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Investment style, regionality aspects, and performance: an analysis in the context of brazilian real estate investment trusts

Estilo de inversión, aspectos de regionalidad y desempeño: un análisis en el contexto de los fondos de inversión inmobiliaria brasileños

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Abstract

The aim of this study was to analyze the possible effects of the location of the assets of real estate investment trusts (REITs) on their risk-adjusted performance. Financial data on 86 REITs were used, some taken from the Funds Explorer website and the rest taken from the Economatica database. The data covered the four-year period from 2016 to 2019. Panel data regression analysis was employed to test the hypotheses, with the random effects model being adopted after conducting the Hausman, Breusch & Pagan, and Chow tests. The main results suggest that management fee has a positive and statistically significant relationship with the Sharpe ratio relating to the risk premium of the REIT's portfolio, while the age of the REIT showed a statistically significant and negative relationship with this dependent variable. Other elements, such of performance fees and the number of cities where the REIT has real estate were not statistically significant.

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Resumen

El objetivo de este estudio fue analizar los posibles efectos de la ubicación de los activos de los fondos de inversión inmobiliaria (REITs) sobre su desempeño ajustado al riesgo. Se utilizaron datos financieros de 86 REITs, algunos tomados del web site Funds Explorer y el resto de la base de datos de Economática. Los datos cubrieron el período de cuatro años, de 2016 a 2019. Se utilizó el análisis de regresión de datos de panel para probar las hipótesis, y se adoptó el modelo de efectos aleatorios después de realizar las pruebas de Hausman, Breusch & Pagan y Chow. Los principales resultados sugieren que la tarifa de administración tiene una relación positiva y estadísticamente significativa con el índice de Sharpe relativo a la prima de riesgo de la cartera de REIT, mientras que la antigüedad del REIT mostró una relación estadísticamente significativa y negativa con esta variable dependiente. Otros elementos, como las tarifas de desempeño y el número de ciudades donde el REIT tiene bienes raíces, no fueron estadísticamente significativos.

Código JEL: G10, G11
Palabras clave: fondos de inversión inmobiliaria; diversificación; Brasil; rentabilidad ajustada al riesgo; localización

Introduction

There are a growing number of studies related to real estate investment trusts (REITs) in the finance literature (Damianov & Elsayed, 2018; Adnan et al., 2021). The REITs market in Brazil has recently expanded, especially after the changes to its regulations that began in 2008 (Yokoyama et al., 2017). REITs combine characteristics of different markets, including the real estate market (the main source of revenue) and the stock market, which is the environment in which they are traded (Damianov & Elsayed, 2018; Yokoyama et al., 2017). In Brazil, REITs benefit from tax incentives (with relation to the distribution of rents), which is an important point to consider when comparing them with other securities (Scolese et al., 2015; Yokoyama et al., 2017; Franco, 2019).

Based on modern portfolio theory, Yokoyama et al. (2017) identified that in the Brazilian market REITs can provide potential diversification benefits in an asset portfolio, either by increasing its return (in a portfolio composed of stocks and REITs) or by keeping the return constant and reducing volatility, thus raising the portfolio's efficient frontier.

Moraes and Serra (2017) identified that bigger REITs (in terms of net equity) are more diversified; however, the quantity and concentration of properties (concentration of assets, real estate, and

financial instruments of the real estate market, such as shares, or "quotas," in other REITs) were not significant in explaining the diversification of REITs.

In this paper, we expect to expand previous research by considering a proxy for asset diversification as a potential determinant of risk-adjusted performance of Brazilian REITs. Therefore, the aim of this study was to analyze the possible effects of the location of the assets of real estate investment trusts (REITs) on their risk-adjusted performance. Other variables, such as structure of fees and size, are also considered in the quantitative model.

Thus, the study may help in filling a gap in the research relating to the possible effect of asset location by city, given the difficulty of finding these data in Brazil (Moraes & Serra, 2017). This difficulty was overcome by collecting data from the Funds Explorer website (Funds Explorer, 2019).

According to Royer (2016), as REITs are closed-ended trusts traded on the stock exchange in Brazil, this type of investment can contribute to a greater circulation of funds in the financial market, thus helping to make it more dynamic. Moreover, private individuals can benefit by diversifying their investments and obtaining greater returns, which can improve many people's quality of life (Scolese et al., 2015).

On one hand, it is important to note that liquidity issues need to be considered when evaluating investments in REITs, since the liquidity of their assets tends to be limited (Cashman et al., 2021). On the other hand, the characteristics related to the type of return (capital gains versus cash dividends) make investments in REITs an attractive alternative (DiBartolomeo et al., 2021).

As more studies are conducted in this area, more knowledge and information will become available, which may encourage institutions to organize and provide greater quantities of higher quality data. Additionally, the information about REITs and about the organizations linked to them is relevant for the market, but investors' attention seems to be limited in some aspects of this relationship (Chen et al., 2020). Therefore, detailed data and information could help to foster more academic studies in the area, as well as facilitating management by fund managers, whose work would be made easier with more such information (Scolese et al., 2015). These factors highlight the relevance of studying this investment modality.

Theoretical framework and literature review

Real estate investment trusts (REITs) have grown in Brazil over recent years, increasingly attracting both private and institutional investors (Scolese et al., 2015). According to Ferreira (2011), various factors have contributed and continue to contribute to the expansion of this investment modality, such as the economic

stability derived from the "Real Plan", advances in the legislation for the real estate sector, and increased foreign investment in Brazil, among others.

In general, direct investments in real estate require high capital expenditure; in light of this, one of the main attractions of REITs is that they enable access for small investors, who with a relatively low value compared to that needed to acquire a property can invest in the real estate sector (Scolese et al., 2015). REITs also provide the possibility of diversification through simultaneous investment in various properties at an affordable cost (Scolese et al., 2015).

REITs are composed of resources used to invest in real estate ventures, both for construction and acquisition for future sale and to earn income from property rentals (CVM, 2014). An REIT is a condominium of investors whose aim is to invest funds in real estate ventures (which are still to be built or are already finalized). REIT investors have no real rights over the ventures that compose the fund; that is, the regulations absolve the quota holder from any legal or contractual obligation concerning the ventures that make up the fund (Scolese et al., 2015). REITs can also acquire securities related to real estate ventures, such as real estate credit bills and real estate receivables certificates, among others (CVM, 2014).

The earnings paid out by REITs (rents) are income tax exempt for private individuals, according to Law 11,033/04, provided they involve a fund with at least 50 quota holders whose quotas are traded exclusively on a stock exchange or organized over-the-counter market (Scolese et al., 2015; Franco, 2019). Moreover, this tax exemption only applies in cases where the investor's earnings do not exceed more than 10% of the REIT's income and they do not own more than 10% of its total quotas (Scolese et al., 2015; Franco, 2019).

The portfolios of REITs involve a collection or physical assets; therefore, these portfolios need to be managed by individuals, requiring human capital investment (Feng et al., 2020). The management of a trust covers the range of services related to running and maintaining it, which can be provided by the manager or by third parties (hired by the manager), as long as they are properly qualified (Scolese et al., 2015).

With relation to the impact of management fees on the risk-adjusted return of investment funds, many studies state that management fees have a negative relationship with such return (Funchal et al., 2016; Milan & Eid Júnior, 2014; Jones, 2009), since managers take fewer risks when these fees are charged in order to avoid the outflow of capital from their fund.

According to Funchal et al. (2016), performance fees partially annul this effect of management fees, making managers assume greater risks in search of higher revenues. Performance fees can also mitigate eventual conflicts of interests among investors and managers, motivating fund managers in obtaining better indexes for risk-adjusted returns (Malaquias & Eid Júnior, 2014). Based on studies that

have measured the impact of these fees on the performance of other types of investment funds (such as equity funds), the first two hypotheses that we intend to test in this study are the following:

H1: Management fees have a negative relationship with the risk-adjusted return of REITs.

H2: Performance fees have a negative relationship with the risk-adjusted return of REITs.

Despite the fact that REITs were officially created by Law 8,668/93 and were regulated by instruction 205/1994 of the CVM (Comissão de Valores Mobiliários, the Brazilian capital market regulator), they only began to expand considerably from 2005 onward, when a significant number of new offers were supported by the growth of the construction industry in the whole country (Locatelli et al., 2018).

The age of investment funds is a variable used in studies in this area. According to Milan and Eid Júnior (2014), Funchal et al. (2016), and Jones (2009), older funds tend to produce lower returns, which may be explained by more conservative management on the part of their managers; a conservative management may be also reflected in lower volatility of returns.

Considering the context of mutual funds, Borges Junior and Malaquias (2019) observed that younger funds tend to achieve better indexes for risk-adjusted performance in comparison to older funds. An argument used by the authors to understand this relationship is competition in the investment fund market, where a new fund (in comparison to their counterparts) would have an additional motivation to provide better performance and attract new investors (Borges Junior & Malaquias, 2019). Therefore, the third hypothesis related to this study is related to age and performance:

H3: The age of REITs in Brazil is negatively related with their risk-adjusted return.

Portfolio diversification is a much debated topic in studies related to finance. Markowitz (1952), one of the main authors responsible for portfolio diversification theory, argued that a combination of assets and diversification strategies reduce the volatility of company profits. Markowitz's work led to better application of the concept of diversification; that is, through diversification an investor is able to obtain greater returns with the same level of risk (Fonseca et al., 2007). Research into the benefits of investment diversification in emerging markets has grown and attracted increasing academic interest (Cumming & Zhang, 2016).

One characteristic of investments in REITs is that they allow small investors to earn income (by buying quotas in REITs and receiving rents) at a lower cost compared to the amount needed to acquire a property. In addition, as mentioned above, there is a kind of fiscal benefit (Scolese et al., 2015). REITs also enable a certain level of diversification, since it involves investments in different properties, earning income through renting, for example (Locatelli et al., 2018). Investments in different locations also demand an analysis that considers regional aspects of each region. The geographical location related to REITs assets can affect their returns and productivity (Feng & Wu, 2021).

Regarding the diversification and return of REITs in Brazil, there is no consensus in the literature. Moraes and Serra (2017) found in their study that only size was significant in relation to REIT diversification; while the number of properties and asset concentration were not significant in relation to diversification. Locatelli et al. (2018) found that in general, REIT performance was unsatisfactory in the analysis period of the research.

Thus, with the aim of determining the relationship between diversification and the risk-adjusted performance of REITs, the fourth hypothesis that guides this study is the following:

H4: The greater the diversification in terms of the number of cities where REIFs have properties, the greater their performance.

Data and methods

The data collection took place in August of 2019, using the information available on Funds Explorer website (Funds Explorer, 2019). This website was chosen as it contains information on the portfolio composition of Brazilian REITs. The period studied covered January of 2016 to July of 2019. The analysis begins in January of 2016 since the indicators that compose the dependent variable (the Sharpe ratio, which will be detailed below) are available as of that month. As the data collection was carried out in August of 2019, the analysis period ends in July of that same year.

In a first analysis, all the available data were gathered relating to the codes of the real estate funds. The date the fund was founded was considered, as well as the cities and respective states in which the REITs have properties (that is, the composition of their investment portfolios). We also identified the number of properties of each REIT, as well as their total meterage (collected separately by city and by REIT).

Of the 166 REITs contained in the database, 86 had the aforementioned data, generating a total of 258 observations. Thus, the sample was composed of those 86 funds. In addition, we collected the values of the monthly quotas of the REITs, the rent paid per quota, and the monthly and annual return.

To complement the analysis, data relating to net equity, management fees, performance fees, and the manager-DM variable were collected from the Economatica database and incorporated into the analysis.

Variables used in the study

Meterage per city: This is the percentage of the total meterage of the real estate invested in by the fund in one particular city, based on information disclosed by the funds up to 07/31/2019. The location of the

properties of the REITs has already been used in previous studies such as those of Byrne and Lee (2003), Danielsen and Harisson (2007), and Anderson et al. (2012). The sign of the relationship is expected to be positive.

Age of the REIT: This is the age (in years) since the creation of the fund up to 07/31/2019. The age of investment funds is another variable used in studies in this area. Based on previous research (Milan & Eid Júnior, 2014; Borges Junior & Malaquias, 2019; Funchal et al., 2016; Jones, 2009), we expect a negative relationship between this variable and performance, since older funds tend to produce lower returns, possibly due to more conservative management, which is reflected in lower volatility of returns.

Number of cities: This is the number of different cities in which the fund invests in properties, based on information disclosed by the funds on 07/31/2019. Other studies that include the location of the properties of REITs are those of Byrne and Lee (2003), Danielsen and Harisson (2007), and Anderson et al. (2012). The sign of the relationship is expected to be positive.

Diversification (by city in which the REITs have properties): A dummy variable was created as a proxy for diversification of investments based on investment in different cities. The funds that have investments in more than three cities were given the value 1 and the rest took the value 0. The number of cities in which REITs have properties has already been used in international studies, such as those of Gyourko and Nelling (1996), Byrne and Lee (2003), Danielsen and Harisson (2007), and Anderson et al. (2012).

Sharpe Ratio: This is the risk premium of the fund, per month, weighted by the standard deviation of the fund's returns, calculated at the end of each year. Sharpe (1966) elaborated a ratio that measures return adjusted by the total risk of the portfolio. The Sharpe ratio (SR) is a widely used indicator to refer to the efficiency of a specific portfolio. It is also used to measure the risk-adjusted return that REITs provide (Locatelli, et al., 2018; Scolese et al., 2015; Bello, 2005).

Sharpe Ratio-P: Here the Sharpe ratio variable was given a zero value in cases where the risk premium was negative.

Ln (Net Equity): This indicates the natural logarithm of the fund's net equity at the start of the year. The greater the REIT's net equity, the higher its return is expected to be; moreover, size can also affect portfolio risk. Based on previous research (Gyourko & Nelling, 1996; Byrne & Lee, 2003; Malaquias & Eid Júnior, 2014; Borges Jr. & Malaquias, 2019), the sign is expected to be positive.

Management Fee: This is the maximum management fee charged by the fund per year. Studies such as those of Funchal et al. (2016), Gil-Bazo and Ruiz-Verdú (2009), and El Ghoul and Karoui (2017) have found that a management fee means that either managers take fewer risks in order to avoid the outflow of capital from their fund, or that agency problems make managers less risk-seeking than the

optimum level, or both. This means that the fund obtains less revenue, thus creating the expectation of a negative sign for this variable.

Performance Fee: A dummy variable was created with the value 1 for funds that charge a performance fee and 0 for the rest. This variable is used as a control variable in studies on investment funds, for example by Basak et al. (2007), Henke (2016), and Funchal et al. (2016). According to previous studies, a performance fee is expected to make investment fund managers take more risks and obtain greater performance, thus the sign is expected to be positive.

Manager-DM: This is a dummy variable that takes the value 1 for observations related to the two management companies with the greatest number of funds in the sample.

The econometric models used in the study to test the hypotheses are presented in Equations 1 and 2.

$$SHP_{it} = \beta_0 + \beta_1*Age_{it} + \beta_2*Diversif_{it} + \beta_3*Ln(Net.Eq)_{it} + \beta_4*MANfee_{it} + \beta_5*PERFfee_{it} + \beta_6*Manage\_DM_{it} + \varepsilon_{it} \quad (1)$$

$$SHP\text{-}P_{it} = \beta_0 + \beta_1*Age_{it} + \beta_2*Diversif_{it} + \beta_3*Ln(Net.Eq)_{it} + \beta_4*MANfee_{it} + \beta_5*PERFfee_{it} + \beta_6*Manage\_DM_{it} + \varepsilon_{it} \quad (2)$$

Where: SHP_{it} = indicates the risk-adjusted performance for each fund, each year; $SHP\text{-}P_{it}$ = indicates the risk-adjusted performance for each fund, each year, but the observations with negative risk-premium were replaced by zero; Age_{it} = indicates the age, in years, of each investment fund; $Diversif_{it}$ = a dummy variable, that takes 1 for funds that have investments in more than three cities and 0 for the other cases; $Ln(Net.Eq)_{it}$ = this is the natural logarithm of the net equity of each fund, at the beginning of each year; $MANfee_{it}$ = represents the maximum management fee charged by the fund per year; $PERFfee_{it}$ = this is a dummy variable that receives 1 for funds that have performance fees and 0 for the other cases; $Manage\_DM_{it}$ = represents a dummy variable that takes 1 for observations related to the two management companies with the greatest number of funds in the sample; β_0; β_1; β_2; β_3; β_4; β_5; β_6; ε = represent the parameters of the quantitative models.

We employed panel data analysis to test the hypotheses, which enables an analysis of the variations in the data over time (Fávero et al., 2014). In order to choose the most appropriate model for hypotheses testing, we evaluate the results of three different tests: the Hausman test; the Breusch and Pagan test; and the Chow test. The quantitative analysis was conducted through the use of Stata software.

Results and analyses

Analysis of the portfolio composition and diversification of the funds in the sample

Table 1 indicates that, in the database consulted, 86 REITs disclosed information on the city where the properties they invest in are located, as well as the meterage of the respective properties. The funds have a mean age of 9.5 years and invest in an average of three different cities. This quantity of cities was taken as the basis for the dummy variable used as a proxy for diversification. The results in Table 1 indicate that around 20% of the funds in the sample received 1 for the diversification variable.

Table 1
Descriptive statistics for the database, considering funds that disclosed information on investment per city

Variable	Obs	Mean	S.D.	Min.	Max.
Meterage per City (%)	86	72.620	36.608	3.030	100.000
Age (years)	86	9.459	5.955	0.420	24.430
Num. of Cities	86	3.070	4.712	1.000	33.000
Diversif. (Num. Cit. > 3)	86	0.209	0.409	0.000	1.000

Source: Prepared by the authors, 2019
Notes: Meterage per City (%): indicates the percentage of the total meterage of the properties the fund invests in per city, based on information disclosed by the funds on 07/31/2019; Age (years): age measured in years, since the start of the fund up to 07/31/2019; Num. Cities: Number of different cities where the fund invests in properties, based on information disclosed by the funds on 07/31/2019; Diversif. (Num. Cit. > 3): dummy variable used as a proxy for diversification of investments based on investment in different cities – in this variable, funds that have investments in more than three different cities are given the value 1 and the rest take the value 0

Table 2 reveals the descriptive statistics for two subsamples generated based on the diversification variable.

Table 2
Descriptive statistics for the database, considering the diversification variable

Variable	Diversif. (Num. Cit. > 3)	Obs	Mean	S.D.	Min.	Max.
Meterage per City (%)	0	68	88.235	22.501	33.333	100.000
Meterage per City (%)	1	18	13.629	6.737	3.030	25.000
Age (years)	0	68	9.882	6.363	0.420	24.430
Age (years)	1	18	7.861	3.781	1.270	12.860
Num. of Cities	0	68	1.265	0.536	1.000	3.000
Num. of Cities	1	18	9.889	6.902	4.000	33.000

Source: Prepared by the authors, 2019

Table 3 presents the descriptive statistics for the percentage of meterage per city, subdividing by state. It can be observed that the states with the greatest frequency in the investment portfolios are São Paulo, Rio de Janeiro, Rio Grande do Sul, and Minas Gerais, respectively. The state of Bahia, for example, attracts investments from at least five funds and the minimum percentage invested in the properties in one of its cities is 34.527%; on the other hand, there is one fund that invests 100% of its equity in one property located in Bahia.

The use of variables related to size in this type of study is based on previous studies, such as those of Gyourko and Nelling (1996), and Byrne and Lee (2003). Gyourko and Nelling (1996) and Moraes and Serra (2017) previously used the number of properties to verify the diversification of real estate funds.

Table 3
Descriptive statistics for the percentage of meterage invested in each city, by state

State	Freq.	Meterage (%)			
		Average	S.D.	Min.	Max.
AL	2	55.948	62.299	11.896	100.000
AM	2	8.010	7.737	2.539	13.481
BA	5	34.527	37.113	11.028	100.000
CE	3	11.036	12.113	1.500	24.665
DF	4	22.074	21.310	5.874	53.452
ES	1	13.418	-	13.418	13.418
GO	3	11.712	14.253	3.049	28.163
MA	2	36.812	33.923	12.824	60.799
MG	19	26.638	33.494	1.049	100.000
MS	1	2.219	-	2.219	2.219
MT	4	15.212	16.640	0.917	39.201
PA	4	8.646	5.073	2.880	13.312
PB	2	13.883	12.912	4.752	23.013
PE	3	21.543	24.062	3.459	48.853
PR	15	13.765	25.406	1.286	100.000
RJ	45	37.404	39.801	0.968	100.000
RN	1	13.726	-	13.726	13.726
RS	24	5.776	3.366	0.139	14.164
SC	7	36.754	43.805	2.863	100.000
SE	1	1.665	-	1.665	1.665
SP	116	43.610	42.085	0.598	100.000

Source: Prepared by the authors, 2019

Diversification and performance of the funds in the sample

To evaluate the possible effect of diversification of investments in properties in different cities, a panel data regression analysis was employed. Regional aspects are indirectly addressed in these tests. To conduct this analysis, the database relating to the diversification of the funds was combined with another

database (taken from Economatica, as explained in the methodology) containing the funds' performance and other control variables.

In order to choose the most appropriate model, we evaluate the results of three different tests: the Hausman test (between fixed-effects and random-effects); the Breusch and Pagan test (between pooled data and random-effects); and the Chow test (between pooled data and fixed-effects). For both models, the random-effects model was identified as the most appropriate (the Hausman test was not statistically significant at 5%; the Breusch and Pagan test was statistically significant at 5%).

First, we identified the funds' monthly return within the period from January of 2016 to July of 2019. The latter was the cutoff month due to the data collection being carried out in August of 2019.

Based on the monthly return, the premium was calculated to identify the monthly risk of each fund. Here, the proxy used for the risk-free rate was the SELIC rate. Next, the annual Sharpe ratio (SHP) of each fund was calculated. Funds with fewer than six observations in a year were excluded from that respective year of analysis, but remained in the parts of the sample where they presented more than six observations in a year. For robustness purposes, the SHP-P variable was created, which was given a zero value in cases in which the risk premium was negative. The two variables (SHP and SHP-P) were 2.5% winsorized (1.25% at each tail) in order to avoid possible biases derived from extreme outliers. Table 4 presents the descriptive statistics of the variables of the study.

Table 4
Descriptive statistics for the performance variables and control variables

Variable	Obs	Average	S.D.	Min.	Max.
SHP	258	-0.734	3.229	-7.387	7.784
SHP-P	258	0.911	1.780	0.000	7.784
Age (years)	258	10.395	4.871	1.017	24.433
Diversif. (Num. Cit. > 3)	258	0.248	0.433	0.000	1.000
Ln(Net.Eq.)	258	19.186	0.936	16.759	21.779
MANfee	258	0.658	0.859	0.002	5.000
PERFfee	258	0.070	0.255	0.000	1.000
Manager-DM	258	0.496	0.501	0.000	1.000

Source: Prepared by the authors, 2019
Notes: SHP: premium for the fund's risk, per month, weighted by the standard deviation of the fund's returns, calculated at the end of each year; SHP-P: the SHP variable takes a zero value in cases in which the risk premium was negative; Age (years): age measured in years, since the start of the fund up to 07/31/2019; Diversif. (Num Cit. > 3): dummy variable representing a proxy for investment diversification based on investment in different cities – in this variable, funds that have investments in more than three different cities take the value 1 and the rest take the value 0; Ln(Net.Eq): indicates the Napierian logarithm of the fund's net equity at the start of the year; MANfee: maximum management fee charged by the fund per year; PERFfee: dummy variable that takes the value 1 for funds that charge a performance fee and 0 for the rest; Manager-DM: dummy variable that takes the value 1 for the observations related to the two management companies with the greatest number of funds in the sample, among the five management companies that were identified in the database.

To evaluate a possible effect of diversification of investments in properties in different cities, a panel data regression analysis was employed. To conduct this analysis, the database relating to the diversification of funds was combined with another database containing the funds' performance and other control variables. The results can be seen in Tables 5 and 6.

Table 5
Panel data regression analysis, dependent variable SHP

Variable	Coef.	Std. Err.	z	P>z
Age (years)	-0.088	0.053	-1.660	0.096
Diversif. (Num. Cit. > 3)	0.613	0.626	0.980	0.327
Ln(Net.Eq.)	-0.313	0.273	-1.150	0.252
MANfee	0.305	0.295	1.040	0.300
PERFfee	1.323	0.963	1.370	0.170
Manager-DM	0.465	0.546	0.850	0.394
Constant	5.539	5.121	1.080	0.279
r2: within =	0.000		nº Obs. =	258
between =	0.128		nº Groups =	73
overall =	0.045			

Source: Prepared by the authors, 2019

According to the results of Table 5, only the age variable presented a significant (and negative, at the 10% significance level) relationship with the risk-adjusted performance of the funds in the sample.

The negative relationship identified between the age and return of the REITs is consistent with previous studies such as those of Milan and Eid Júnior (2014), Funchal et al. (2016), Borges Junior and Malaquias (2019), and Jones (2009). One possible explanation for this is that older funds probably tend to have more conservative management, which is reflected in lower volatility of returns. This confirms the second hypothesis of the study (the age of REITs in Brazil is negatively related with their risk-adjusted return).

Table 6
Panel data regression analysis, dependent variable SHP-P

Variable	Coef.	Std. Err.	z	P>z
Age (years)	-0.070	0.029	-2.410	0.016
Diversif. (Num. Cit. > 3)	0.148	0.344	0.430	0.667
Ln(Net.Eq.)	-0.114	0.150	-0.760	0.447
MANfee	0.284	0.162	1.760	0.079
PERFfee	0.208	0.530	0.390	0.694
Manager-DM	0.194	0.300	0.640	0.519
Constant	3.507	2.818	1.240	0.213
r2: within =	0.006		nº Obs. =	258
between =	0.136		nº Groups =	73
overall =	0.053			

Source: Prepared by the authors, 2019

Concerning the results of Table 6, the age and MANfee variables presented a significant relationship with the risk-adjusted performance of the funds in the sample when the risk-adjusted performance of the funds with a negative risk premium was given a zero value.

The diversification variable was not significant, neither with relation to the risk-adjusted return (Sharpe ratio), nor with relation to the risk-adjusted return substituted by a zero value in cases in which the risk premium was negative (Sharpe-P). This result is consistent with previous studies (Moraes & Serra, 2017) and suggests that regional aspects related to the assets in which the funds invest, as measured in this paper, do not necessarily affect fund performance. Thus, the third hypothesis of this study was not confirmed (the greater the diversification in relation to the quantity of cities where REITs have properties, the greater their performance).

In contrast with other studies in the area (Funchal et al., 2016; Gil-Bazo & Ruiz-Verdú, 2009; El Ghoul & Karoui, 2017), this study identified that the management fee charged by REITs has a positive relationship with their risk-adjusted return, and that the performance fee is not statistically significant. This contradicts the first hypothesis of this study (management fees have a negative relationship with the risk-adjusted return of REITs).

One possible explanation for this is that the performance of REITs depends on tenants' payments, the building of properties depends on greater investments, and the portfolios of REITs are more fixed and do not change as quickly as an equities portfolio, which can be altered more quickly. Given the specificity of this type of investment (related to questions such as property location and tenants paying rent on time, among others), the performance fee is not significant.

According to Martins et al. (2016), the management fee of investment funds is the remuneration that managers receive for the service they provide in relation to managing the fund, such as choosing the assets that will compose the portfolio and investment policies, among others. Thus, in this type of investment, one possible explanation for the management fee having a positive relationship with the risk-return ratio relates to its specificity.

We conducted an additional round of quantitative analysis, replacing the dummy variable of diversification for a scalar measure: the natural logarithmic of the number of cities in which the fund has investments. The effect of this new metric for diversification was equivalent of that effect observed in Tables 6 and 7 (statistically not significant), reinforcing the previous result obtained in the quantitative analysis.

Conclusion

This study analyzed the relationship between the risk-adjusted performance of Brazilian REITs and a proxy for diversification, based on the number of cities in which they have investments. Moreover, the Sharpe ratio was used to evaluate the risk-return ratio of REITs, and other factors were considered, such as their net equity, management and performance fees, and the Manager-DM variable.

It was verified that age presents a negative and statistically significant relationship with the risk-adjusted performance of the REITs in the sample. When the funds with a negative risk premium are given a zero value for their risk-adjusted performance, age continues to be statistically significant with a negative sign, indicating that older funds tend to have worse performance, while younger funds are perhaps willing to assume greater risks to achieve better levels of return.

This analysis may indicate a kind of conflict of interests, where younger funds may have an additional incentive to achieve better performance when compared to their counterparts. Investors who seek to obtain benefits related to diversification, allocating resources in REITs, may consider this information to select the funds. It is important to highlight that these results were obtained considering the sample of funds with complete data and that disclosed the information related to portfolio composition. Therefore, caution is needed with generalizations.

In the analysis that substituted the values of a negative Sharpe ratio for zero, the management fee variable was significant with a positive sign, suggesting that funds that charge this type of fee have a tendency to obtain better performance. However, the location of properties and number of cities in which the REITs have properties were not statistically significant.

The result for the main variable of this study, a dummy for diversification, suggests that regional aspects of the assets available at REITs portfolios, considering the information of number of cities, does not necessarily is converted in better returns for investors. In this regard, we recommend future analysis considering other measures for diversification, for example, investment in cities with different levels of social and economic development. These additional analyses can expand the results obtained by this research.

The main advance made by this study is that it indicates that it is not necessarily funds that invest in real estate located in different Brazilian regions that present the best risk-adjusted returns. However, it is also important to note that REITs can represent a good vehicle for diversification and that has a different pattern of cash dividends, and these characteristics can guide the decision-making process, since other benefits can be considered (such as tax-related benefits and a possible reduction of risk due diversification).

This study has also implications for the investment fund industry, since it can suggest that performance fees can present a different behavior in reducing eventual conflicts of interests between REITs investors and managers; in other vehicles of investments, such as in equity mutual funds, performance fees can represent a more effective resource to mitigate eventual conflicts of interests.

As a suggestion for future studies, the sample period could be extended. More financial indicators relating to the funds that were not contemplated in this study due to a lack of data could also be considered. These were thus limitations that affected the execution of the study.

Despite the limitations, the study contributes to the research on REITs in the area of diversification and performance, by using variables related to asset location per city. We suggest using these variables (as well as others) to raise the quantity and quality of data of studies in this area, as well as to increase the availability of these in order to structure related research.

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