Performance of Active Index Stock funds using the CAPM from 1997 to 2019

Desempenho dos fundos de Ações Índice Ativos utilizando o CAPM de 1997 a 2019

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Abstract
The aim was to evaluate the performance of active index stock mutual funds in the Brazilian market, over more than 21 years, based on the CAPM model, in order to highlight if there exist management skills to outperform the Ibovespa benchmark, controlling for the influence of survivorship bias in the generation of abnormal returns. The study used secondary data and a quantitative approach. The sample considered 588 active index stock funds from January 1997 to December 2019. The abnormal returns were calculated by regressing the funds' monthly returns against the Ibovespa' monthly returns, both in excess of the IDC rate. That is, using the regression equation of the CAPM model. The results revealed that the analyzed funds, in average and median values, had a positive significant performance. From the total sample, 64.6% of the funds showed a positive alpha, that is, a risk-adjusted performance superior to that of the Ibovespa in the analyzed period. It was also found that the survival bias factor, in the long run, had considerable influence on the performance results. The performance of the discontinued funds was, on average, significantly lower than that of the funds in operation. These results may support further research and decision making by investors who wish to understand the abnormal returns of these funds relative to the Ibovespa over the long term, and also to assist in the selection of funds aiming at superior returns to those provided by the benchmark index.
Keywords: Investments. Mutual Funds. Equity Funds. Active Management. Portfolio Management.

Resumo
O objetivo foi avaliar o desempenho de fundos de ações índice ativos no mercado brasileiro, ao longo mais de 21 anos, com base no modelo CAPM, de forma a evidenciar se existem habilidades nos administradores de carteiras desses fundos para superarem o desempenho do índice Ibovespa, controlando a influência do viés de sobrevivência na geração do retorno anormal. O estudo

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utilizou dados secundários e abordagem quantitativa. A amostra considerou 588 fundos de ações índice ativos de janeiro 1997 a dezembro 2019. O retorno anormal foi calculado regredindo os retornos mensais dos fundos em relação aos retornos mensais do Ibovespa, ambos em excesso à taxa do CDI. Isto é, utilizando a equação de regressão do modelo CAPM. Os resultados revelaram que os fundos de ações índice ativos analisados, em valores médios e medianos, tiveram desempenho significativo positivo. Do total da amostra 64,6% dos fundos apresentaram alfa positivo, ou seja, desempenho ajustado ao risco superior ao do Ibovespa no período analisado. Constatou-se que o fator viés de sobrevivência, no longo prazo, exerceu influência considerável nos resultados de desempenho. O desempenho dos fundos descontinuados foi, em média, significativamente inferior ao dos fundos em funcionamento. Esses resultados podem subsidiar outras pesquisas e a tomada de decisões de investidores que desejem compreender a magnitude do retorno anormal dessa classe de fundos em relação ao Ibovespa no longo prazo, e também para auxiliar na seleção desses fundos de ações visando retornos superiores ao proporcionado pelo índice de referência.

Palavras-Chave: Investimentos. Fundos de Investimentos. Fundos de Ações. Gestão Ativa. Gestão de Portfólio.

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1 Introduction

Unlike the passive management strategy, in which the portfolio manager invests in assets by aiming to replicate the portfolio of a previously defined index in order to obtain the closest possible return from the index, in the active management strategy, the portfolio manager accomplishes the purchase and sale of assets in order to obtain a higher return than that of the benchmark for the portfolio management or for the investment fund (Sharpe, 1991; Castro & Minardi, 2009). The active management strategy can offer the investor the possibility of earning higher yields by using different managerial approaches, knowledge and skills. Nonetheless, it makes the investor incur higher exposure to risk and frequent transactions (Sharpe, 1991; Matallín-Sáez, Soler-Domínguez, & Tortosa-Ausina, 2018).

The active index mutual funds, which are the research object, are found in the stock fund class, being the ones that aim to surpass a market index. These funds "use tactical shifts regarding the benchmark in order to achieve their objectives" (Anbima, 2015, p.14). Other active stock mutual funds such as the free portfolio or the sector or industry specific have a more diversified set of investment options and they seek to add value when they achieve differentiation and higher exposure to the idiosyncratic risk, and it

can lead to an abnormal performance other than zero (Matallín-Sáez, et al., 2018).

The debate on the finance field, among the proponents and the opponents of active management strategy adoption of investment funds, has been considerable in the last decades (Jensen, 1968, 1969; Grinblatt & Titman, 1989; Sharpe, 1991; Malkiel, 1995; Gruber, 1996; Carhart, 1997; Wermers, 2000; Elton, Gruber & Busse, 2004; Cremers & Petajisto, 2009; Fama & French, 2010; Matallín-Sáez, et al., 2018, Casavecchia & Hulley, 2018; Stark, 2019; Riley, 2021).

The issue became more relevant after the launching of the first indexed investment fund in the American market in the late 1970s. The increase of the passive management and a popularity growth of the indexed funds and the Exchange Traded Funds – ETF's (Cremers, Fulkerson & Riley, 2019) have been observed thereafter.

The majority of the empirical studies, carried out on the performance of the mutual funds in the period of time from 1968 to 1997, points to the finding that the markets are efficient (Fama, 1970; Carhart, 1997), and that, thus, there are no significant signs that the funds, which adopt an active management strategy, may achieve, recurrently, a higher performance than those of the market reference indices or benchmarks.

One of the first and important studies that found that the active management does not create value for the investors was developed by Jensen (1968). Almost 30 years later, in another reference study in the literature on the subject, Carhart (1997) reached a similar result. The results obtained did not show the existence of sufficiently skilled or informed portfolio managers in order to produce superior performance on a regular basis.

Hence, to choose the best fund to invest and thus to obtain a consistent future performance, among the great variety of stock funds in the market, become a challenge for the investor (Silva, Roma, & Iquiapaza, 2018). Longer period of time analyses may support this decision-making.

In order to verify whether the so-called conventional wisdom on active management remained valid, Cremers, Fulkerson and Riley (2019) carried out a wide literature review on the subject since the study by Carhart (1997). The authors suggest that the conventional wisdom judges the active management negatively. The studies designed in the last 20 years demonstrate that the portfolio managers who adopt active management strategies hold several skills and, in many cases, they are able to create value for the investors, even after accounting for fund expenses (Cremers, Fulkerson & Riley, 2019). A present difficulty in some previous studies is the small size of the time-series used in the tests, which does not allow to identify the performance significance statistics correctly. Thus, the size of the series used in the current research allows a greater reliability on the significant effect of the strategies used by the fund portfolio managers.

This article analyses the performance of the active stock mutual funds that have the market index as benchmark, by measuring the risk-adjusted performance of 588 active stock funds in the Brazilian market, and by using a sample for more than 21 years of information. Additionally, the survivorship bias influence in the generation of the risk-adjusted abnormal return was verified, and the difficulties faced by the active stock fund managers in order to surpass the performance reference index, the Ibovespa, are discussed.

Therefore, the main differences and contributions of the article are three: it uses a long period of time to assess the fund performance; it analyses a stock fund category that individually is insufficiently researched in Brazil; and it shows evidence of the survivorship bias in the estimating the performance of these funds in aggregate basis.

The theoretical framework used to support the accomplished analysis is in section 2 of this article. The methodology used to calculate the risk-adjusted performance of the active stock funds and the selected data are described in section 3. The results obtained are presented in section 4. The final considerations on this study are discussed in section 5 of the study.

2 Theoretical Framework

2.1 Market Efficiency Hypothesis

According to the market efficiency theory, an efficient capital market is one in which the current asset prices always fully reflect the available information (Fama, 1970). In an efficient capital market, the current prices reflect the underlying present value of the assets. Another fundamental characteristic of an efficient capital market is that it is not possible to make extraordinary profits by using the available information. The market efficiency theory is particularly interested in how information affects the asset prices. In order to examine how this price adjustment occurs, empirical tests that use three subsets of relevant information are conducted. Firstly, the weak form efficiency tests consider the historical prices. Next, tests of semi-strong form of efficiency take into account the publicly available information. Finally, tests of the strong form of the efficiency consider all available information.

In tests of the weak form the aim is to verify the influence of historical prices on the current asset prices. A capital market is efficient in the weak form when the asset prices embody the historical prices completely. Hence, the market is efficient concerning these prices. Any investment strategy based on historical prices is not able to generate profits in an efficient market in the weak form. Buying stocks using patterns of past price movements is no better than buying stocks randomly (Fama, 1970).

In the semi-strong form tests, the impact of publicly available information on the asset prices is analyzed. In this case, a capital market is efficient in the semi-strong form when the asset prices reflect all public information, such as the economic and financial statements released by the company, the announcement of stock split, among others. Therefore, investors cannot outperform the market with investment strategies using the available public information (Fama, 1970).

In the strong form tests, the objective is to investigate the effect of all available information, both public and private, on asset prices. A capital market is efficient in the strong form when asset prices reflect all existing information. In the strong form of market efficiency, the investors have access to and use all the information that any individual have about assets, even if it concerns privileged information (insider information) (Fama, 1970; Ross, Westerfield, & Jaffe, 1995).

The results of the empirical tests that are conducted in different markets support the validity of the weak-form efficiency and the semi-strong-form efficiency hypotheses. Fama, Fisher, Jensen, and Roll (1969) designed an event study that analyzed 940 stock splits. Positive abnormal returns were verified before the stock split and in periods close to split announcement, thus suggesting that the splits seemed to communicate information to the market. After the split, no upward trend in positive abnormal return was found, which is consistent with the market efficiency theory in the semi-strong form.

Fama (1991) states that the clearest evidence on market efficiency comes from the event studies, especially event studies on daily returns. The results point out that in average the stock prices adjust quickly to information about investment decisions, dividend changes, capital structure changes and corporate control transactions. Such evidence makes it possible to reach the conclusion that prices adjust efficiently to the firms' publicly available information.

The hypothesis of semi-strong form efficiency can also be analyzed by comparing the performance of investment funds against the performance of a market reference index. If the market is efficient in the semi-strong form, then the portfolio managers, who generally use available public information in the analysis and in the investment decision-making, will not be able to provide average returns higher than those obtained by a typical investor (Ross et al., 1995).

By considering the studies carried out on the semi-strong form of efficiency, it can be concluded that actively management investment funds, which assumes that there are sufficiently skilled portfolio managers to select undervalued assets with high appreciation potential, and that is based on application of economic and/or statistical analysis techniques, cannot consistently guarantee the achievement of outperformance compared to a market benchmark index (Carneiro, 2014)

The results of empirical test filed to prove the validity of the strong form efficiency hypothesis. Studies were conducted on the returns provided by operations carried out by company's insiders, individuals with access to information that is not available publicly. It was verified that these trades were able to generate substantial abnormal returns, which attest that the markets are not efficient in the strong form. Although the company's insiders have some private information that provides them with abnormal returns in their operations, the outsiders cannot profit based on public insider trading information (Fama, 1991).

An interesting finding by Fama (1991) is that the efficient market literature is the first case in finance in which the academic research brought a discussion with the financial market. Before the study on efficiency, it was believed that private information was abundant among portfolio managers. The efficiency research proposed the challenge that private information is rare. A result of the study was the raise of passive investment strategies, in which the portfolio managers simply buy and hold diversified portfolios, with the objective of replicating a market benchmark. Portfolio managers who adopted passive strategies and therefore charged low fees were not important in the U.S. market in 1960. More recently, these managers and the passive funds became an important part of the investment management industry (Gruber, 1996; Castro, & Minardi, 2009; Cremers, Fulkerson & Riley, 2019).

The literature on market efficiency also produced a demand for performance evaluation of portfolio managers. According to Fama (1991), in

1960 the portfolio managers were free to argue about their performances. After the study on efficiency, the performance measurement relative to passive benchmarks became the rule, and there are firms that specialized in evaluating portfolio managers. The data generated by these firms are also a source for tests on private information that the academics have often used.

2.2   Fund Performance

Sharpe (1966) analyzed the performance of 34 mutual funds against the Dow Jones Industrial Average from 1954 to 1963. The R/V index was used as a comparison measurement, which measures the return provided in relation to the variability of returns. Only 11 investment funds outperformed the Dow Jones portfolio.

Using the fundaments of the Capital Asset Pricing Model – CAPM, a one-factor equilibrium model developed by Sharpe (1964), Lintner (1965) and Mossin (1966), Jensen (1968 and 1969) verified that the returns for the investors in U.S. mutual funds over the period 1945 to 1965 averaged 1% per year below the market line, a line from the risk-free rate to the market portfolio represented by the S&P 500, and that average returns in more than half of the funds were below the line. The average returns spread randomly over the market line only when all the fund's public knowledge fees were added back. The conclusion by Jensen (1968 and 1969) is that portfolio managers do not have access to private information. The average portfolio manager underperformed the aggregate S&P 500 index, which is consistent with the market efficiency theory in the semi-strong form.

Studies carried out by Brinson, Hood, and Beebower (1986) and by other authors with the aim of evaluating the performance of investment fund using multifactorial models found that mutual funds and pension funds presented negative abnormal returns compared to the reference indices used. Once more, it was evident that portfolio managers do not have access to private information.

When analyzing the returns of investment fund from 1971 to 1991, Malkiel (1995) verified that the funds underperformed the market, not only after deducting management fees, but also in relation to the gross results of all reported expenditures except the loading fees. In addition, in the CAPM context, there was no evidence of return excess and a positive relationship between risk and return.

Gruber (1996) also showed the difficulty of investment fund in presenting superior performance to the reference indexes on a recurrent basis, using both CAPM and multifactorial models. The funds presented, on average, a negative-risk adjusted return over the period 1985 to 1994.

Using a sample without the survivorship bias, Carhart (1997) demonstrated that common factors in stock returns (Fama & French, 1992) and the persistent differences in expenses and transaction costs explain almost all the predictability in stock fund returns. The results found by Carhart (1997) do not support the existence of managers who are sufficiently skilled or informed to produce superior performance.

More recently, Fama and French (2015) extended the 3-factor model by adding the investment and profitability factors. Nonetheless, this new model, despite increasing the explanatory power, does not offer the best trade-off for evaluating the performance of Brazilian free-portfolio stock investment funds (Fernandes, Fonseca & Iquiapaza, 2018).

In Brazil, Borges and Martelanc (2015) constructed an empirical distribution for the distribution of alphas and compared it with the alphas generated by the funds, in an attempt to differentiate the performance obtained by mere luck. In comparing the simulated alphas with the real ones, they showed there is an ability to generate positive abnormal returns, especially by large fund managers.

According to Silva et al. (2018) and Casavecchia and Hulley (2018), the investors should also pay attention to values of management fees as these may be negatively impacting the performance and/or making its assessment difficult. Other Brazilian studies corroborate this idea (Borges

Junior & Malaquias, 2019; Castro & Minardi, 2009; Matos, Penna, & Silva, 2015; Silva, Roma, & Iquiapaza, 2020).

Other studies highlight that younger funds, with redemption restrictions, with higher portfolio turnover, can deliver a better performance (Borges Junior & Malaquias, 2019; Silva et al., 2020). Borges Junior and Malaquias (2019) emphasize that managers of younger funds may have a tendency to try harder in pursuit of a better performance because they need to survive and attract clientele.

Matallín-Sáez et al. (2018) analyzed the relationship between active management and performance of a sample of U.S. active equity funds, uncontaminated by survivorship bias, over the period from 2001 to 2011 for both gross and net return. In the aggregate, the funds did not perform positively and most of them perform negatively. It was also found that the best and worst funds presented a higher level of active management, which was reflected in the U-shaped relationship between performance and active management.

Riley (2021) argues that the investors should be concerned with the performance of a portfolio of active funds rather than the performance of an active fund analyzed individually. On the basis of this approach, Riley (2021) constructed an optimized portfolio of active funds with low idiosyncratic volatility and obtained a positive, statistically significant alpha. The superior performance obtained by this optimized portfolio will not be long-lasting if the portfolio is not rebalanced frequently, due to the substantial allocation of capital by investors to the highly representative funds in the portfolio.

In a study carried out with 25 funds from Pakistan, predominantly equity funds, that compared the risk-adjusted return of the funds against the benchmark, Ali, Aqil, Kazmi and Zaman (2021) found that the managers were not able to outperform the market return. According to the authors, qualitative factors such as managers' qualification, political instability and macroeconomic issues may have affected the fund returns in such a way

that the returns were equal or lower than market return or risk-free asset returns.

3 Methodological Procedures

3.1 Sample and Data

This study was carried out using the monthly net returns, after the management fees, of a sample of 588 active index stock funds, in operation or already discontinued, in the Brazilian market from January, 1997 to December, 2019, contained in Anbima's SI database. The referred funds were selected using the most recent "Active Index Stock Funds" classification adopted by Anbima (2015), the institution that represents the Brazilian capital market entities. To complete the database, with a longer period of information, fund categories that are not in force were considered, but corresponded to active funds referenced in indexes, for example, Ibovespa and IBRX active funds, available on the database.

Hence, unlike previous studies, the performance of investment fund was evaluated for a long period, comprising 263 months, over 21 years of information. This period provides sufficient data for the development of an adequate analysis. It is noteworthy that the studied fund sample does not include only funds in operation, but also funds that possibly have ceased their activities, due to any reason, during the period under analysis. This is necessary in order to avoid the so-called survivorship bias. According to Elton, Gruber and Blake (1996), the survivorship bias occurs when the study includes only the existing funds at the end of the selection period. It is also highlighted that the conducted selection may not include data from all the active index stock funds in operation or already discontinued as of January 1997, simply because some funds did not report their information to Anbima, for any reason, during the analyzed period.

Table 1 presents information about the representativeness of the sample. In the analyzed period, a total of 1515 funds were recorded in the database, over 60% with less than 5 years of information. Within this total

of funds, 329 were on the database as in force ones in the study final period. Thus, due to the requirements of the performance estimation technique to rely on at least 60 months of information, only funds with over 5 years of information were included in the study, resulting in a total sample of 588 funds, 38,8% of the total existing funds in the period. In the defined sample, a total of 216 funds were in force in December, 2019, 66% of the total sample.

To compare the performance of the active index stock funds against a market reference index, the Ibovespa monthly returns, the most important and traditional index of the Brazilian equity market, whose basic purpose to serve as an average indicator of market behavior, were collected in the Economatica® database.

In order to calculate the risk premium for the investment in risky asset, the Interbank Deposit Certificate – IDC was adopted as reference for the risk-free asset, similarly to other studies in Brazil (Fonseca, Bressan, Iquiapaza & Guerra, 2007; Borges & Martelanc, 2015; Fernandes et al., 2018). The IDC interest rate is the cost of money that the bank' treasuries use as reference for the accomplishments of funding operations or short-term resource loan among the banks. The IDC monthly returns for the same period of time were also obtained on Economatica® database.

Table 1 shows the number of returns (in years) for the universe of funds, the in-force funds and the ones included in the study. As well as the average assets under management (AUM) by these funds. In the total universe, an average AUM of R$ 71,4 million is perceived, but in the in-force funds this average increases to R$ 287,8 million, reflecting that the funds that were not included in the study were mostly small and of short duration. In the fund industry, some funds recently launched by the managers have an incubation period with initial funding, and do not necessarily remain in operation, being in-force only those with attractive returns (Borges & Martelanc, 2015; Malaquias & Maestri, 2017). Thus, the defined sample has

funds with AUM values quite close to the universe of the analyzed fund class.

Table 1. Population and Sample of the Active Index Stock Funds.

				Return valid information (years)				
	Min.	1º Quart.	Median	Mean	3º Quart.	Max.	Nº Funds	Average AUM (Millions R$)
Total	0.00	1.75	3.75	5.08	7.00	21.92	1515	71.43
In force_Total	0.00	3.33	6.92	8.31	12.17	21.92	329	287.84
Sample	5.00	6.42	8.08	9.56	11.50	21.92	588	79.75
In force_Sample	5.00	6.92	10.17	11.49	16.46	21.92	216	292.87

Source: Data from this study.
Notes: AUM= Assets under management.

3.2   *Performance Calculation of the Active Stock Funds*

Grinblatt and Titman (1989) state that evaluation of the investment performance is sensitive to the methodology employed. According to Elton, Gruber and Busse (2004), non-sophisticated investors will simply look at how much return they receive above or below the benchmark index as profit evaluation metric. On the other hand, more sophisticated investors will consider the risk-adjusted return as the adequate metric for the result evaluation. As such, in order to verify whether the active stock funds outperform the Ibovespa, a one-factor equilibrium model, the CAPM, was used, which allows one investment to be compare to others, translating the risk measure in terms of expected return.

Using the CAPM equation for the calculation, the abnormal return of an active stock fund can be quantified by regressing the fund's monthly returns against the monthly returns of the benchmark index. The risk-adjusted fund abnormal return will be given by the linear α_p coefficient, the point at which the linear regression line intercepts the y-axis, also called Jensen's α. The regression equation (1) was used to estimate the performance measure (α_p).

$$R_{pt} - R_{ft} = \alpha_p + \beta_p\left(R_{mt} - R_{ft}\right) + \varepsilon_{pt} \tag{1}$$

in which R_{pt} is the monthly return of the active index stock fund, R_{ft} is the IDC monthly return, β_p is the sensitivity of the active stock fund return concerning the Ibovespa return, R_{mt} is the Ibovespa monthly return and ε_{pt} is the model's error term.

The returns were calculated using the difference of the logarithm of the value of the quotas at the end of each month, according to equation (2).

$$R_t = ln\left(\frac{V_t}{V_{t-1}}\right) \tag{2}$$

Jensen's alpha (Jensen, 1968, 1969) was used to calculate the risk-adjusted abnormal return of a investment fund. This indicator makes it possible to verify whether the portfolio manager outperform the market, also informing this performance magnitude, being either higher or lower.

It is a measure of selectivity, that is, it seeks to measure the portfolio manager's skill to choose individual assets adequately, anticipating periods of high prices in these assets (Stark, 2019). In this sense, Jensen's alpha estimates the amount that the predictive skill of a portfolio manager contributes to the returns of a fund (Jensen, 1968).

The selection of the single-factor model was grounded on the type of funds included in the sample, all index -referenced active funds, thus being consistent with the funds' benchmark (Ali et al., 2021). Moreover, Fernandes et al. (2018), when analyzing the performance of pricing models in free-portfolio stock funds, report that approximately 56% of the variability in the returns of these funds can be explained by the CAPM model, and when including other factors, such as those of Carhart (1997) and Fama and French (2015), the gain in explanatory power was from 2% to 3%.

4 Result Analysis

4.1 Performance of Active Index Stock Funds

The goal of an active stock fund is that its risk-adjusted abnormal return, measured by α, is positive on a recurring basis. Table 2 presents a summary of statistical related to the performance of 588 active index stock funds included in this study. The left panel presents the descriptive statistics of the funds' returns and the benchmark indicators, Ibovespa index (Ibov) and the IDC rate. It can be observed that the mean and the median were positive (0,76% and 0,89% monthly, respectively) and lower than the market returns and the risk-free rate.

The right panel (Tab. 2), presents the regression indicators using the CAPM model. Hence, the risk-adjusted performance, the α reached, 0,02% in average, median of 0,12% and ranged from -3,91% to 1,45%. These results show that the active index stock funds operating in the Brazilian market have, on average, fulfilled their objectives, differently from results of the previously mentioned studies (Jensen, 1969; Carhart, 1997), but aligned with more recent studies such as the ones by Borges and Martelanc (2015) and Silva et al. (2020). Although active management in funds is a kind of zero-sum game, there are different situations, such as indexer change, industry competition changes, interest rate changes, etc., in which the active managers can anticipate good outcomes, mainly with assets selection and/or market timing skills (Hoberg, Kumar, & Prabhala, 2018; Cremers et al., 2019). Thus, recent researchers found that "many active managers have significant observable skills, that these skills create real value for investors and that these skills persist over time" (Cremers et al., 2019, p. 11).

The average R2 was 81%, (ranging from 0,14% to 99,14%) indicating that the equilibrium model used in this study, the CAPM, presented an adequate explanatory power for most funds.

Table 2. Summary of Fund's Return and Regression Model Statistics

Statistic	Monthly Returns (%)				Regression Indicators			
	Funds	Ibov	IDC	Alfa (%)	Beta	Reg SE (%)	R2 (%)	N Observations
Mean	0.76	1.10	1.12	0.02	0.84	2.58	81.07	114.70
Standard Deviation	6.83	8.29	0.50	0.57	0.18	2.30	18.71	50.15
Minimum	-91.62	-50.34	0.37	-3.91	0.03	0.53	0.14	60.00
1st quartile	-2.80	-3.32	0.79	-0.12	0.74	1.56	75.60	77.00
Median	0.89	1.21	1.03	0.12	0.87	2.06	87.61	97.00
3rd quartile	4.88	6.54	1.40	0.28	0.94	2.80	93.48	138.00
Maximum	52.41	21.55	3.24	1.45	1.88	25.14	99.14	262.00
Asymmetry	-1.23	-1.30	1.26	-2.91	0.21	5.60	-2.01	1.19
Kurtosis	10.64	5.84	2.26	13.72	4.87	41.39	4.33	0.60
No Obs	67441	262	262	588	588	588	588	588

Source: The authors.
Notes: R2 = adjustment degree or coefficient of determination, Reg SE = regression standard error.

Regarding the distribution of the performance measure, Figure 1 presents the histogram with Jensen's alpha distribution, highlighting the ones statistically different from zero at the 5% level, positive (green color) and negative (red color). Only 4,4% of the funds had an alpha lower than -1,0%, but in 64,6% of the funds, the performance was positive. At the other extreme, only 1% of the funds had an alpha greater than 1,0%, revealing difficulty in obtaining extraordinary performances. Among the total of funds, 17,2% presented positive and significant alpha at the 5% level, and 9,2% of the funds presented negative and statistically significant alpha.
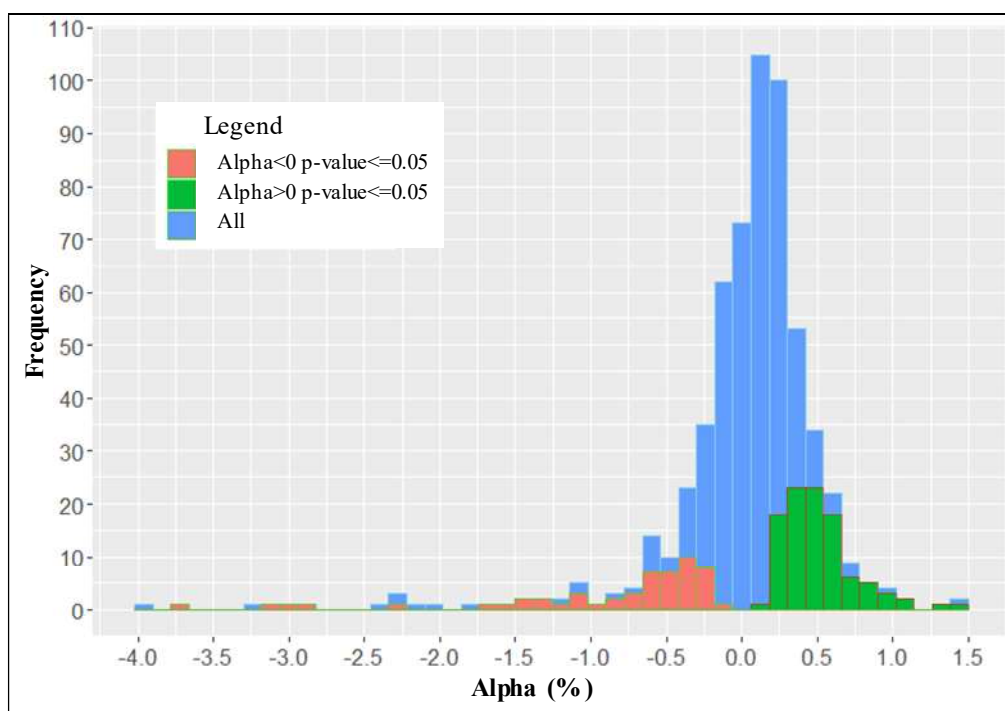
Figure 1. Alpha histogram estimated by the CAPM model

4.2 Survivorship Bias in the Performance of Active Index Stock Funds

In order to verify the survivorship bias influence in the risk-adjusted performance of the active stock funds selected in this study, the funds were segregated in two groups, as follows: a group including only the 216 funds in operation in December, 2019 and another group with the 372 funds discontinued for several reasons during the study period. It is observed in Table 3 that the risk-adjusted performance of the group with all the "in force" funds was, on average 0,12%, and median 0,15%, superior to the performance in "discontinued" funds, which, on average stood at -0,04%, and median 0,08%. By using the t-test and Wilcoxon nonparametric test, in both cases the mean values were statistically different from zero at the 1% level, as well as the two sample returns were statistically different at the same level of significance. It demonstrates that the exclusion of the discontinued funds can significantly improve the performance shown by the group composed of the operating funds, and it reveals the importance of keeping the discontinued funds in investment fund performance analyses (Carhart,

1997; Elton, Gruber, & Blake, 1996). On the other hand, a greater dispersion of the different indicators is observed among the discontinued funds, such as alpha, beta and R2. Thus, based on these results, the survivorship bias factor exerted considerable influence on the performance of funds analyzed in this study.

Table 3. Influence of the Survivorship Bias on the Fund Performance.

Situation	Indicator	Mean	Std. Dev.	Min.	Median	Max.	Asymmetry	Kurtosis
In Operation in Dec. 2019 (216 funds)	Alpha(%)	0.12	0.41	-2.86	0.15	1.45	-2.54	17.55
	Beta	0.83	0.15	0.42	0.87	1.42	-0.40	0.67
	R2 (%)	84.03	15.74	4.65	90.07	99.14	-2.08	5.68
	N Obs.	137.77	62.30	60.00	122.00	262.00	0.57	-1.04
Discontinued (372 funds)	Alpha(%)	-0.04	0.64	-3.91	0.08	1.27	-2.74	10.99
	Beta	0.84	0.20	0.03	0.88	1.88	0.31	5.04
	R2 (%)	79.35	20.05	0.14	86.90	98.50	-1.90	3.47
	N Obs.	101.30	35.22	60.00	90.00	228.00	1.07	0.44

Source: The authors.
Notes: R2 = adjustment degree or coefficient of determination. N Obs = number of observations.

Among the total of 216 operating funds, 1,4% presented a risk-adjusted performance lower than -1%, 72,7% had positive alpha, and 1,9% of the funds had alpha greater than 1% per month. Among these funds, 26,4% had positive and significant alpha at the 5% level, and 9,7% of the funds had negative and significant alpha. The average R2 of the operating funds was 84,0%.

Among the total of 372 discontinued funds, 6,2% presented a risk-adjusted performance lower than -1%, 60,0% had positive alpha, and 0,5% of the funds presented alpha greater than 1% per month. Among these funds, 11,8% had positive and significant alpha at 5% level, and only 8,9% had negative and significant alpha. These average R2 of these funds was 79,2%. Comparing to the funds in operation, worse results for the performance of discontinued funds are perceived.

In Table 4, the results for the 10 worst and the 10 best performances of funds in force in December, 2019 are presented; in the worst fund case, the result was significant at 5% and apparently this performance is reflected on the selection of moving away from Ibovespa, as it presented a 0,48 beta and a 4,7% R2. As for the best fund, the performance was significant only at the 10% level, and the result also seems to have been originated in lower exposure strategies to the market, as the fund had 0,45 beta and 9,8% R2. In both cases, due to the beta relatively low value, it can be inferred that the fund managers used strategies that led to a portfolio composition different, or in very different proportions, from the Ibovespa index.

Table 4. Performance of the Active Index Stock Funds in Operation

Fund	Alpha	Pval-Alpha	Beta	Pval-Beta	R2	N
Figi Fundo De Investimento De Acoes	-2.8601	0.0245	0.4788	0.0295	4.65	102
Fact Active FI Em Acoes	-2.2982	0.1080	1.0818	0.0000	24.33	63
Alfa Fic De FI Em Acoes	-1.2442	0.0000	0.9666	0.0000	93.97	153
Alfamais FIC De FI Em Acoes	-0.7740	0.0000	0.9617	0.0000	95.68	262
Maitaca Acoes FIC FIA	-0.6172	0.1520	0.7956	0.0000	65.51	67
Bradesco FIC De Fia Iv	-0.6064	0.0000	0.9273	0.0000	95.68	262
Santander FC FI Onix Acoes	-0.5089	0.0000	0.9537	0.0000	97.75	159
Bradesco FIC De Fia Maxi	-0.4550	0.0000	0.9109	0.0000	97.20	247
Bradesco FIC De Fia	-0.4134	0.0002	0.8675	0.0000	94.30	262
Banrisul Performance FI Acoes	-0.3993	0.0770	1.0521	0.0000	82.12	218
Uv Equity Brasil FI De Acoes	0.5812	0.0009	0.5810	0.0000	77.50	136
Xp Investor FI De Acoes	0.6033	0.0056	0.9163	0.0000	81.92	160
M. Safra Equities FI De Acoes	0.6403	0.0428	0.5486	0.0000	43.81	126
Reach FI Acoes	0.7522	0.0326	0.4831	0.0000	53.49	61
Atmos Institucional FC FI De Acoes	0.7557	0.0052	0.6457	0.0000	68.65	89
Atlas One Master FI De Fia	0.8091	0.0010	0.5211	0.0000	55.47	120
Alaska Black FIC FI Acoes Bdr Nivel I	1.0050	0.0517	1.0800	0.0000	57.60	108
Atmos Institucional Master Fia	1.0551	0.0025	0.7818	0.0000	72.96	61
Alaska Black Master FI Acoes Bdr Nivel I	1.4097	0.0110	1.1437	0.0000	55.86	112
Dvg1 FI Em Acoes	1.4539	0.0692	0.4452	0.0018	9.75	97

Source: The authors.
Notes: Pval-Alpha = alpha p value, Pval-Beta = beta p value, R2 = adjustment degree or coefficient of determination, N = number of observations.

In Table 5, the results for the 10 worst and the 10 best performances of discontinued fund over the period can be verified, whose returns started in January, 1997. In the worst fund case, the result was significant at 10% and apparently this performance is reflected on the selection to leverage the exposure to Ibovespa, as it presented beta of 1,58 and R2 of 22,9%. As for the best fund, the performance was significant only at the 5% level, and the result was determined by the lowest exposure to Ibovespa, as the fund had beta of 0,47 and R2 of 50,0%. By observing the worst fund alphas, it can be inferred that some of them may have been discontinued due to non-satisfactory performance.

Table 5: Performance of Discontinued Active Index Stock Funds

Fundo	Alfa	Pval-Alfa	Beta	Pval-Beta	R2	No Obs
Gwi Fundo De Investimento De Acoes	-3.9058	0.0536	1.5828	0.0000	22.90	70
Gwi Leverage FI Em Acoes	-3.6739	0.0352	1.7655	0.0000	19.74	170
Gwi High Value FI Em Acoes	-3.2760	0.2036	1.0259	0.0276	4.90	99
Elite Vip FIA	-3.1058	0.0153	1.6211	0.0000	45.24	66
Geracao FIA Gol Sul	-2.9653	0.0000	1.2956	0.0000	88.92	66
Treviso FIA Acoes Ie	-2.3793	0.0501	0.7302	0.0006	14.51	78
FIA Gwi Private Investimento No Exterior	-2.3286	0.1351	1.6334	0.0000	36.85	89
Gf FIA Gol Vida	-2.2702	0.0000	1.2377	0.0000	88.99	66
Roma Acoes FI De Acoes	-2.1903	0.0954	0.1843	0.4199	1.00	67
Gwi Small E Mid Caps FI De Acoes	-1.9816	0.4248	0.5281	0.2353	1.71	84
Xp Absoluto Consumo FI De Acoes	0.7419	0.0529	0.6905	0.0000	61.38	100
Alaska Poland FI Acoes BDR Nivel I Ie	0.7823	0.0320	0.6158	0.0000	38.54	185
Everest Fundo De Investimento De Acoes	0.8065	0.0321	0.8194	0.0000	77.40	67
Explora Long Acoes FI Acoes	0.8092	0.0392	0.9580	0.0000	75.97	93
Tuias Fi Em Cotas De FI De Acoes	0.8999	0.0399	0.6989	0.0000	64.87	71
Fundo De Investimento Elo Acoes Ie	0.9058	0.0022	0.6670	0.0000	65.42	124
Cshg Leopardo Acoes FI Acoes	0.9591	0.0234	0.7009	0.0000	70.41	63
Bogari Value FC FI De Acoes	0.9983	0.0004	0.5783	0.0000	67.81	101
Schroder Brasil FIA	1.1113	0.0135	0.7183	0.0000	79.09	64
FI Acoes Lumina	1.2748	0.0016	0.4666	0.0000	49.69	75

Source: The authors.
Notes: Alpha Pval = alpha p value, Beta Pval = beta p value, R2 = adjustment degree or coefficient of determination, N = number of observations.

5 Final Considerations

The article aimed to assess the performance of the active index stock funds in the Brazilian market, based on the CAPM model, and it presents evidence of abnormal return, indicating that there are skills in the portfolio managers of these funds to outperform the Ibovespa index.

This study contributes to the advancement of the literature in this area in three ways. Firstly, a long period of time for the fund performance assessment was used; secondly, it studies a stock fund category that individually is insufficiently researched in Brazil; and finally, it shows findings of the survivorship bias in the performance estimation of these funds on an aggregate basis.

The study period began in January, 1997 and ended in December, 2019, thus comprising 21 years and 11 months or 263 months of returns. A longer time period than that used by most recent studies in this area, giving greater robustness to the results and inferences. The abnormal return was estimated based on a single factor equilibrium model, the CAPM, for the class of active index stock funds in the Brazilian market. The analysis was performed on a sample of 588 funds, with a minimum of 60 months of information, in operation or already discontinued. The influence of the survivorship bias on the estimate of the fund mean performance was found by comparing in operation funds to discontinued ones, and the result showed the difficulties faced by the portfolio managers of active stock funds to outperform the benchmark index, the Ibovespa, on a recurring basis.

It was found that the active index stock funds, in the analyzed period, achieved a significant positive average performance measured by Jensen's alpha (mean of 0,02% and median of 0,12% monthly), showing that some funds managed to outperform the market benchmark. But the performance distribution was asymmetric, with some funds with significant losses in the distribution lower end, signaling the difficulty to surpass the Ibovespa performance recurrently. Although from a total of 588 funds in the analysis, 64,6% of the funds managed to present a positive risk-adjusted abnormal

return in the analyzed period. This result is important and shows that some fund managers may be presenting skill in the assets portfolio selection, as it was emphasized in previous studies (Borges & Martelanc, 2015 and Silva et al., 2020).

It was also found that the discontinued fund exclusion from the analysis can significantly improve the performance presented by the group of operating funds, leading to incorrect conclusions about the performance. Based on these results, it was verified that the survivorship bias factor had considerable influence in the period of this study. As it is reported by the literature, the discontinued funds on average, significantly underperformed the funds in operation, which suggests that some discontinued funds may have been ceased due to performance problems (Elton, Gruber, & Blake, 1996).

The study results can support other studies on the investment fund performance, and on the decision-making of those investors who want to understand the magnitude of the abnormal return of the active index stock funds relative to Ibovespa. The considerations in this article can also be useful for more sophisticated investors, who evaluate their investment performance based on the risk-adjusted return as a metric to measure their results, and alternative investment definitions such as those highlighted by Riley (2021).

As a deeper examination of the study in further researches, the use of factor models for the performance measurement is emphasized (Fama, 1991; Carhart, 1997). In this sense, in order to obtain even more representative results, new studies will be necessary to evaluate the performance of active index stock funds by using factorial models. The performance can also be estimated by sub-periods, and/or by associating performance to the fund characteristics in order to determine internal and external factors related to the funds, which may benefit or jeopardize their performance (Silva et al., 2020).

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