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Dividend Cagr as an Asset Selection Criterion in Momentum Strategies of Brazilian Reits

Cagr de Dividendos como Critério de Seleção de Ativos em Estratégias de Momentum de Fundos de Investimentos Imobiliários Brasileiros

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RESUMO

This study seeks to introduce a selection criterion applicable to portfolio creation strategies. We propose, supported by empirical evidence and theoretical reasoning, that utilizing the dividend CAGR as a selection criterion for assets enables the capture of returns. Results were measured by Sharpe ratio, alpha of the Fama and French three-factor model, and excess returns obtained in relation to the market's index. Statistical tests were applied to verify the significance of the results. This paper shows that the dividend compound annual growth rate (CAGR) is not a relevant selection criterion of Brazilian real estate investment trusts (BR-REITs) to form winner portfolios. It was shown that strategies around the momentum effect that buy BR-REITs that had greater CAGR in previous months do not tend to have superior performance to the market. Considering the relatively scant attention directed towards BR-REITs within the existing literature, this paper assumes importance in the context of filling a void within the field of finance. It contributes knowledge pertaining to an asset class characterized by its distinctive dynamics and specificities. To the best of our knowledge, there exists no prior study within the national literature that delves into the utilization of this momentum strategy for BR-REITs. Considering the growing BR-REITs market expansion, this paper has the potential to influence numerous institutional and individual investors by providing a solid scientific foundation to enhance their investment decisions.

Keywords: Real Estate Investment Trust. BR-REIT. Momentum Strategy. Dividend CAGR.

RESUMO

Este estudo busca introduzir um critério de seleção aplicável às estratégias de criação de portfólio. Propomos, apoiados em evidências empíricas e raciocínio teórico, que a utilização do CAGR de dividendos como critério de seleção de ativos possibilita a captura de retornos. Os resultados foram medidos pelo índice de Sharpe, alfa do modelo de três fatores de Fama e French, e os retornos excedentes obtidos em relação ao índice de mercado. Testes estatísticos foram aplicados para verificar a significância estatística dos resultados. Este artigo mostra que a taxa de crescimento anual composta de dividendos (CAGR) não é um critério de seleção relevante dos fundos de investimento imobiliário brasileiros (BR-REITs) para formar carteiras vencedoras. Foi mostrado que estratégias em torno do efeito momentum que compram BR-REITs que tiveram maior CAGR nos meses anteriores não tendem a ter desempenho superior ao mercado. Considerando a escassa atenção direcionada aos BR-REITs na literatura existente, este artigo assume importância no contexto de preencher uma lacuna no campo das finanças. Contribui com conhecimentos pertencentes a uma classe de ativos caracterizada por suas dinâmicas e especificidades distintas. Até onde sabemos, não existe nenhum estudo prévio na literatura nacional que aprofunde a utilização dessa estratégia momentum para BR-REITs. Considerando a crescente expansão do mercado de BR-REITs, este artigo tem o potencial de influenciar inúmeros investidores institucionais e individuais, fornecendo uma base científica sólida para aprimorar suas decisões de investimento.

Palavras-Chave: Fundo de Investimento Imobiliário. BR-REIT. Estratégia de Momentum. CAGR de Dividendos.

1 INTRODUCTION

Brazilian Real Estate Investment Funds (BR-REITs) represent the fastest-growing financial asset class in Brazil over the past decade. According to the December 2022 Monthly Report issued by B3, the number of BR-REITs investors surged from just over 100,000 in December 2012 to nearly 2 million in December 2022, marking an exponential growth of nearly 2000% in the last decade. In terms of net asset value, market capitalization, trading volume, and public offerings, we observe the same exponential growth rates. Today, this industry in the country is valued at approximately 200 billion Brazilian Reais, and as demonstrated, it continues to grow year after year.

The illustrated growth shows no signs of slowing down; on the contrary, the potential of this industry in Brazil remains immense, and the market has only just begun to develop. This becomes even more apparent when we look at the REIT market in the United States, which has been evolving since the 1960s and currently boasts a market value of approximately 1.3 trillion dollars.

It is worth noting that this sharp growth in the Brazilian REIT market has been accompanied by the evolution of the regulatory framework, with various changes and improvements since its inception. However, while we observe a regulator's interest in the subject, the same cannot be said for academia, as very few works have been published on this topic in Brazil.

This study aims to collaborate with recent research about the BR-REIT market to reduce the gap in academic studies regarding the diffusion of this market in the context of individual and institutional Brazilian investors. The primary contribution of this work is to test whether the dividend Compound Annual Growth Rate (CAGR) paid is a significant value indicator and can predict which funds will outperform the index in future years.

The success of BR-REITs can be attributed to several factors. Historically, due to a macroeconomic trend of uncontrolled inflation in the country, we have inherited from our ancestors the belief that real estate investment is a safe harbor in the face of numerous economic crises and currency fluctuations, ensuring income. Investment in physical real estate has created many millionaires and has allowed many individuals to live off rental income in the country, even in the not-so-distant past.

Starting in the 1970s, with the beginning of the development of the capital market in the country and the subsequent evolution of stock exchanges, a new culture of savings allocation in listed assets began to emerge in its early stages.

However, it was only in 1993, with the enactment of Law 8668/93, that Brazil established the necessary regulatory bridge between real estate investment and the stock exchange. Several years were required for the market to evolve and reach the level of maturity and traction that we are currently experiencing. The first stage of development for this market only occurred after 2008, the year in which the Brazilian Securities and Exchange Commission (CVM) finally regulated this asset class with Instruction No. 472. From this milestone, the number of investors and the number of listed BR-REITs began to experience rapid growth.

Since them, BR-REITs have become the best alternative for the average investor seeking exposure to the local real estate market because: (i) it eliminates all the bureaucratic frictions of buying and selling real estate; (ii) it requires a much smaller initial investment compared to direct property purchases; (iii) it allows for greater diversification in terms of the quantity and types of real estate assets, reducing vacancy risks; (iv) it provides greater liquidity for buying and selling; (v) it adheres to mandatory income distribution rules, making it an excellent income generator; and (vi) it benefits from professional management of real estate assets.

In addition to the advantages listed above, there are also income tax exemption rules on earnings that apply to most individual investors, which do not exist when receiving rental income from direct property investments. Because of all these factors, BR-REITs are gaining increasing popularity in the portfolios of Brazilian investors, especially among individual investors.

With such success among individual investors, this market segment is comprised of a significantly larger number and trading volume of individual investors compared to the Brazilian stock market. According to the December 2022 Monthly Report issued by B3, individual investors hold custody of approximately 74% of this market and are responsible for 67.7% of the trading volume. Furthermore, out of the nearly 2 million registered investors in this market, 99.65% are individual investors. This distinctive characteristic leads to certain inefficiencies in the market, creating opportunities for gains through momentum strategies, as demonstrated in the article by Barreto and Campani (2023).

Between 2018 and 2022, BR-REITs were ranked based on their highest annual dividend CAGRs for two, three, and five year periods. From these rankings, portfolios were constructed with varying sizes (number of assets) and holding periods (rebalancing intervals according to the ranking). All portfolios exhibited performance below the market in terms of excess returns generated, and only a few strategies yielded positive alphas with no statistical

significance. Consequently, the results suggest consistent evidence that historical dividend CAGR is not a reliable criterion for selecting BR-REITs.

To the best of our knowledge, the use of dividend CAGR as a selection criterion for constructing a portfolio of BR-REITs is a completely innovative approach in the literature. The motivation behind this approach was the understanding that, due to the requirement to distribute 95% of the fund's cash profit semi-annually, the consistent growth of dividends, even during challenging macroeconomic periods, could serve as a good proxy for the quality of BR-REIT's management. We considered this factor to be important in predicting the future value generation of the assets.

This article is divided into four additional chapters in addition to this introductory chapter. In Chapter 2, we will conduct an extensive literature review on momentum strategies in Brazil and abroad, as well as on Real Estate Investment Funds (REITs) in Brazil and abroad. Chapter 3 will describe the article's research methodology. In Chapter 4, we will present and discuss the main results, and finally, in Chapter 5, we will provide the key conclusions.

2 LITERATURE REVIEW

One of the most widely recognized strategies in the financial market is the momentum strategy, which posits that the future returns of a stock traded on the stock exchange can be explained by the past performance of that same asset. This strategy has its initial landmark in the article by Jegadeesh and Titman (1993), where the authors, analyzing the U.S. market between 1965 and 1989, were able to generate significantly positive returns by buying portfolios with assets that had positive past returns (winning portfolios) and selling portfolios with assets that had negative past returns (losing portfolios). In addition to this important discovery, they also found evidence that such portfolios formed based on past return criteria tended to have their generated alpha reversed after 12 months. This indicates that this strategy works better in a short-term approach, as over time, the market would return to seeking rationality, contradicting the Efficient Market Hypothesis of Fama (1970).

The authors go on to propose some explanations for this behavior, introducing the concepts of underreaction and overreaction that could account for this short-term irrationality, leading to the possibility of returns that do not align with risk.

Subsequently, other authors delved into the concept of underreaction, such as Lo and MacKinlay (1988), Poterba and Summers (1988), Jegadeesh himself (1990), and Barberis,

Shleifer, and Vishny (1998), arriving at the definition that it could be an emotional response by investors that prevents them from fully incorporating information into asset prices immediately. One possible explanation for this phenomenon could be the existence of a conservatism bias among investors, which would create resistance to changing their beliefs in the face of new information.

On the other hand, the phenomenon of overreaction, when studied by De Bondt and Thaler (1985), De Bondt and Thaler (1987), and Barberis, Shleifer, and Vishny (1998), was characterized as an emotional response leading to an exaggerated selling of assets. As an explanation for this behavior, we have the representativeness bias, which causes investors to extrapolate short-term information into the perpetuity of the asset.

In other studies, alternative explanations have been found for these behaviors. Hong and Stein (1999) discovered that the speed of information dissemination among investors, which they considered to be low at the time, is one of the explanations for the returns of momentum strategies.

In their turn, Daniel, Hirshleifer, and Subrahmanyam (1998) demonstrate that it's not underreaction causing momentum and overreaction causing reversal. Instead, overreaction is what causes momentum due to investor overconfidence. Moreover, overreaction can persist if future information confirms and reinforces investor beliefs.

Overall, underreaction occurs when market participants do not fully adjust to new information in a timely manner, causing stock prices to move gradually rather than instantly reflecting all available information. Overreaction, on the other hand, suggests that market participants might overreact to news or events, causing prices to overshoot their true value temporarily. These concepts of underreaction and overreaction can help explain the observed short-term anomalies in stock returns and provide a basis for understanding why momentum strategies can be profitable in the short run, as market participants may not fully incorporate all available information into stock prices.

In the Brazilian academic literature, studies on the momentum effect are predominantly limited to the stock market. Initially, Campani and Leal (2016) proposed an equally weighted portfolio model to develop two stock indices subsequently named the "Valor-Coppead Indices." One of these indices is based on a momentum strategy using Israelsen's (2005) adjusted SR (Sharpe Ratio), aiming to generate maximum returns with volatility equal to that of the market index.

Subsequently, Carneiro and Leal (2017) examined the effects of momentum strategies using past metrics such as Sharpe Ratio (SR), dividend yield (DY), and liquidity as stock

selection criteria in the Brazilian market between 2003 and 2012. They demonstrated that various strategies can be employed to achieve returns due to momentum effects. Following this, Mendonça, Campani, and Leal (2017) studied the use of SR and Jensen's alpha as criteria for selecting stock investment funds in Brazil from 2004 to 2014.

Lastly, Civiletti, Campani, and Roquete (2020) conducted studies that found satisfactory returns in the Brazilian stock market using momentum strategies between 2009 and 2018, providing evidence that momentum effects also exist in the Brazilian stock market.

Regarding the BR-REITs, there are very few academic works in this area. However, when we look at the academic literature on U.S. Real Estate Investment Trusts (REITs), which can be considered the corresponding asset class to BR-REITS in U.S. market (although there are regulatory differences that bring some particularities, making them not exactly the same), we find a substantial amount of literature on the subject.

In international literature, many studies correlate behavioral biases with the returns of REITs, generating various momentum and reversal strategies. Chui, Titman, and Wei (2003) discovered, after analyzing data from the U.S. market between 1982 and 1999, that short-term movements in REITs cannot be explained by risk factors. They propose an explanation based on the theory developed by Daniel, Hirshleifer, and Subrahmanyam (1998). They believe that, starting in 1992, due to changes in the regulatory framework of REITs, the valuation of this asset class became more complex, leading investors to act with overconfidence. When they applied the Jegadeesh and Titman (1993) strategy to REITs, they obtained excess returns almost twice as high as in the stock market, demonstrating that momentum strategies have much more strength in the REIT market.

Hung and Glascock (2008) examined the dividend yield (DY) as a factor in a momentum strategy in the U.S. market between 1972 and 2000. They demonstrated that DY is higher among funds with higher recent returns, leading to the conclusion that momentum can be explained by the inherent risk of DY variation.

Furthermore, we can find more recent studies associating momentum strategies with the returns of REITs, such as Bron, Ghosh, and Petrova (2017), who found evidence of momentum in European and UK REITs by analyzing returns between 2002 and 2014. Additionally, Byun, Lim, and Yun (2016) and Liu and Lu (2019) suggest that utilizing a continuing overreaction strategy can generate significant positive returns in the U.S. REIT market.

In the Brazilian literature, initially, we find articles by Calado, Giotto & Securato (2002) and Amato, Takaoda, Lima & Securato (2005). These articles primarily provide basic

studies on the characteristics of BR-REITs, the predominant investment sectors, the number of investors, all during a period when the market was taking its first steps in development.

Due to the predominance of individual investors both in trading volume and total asset custody, as previously mentioned, this is a market exposed to a higher risk of inefficiencies due to the lower level of sophistication among its players. Additionally, it is a market still in the growth and maturation phase, as previously highlighted.

Although there is clear evidence that the BR-REITs market is exposed to these inefficiencies, few have taken an interest in studying the topic. Guimarães (2013), using Carhart's (1997) four-factor model on a small group of BR-REITs in the Brazilian market between 2008 and 2012, demonstrated a performance trend, observing a persistence of past returns into the future (momentum). More recently, Barreto and Campani (2023), analyzing the Brazilian market between 2012 and 2020, found that the variation in dividend yield (DY) is a factor that can be used very successfully in a momentum strategy, generating excellent returns above the market.

Predominantly, in the Brazilian academic literature, we find more articles on the BR-REITs market that study risk factors that can explain their returns. For example, Dias (2019) points out that the returns of BR-REITs market index (IFIX) and Brazilian stock market index (IBOV) have low covariance when analyzed by the beta of CAPM models. Oliveira and Milani (2020) demonstrate that the return of IBOV, among other variables studied, is the one that best explains the return of IFIX. Lastly, Nascimento, Scaramussa, and Bortolon (2020) evaluated BR-REITs returns from the perspective of regulatory, tax, and management aspects.

In an attempt to complement the efforts of this recent national literature, the next section will present the methodology used to study the momentum strategy in BR-REITs using dividend CAGR. Subsequently, the results will be presented in section 4, and the conclusions in section 5. Section 6 will provide the reference literature.

3 METHODOLOGY

3.1 Data

The present article will analyze the month-by-month results of all Brazilian Real Estate Investment Funds (BR-REITs) that are eligible within the criteria explained below, from January 2018 to December 2022.

The initial idea of this study was to use a time frame of ten years. The choice of such an extensive time frame would be explained by the length of the Brazilian real estate market cycle, which lasts approximately 8 to 10 years, according to sources such as the Brazilian Association of Real Estate Developers (ABRAINC) and the Federation of Industries of the State of São Paulo (FIESP). Additionally, by using a significantly long period, we would expose BR-REITs managers to a wide range of macroeconomic scenarios, adding robustness to the study. However, when analyzing the Compound Annual Growth Rates (CAGRs) with the filters applied for the periods between January 2013 and December 2017, the sample of approved funds in the research filters became too small, forming portfolios with fewer than three assets. For this reason, we chose to cut the analysis from January 2018 onwards, a period in which market liquidity, the number of assets listed on the stock exchange, and the number of investors experienced more significant growth.

The funds that comprised the total universe sample for this study were the ones categorized by the Quantum Axis platform as intended for general investors, resulting in a total of 283 funds over the entire analysis period. The number of funds analyzed each month varied due to various factors, such as the launch of new funds, the termination of old funds, or even operational issues that led to non-dividend distributions.

Based on the asset selection criteria proposed below, monthly dividend payment data was extracted from the Quantum Axis platform, leading to the total dividend paid over the last twelve months, thereby eliminating any issues related to dividend distribution seasonality. As previously mentioned, due to regulatory requirements, BR-REITs are obligated to distribute a minimum of 95% of the semi-annual cash profit, leaving little room for managers to make discretionary distributions.

From the universe sample, funds with constitution dates later than the denominator period used in the CAGR calculation, as shown in the Equation1 below, and funds that had not distributed dividend for any reason during the denominator period of the CAGR calculation were excluded.

By using the filters mentioned above and the annual dividend paid, we are assuming that we are eliminating any spurious effects from the analysis.

To exclude funds with low liquidity that may distort comparisons with their peers, for each reference month, only the funds that met the following criteria were considered: (i) presence in 100% of the trading days of the analysis month, i.e. at least one negotiation in all of the trading days in the reference month. This liquidity criterion was selected to be even more stringent than the trading criteria for the composition of the market index (IFIX), as will

be detailed later in this article. The reason for using this stricter criterion is to ensure that the portfolios formed in this study can be easily replicable by individual investors; and (ii) an average daily trading liquidity of over R$ 100,000.00 (one hundred thousand Brazilian Reais) for the analysis month. This liquidity filter represents that, within the smaller sample in the entire study, ensures that the selected funds will be among the 75% most liquid in the sample.

Additionally, for return calculations, the monthly adjusted return value of each fund was extracted from Quantum Axis, considering the monthly dividend payment value for the reference month.

The monthly closing prices of the BR-REITs market index (IFIX) and the Brazilian Interbank Deposit Certificates rate (CDI) were also extracted from Quantum Axis. These data were used, with the former serving as a benchmark for return and volatility analyses, and the latter as the risk-free rate for the Brazilian economy.

3.2 Portfolio Formation

3.2.1 Seleon criterion and formation period

The selection criterion that this article proposes to use in a momentum strategy analysis is the dividend Compound Annual Growth Rate. The use of the dividend CAGR is based on the hypothesis that this factor is a relevant proxy for the fund's management quality. Since, by regulatory definition, the manager is obliged to distribute up to 95% of the fund's cash profit semi-annually, an increase in dividend distribution is a strong indicator of success in achieving increasingly positive results at different points in the market cycle.

To achieve this, it was necessary to calculate: (i) the total dividend paid in the last twelve months; (ii) the total dividend paid between the 13th and 24th months; (iii) the total dividend paid between the 15th and 36th months; (iv) the total dividend paid between the 37th and 48th months; (v) the total dividend paid between the 49th and 60th months; and (vi) the total dividend paid between the 61st and 72nd months, all relative to the reference month. With this information, it was possible to calculate the dividend Compound Annual Growth Rate (CAGR) for the last two-, three-, and five-years using Equation 1. The highest CAGRs were used as the selection criterion for the winning portfolios.

Equation 1 presents the process of calculating the CAGR for a period of time “n”, where n represents the total analysis period (2, 3 or 5 years) and Total Dividend1 represents the first year's returns.

$$CAGR_n = \sqrt[n]{Total\ Dividend_n / Total\ Dividend_1} - 1 \quad \textbf{(1)}$$

3.2.2 Size, weights and strategy of the portfolios

The next step in composing the winning portfolios (long only) for this study's analysis involved monthly ranking the BR-REITs within the universe sample over the specified time frame based on the best to worst dividend CAGRs of two years, three years, and five years. For each of the rankings described above, three portfolios were formed with the following asset composition: the top-ranked funds from the ranking present in the 10%, 20%, and 30% percentiles of the total funds in the sample space for the reference month, totaling nine portfolios.

Each asset will make up its portfolio with equal weights, which, according to Benartzi and Thaler (2001), is an excellent weighting strategy for unsophisticated investors. Furthermore, by using portfolios with equal weights, we aim to eliminate from the analysis any alpha generated by more sophisticated weighting techniques, analyzing the effects of the momentum strategy in the purest possible way.

Usually, the analysis of momentum strategies involves buying a winning portfolio and selling a losing portfolio, creating long, short, long-short, and long-biased portfolios. However, in this study, losing portfolios will not be created due to the fact that the BR-REITs regulation only recently allowed short selling of this asset class, and to this day, the liquidity for borrowing BR-REITs is very low. Therefore, it would not be possible to accurately determine the costs of implementing this short selling strategy.

3.2.3 Holding period

As mentioned earlier, momentum theory suggests that the generated returns are consequences of market inefficiencies, which, in turn, are generated by some cognitive biases in markets where individual investors, who are less sophisticated, have a significant presence. Due to these characteristics, such inefficiencies tend to dissipate over time, making the momentum strategy more effective for short-term rebalancing.

To test this property of momentum strategies, the nine winning portfolios described above will also be analyzed from the perspective of three different rebalancing strategies: (i) quarterly; (ii) semi-annually; (iii) annually, resulting in a total of twenty seven different portfolios.

3.3 Performance evaluation

To assess the risk of the portfolios formed based on the selection criteria explained above, the Sharpe Ratio (SR) was used. To evaluate the return of the strategies, excess return, and the alpha of the three-factor model, representing risk-adjusted returns, were calculated. Both the SR results and the alpha of the three-factor model generated by each of the twenty seven portfolios were compared with the results of the market index (IFIX) in terms of both return generation and volatility.

3.3.1 Sharpe ratio (SR)

The Sharpe Ratio will be calculated for each portfolio according to Equation 2 below. It will be obtained by considering the difference between the arithmetic mean of the monthly return of the portfolio and the arithmetic mean of the monthly return of the risk-free rate, divided by the standard deviation of the portfolio.

$$SR = \frac{\overline{(R_p - R_f)}}{\sigma_p} \quad \textbf{(2)}$$

3.3.2 Three-factor model's alpha

The Jansen's Alpha of each portfolio will be estimated by calculating the intercept of the linear regressions performed using the least squares method. Equation 3, used as a basis, is described below. It is based on the Fama-French three-factor model, which is an extension of the Capital Asset Pricing Model (CAPM), adding to market risk: (i) the outperformance of small companies compared to large companies ("SMB"); and (ii) the outperformance of high book-to-market companies compared to low book-to-market companies ("HML"). We will use the IFIX as the market index and the SMB and HML factors calculated by the Center for Research in Financial Economics at the University of São Paulo (NEFIN).

$$R_{p,t} - R_{f,t} = \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 SMB_t + \beta_3 HML_t + \alpha_p + \varepsilon_{p,t} \quad \textbf{(3)}$$

3.3.3 The BR-REIT market index (IFIX) composition

For a better understanding of the results compared to the market index, it is important to clarify how it is composed.

In general terms, BR-REITs market index (IFIX) is a total return index that is composed of all Real Estate Investment Funds listed on the B3 stock exchange or over-the-counter market, provided that they meet the following cumulative criteria: (i) have at least one negotiation in 95% of the trading days of the period covered by the previous three IFIX portfolios; (ii) do not have a minimal quotation that classifies them as 'Penny Stocks'; and (iii) are classified among eligible assets, which during the previous three IFIX portfolios, that represent 99% of the sum of the indicators of the Liquidity Index formulated by B3, in descending order.

The eligible assets are weighted by the market value of the Real Estate Investment Fund in reference. It is worth noting that a REIT’s participation in the index cannot exceed 20% upon its inclusion or during periodic reviews. If this occurs, adjustments will be made to bring the fund's weight within this limit, redistributing the excess proportionally among the other assets in the portfolio.

4 RESULTS

Table 1 presents the descriptive statistics for each of the twenty seven portfolios formed. Firstly, it is observed that all excess returns relative to the market index are generally negative. However, it is important to outstand that only the excess returns associated with portfolios C2(10)Q and C3(30)Q exhibit statistical significance at the 5% and 10% levels, respectively. All portfolios when mentioned on this paper will receive the following denotation: C YEAR(SIZE) FORMATION PERIOD, that is, if we are referring to the portfolio formed by the best 5-year dividend CAGRs with size of the best 20% funds in the sample and rebalanced quarterly, we will abbreviate to C5(20)Q and so on.

Additionally, it is noteworthy that all calculated Sharpe Ratios (SR) for the portfolios exhibited negative values, except for portfolio C3(30)Q, which had a positive SR and, along

with portfolio C2(10)Q, outperformed the benchmark. This particular data suggests that possibly only portfolios (C3(30)Q and C2(10)Q), within the context of this study, demonstrated a performance that translated into a more favorable risk-return relationship compared to the market index, although they did not generate an excess return.

It is significant to observe that, during the analysis period of this study, the market index itself (IFIX) exhibited a lower return than the Brazilian risk-free rate (CDI), with higher volatility, resulting in a negative SR for the market index. However, it is important to emphasize that the analysis in Table 1 against the risk-free rate is done before taxes. In Brazil, individual investors have relatively easy access to tax-exempt fixed-income instruments. However, these instruments are not sovereign risk but corporate risk, which distorts the analysis against the risk-free rate. Within assets with sovereign risk, income tax is calculated based on a descending scale that considers the investment period. For investments over two years, the lowest possible tax rate is 15% on the capital gain. The tax structure of Real Estate Investment Funds (REITs) in Brazil is hybrid. There is income tax exemption for individuals on distributed dividends once certain rules are met, including a minimum number of shareholders in the BR-REIT, mandatory semi-annual distribution of 95% of cash profit, and trading on a stock exchange or over-the-counter market, which virtually all funds in the sample comply with. Therefore, for the purposes of this analysis, we will consider the exemption of dividends. Additionally, there is a 20% tax rate on capital gains from buying and selling BR- REITs. Considering that IFIX is a total return index, meaning it considers the return generated by capital gains and reinvestment of dividends, we can use a simplified average tax rate of 10% for tax comparison purposes. With this, we would have an average monthly return of 0.43% for the CDI against an average monthly return of 0.44% for IFIX. As can be seen, in the analysis after taxes, the market index offers a slightly higher return than the risk-free asset.

Table 1 Descriptive statistics of the portfolios between January of 2018 and December of 2022

Panel A: Market indexes

Indexes	Average Return	Vol. month (%)	SR month	Min return	Max return
CDI	0,51%	0,28%	na	0,13%	1,17%
IFIX	0,49%	3,63%	-0,007	-15,85%	10,63%

Panel B: Portfolios

CAGR	Size	Formation period	Average return	Vol. month (%)	SR	Excess return annual(%)	Min return	Max return
CAGR 2 years	10%	A	-0,12%	6,25%	-0,102	-11,69%	-22,46%	15,29%
		S	0,08%	5,69%	-0,076	-7,92%	-22,46%	12,04%
		Q	0,51%	5,76%	-0,001	-1,28%**	-22,46%	13,96%
	20%	A	0,00%	4,91%	-0,104	-8,45%	-18,79%	9,14%
		S	0,40%	4,74%	-0,025	-2,17%	-18,79%	10,04%
		Q	0,39%	4,80%	-0,026	-2,31%	-18,79%	9,33%
	30%	A	0,24%	4,54%	-0,060	-4,44%	-17,56%	9,18%
		S	0,35%	4,59%	-0,037	-2,82%	-17,56%	9,27%
		Q	0,32%	4,45%	-0,043	-3,08%	-17,56%	9,20%
CAGR 3 years	10%	A	-0,02%	5,36%	-0,100	-9,22%	-14,88%	12,56%
		S	0,21%	5,30%	-0,058	-5,50%	-14,88%	12,56%
		Q	0,27%	5,31%	-0,045	-4,46%	-14,88%	12,66%
	20%	A	0,20%	4,92%	-0,064	-5,31%	-16,56%	10,72%
		S	0,24%	4,64%	-0,058	-4,42%	-16,56%	10,72%
		Q	0,38%	4,77%	-0,027	-2,35%	-16,56%	11,12%
	30%	A	0,35%	4,58%	-0,036	-2,73%	-16,50%	9,94%
		S	0,43%	4,43%	-0,019	-1,38%	-16,50%	9,94%
		Q	0,52%	4,52%	0,002	-0,04%*	-16,50%	10,78%
CAGR 5 years	10%	A	-0,16%	6,16%	-0,109	-12,09%	-17,95%	13,72%
		S	0,02%	5,93%	-0,084	-9,06%	-17,95%	13,17%
		Q	-0,04%	6,26%	-0,088	-10,34%	-17,95%	13,07%
	20%	A	0,27%	5,18%	-0,046	-4,38%	-18,34%	10,65%
		S	0,29%	5,03%	-0,045	-4,03%	-18,34%	10,41%
		Q	0,35%	5,25%	-0,031	-3,23%	-18,34%	12,95%
	30%	A	0,30%	4,80%	-0,044	-3,66%	-18,10%	11,55%
		S	0,37%	4,66%	-0,030	-2,43%	-18,10%	11,55%
		Q	0,32%	4,77%	-0,041	-3,37%	-18,10%	11,35%

*Note: On panel A, the average return was obtained based on the arithmetic mean of the monthly returns of the indices. The standard deviation was also calculated based on monthly data. The Sharpe ratio (SR) was calculated based on equation 2 for IFIX since the CDI is the risk-free rate itself. The minimum value corresponds to the lowest observed return. The maximum value corresponds to the highest return observed. On panels B, portfolios were divided based on CAGR analysis into three groups, one formed by the best 2 years dividend CAGR, other by the best 3 years dividend CAGR, and the last by the best 5 years dividend CAGR. The CAGR was calculated based on equation 1. The size of the portfolios adopted values of 10%, 20%, and 30%. The formation period adopted values of a (annual), s (semi-annual) and q (quarterly). 60 monthly return data were generated for each portfolio. The average return was obtained based on the arithmetic mean of the monthly returns of each 1/N portfolio formed based on the size and formation period. The standard deviation was also calculated based on monthly data. The Sharpe Ratio (SR) was calculated based on equation 2. The excess return was calculated as the difference between the total return of each portfolio subtracted from the total return of the IFIX and after annualized. The minimum value corresponds to the lowest observed portfolio return. The maximum value corresponds to the highest observed portfolio return. * denotes significance at 10% and ** at 5%, as measured by bilateral t-test.*

Ultimately, what is evident from Table 1 is that the excess returns of the portfolios constructed according to the methodology of this article, except for portfolios C2(10)Q and C3(30)Q, do not have statistical significance. Therefore, it can be concluded that the momentum strategy, when employed with CAGR as the selection factor, did not demonstrate superior performance to the market index in terms of both return and, in general, risk.

Table 2 presents the results for the estimated alpha according to the three-factor CAPM models, as per Equation 3.

None of the alphas calculated for the portfolios had positive values, except for portfolios C2(10)Q and C3(10)S, C3(10)Q, C3(20)Q, C3(30)S, C3(30)Q, C5(20)Q, C5(30)S, and C5(30)Q. This means that these portfolios, although they did not generate excess returns compared to the market index, possibly created value by providing a better risk-return relation. However, it is important to note that even in these cases, the alphas did not reach statistical significance higher than 10%. This result suggests that, in general, the portfolios did not generate excess returns relative to the market index that could be attributed to asset selection skills. If there was any merit in the portfolio's return generation, it was not due to the momentum strategy using dividend CAGR as a selection factor but rather to an effect of the market risk premium relative to the risk-free rate, captured by the beta risk factor coefficient in Equation 3, which is notably positive and highly statistically significant at the 1% level for all portfolios.

Tabel 2 – CAPM 3 factors model

CAGR	Size	Formation period	a (% month)	b	s	h	R2
CAGR 2 years	10%	A	-0,0036	1,1250***	0,2368*	-0,1448	0,5875
		S	-0,0032	1,0519***	0,1741	-0,0011	0,6036
		Q	0,0007	1,1457***	0,1124	0,0144	0,6247
	20%	A	-0,0037	1,1485***	0,0563	-0,0909	0,7660
		S	-0,0006	1,1021***	0,0627	0,0026	0,7888
		Q	-0,0004	1,1286***	0,0422	-0,0336	0,7667
	30%	A	-0,0012	1,1029***	0,0684	-0,0978	0,8360
		S	-0,0003	1,0850***	0,0692	-0,0817	0,7968
		Q	-0,0005	1,0935***	0,0459	-0,0978	0,8214
CAGR 3 years	10%	A	-0,0024	1,1810***	0,0873	-0,2510*	0,6697
		S	0,0000	0,9437***	0,1844	-0,2121	0,5429
		Q	0,0004	1,0367***	0,1037	-0,2215	0,5520
	20%	A	-0,0012	1,1678***	0,0796	-0,1349	0,7968
		S	-0,0008	1,0025***	0,1259	-0,1070	0,7351
		Q	0,0008	1,0686***	0,1120	-0,1430	0,7540

		A	-0,0001	1,0957***	0,8334	-0,0981	0,8391
	30%	S	0,0009	0,9976***	0,1302*	-0,0938	0,8070
		Q	0,0018	0,9902***	0,1454**	-0,0823	0,7890
		A	-0,0027	1,1633***	0,1962	-0,3006*	0,5817
	10%	S	-0,0017	1,0240***	0,2473*	-0,1969	0,5619
		Q	-0,0014	1,1474***	0,2030	-0,3156*	0,5502
		A	-0,0004	1,1662***	0,1020	-0,1285	0,7443
CAGR 5 years	20%	S	-0,0023	1,1032***	0,1019	-0,1362	0,7089
		Q	0,0010	1,0621***	0,1832*	-0,1617	0,6875
		A	-0,0001	1,1515***	0,0885	-0,1466	0,8241
	30%	S	0,0006	1,0898***	0,0970	-0,1331	0,8001
		Q	0,0001	1,1103***	0,1077	-0,1345	0,8013

*Note: Portfolios were divided based on CAGR analysis into three groups, one formed by the best 2 years dividend CAGR, other by the best 3 years dividend CAGR, and the last by the best 5 years dividend CAGR. The CAGR was calculated based on equation 3. The size of the portfolios adopted values of 10%, 20%, and 30%. The formation period adopted values of a (annual), s (semester) and q (quarterly). 60 monthly return data were generated for each portfolio. 60 monthly return data were generated for each portfolio between January 2018 and December 2022. The three-factor CAPM model was estimated according to Equation 3. No alpha for the three-factor model is significant at the 10% level or less. All model equations passed the White Test for heteroscedasticity. * denotes significance at 10%, ** at 5% and *** at 1%.*

Additionally, it is relevant to mention that, to a lesser extent, in some portfolios, an effect related to "small stocks" was identified, as indicated by the SMB risk factor in Equation 3. Although this factor was slightly positive, it showed statistical significance in some portfolios, suggesting that the size of the selected BR-REITs may have played a secondary role in the return generation of some portfolios under analysis.

5 CONCLUSION

This article analyzed the results of portfolios of Brazilian Real Estate Investment Trusts (BR-REITs) formed using momentum strategies with dividend CAGR as the selection factor between January 2018 and December 2022. These portfolios were analyzed both in terms of their excess return, through the generation of alphas, and in terms of risk, measuring their volatilities and Sharpe Ratios, always comparing them with the results obtained by the market portfolio (IFIX).

The results obtained by the study suggest that there was no evidence of superior performance in portfolios that adopted the momentum strategy based on dividend CAGR, both in terms of return and risk, compared to the market index.

None of the formed portfolios showed an alpha that was statistically significant. The absence of a significant alpha suggests that the momentum strategy, as applied in this study, did not demonstrate the ability to generate returns that could be attributed to asset selection

skills of the strategy, which led to the decision to not proceed with the analysis using another multifactor model, such as the 5-factor CAPM.

It is worth noting that some portfolios, such as C2(10)Q and C3(30)Q, possibly exhibit a better risk/return relation than the market portfolio as measured by the Sharpe Ratio. One assumption for this behavior is the more frequent rebalancing strategy (quarterly) and the use of not-so-distant CAGRs (2 and 3 years), which aligns with Jegadeesh and Titman's (1993) understanding that momentum strategies tend to have their generated alpha reversed after 12 months, indicating that such a strategy works better in a short-term approach. As suggestions for future studies, it would be interesting to perform additional tests with monthly rebalancing and 1 (one) year CAGRs to further explore these dynamics.

Finally, it is important to highlight that the results of this study were calculated over a relatively short period compared to the real estate market cycle. This limitation was due to the reported issues of a lack of a relevant universe sample of available funds within the applied methodology. Additionally, during this short time frame, we had the market effects of the coronavirus pandemic, which could have also contributed to the distortion of the results found. Therefore, the analysis covered a more restricted period, which may impact the generalization of the results to longer periods. Future research may consider expanding the analysis period if appropriate data becomes available to gain a more comprehensive understanding of the performance of momentum strategies in the context of the real estate market.

Comparing with the article written by Barreto and Campani that inspired this study, the initial expectation was to find a methodology that generates alpha, probably smaller than what Barreto and Campani found, but with lower volatility and easier to replicate by individual investor since it would require less asset turnover in the portfolio. However, the methodology discovered in this article did not scientifically prove to be alpha-generating. This suggests that, due to the still emerging stage of this market in Brazil, asset prices are much more sensitive to short-term results than quality fundamentals such as the management's ability to deliver increasing and recurring results.

REFERENCES

AMATO, F. B.; TAKAODA, V. K.; LIMA JR, J. R.; SECURATO, J. R. (2005). Estratégias de Aplicação em Fundos Imobiliários como Diversificação de Investimentos: Uma Análise do

Desempenho Recente e seus Fatores de Influência. VIII Seminário em Administração, FEA-USP, São Paulo.

B3 – Brasil, Bolsa, Balcão (2022). Boletim do Mercado Imobiliário de dezembro de 2022. São Paulo, 2022.

BARBERIS, N., SHLEIFER, A., & VISHNY, R. (1998). A model of investor sentiment. *Journal of Financial Economics, 49*(3), 307–343.https://doi.org/10.1016/S0304-405X(98)00027-0

BARRETO, L.H. & CAMPANI, C. (2023). Dividend-Yield Variation as a Predictor in Momentum Strategies: Analysis of Brazilian REITs**.** *Revista Contabilidade & Finanças, 34*(91), 1-18.
doi: 10.1590/1808-057x20221667.pt

BENARTZI, S., THALER R. H. (2001). Naive Diversification Strategies in Defined Contribution Saving Plans. *American Economic Review, 91*(1), 79-98.doi: 10.1257/aer.91.1.79

BONDT, W. F. M. D.; THALER, R. (1985). Does the Stock Market Overreact? *The Journal of Finance, 40*(3), 793-805.https://doi.org/10.2307/2327804

BONDT, W. F. M. D.; THALER, R. H. (1987). Further Evidence on Investor Overreaction and Stock Market Seasonality**.** *The Journal of Finance, 42*(3), 557-581.https://doi.org/10.2307/2328371

BRON, J. J., GHOSH, C., & T. PETROVA, M. (2017). On the Earnings and Price Momentum Strategies: Evidence from European Real Estate Firms. *The Journal of Real Estate Finance and Economics, 57*, 400-430.

BYUN, S. J., LIM, S. S., & YUN, S. H. (2016). Continuing overreaction and stock return predictability. *Journal of Financial and Quantitative Analysis*, *51*(6), 2015–2046.
Calado, L. C.; Giotto, R. C.; Securato, J. R. (2002). Um Estudo Atual Sobre Fundos de Investimentos Imobiliários. Seminário de Economia e Administração – SEMEAD, 5, FEA-USP, São Paulo.

CAMPANI, C. H.; LEAL, R. P. C. (2017). Valor-Coppead Indices, Equally Weighed and Minimum Variance Portfolios. *Revista Brasileira de Finanças, 14*(1), 45 – 64. https://doi.org/10.12660/rbfin.v14n1.2016.57865

CARHART, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance*, *52*(1), 57-82.https://doi.org/10.2307/2329556

CARNEIRO, A.; LEAL, R. (2017). Naive portfolios, Brazilian stock funds, and individual investors**.** *Academia Revista Latinoamericana de Administración, 30*(3), 383-401.
https://doi.org/10.1108/ARLA-08-2016-0217

CHUI, A. C., TITMAN, S., & WEI, K. (2003a). Intra-industry momentum: The case of REITs**.** *Journal of Financial Markets, 6*(3), 363–387. https://doi.org/10.1016/S1386-4181(03)00002-8

CIVILETTI, F.; CAMPANI, C.; ROQUETE, R. (2020). Equally weighted portfolios and "momentum effect": an interesting combination for unsophisticated investors? *Brazilian Business Review, 17*(5), 506–522. https://doi.org/10.15728/bbr.2020.17.5.2

DANIEL, K., HIRSHLEIFER, D., & SUBRAHMANYAM, A. (1998). Investor Psychology and Security Market Under and Overreactions**.** *The Journal of Finance, 53*(6), 1839–1885.

DIAS, A. D. M. (2019). Fundos de investimento imobiliário no Brasil como oportunidade de diversificação de risco: uma estimação empírica do beta condicional. Fundação Getúlio Vargas, SP, Brasil.

FAMA, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work**.** *The Journal of Finance, 25*(2), 383-417. https://doi.org/10.2307/2325486

GUIMARÃES, J. G. M. (2013). Persistência na performance de fundos de investimento imobiliário brasileiros entre 2008 e 2012**.** Fundação Getúlio Vargas, SP, Brasil.

HONG, H., & STEIN, J. C. (1999). A Unified Theory of Underreaction, Momentum Trading, and Overreaction in Asset Markets. *The Journal of Finance, 54*(6), 2143–2184.

HUNG, S.-Y. K., & GLASCOCK, J. L. (2008). Momentum profitability and market trend: Evidence from REITs**.** *The Journal of Real Estate Finance and Economics, 37*(1), 51–69. doi: 10.1007/s11146-007-9056-4

ISRAELSEN, C. (2005). A refinement to the Sharpe ratio and information ratio. *Journal of Asset Management, 5*(6), 423-427. https://doi.org/10.1057/palgrave.jam.2240158

JEGADEESH, N. (1990). Evidence of Predictable Behavior of Security Returns. *The Journal of Finance*, 45(3), 881–898.https://doi.org/10.2307/2328797

JEGADEESH, N., & TITMAN, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency**.** *The Journal of Finance, 48*(1), 65–91. https://doi.org/10.2307/2328882

LIU, M.-Y., & LU, C. (2019). The Continuing Overreaction in the REIT Market**.** *The Journal of Real Estate Finance and Economics, 61*, 129-149.

LO, A. W.; MACKINLAY, A. C. (1988). Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test. *Review of Financial Studies, 1*(1), 41–66.

MENDONÇA JÚNIOR, J. A. DE; CAMPANI, C. H.; LEAL, R. P. C. (2017). A Escolha de Fundos de Ações e o Investidor Individual. *Revista de Administração Contemporânea, 21*, 41–62. https://doi.org/10.1590/1982-7849rac2017160037

NASCIMENTO, P. H. M.; SCARAMUSSA, F. M.; BORTOLON, P. M. (2020). A Evolução da Indústria de Fundos de Investimento Brasileira entre 2010 e 2019. Congresso UFSC de Controladoria e Finanças, 10, UFSC, Santa Catarina.

OLIVEIRA, J.; MILANI, B. (2020). Variáveis que explicam o retorno dos fundos imobiliários brasileiros**.** *Revista Visão: Gestão Organizacional, 9*(1), 17-33.https://doi.org/10.33362/visao.v9i1.2051

POTERBA, J.; SUMMERS, L. (1987). Mean Reversion in Stock Prices: Evidence and Implications. *Journal of Financial Economics, 22*(1), 27-59.https://doi.org/10.1016/0304-405X(88)90021-9

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