evidence for an increased impact of foreign investor trading on REIT share liquidity in the REIT period.

Second, diversification benefits to U.S. investors may have been impacted by the most recent financial crisis. Liow and Newell (2016) show that international public real

Exhibit 3
U.S. and S.A. REIT Return Correlation (2002–2016)



estate markets exhibit increasing stock market linkages during the financial crisis. Lu, Tse, and Williams (2013) show that the correlation of U.S. REIT returns with international REIT market returns varies over time. Correlations are affected by U.S. REIT market conditions and diversification benefits were eroded during the most recent financial crisis. Pham (2012) finds that returns are transmitted from developed to emerging markets in Asia. Gibliaro and Mattarocci (2016) find that international home biased REIT perform worse after the financial crisis compared to internationally diversified REITs. Other studies show REIT investor behavior changed from the pre-crisis to the post-crisis period (Devos, Ong, Spieler, and Tsang, 2013; Das, Freybote, and Marcato, 2015). As a result, we distinguish between the pre-crisis (2002–2006), crisis (2007–2009), and post-crisis (2010–2016) periods in the U.S., in line with Devos, Ong, Spieler, and Tsang (2013) and Das, Freybote, and Marcato (2015).

In our empirical analysis, we employ mean-variance portfolio optimization methodologies. Markowitz modern portfolio theory (MPT) has been used in a number of studies analyzing various real estate diversification strategies, including geographical diversification (Byrne and Lee, 1997; Cheng and Liang, 2000). Markowitz (1959) argues that a risk-averse investor always prefers lower risk and consequently lower returns. Considering the emerging market context of our study, we first consider a minimum variance model as it minimizes portfolio risk. In addition to portfolio variance, we apply the Sharpe performance measure to assess whether our results hold when incorporating return considerations. The Sharpe measure is defined as the excess returns that exceed the risk-free rate of return per unit of standard deviation of returns (Giannotti and Mattarocci, 2013).

We first employ equally-weighted portfolios in line with previous studies (e.g., Conover, Friday, and Sirmans, 2002; Moss, Clare, Thomas, and Seaton, 2015). Next, we conduct mean variance portfolio optimization using quadratic programming (QP). We estimate a QP model (Ragsdale, 2015) as shown in equation (1) to minimize risk subject to a number of constraints.

$$\begin{aligned} \text{Minimize } \text{Var}(p) &= \sum_{i=1}^n \sigma_i^2 p_i^2 + 2 \sum_{i=1}^{n-1} \sum_{j=i+1}^n \sigma_{ij} p_i p_j \\ \text{Subject to:} \\ p_i &\geq 0, i = 1, 2, 3, \dots, N \\ \sum_{i=1}^n p_i &= 1 \\ \sum_{j=1}^n p_j &\leq 0.3, \end{aligned} \tag{1}$$

where $\text{Var}(p)$ denotes the portfolio variance and p_i exhibits the portion of the portfolio invested in REIT i . The variance of investment in REIT i is represented by σ_i^2 , with σ_{ij} displaying the covariance between REIT investments i and j .

The model includes three constraints. The first condition limits short selling (Cheng and Liang, 2000) with the second condition requiring all capital to be invested by equating the total portfolio weight to one (Ho, Rengarajan, and Xie, 2014). Finally, the model limits the portfolio inclusion of S.A. REITs with p_j representing the portion of S.A. REITs. The literature suggests that foreign real estate investment may be limited to 10% for risk-tolerant investors and 5% for risk-averse investors (Cheng, Ziobrowski, Caines, and Ziobrowski, 1999). However, yield-seeking investors may be more risk tolerant, potentially increasing the attractiveness of diversification benefits from foreign investment (Cheng, Ziobrowski, Caines, and Ziobrowski, 1999). Following Ghysels, Plazzi, and Valkanov (2016), who use an emerging market portfolio weight of 30%, and Kyrychenko and Shum (2009), who suggest a foreign to total U.S. stocks proportion of 30% to 50%, we constrain our allocation to S.A. REITs to 30% of the total REIT portfolio. Considering the improving share liquidity in emerging REIT markets (Carstens and Freybote, 2018), increasing international investments and an increasing interest in emerging markets (Ghysels, Plazzi, and Valkanov, 2016) in particular, the argument can be made that higher emerging market portfolio allocations may be justified and future studies may investigate the portfolio implications of such allocations.

The Sharpe ratio is calculated (Sharpe, 1964) as shown in equation (2):

$$S = \frac{k_p - k_{RF}}{\sigma_p}, \quad (2)$$

where k_p denotes the portfolio return, k_{RF} the risk-free rate, and σ_p the portfolio return standard deviation. The 30-day Treasury bill rate is employed as the risk-free rate for the corresponding period. The return on portfolio k_p is the weighted average of the returns achieved by the investment in different REITs, or:

$$k_p = \sum_{i=1}^n k_i p_i, \quad (3)$$

where k_i denotes the return on REIT i and p_i the portion of the portfolio invested in REIT i .

Substituting into equation (2), and substituting for σ_p from equation (1) yields:

$$S = \frac{(\sum_{i=1}^n k_i p_i) - k_{RF}}{\sqrt{\sum_{i=1}^n \sigma_i^2 p_i^2 + 2 \sum_{i=1}^{n-1} \sum_{j=i+1}^n \sigma_{ij} p_i p_j}}.$$

We therefore estimate a QP model solving for a return maximization objective as shown in equation (4) with a number of constraints:

Exhibit 4
Pairwise Correlations of U.S. and S.A. REIT Returns

Period	Correlation
Panel A: U.S. and S.A. REIT Returns for 2002–2016	
Full Period	0.3980***
Panel B: U.S. Periods	
Pre-crisis	0.0900
Crisis	0.5702***
Post-crisis	0.4225***
Panel C: S.A. Periods	
Pre-REIT period	0.3846***
REIT period	0.4926***

Notes: This exhibit presents the pairwise correlations for the returns (in U.S. dollars) of the 20 largest U.S. and S.A. REITs each month for 2002–2016.

*** Significant at the 1% level.

$$\text{Maximise } S(p) = \frac{(\sum_{i=1}^n k_i p_i) - k_{RF}}{\sqrt{\sum_{i=1}^n \sigma_i^2 p_i^2 + 2 \sum_{i=1}^{n-1} \sum_{j=i+1}^n \sigma_{ij} p_i p_j}}$$

Subject to:

$$p_i \geq 0, i = 1, 2, 3, \dots, N$$

$$\sum_{i=1}^n p_i = 1, \tag{4}$$

where $S(p)$ denotes the portfolio Sharpe performance, p_i the portion of the portfolio invested in REIT i , σ_i^2 the investment variance, with σ_{ij} denoting the covariance between REIT investments i and j . Analogous to the first model, constraints limit short selling, ensuring that all capital is invested, and S.A. REIT exposure is limited to 30% as well. Considering the possibility that some REIT investors may exhibit return-chasing behavior, we additionally present a model that maximizes the Sharpe performance without the S.A. allocation constraint. Thus, we can determine whether investors gain improved risk-adjusted return benefits if home bias allocation preferences are not considered.

RESULTS

Real estate diversification benefits are created from the low correlation between different markets Liow, Ho, Ibrahim, and Chen (2009). As shown in Exhibit 4, U.S. and S.A. REIT returns for the 2002–2016 period have a significantly positive correlation of 0.3980. However, this pairwise correlation varies over time, which is in line with studies that find temporally unstable correlations (Pham, 2012; Lu, Tse,

Exhibit 5
Results for Equally-Weighted Portfolios

	U.S. REIT	U.S.-S.A. REIT
Panel A: Portfolio Variance		
Pre-Crisis	0.0016	0.0016
Crisis	0.0174	0.0087
Post-Crisis	0.0022	0.0016
Pre-REIT period	0.0061	0.0032
REIT period	0.0018	0.0017
Panel B: Portfolio Sharpe Ratio		
Pre-Crisis	0.0201	0.0357
Crisis	-0.0980	-0.1139
Post-Crisis	0.2597	0.1700
Pre-REIT period	0.0177	0.0160
REIT period	0.1699	0.0325

Notes: The figures in bold indicate the portfolio with superior performance (lower risk and/or higher risk-adjusted returns) for the respective period.

and Williams, 2013; Liow and Newell, 2016). In the crisis period (2007–2009), U.S. and S.A. REIT returns exhibit the highest correlation (0.57), which is in line with studies that find higher correlations between global REIT markets during volatile periods (Lu, Tse, and Williams, 2013). Compared to the pre-crisis period (2002–2006) in which REIT returns had a low and insignificant correlation of 0.09, the correlation is a high and significant 0.42 in the post-crisis period. If time periods are separated based on the pre-REIT period and the REIT period in S.A., pairwise correlations between the U.S. and S.A. REIT returns are significantly positive, albeit higher in the REIT period. The pairwise correlations in both periods are likely driven by the increased integration of the S.A. REIT market with international REIT markets as a result of the inward listings of European REITs and/or increased investments by foreign investors. Our results in Exhibit 4 are in line with the increasing return comovement shown in Exhibit 2.

Next, we evaluate to what extent S.A. REITs in general provide diversification by establishing equal-weighted and optimized portfolios for our sample of U.S. and S.A. REITs. Considering the potential risk concerns of developed market investors, we first construct a minimum risk portfolio to compare the portfolio variance of a U.S. REIT and combined U.S.-S.A. REIT portfolio. In this initial analysis, we do not distinguish between S.A. REITs with a S.A. or international market investment focus. Secondly, we derive Sharpe-based portfolio allocations to assess the inclusion of emerging market REITs on a risk-adjusted basis. Our model performs portfolio allocations to individual REITs on a country level.

Exhibit 5 presents the minimum variance portfolio and Sharpe ratio results for an equally-weighted portfolio. The minimum variance results in Panel A indicate that the

Exhibit 6
Results for Equally-Weighted REIT Portfolios (separated by geographical investment focus)

	U.S. REIT	U.S.-S.A.REITSA	U.S.-S.A.REITFOR
Panel A: Portfolio Variance			
Pre-Crisis	0.0016	0.0014	0.0013
Crisis	0.0174	0.0114	0.0108
Post-Crisis	0.0022	0.0017	0.0016
Pre-REIT period	0.0061	0.0039	0.0038
REIT period	0.0018	0.0017	0.0016
Panel B: Portfolio Sharpe Ratio			
Pre-Crisis	0.0201	0.0523	0.0657
Crisis	-0.0980	-0.1258	-0.0907
Post-Crisis	0.2597	0.1906	0.2294
Pre-REIT period	0.0177	0.0055	0.0351
REIT period	0.1699	0.0505	0.1119

Note: The figures in bold indicate the portfolio with superior performance (lower risk and/or higher risk-adjusted returns) for the respective period.

inclusion of S.A. REITs on an equally-weighted basis reduces the overall portfolio risk for all periods, except the pre-crisis period. Additionally, including S.A. REITs in a portfolio with U.S. REITs in the REIT period reduces the variance only slightly. The results in Exhibit 5 suggest that combining emerging and developed REITs in a portfolio has diversification benefits for foreign investors.

Panel B in Exhibit 5 provides the results for the portfolio Sharpe ratio. In the pre-crisis period, the inclusion of S.A. REITs in a portfolio with U.S. REITs maximizes Sharpe ratios. However, in all other periods, diversifying into S.A. REITs yields smaller Sharpe ratios than a pure U.S. REIT portfolio. Thus, on a risk-adjusted basis, the diversification into S.A. REITs does not appear to be beneficial to a foreign investor, based on an equally-weighted portfolio.

To assess whether the geographical investment focus of S.A. REITs has an impact on the diversification benefits of foreign investors, we estimate equally-weighted and optimized portfolios for U.S. REITs, S.A. REITs with S.A. focus (S.A.REITSA), and S.A. REITs with a foreign focus (S.A.REITFOR). Exhibit 6 reports our findings for these three scenarios. The inclusion of S.A. REITs with a foreign focus in a portfolio with U.S. REITs yields the lowest portfolio variance compared to a U.S. REIT-only portfolio or a portfolio of U.S. REITs and S.A. REITs with S.A. assets (Panel A). This result suggests that emerging market REITs with developed market assets improve the diversification benefits for foreign investors. One explanation for our findings is that the exposure to developed commercial real estate markets likely reduces emerging country-specific risks inherent in a REIT portfolio.

Exhibit 7
Variance Results for Optimized Portfolios

	U.S. REIT	U.S.- S.A. REIT	Allocation to S.A. REITs		
Panel A: Variance for U.S. and U.S.-S.A. Portfolios					
Pre-Crisis	0.0008	0.0004	30%		
Crisis	0.0057	0.0025	30%		
Post-Crisis	0.0014	0.0001	30%		
Pre-REIT period	0.0019	0.0011	30%		
REIT period	0.0013	0.0010	30%		
	U.S. REIT	U.S.- S.A.REITSA	Allocation to S.A.REITSA	U.S.- S.A.REITFOR	Allocation to S.A.REITFOR
Panel B: Variance for U.S. and U.S.-S.A. Portfolios Separated by Geographical Investment Focus					
Pre-Crisis	0.0008	0.0007	5%	0.0006	16%
Crisis	0.0057	0.0045	30%	0.0025	30%
Post-Crisis	0.0014	0.0012	30%	0.0010	30%
Pre-REIT period	0.0019	0.0011	30%	0.0012	30%
REIT period	0.0013	0.0012	21%	0.0010	30%

Note: The figures in bold indicate the portfolio with superior performance (lower risk) for the respective period.

The results for the Sharpe ratio in Panel B in Exhibit 6 are more mixed. For the pre-crisis, crisis, and pre-REIT periods, the portfolio of U.S. and S.A. REITs with a foreign focus yields the highest Sharpe ratio in an equally-weighted portfolio. In the post-crisis and REIT periods, a portfolio of only U.S. REITs maximizes the Sharpe ratio. Explanations for this reduction in diversification benefits are the increased correlation between S.A. and U.S. REIT returns over time and increased investments of foreign investors after May 2013. Note that the risk-adjusted performance for the crisis period yields negative Sharpe values for all portfolios, suggesting that risk-free investments such as Treasury bills would have provided investors with a better investment alternative.

The advantage of optimized portfolios over equally-weighted portfolios is that the former method estimates portfolio weights based on the objective of the lowest variance or the highest risk-adjusted returns, thus yielding better results. Exhibit 7 reports the results for optimized portfolios of U.S. and S.A. REITs based on the objective of minimizing portfolio variance.

As shown in Panel A in Exhibit 7, a portfolio of S.A. REITs, irrespective of their geographical investment focus, and U.S. REITs allows foreign investors to minimize the portfolio variance in all periods. Interestingly, in the optimized portfolios, the maximum allowed portion (30%) is allocated to emerging country REITs across all periods, indicating that the inclusion of S.A. REITs provides consistent risk reduction

benefits. The allocation to S.A. REITs represents the percentage allocation that shifted from U.S. to S.A. REITs. The 30% allocations to S.A. REITs are in line with the conclusions of Kyrychenko and Shum (2009) and Ghysels, Plazzi, and Valkanov (2016).

The results in Panel B in Exhibit 7 suggest that S.A. REITs with foreign exposure minimize portfolio risk in all periods but the pre-REIT period and overall provide superior risk reduction benefits relative to both the U.S. REITs and U.S.-S.A. REITs with domestic portfolios.

Exhibit 8 presents the Sharpe performance results for the optimized portfolios. The results in Panel A suggest that S.A. REITs should be included in a portfolio with U.S. REITs to maximize the Sharpe ratio in all periods. In line with Rubens, Louton, and Yabaccio (1998), we employ the *W*-test statistic that compares the performance of an expanded portfolio performance relative to a base portfolio using the Sharpe ratio. Hereby, a positive *W*-test statistic value indicates that the expanded REIT portfolio including S.A. REITs provides superior performance relative to the U.S.-only REIT portfolio. However, our *W*-test statistics in Exhibit 8 are not statistically significant.

As shown in Panel A in Exhibit 8, the optimized portfolio allocates 30% to emerging market REITs, except in the pre-crisis period (17%) and the REIT period (20%). One explanation for this result is that, when using the Sharpe ratio as a proxy for risk-adjusted returns, high returns in particular periods dominate. In our analysis, this results in high allocations to high-yielding S.A. REITs and a reduction of the share allocated to U.S. REITs included in the model. The higher portion allocation to fewer high-performing REITs is consistent with expectations that high performance real estate displays an increased prominence in the efficient portfolio (Seiler and Seiler, 2005). We also suspect that if our S.A. REIT allocation limitation of 30% is removed, an even higher percentage of the portfolio would be allocated to S.A. REITs.

Panel B in Exhibit 8 shows that S.A.REITFOR provides superior risk-adjusted performance relative to the other portfolio combinations for all periods. Overall, our results in Exhibits 7 and 8 suggest that S.A. REITs with foreign exposure minimize portfolio risk in all periods but the pre-REIT period and maximize the Sharpe ratio, suggesting that optimized portfolios that include S.A.REITFOR improve diversification benefits for foreign REIT investors. Our findings support Liow, Ho, Ibrahim, and Chen (2009), who find that international diversification reduces portfolio risk without diluting returns.

Lastly, Exhibit 9 shows our optimized Sharpe portfolio results when we remove the S.A. asset allocation constraint of 30%. Panel A shows that the overall allocation to S.A. REITs during the post-crisis period (36%), crisis period (93%), and pre-REIT period (71%) exceed 30%. Thus, in absence of an emerging market allocation limitation, higher proportions of S.A. REITs are included in the optimized portfolio in these periods. In line with Rubens, Louton, and Yobaccio (1998), we assess whether the Sharpe ratios of different portfolios are statistically different from each other. We find a statistically significant difference for the Sharpe ratio of the U.S.-only and U.S./S.A. portfolios in the crisis period.

Exhibit 8
Sharpe Ratio Results for Optimized REIT Portfolios

	U.S. REIT	U.S.- S.A. REIT	W-Test Statistic	F-Stat.	Allocation to S.A.REITs		
Panel A: Sharpe Ratio for U.S. and U.S.-S.A. Portfolios							
Pre-Crisis	0.3849	0.4054	0.0141	0.0285	17%		
Crisis	0.0392	0.5299	0.2788	0.2214	30%		
Post-Crisis	0.4059	0.5264	0.0965	0.3112	30%		
Pre-REIT period	0.0967	0.2969	0.0781	0.4595	30%		
REIT period	0.3285	0.3775	0.0312	0.0360	20%		
	U.S. REIT	U.S.- S.A.REITSA	W-Test Statistic	F-Stat.	U.S.- S.A.REITFOR	W-Test Statistic	F-Stat.
Panel B: Sharpe Ratios for U.S. and U.S.-S.A. Portfolios Separated by Geographical Investment Focus							
Pre-Crisis	0.3849	0.3982	0.0091	0.0460	0.4013	0.0112	0.0569
Crisis	0.0392	0.0398	0.0000	0.0001	0.5299	0.2788	0.7381
Post-Crisis	0.4059	0.4093	0.0024	0.0178	0.5265	0.0965	0.7219
Pre-REIT period	0.0967	0.1234	0.0058	0.0744	0.2970	0.0781	0.9990
REIT period	0.3285	0.3335	0.0030	0.0100	0.3774	0.0312	0.1046

Notes: Following Rubens, Louton, and Yobaccio (1998), the *W*-test statistic and *F*-statistic are calculated to determine the superior performance of one portfolio relative to another. The figures in bold indicate the portfolio with superior performance (higher risk-adjusted returns) for the respective period.

Exhibit 9
Sharpe Ratio Results for Optimized Portfolios without Allocation Constraints

	U.S. REIT	U.S.- S.A. REIT	W-Test Statistic	F-Stat.	Allocation to S.A.REITs		
Panel A: Sharpe Ratio for U.S. and U.S.-S.A. Portfolios							
Pre-Crisis	0.3849	0.4054	0.0141	0.0285	17%		
Crisis	0.0392	6.8040	46.2219	36.706***	93%		
Post-Crisis	0.4059	0.5300	0.0997	0.3218	36%		
Pre-REIT period	0.0967	0.4216	0.1668	0.9820	71%		
REIT period	0.3285	0.3775	0.0312	0.0360	20%		
	U.S. REIT	U.S.- S.A.REITSA	W-Test Statistic	F-Stat.	U.S.- S.A.REITFOR	W-Test Statistic	F-Stat.
Panel B: Sharpe Ratio for U.S. and U.S.-S.A. Portfolios Separated by Geographical Investment Focus							
Pre-Crisis	0.3849	0.4030	0.0124	0.0630	0.4015	0.0114	0.0576
Crisis	0.0392	0.0398	0.0000	0.0001	6.7412	45.373	120.10***
Post-Crisis	0.4059	0.4093	0.0024	0.0178	0.5291	0.0989	0.7396
Pre-REIT period	0.0967	0.1234	0.0058	0.0744	0.4216	0.1668	2.13**
REIT period	0.3285	0.3335	0.0030	0.0100	0.3774	0.0312	0.1046

Notes: Following Rubens, Louton, and Yobaccio (1998), the *W*-test statistic and *F*-statistic are calculated to determine the superior performance of one portfolio relative to another. The figures in bold indicate the portfolio with superior performance (higher risk-adjusted returns) for the respective period.

** Significant at the 5% level.

*** Significant at the 1% level.

Panel B of Exhibit 9 reports the results for S.A. REIT portfolios separated by geographical investment focus. U.S. REIT portfolios with S.A. REITs with a local asset focus (U.S.-S.A.REITSA) consistently provide diversification gains compared to U.S. REIT-only portfolios across all periods, albeit Sharpe ratio differences are insignificant. Portfolios that combine U.S. REITs with S.A. REITs with foreign holdings consistently outperform U.S. REIT-only and U.S.-SAREITSA portfolios. Portfolio Sharpe ratios for the U.S.-S.A.REITFOR portfolios are statistically different from the U.S. REIT-only portfolio in the crisis and pre-REIT periods, but not in any other period. The finding for the crisis period is particularly interesting considering that previous studies have found the correlations between international REIT markets to increase during times of crisis (Lu, Tse, and Williams, 2013; Liow and Newell, 2016), which may reduce diversification benefits. Our results for the financial crisis period suggest that including emerging market REITs in a portfolio with U.S. REITs in that period provided diversification benefits.

As a robustness check, we winsorize U.S. and S.A. REIT returns to remove the impact of extreme return behavior and conduct our analysis again. As the winsorized results are in line with our previous results, we do not report them.

CONCLUSION

REITs in emerging countries or smaller-sized developed countries such as Australia are likely to invest outside their home country. We investigate the implications of the geographical focus of REITs for foreign investors holding U.S. REITs. In particular, we focus on emerging country REITs from S.A., which differ in their exposure to commercial real estate markets in developed countries, predominantly in Europe.

In our empirical analysis, we use the 20 largest U.S. and S.A. REITs in each month from January 2002 to December 2016. Using equally-weighted and optimized portfolios (quadratic programming), we find that including S.A. REITs in general in a portfolio with U.S. REITs has diversification benefits. In addition, S.A. REITs with predominantly foreign assets have superior diversification benefits compared to S.A. REITs that predominantly hold assets in S.A. in terms of variance minimization and Sharpe ratio maximization to foreign investors holding U.S. REITs.

Our study complements the literature on foreign REIT investments (e.g., Liu and Mei, 1998; Ling and Naranjo, 2002). In particular, we are the first to assess the diversification implications of the geographical focus of REITs for foreign investors. Our findings are of value to portfolio managers constructing international real estate portfolios and investors in emerging markets as they suggest that the location of emerging market REIT holdings have implications for diversification benefits. Thus, foreign investors benefit from an in-depth analysis of the geographical focus of investable emerging market REITs in order to make investment decisions and develop portfolio strategies.

Future studies may investigate the effect of the geographical investment focus of developed market REITs, for example from Australia, on diversification benefits for

U.S. investors. Additionally, future studies may revisit our findings to assess the implications of S.A. REIT holdings in Europe on U.S. investors holding assets, considering that U.S. investors are likely to be invested in commercial real estate and/or REITs in Europe already. Lastly, future studies may investigate whether the asset portfolios of REITs in other emerging countries differ from S.A. REIT portfolios in their exposure to commercial real estate markets in developed countries and further investigate the motivations of emerging market REITs to do so.

Considering that REITs in S.A. not only invest in direct real estate, but also REIT stocks, future studies with the appropriate datasets may also investigate their motivations to hold REIT stocks and the portfolio implications for REITs and REIT investors.

ENDNOTES

1. These numbers are based on a combination of Nedbank data (Nedbank Property Sector Report, 2017) regarding the geographic concentration of assets of the S.A. listed property sector and a review of the financial statements of S.A. REITs.
2. Based on information from the State Department's Office of Investment Affairs' Climate Statement (<https://www.export.gov/article?id=South-Africa-foreign-direct-investment-statistics>).

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