Stock investment funds in Brazil: performance and management expertise

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ABSTRACT

This article analyzes the stock investment fund market in Brazil and proposes dynamic rankings constructed from different risk-return metrics, during the period from 1998 to 2009. We find an uncommon level of persistence, mainly among the best performing funds, due to the expertise of the managers. The quadrimestral rebalancing of the portfolios based on these rankings permits inferring that in scenarios characterized as economic booms or recovery of financial markets, the strategies with equal participation in winner funds provides significantly higher average monthly gains, reduction of risk associated with diversification and consequently enhanced performance in relation to market or sector benchmarks. This evidence is robust to the use of different performance metrics for fund selection, indicating that active investors in winning funds demand good performance not only in terms of the Sharpe ratio, but also with respect to other metrics, such as the Treynor, Calmar and Sortino ratios. In these optimistic scenarios, only the industrial sector index (INDX) provided returns compatible with those of these fund's portfolios. However, during periods of crisis, no strategy involving the funds managed to provide hedge levels characteristic of the electric energy sector index (IEE), so it can be said that the majority of investing strategies are dominated in gain-risk criteria by sector or market indexes, with the exception of value-weighted portfolios composed of losing funds, a signal that the usual passive investors in large funds indexed to the Ibovespa can be presenting a greater level of inertia.

Keywords: Dynamic portfolios; mutual funds; persistence of performance metrics; management expertise; fund performance ranking.

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1. INTRODUCTION

Mutual funds are vehicles to pool investors' resources to invest in the stock market according to a specific investment policy, determined by each fund's bylaws, which specify the rights and duties of the investors, the rules on charging fees and aspects related to their organization, management and custody of the portfolios.

Although the first mutual funds appeared as early as the eighteenth century, it was only in the twentieth century that these investment vehicles started to use advanced risk management techniques. The growth of the investment fund industry in the United States in recent decades has been spectacular: in 1984 the mutual funds numbered only in the hundreds and held around US\$ 370 million in assets, while in 2009 there were more than 10 thousand funds managing more than US\$ 10 trillion in assets. In that country, around half of all households have investments in mutual funds. They are also growing in popularity in developing economies. In global terms, estimates are that about 90% of the volume of financial transactions with the aim of financing or investing in companies is associated with various types of investment funds.

In Brazil, the first mutual funds date to 1957 but this investment segment only became subject to specific regulations in the 1970s, by means of Resolution 145 from the Brazilian Central Bank. In the 1990s, Brazilian investors began to use these funds not only as a way to protect their assets against inflation, but also to make them grow under financial stability (established in 1994 by the Real Plan, after years of rampant inflation interspersed with fleeting intervals of stability under ultimately unsuccessful stabilization plans). Since 2000 the industry has passed through a series of liberalizing reforms seeking to expand the liberty of managing funds and stimulating differentiation in the financial market.

Over the period from 1998 to 2011, the number of mutual funds grew from about 1750 to nearly 4800, growth of 9.8% a year, accompanied by an average yearly increase of 23.8% in net assets. The volume of resources under management, which was only R\$ 150 billion in 1998, stood at R\$ 1.5 trillion at the end of 2009.

According to Varga & Wengert (2011), the evolution of this industry is due to the fact that funds offer technical management of portfolios and provide greater liquidity,

smaller transaction costs and greater access to certain assets, and consequently greater diversification, for both retail and institutional investors.

In counterpart, in academic terms there has not been an “explosion” of studies of this financial industry. According to Haslem (2009), there has been an increase in the number of studies starting from the 1990s, with the main lines of investigation being institutional and structural aspects and the ability of managers to “beat the market” or for funds to be considered specific benchmarksⁱ.

In the international literature, it is possible to mention the recent work of Fama & French (2010), in which the authors apply bootstrap simulations to compare portfolios formed by traditional funds and show that few funds are able to generate returns, after deducting transaction costs, compatible with market benchmarks, to the point of compensating an active management strategy. Other interesting articles analyzing portfolio composition and performance of mutual funds are Adcock et al. (2010), Bessler et al. (2010) and Ferreira et al. (2010), while regarding investor behavior, the articles of Rubbany et al. (2010) and Brookfield & Cortez (2010) can be mentioned.

For Brazil, a number of authors have examined the pricing of investment funds, such as Matos & Rocha (2009), Matos, Linhares & Zech (2009), Matos & Silva (2011) and Matos & Moreira (2011), while on efficiency, the article of Matos, Benegas & Padilha (2012) stands out, and specifically on the management of portfolios, some interesting studies are Varga (2001), Varga & Wengert (2003) and Duvernoy (2009). In this context, the present empirical study is aligned in methodological terms with Adcock et al. (2010), with motivation supplied by the evidence presented by Matos, Balbina & Penna (2010), according to which there is no common trend in the paths of cumulative real return of a panel of Brazilian mutual funds, but rather the composition of four convergence clubs with highly specific transition and composition dynamics.

This work adds to the literature on the management performance of this category of funds by providing investors and the financial market: i) a ranking of funds according to aggregate performance, based on four different metrics, ii) unleveraged active dynamic strategies (equal and value weighted) for portfolio composition of funds based on the best and worst performances observed; and iii) a statistical analysis of the robustness in the choice of funds with best or worst performance, even when changing the performance yardstick. Besides evidence on the persistence of stock investment funds in the Brazilian market, we provide some considerations on the factors that influence the differences

among the optimal-risk portfolios proposed by each fund, which can be associated with the management expertise. The panel used here contains 68 funds, during the period from January 1998 to December 2009.

The article is structured in five sections including this introduction. In the next section we review the literature, while in the third section we describe the performance metrics used and the method to compose the portfolios. In the fourth section we present the main statistics and the results obtained, while the fifth section contains our concluding remarks.

2. REVIEW OF THE LITERATURE

2.1. Performance of Mutual Funds and Pricing Models

Among the various categories that compose the mutual fund industry, the segment of funds that invest in stocks accounts for approximately 12% of the volume of assets under management. These funds, also called variable income funds, must in Brazil invest at least 67% of their assets in shares traded on an exchange or organized over-the-counter market, with few restrictions on the composition of the remaining 33%.

According to Sharpe (1991), taking into consideration the returns obtained before deducting the transaction costs, investors do not tend to outperform the benchmark or positive risk-adjusted gain if they follow a strategy of investing only in passive funds indexed to this benchmark. In other words, the Jensen alphas are nil. A direct implication is the arithmetic of active management: in aggregate terms, the Jensen alpha must be zero for the passive category of funds. A consequence of this restriction imposed on the very good or very bad relative performances in the investment fund industry was the development of a literature in which mainstream authors have analyzed the modeling of pricing, forecasting and performance of investment fundsⁱⁱ.

2.1.1. Price Models of Brazilian Stock Investment Funds

Because they are dynamics portfolios whose composition is not necessarily associated directly with the stock market, equity investment funds are financial assets whose specific features have prompted the development of their own pricing models.

In this current, Matos & Rocha (2009) show that linear factor models à la Fama & French (1992) and (1993) better capture the risks associated with large-cap investment funds than the capital asset pricing model (CAPM), with a greater performance gap in

relation to the Ibovespa (the index that tracks the BM&FBovespa), although this improvement does not appear to be sufficient. Matos, Linhares & Zech (2009) corroborate this pattern for a larger panel and show the low empirical relevance when permitting distinct dynamics behaviors for the returns of investment funds, depending on their regime in time. This nonlinearity is characteristic when using the threshold CAPM (TCAPM), in the form, for example, of the threshold autoregressive (TAR) model, initially proposed by Tong (1978) and Tong & Lim (1980).

Motivated by this pattern of outperformance associated with the size effect for Brazilian funds, a successful empirical extension is Matos & Silva (2011). The authors propose groundbreaking exercises for pricing and in-sample forecasting using a linear factor model framework. Following the method developed by Fama & French (1992; 1993), they constructed factors – zero cost equal weighted portfolios, but composed of funds rather than stocks – able to capture the effects of size and performance of these assets. The evidence of the inadequacy of the CAPM to model funds with large net asset values and very high or very low performances appears to be well accommodated with the incorporation of the factors, which proved to be significant, individually and collectively, in nearly 50% of the 75 funds analyzed. This evidence, obtained from individual time series regressions, was corroborated when testing a panel with random effects in which both effects are essential to explain the returns of stock investment funds in Brazil.

Matos & Moreira (2011) extract a time series for stochastic discount factors, first based only on stock returns and second on investment fund returns, finding that the performance in pricing and nonlinear prediction (via the generalized method of moments) of the second stochastic factor to be considerably better than the first. These results corroborate the suggestion made by Matos & Rocha (2009), indicating the need to derive a specific model for investment funds.

2.1.2. Performance of Investment Funds

A recent investigation of the American market was carried out by Fama & French (2010). Aligned with Kosowski et al. (2006), the authors add to the results obtained by Berk & Green (2004), proposing the use of the capital asset pricing model (CAPM) and the factor model à la Fama & French (1992) and (1993) to price a panel containing over 5,000 funds during the period from January 1984 to September 2006ⁱⁱⁱ. The authors employ 10,000 bootstrap simulations, seeking to find evidence of actively managed equity mutual funds that have significant random or systematic outperformance in comparison to passive

benchmark funds. They do this by comparing Jensen alphas estimated by means of these models with the alphas obtained by bootstrap.

For Brazil, Varga (2001) implemented various statistical performance assessment measures to the ten largest stock investment funds offered in the Brazilian market, finding different classifications of funds according to each of these indicators. Varga & Wengert (2003) identified common strategies of investment funds offered in the Brazilian market, while Sobrinho (2003) studied the ability of actively managed stock investment funds to obtain consistent and lasting returns better than the Ibovespa, measuring the risk these funds incur and the capacity of their managers to buy undervalued stocks and to diversify their portfolios. According to the results, 70.46% of these funds were unable to beat the Ibovespa by means of active management.

Monteiro (2006) evaluated 112 Brazilian funds by calculating measures of profitability, asset selection, market timing and measures combining the last two, with daily data in windows of three months to one year, for the period from January 1998 to December 2005, using the method proposed by Bollen & Busse (2005). The evidence suggests the existence of persistent performance by selectivity and market timing for up to six months for a small number of funds, with the strongest results applying to the top 10% by performance.

More recently, Duvernoy (2009) investigated the performance of Brazilian investment funds using nonparametric admissible stochastic discount factors. Under the hypotheses of incomplete markets and no arbitrage, they determined the limits for the funds' performance based on admissible measures. In parallel, they presented a variation of this method, excluding the possibility of highly persistent Sharpe ratios in a market in equilibrium. Based on a sample of 33 multimarket funds for a period of approximately eight years, the results showed that the funds' performance could vary substantially according to the measure.

2.2. This article and the literature

An investor observing Brazilian investment funds, more specifically those in the Ibovespa Active category, will find hundreds of funds, making any attempt to follow an active strategy a highly complex task. Nevertheless, this is an industry with a significant level of regulation and transparency, characterized by low transaction costs, in which an accentuated divergence of the returns of different funds would not be expected.

Theoretically, convergence would be expected if the hypotheses of the Markowitz separation property (Markowitz, 1952) are valid.

Matos, Balbina & Penna (2010), using the semiparametric convergence technique proposed by Phillips & Sul (2007), showed for a panel containing 68 Brazilian stock funds, during the period from January 1998 to June 2007, the absence of a common trend and the composition of four convergence clubs, with quite specific transition dynamics and compositions. In other words, the absence of convergence characterizes a high degree of heterogeneity in the returns and a diversification power such that different portfolios can generate very distinct return distributions.

In light of this evidence, what risk-return performance measure should investors use to choose an investment fund or the composition of their portfolios? Does the performance of funds differ greatly depending on the metric used? How does this behavior change between periods of economic crisis and booms? How robust is the ranking of funds when the performance metric is changed? Is this robustness stronger for funds that are losers or winners? What can explain this difference in performance in a sample of funds?

Just as Adcock et al. (2010), who analyzed the impact of the use of different risk-adjusted performance measures on the ranking of investment funds in the United Kingdom, here we add to the literature on the management performance of Brazilian stock mutual funds by addressing these questions for a panel composed of 68 funds for the period from January 1998 to December 2009^{iv}.

3. METHODOLOGY

3.1. Database

The exercise proposed in this article entails the construction of dynamic portfolios composed of stock funds based on different performance metrics. As in the majority of empirical works, here we faced the dilemma of the use of the database in its temporal (T) and cross-section (N) dimensions. In this respect, we opted for a panel containing the time series available in the database of the site www.fortuna.com.br, during the period from January 1998 through December 2009, covering 144 observations over time. In this interval there are 68 stock investment funds with complete time series, classified as Ibovespa Active, according to the categorization of Anbid (National Association of Investment Banks). This subcategory uses the Ibovespa as a benchmark but does not permit leverage. The time series extracted were the closing quotation on the last trading

day of the month, which allowed calculating the nominal series of net monthly returns, besides the series consisting of net asset value (NA) at the end of each month. The complete names are listed in **Table 1**, along with the financial statistics associated with the gain, various types of risk, third and fourth moments and accounting data.

From this table, it can be perceived that a significant portion of the sample is composed of funds that do not have a direct management connection with large financial institutions and that the participation of private-sector banks is greater than that of public-sector ones. In this table we assign codes to the funds, by which they are identified in other tables.

We also obtained from this site, for the same period, the monthly returns of the Ibovespa and of the standard (government regulated) passbook savings account offered by banks, used as a proxy for the Brazilian risk-free return. Besides this rate, many empirical studies of the Brazilian market use the SELIC rate (Central Bank benchmark rate), as well as the expected returns on acquisition of American Treasury Bills tied to a future exchange rate, or also IMA fixed-income indexes, whose calculation is based on the market value of portfolios composed of pre-fixed public bonds tied to the SELIC rate (LFT), to the IPCA (consumer price index) (NTN-B) and IGP-M (general market price index) (NTN-C).

Tabela 1

Estatísticas descritivas financeiras do painel de fundos de investimento em ações no Brasil ^{a,b,c}

Fundos de investimentos	Código	Métricas de Retorno		Métricas de risco			Métricas de 3 e 4º momentos			Métricas de performance				Métricas contábeis	
		Retorno líquido real acumulado	Retorno líquido real médio	Desvio padrão	Downside risk	Beta de mercado	Drawdown	Assimetria	Curtose	Sharpe	Sortino	Treynor	Calmar	PL médio (R\$ milhões)	Ranking PL
PROSPER ADINVEST FUNDO DE INVESTIMENTO EM ACOES	pros	1609,201%	2,566%	11,503%	5,849%	0,921	61,101%	2,625	21,048	0,223	0,439	0,028	0,042	6,79	58
DYNAMO COUGAR FIA	dyna	1482,022%	2,172%	6,898%	4,095%	0,586	40,590%	-0,230	2,318	0,315	0,530	0,037	0,054	409,77	2
SMALL CAP VALUATION IB FIA	smal	1244,039%	2,267%	9,319%	6,027%	0,876	59,544%	-0,495	3,441	0,243	0,376	0,026	0,038	76,73	13
COMERCIAL MASTER FUNDO DE INVESTIMENTO EMACOE	come	1239,396%	2,213%	9,086%	4,959%	0,835	47,003%	0,662	3,875	0,244	0,446	0,027	0,047	8,03	54
OPPORTUNITY LOGICA II FI ACOES	oppo	1073,144%	2,228%	10,320%	5,744%	0,949	47,146%	0,708	2,468	0,216	0,388	0,023	0,047	1140,54	1
SAFRA MULTIDIVIDENDOS FI ACOES	safr2	926,121%	1,895%	7,274%	4,558%	0,664	51,109%	-0,347	1,647	0,261	0,416	0,029	0,037	149,05	4
GERACAO FUNDO DE INVESTIMENTO EMACOE	gera	845,915%	2,045%	9,719%	6,137%	0,916	65,236%	-0,131	1,408	0,210	0,333	0,022	0,031	106,75	10
IP PARTICIPACOES FUNDO DE INVESTIMENTO EM ACOES	ip	755,881%	1,787%	7,577%	4,625%	0,668	47,122%	-0,020	2,981	0,236	0,386	0,027	0,038	130,28	5
GRADUAL PAVARINI FUNDO DE INVESTIMENTO EM ACOES	grad	726,731%	1,825%	8,307%	5,260%	0,815	50,317%	-0,302	1,562	0,220	0,347	0,022	0,036	20,58	46
ITAU OPPORTUNITY LOGICA II ACOES FICFI	itau11	698,740%	1,952%	9,890%	6,293%	0,964	47,354%	-0,319	2,309	0,197	0,310	0,020	0,041	10,83	52
SAFRA SETORIAL BANCOS FI ACOES	safr4	686,610%	1,903%	9,583%	6,023%	0,867	51,208%	-0,188	0,863	0,199	0,316	0,022	0,037	113,27	9
HG TOP ACOES FICFI ACOES	hg	653,813%	1,773%	8,325%	5,575%	0,840	47,569%	-0,773	3,310	0,213	0,318	0,021	0,037	55,54	22
FAMA CHALLENGER FIC FI ACOES	fama	592,381%	1,780%	9,348%	5,716%	0,821	59,824%	0,298	2,785	0,190	0,311	0,022	0,030	47,90	26
BRADESCO PRIME FIC DE FIA ACTIVE	brad6	525,129%	1,726%	9,280%	6,245%	0,971	48,313%	-0,606	1,861	0,186	0,276	0,018	0,036	29,06	39
ITAU PRIVATE EXPERTISE ACOES FICFI	itau10	521,012%	1,667%	8,761%	5,712%	0,871	50,056%	-0,367	2,713	0,190	0,292	0,019	0,033	7,25	57
ITAU INSTUCIONAL IBRX ATIVO ACOES FI	itau5	485,454%	1,661%	9,015%	6,142%	0,937	50,800%	-0,746	3,298	0,184	0,270	0,018	0,033	29,80	38
FI FATOR JAGUAR ACOES	jagu1	474,116%	1,707%	9,512%	6,739%	0,966	54,378%	-1,036	3,410	0,179	0,253	0,018	0,031	40,50	30
BTG PACTUAL ANDROMEDA FI DE ACOES	btg1	467,344%	1,704%	9,773%	6,441%	0,994	53,562%	-0,429	2,323	0,174	0,265	0,017	0,032	30,57	37
FI FATOR ACOES INSTITUCIONAL	fato	442,047%	1,610%	9,037%	6,272%	0,919	49,858%	-0,824	2,820	0,178	0,257	0,018	0,032	40,81	29
BRADESCO PRIVATE FIA IBOVESPA ALAVANCADO	brad1	428,647%	1,593%	9,053%	6,264%	0,950	53,610%	-0,799	2,666	0,176	0,254	0,017	0,030	7,81	55
SAFRA PRIVATE FI ACOES	safr3	414,799%	1,664%	10,014%	6,740%	0,991	59,246%	-0,514	2,104	0,166	0,247	0,017	0,028	31,08	36
SANTANDER FI INST ACOES	sant2	407,728%	1,577%	9,257%	6,248%	0,975	51,275%	-0,564	2,040	0,170	0,252	0,016	0,031	38,67	32
ELITE FUNDO DE INVESTIMENTO EMACOE	elit	403,358%	1,484%	8,289%	5,672%	0,829	51,645%	-0,711	2,371	0,179	0,262	0,018	0,029	2,74	66
REAL FUNDO DE INVESTIMENTO EM ACOES INSTITUCIONA	real	398,269%	1,520%	8,854%	5,921%	0,915	49,099%	-0,448	0,848	0,172	0,257	0,017	0,031	27,63	40
CREDIT SUISSE "FIG" PREMIUM FUNDO DE INVESTIMENT	crsu	393,644%	1,593%	9,589%	6,666%	0,987	56,321%	-0,692	1,404	0,166	0,239	0,016	0,028	36,67	34
LEGG MASON ACOES IBOVESPA ATIVO SILVER FICFI	legg2	390,399%	1,606%	9,765%	6,654%	1,031	52,404%	-0,607	2,086	0,165	0,241	0,016	0,031	57,28	19
UNIBANCO INSTITUCIONAL IBX FI ACOES	unib2	387,787%	1,473%	8,362%	5,824%	0,871	48,883%	-0,866	2,767	0,176	0,253	0,017	0,030	16,57	47
BRADESCO FIC DE FIA IBOVESPA ATIVO	brad7	367,072%	1,500%	9,032%	6,203%	0,925	54,394%	-0,655	2,451	0,166	0,242	0,016	0,028	55,92	21
SUL AMERICA EQUILIBRIUM FUNDO DE INVESTIMENTO	sula	357,710%	1,444%	8,701%	5,776%	0,886	54,507%	-0,305	1,074	0,166	0,250	0,016	0,026	15,99	48
FIBRA VIC FUNDO DE INV EMACOE	fibr	353,672%	1,419%	8,486%	5,649%	0,852	53,367%	-0,327	1,110	0,167	0,251	0,017	0,027	2,39	68
GAP FDO DE INVESTIMENTO MULTIMERCADO	gap	316,544%	1,504%	9,904%	6,739%	1,025	60,319%	-0,477	2,495	0,152	0,223	0,015	0,025	50,00	23
ITAU INSTITUCIONAL IBOVESPA ATIVO ACOES FI	itau4	313,231%	1,461%	9,495%	6,527%	1,004	50,827%	-0,632	2,658	0,154	0,224	0,015	0,029	36,08	35
ITAU PRIVATE ATIVO ACOES FI	itau9	311,494%	1,463%	9,557%	6,533%	1,009	51,189%	-0,582	2,640	0,153	0,224	0,015	0,029	22,65	44
COINVALORES FUNDO DE INVESTIMENTO EM ACOES	coin	304,314%	1,431%	9,417%	6,453%	0,963	52,463%	-0,456	2,262	0,152	0,222	0,015	0,027	6,03	60

Tabela 1 (cont.)

Estatísticas descritivas financeiras do painel de fundos de investimento em ações no Brasil ^{a,b,c}

Fundos de investimentos	Código	Métricas de Retorno		Métricas de risco				Métricas de 3 ^o e 4 ^o momentos		Métricas de performance				Métricas contábeis	
		Retorno líquido real acumulado	Retorno líquido real médio	Desvio padrão	Downside risk	Beta de mercado	Drawdown	Assimetria	Curtose	Sharpe	Sortino	Treynor	Calmar	PL médio (R\$ milhões)	Ranking PL
UNIBANCO TIMING FI ACOES	unib5	290,727%	1,275%	7,978%	5,437%	0,741	53,137%	-0,501	0,765	0,160	0,234	0,017	0,024	11,53	51
ITAU PERSONNALITE ACOES FICFI	itau8	247,862%	1,245%	8,429%	6,046%	0,876	50,783%	-0,949	3,147	0,148	0,206	0,014	0,025	62,84	16
ATICO ACOES FI EM ACOES	atico	244,040%	1,231%	8,550%	5,728%	0,834	51,813%	-0,265	1,127	0,144	0,215	0,015	0,024	6,47	59
SAFRA SETORIAL ENERGIA FI ACOES	safr5	226,257%	1,269%	9,407%	6,198%	0,834	53,569%	-0,021	2,742	0,135	0,205	0,015	0,024	26,07	42
CREDIT SUISSE IBOVESPA INDEX FUND DE INVESTIMENTO	crsu2	219,382%	1,266%	9,365%	6,495%	0,997	56,082%	-0,595	2,042	0,135	0,195	0,013	0,023	4,70	63
FI VOTORANTIM EM ACOES	voto1	217,530%	1,291%	9,598%	6,767%	1,000	58,554%	-0,751	2,428	0,135	0,191	0,013	0,022	8,79	53
FI ACOES SANTANDER ACOES	sant1	211,505%	1,228%	9,143%	6,392%	0,964	53,794%	-0,647	2,211	0,134	0,192	0,013	0,023	61,88	17
LEGG MASON PRIVATE FOCUS ACOES FIC FI	legg1	198,205%	1,256%	9,734%	6,798%	1,028	55,553%	-0,610	2,094	0,129	0,185	0,012	0,023	23,17	43
ITAU IBOVESPA SELECT ACOES - FIC FI	itau12	180,340%	1,174%	9,345%	6,582%	0,993	54,594%	-0,635	2,138	0,126	0,178	0,012	0,022	150,35	3
ITAU PERSONNALITE MARCHE IBOVESPA ACOES FICFI	itau6	176,099%	1,168%	9,376%	6,651%	0,999	60,036%	-0,703	2,169	0,125	0,176	0,012	0,019	70,76	14
BANRISUL INDICE FI EM ACOES	banr1	173,543%	1,182%	9,514%	6,785%	1,000	60,116%	-0,825	3,040	0,124	0,174	0,012	0,020	7,50	56
ITAU PERSONNALITE TECHNIQUE ACOES FI	itau7	168,373%	1,233%	10,019%	7,188%	1,048	63,922%	-0,911	4,381	0,123	0,172	0,012	0,019	58,18	18
UNIBANCO STRATEGY FI ACOES	unib4	165,558%	1,112%	9,068%	6,470%	0,953	55,441%	-0,734	2,269	0,123	0,172	0,012	0,020	83,46	12
ALFA SPECIAL - FUNDO DE INVESTIMENTO EM ACOES	alfa1	164,491%	1,137%	9,341%	6,615%	0,982	55,963%	-0,735	2,358	0,122	0,172	0,012	0,020	37,76	33
BNB FI ACOES	bnb	162,760%	1,089%	8,929%	6,312%	0,921	52,831%	-0,642	2,774	0,122	0,173	0,012	0,021	4,68	64
SAFRA ACOES FI ACOES	safr6	158,400%	1,126%	9,431%	6,652%	0,974	59,593%	-0,628	2,194	0,119	0,169	0,012	0,019	46,26	27
SAFRA INDICIAL FI ACOES	safr1	158,111%	1,114%	9,304%	6,602%	0,990	59,912%	-0,680	2,203	0,120	0,169	0,011	0,019	21,07	45
ITAU INDICE ACOES IBOVESPA FICFI	itau3	153,983%	1,121%	9,477%	6,730%	1,009	61,047%	-0,684	2,330	0,118	0,167	0,011	0,018	48,89	25
HSBC FUNDO DE INVESTIMENTO EM ACOES TOP	hsbc2	153,906%	1,108%	9,329%	6,630%	0,992	58,730%	-0,734	2,755	0,119	0,167	0,011	0,019	64,75	15
HSBC FDO INV EM COTAS FDO INV EM ACOES	hsbc3	147,246%	1,095%	9,347%	6,672%	0,979	53,148%	-0,803	3,412	0,117	0,164	0,011	0,021	45,29	28
FUNDO BANESTES DE INVESTIMENTO EM ACOES	bane	146,125%	1,002%	8,490%	5,938%	0,851	49,859%	-0,566	3,867	0,118	0,169	0,012	0,020	3,32	65
REAL FUNDO DE INVESTI EM QUOTAS DE FDO INVESTE	Realp1	143,967%	1,051%	9,026%	6,481%	0,932	53,862%	-0,798	2,535	0,116	0,162	0,011	0,020	15,78	49
LEGG MASON PORTFOLIO ACOES FI	legg4	136,888%	1,095%	9,720%	6,864%	1,026	56,998%	-0,608	2,087	0,113	0,159	0,011	0,019	95,61	11
ITAU CARTEIRA LIVRE ACOES FI	itau2	124,441%	1,051%	9,612%	6,871%	1,016	61,128%	-0,705	2,737	0,109	0,153	0,010	0,017	117,38	7
BRADESCO FIA SUPER ACAA	brad3	124,152%	1,050%	9,753%	6,801%	0,992	69,086%	-0,292	2,645	0,108	0,154	0,011	0,015	39,72	31
REAL FUNDO DE INVESTIMENTO ACOES ENERGY	abn1	121,975%	0,969%	8,926%	6,267%	0,836	61,236%	-0,483	3,689	0,109	0,155	0,012	0,016	49,57	24
FUNDO DE INVESTIMENTO EM ACOES CAIXA IBOVESPA	caix	110,014%	0,977%	9,388%	6,687%	0,999	60,130%	-0,632	2,096	0,104	0,146	0,010	0,016	130,14	6
FUNDO DE INVESTIMENTO EM ACOES BRB ACOES	brb	97,421%	0,779%	7,698%	5,536%	0,785	55,902%	-0,609	1,738	0,101	0,141	0,010	0,014	5,53	61
BB ACOES IBOVESPA ATIVO FICFI	bb3	94,084%	0,904%	9,205%	6,573%	0,974	60,292%	-0,631	2,221	0,098	0,138	0,009	0,015	55,96	20
UNIBANCO BLUE FI ACOES	unib1	86,208%	0,841%	8,803%	6,422%	0,928	53,423%	-0,788	2,506	0,095	0,131	0,009	0,016	113,94	8
FIC FI ACOES SANTANDER ONIX	sant4	63,749%	0,795%	9,242%	6,749%	0,978	57,201%	-0,751	2,641	0,086	0,118	0,008	0,014	26,08	41
ALFA DINAMICO - FIC FI EM ACOES	alfa2	58,992%	0,770%	9,202%	6,696%	0,966	55,866%	-0,768	2,528	0,084	0,115	0,008	0,014	5,39	62
SLW FUNDO DE INVESTIMENTO - ACOES	slw	37,592%	0,620%	8,691%	6,436%	0,876	62,686%	-0,743	2,894	0,071	0,096	0,007	0,010	2,63	67
ALFAMAIS FIC DE FI EM ACOES	alfa	5,193%	0,490%	9,238%	6,897%	0,972	57,235%	-0,820	2,781	0,053	0,071	0,005	0,009	12,39	50

^a Painel contendo séries temporais mensais de retornos reais líquidos de 68 fundos de investimento em ações (1998.1 a 2009.12, 144 observações)^b Disposição dos fundos: ordem decrescente por retorno líquido real acumulado^c Fonte dos dados: www.fortuna.com.br

Finally, to express the series of net and cumulative returns in real terms, we adjusted them by the National Consumer Price Index (IPCA), published by the Brazilian Institute of Geography and Statistics (IBGE)^v.

3.2. Performance of financial assets

In a scenario where economic agents are not risk neutral, a statistical measure of performance that aims to summarize information on an asset's return needs to incorporate information on the two first moments of the probability function of this return. These two moments can be sufficient if this distribution is characterized completely by the parameters associated with the mean and standard deviation – a common aspect of distributions of the location-scale family – or if agents consider as of secondary order the other centered moments of the distribution.

In this context, among the best known performance measures is the traditional Sharpe ratio (SR), whose geometric interpretation is associated with the slope of the capital allocation line of the referred asset^{vi}. Besides the advantage in terms of interpretation, this metric can be calculated from the time series of any financial asset without the need for additional data on the asset. Another advantage is that its value can be calculated not only for individual assets, but also for portfolios. Therefore, because the numerator and denominator are both linear functions of the first- and second-order centered moments, the calculation of the optimization of the Sharpe ratio of portfolios is computationally accessible and it is more probable to obtain properties of interest to an optimization problem with restrictions, such as the existence of unicity.

This metric consists of the ratio between the risk premium paid for the asset in question and its volatility, measured by the respective standard deviation. Formally, the Sharpe ratio for asset i is given by:

$$\begin{aligned} & \text{[Replace ISH} \Rightarrow \text{SR]} \\ \text{ISH}(r_t)_i &= \frac{E(r_t^i) - r_f}{a(r_t^i)} \end{aligned} \quad (1)$$

where r_{it} denotes the net real nominal return of asset i in period t , $E(r_t^i)$ corresponds to the unconditional expected value for the return of the asset in question, $a(r_t^i)$ is the unconditional standard deviation of this return, and r_f denotes the net nominal risk-free return. A central element of the modern theory of finance developed by Markowitz (1952), because it consists of the objective function itself to be maximized in the composition of a

risky portfolio and a risk-free asset, this ratio nevertheless has limitations associated with the risk metric utilized. In finance, the random variable in question, commonly the return of a financial asset, is such that its dispersion is not sensed symmetrically by financial agents.

In this context, there are criticisms regarding this metric's ability to capture the behavior of investors, who normally react differently to good and bad news of the same magnitude or importance, or to gains and losses of the same amount. Investors are worried more about fluctuations when this implies losing money than when it implies gaining money, so that not all fluctuations are necessarily viewed as bad, nor is all uncertainty considered to be risk.

Therefore, various authors have proposed measures of risk, and thus of risk-return performance, that are more consistent with the distribution of expected gains observed in practice, that is, non-normal distributions, and that consider investor rationality^{vii}. Although the standard deviation metric does not satisfy the desirable theoretical characteristics in the sense of Artzner et al. (1999), such as allocation, subadditivity, monotonicity and first-degree homogeneity, the critique on this point is more associated with the psychology of investors, which is not captured by this metric.

The Treynor ratio (TRR), named for the contribution of Treynor (1965), measures a portfolio's excess return per unit of systemic or market risk (instead of the total risk, which also incorporates idiosyncratic risk), as captured by the β of the market, obtained from the capital asset pricing model (CAPM). This is one of the most widely cited and used models for pricing assets based on microfoundations, having been developed by Sharpe (1964), Lintner (1965) and Mossin (1966). Formally, the Treynor index of asset i is given by:

$$ITR(r_t^i) = \frac{E(r_t^i) - r^f}{\beta^i} \quad (2)$$

where $\beta^i = \frac{\text{Cov}(r_t^i, r_t^m)}{\sigma^2(r_t^m)}$ is the market beta. In this ratio, r_t^m is the net real return of a market portfolio at time t . Just as the Sharpe ratio, the Treynor index is not advisable for more rigorous analysis of portfolio management, with more refined pricing models being preferred. Another limitation of this index is the fact that it can give the same ranking to two portfolios with the same systemic risk and expected gain, even though one of them has

greater idiosyncratic risk. Hence, it is advisable to use the Sharpe ratio when there is uncertainty about the risk drivers that influence the asset in question.

More recently, specifically in the 1980s, the Sortino ratio was proposed and was applied in Sortino & Lee (1994). This performance measure provides a value for the additional gain in relation to a benchmark considered minimally acceptable (minimum accepted return, or MAR) per unit of asymmetric risk, which penalizes only the returns falling below the user-specified target, unlike the standard deviation, which penalizes deviations from both good and bad surprises (both upside and downside volatility).

This ratio for asset i is expressed by the following formula:

$$ISO(r_t^i) = \frac{E(r_t^i) - TMA_t}{\sqrt{\frac{1}{T} \sum_{t=0}^n [Min(r_{i,t} - TMA_t; 0)]^2}} \quad (3)$$

In this case, the denominator represents the downside risk, which in this article is defined as the return on the passbook savings account, considered to be the minimum acceptable return.

The Calmar ratio (CR) was proposed by Young (1991). It is less known and used, with its main applications being to hedge funds and commodity trading. The only difference is the risk metric, which is captured by means of the drawdown, the cumulative decline in the series of returns of the financial asset in question. This metric evolves gradually over time, but reacts more quickly to movements of the mentioned assets than traditional measures. The Calmar ratio of asset i is defined by:

$$ITR(r_t^i) = \frac{E(r_t^i) - r^f}{\text{drawdown}(r_t^i)} \quad (4)$$

3.3. Composition and Rebalancing of Dynamic Portfolios

Our aim here is to provide a ranking of the 68 stock investment funds based on each of these metrics, and consequently to analyze the performance and composition of dynamic portfolios constructed from the funds with the best and worst performance, based on each of the four performance metrics. Here we detail the method followed. In terms of the database, as already described in subsection 3.1, we rely on a panel containing 144

monthly observations from January 1998 to December 2009, of the return and net asset value for the 68 funds. This requires rebalancing the portfolios periodically.

As an example, below we explain the first rebalancing based on the Sharpe ratio, on December 31, 2000, according to the monthly time series from January 1998 to December 2000. Accordingly, based on the Sharpe ratio calculated for this 36-month period, we ranked the 68 funds in decreasing order. We composed a portfolio, called ***Equally Weighted Sharpe_B***, allocating 10% in each of the 10 best funds, i.e., the funds with the highest Sharpe ratio. Analogously, we composed a portfolio called ***Equally Weighted Sharpe_W***, allocating 10% in each of the 10 funds with the worst (lowest) Sharpe ratio. To construct funds considered winners and losers according to the Sharpe ratio, but considering the net asset value, respectively identified as ***Value-Weighted Sharpe_B*** and ***Value-Weighted Sharpe_W***, we weighted the composition of each of the 10 best or worst funds based on the ratio between the average NA in the previous 36 months and the average cumulative NA of the 10 funds in question for the same period.

The ranking generated for the winning funds based on the Sharpe ratio was done by assigning points: 10 points to the top fund, 9 points to the second, and so on, so that the tenth best received 1 point. Analogously, for the losing funds we assigned 10 points in each rebalancing to the worst fund to 1 point for the tenth worst fund.

This rebalancing was dynamic, such that each four months (the rebalancing interval of the Ibovespa), the data from the previous 3 years (36 months) were used to calculate the Sharpe ratio for all 68 funds. Therefore, starting on December 31, 2000 until August 31, 2009, there were 27 quadrimestral rebalancings. Just based on the Sharpe ratio, a determined winning or losing fund could attain a maximum of 270 points. We repeated this dynamic portfolio construction procedure for winning and losing funds, with four-monthly rebalancing, for the other performance yardsticks: Sortino, Treynor and Calmar.

4. EMPIRICAL EXERCISE

4.1. Descriptive Statistics of the Investment Funds

During the period analyzed here, benchmark fixed-income assets, such as savings account deposits and investments in short-term Brazilian government bonds, yielded in real terms approximately 0.2% and 0.5% per month, respectively, and had monthly volatility of under 1%. In the capital market, the traditional Ibovespa index yielded an average of 1.3% a month, but in counterpart its average monthly volatility was 9.3%. The statistics

associated with the cumulative gains of the stock investment funds at the moment of distributing returns, and the performances and size metrics are reported in Table 1.

It is possible to observe average returns higher than the Ibovespa for 50% of the selected funds^{viii}. The standout funds were *pros*, *dyna*, *smal*, *come*, *oppo* and *gera*, with average monthly gains greater than 2.0%, while 21 funds had monthly gains between 1.5% and 2% and another 32 obtained returns between 1% and 1.5%. Only 9 funds obtained real net returns lower than 1% a month, thus generating lower gains for investors than investments in federal government bonds. All the funds obtained higher gains than from putting the money in a savings account. Figure 1 shows the mean variance frontier and the arrangement of the 34 funds that beat the Ibovespa and the funds that underperformed that index.

Figure 1: Mean Variance Frontier (Panel: Stock investment funds and Ibovespa, from 1998.1 to 2009.12)
1.a. Mean variance frontier of the 34 funds that outperformed the Ibovespa

1.b. Mean variance frontier of the 34 funds that underperformed the Ibovespa

Even though it is not possible to make many inferences from the unconditional statistics obtained based on the series of nonstationary, and probably heteroscedastic, returns, the funds that obtained lower average return than the Ibovespa were more diversified than the funds that beat this benchmark. In both cases, portfolios with stock funds permitted maintaining the average gain associated with the Ibovespa, but with lower monthly standard deviation, from 9% to below 5%. Even choosing a single fund, such as *dyna*, there would have been significant performance gains, because 20 funds dominated the Ibovespa according to the mean-variance criterion.

From Figure 2 it can be seen the huge amplitude of the cumulative gains, ranging from the *pros* fund with a return of 1,600% to *alfa* with an accrued gain of only 5%. Apparently there is a degree of persistence, in the sense that some funds systematically beat the Ibovespa, which gained under 250%. This evidence diverges from the American mutual fund market, where the top 20 funds in average annual return, during the period from 1993 to 1999, fell to rankings between 167th and 424th in the period from 1999 to 2005, according to Haslem (2009).

For the Brazilian case, when dividing the entire study period – 1998 to 2009 – into four subsamples of four years each, for the top 10 funds in terms of cumulative gain in the whole period, only *smal* and *safr2* (1998 to 2001), *oppo* (2002 to 2005) and *ip* (2002 to

2005 and 2006 to 2009) fell out of the top 20. In turn, for the 10 worst performing funds over the entire period, only **bb3** and **abn1** (2006 to 2009), **brb** (2002 to 2005) and **brad3** (2002 to 2005 and 2006 to 2009) managed to climb out of the bottom 20.

Figure 2: Cumulative performance of the 68 Brazilian stock investment funds (1998.1 to 2009.12) ^{a, b}

^a Panel containing monthly time series of cumulative returns of 68 Brazilian stock investment funds (1998.1 to 2009.12, 144 observations)

^b Source: FORTUNA

With respect to risk, the volatility based on the standard deviation oscillates between 6.9% and 11.5%, comparable values to those obtained by the Ibovespa, but lower than stocks in general. The downside risk is between 4.1% and 7.2%, while the systemic risk measured by the market beta varies from 0.6 to 1.0. However, there are funds that during the crisis period suffered cumulative losses of some 70%, greater than the 50% loss of the Ibovespa.

Regarding the risk-return pattern, there was a negative correlation (-0.7) between the downside risk and the cumulative return of the funds. This evidence on the negative correlation between gain and risk metrics, at first glance counterintuitive, can explain [be explained by?] the pattern associated with the performance metrics used here. For the entire cross-section of the 68 funds in the period in question, for all four metrics, the correlation is greater than 0.9 between the cumulative return and the respective performance, with the highest correlation being for the Sortino ratio.

By the Sharpe ratio, the most widely used, this positive correlation can be an indication that the first two moments of the distribution are relevant in the investor's analysis, explaining the fact that funds classified as winners heed this metric. However, based on the robust pattern for the other performance metrics as well, a possible explanation is that the fund managers observe and base their investment decisions not only on the Sharpe ratio, for example, but on all the metrics.

With respect to the third and fourth moments, the great majority of the funds show slight asymmetry to the left, the exceptions being the four funds with highest return: *pros*, *come*, *oppo* and *fama*. The funds have relatively slender tails, because the kurtosis measures are moderate, between 1 and 3, for all the funds except for the extreme kurtosis of *pros*.

Finally, there is a positive but low correlation of 0.11 between the net asset value and cumulative gain of the funds. Indeed, there are funds in the sample with NA values of between R\$ 2.4 and R\$ 8 million with very similar performances to those with NA values of roughly R\$1.1 billion.

4.2. Discussion of the Results

How complex would it be for a common investor to adopt an active and dynamic strategy regarding the composition and monitoring of portfolios of investment funds belonging to the Ibovespa Active category? For example, in the complete series of returns,

between 1998 and 2009, the 68 funds are arranged in the mean vs. standard deviation locus in a form that evidences a considerable capacity for diversification. The cumulative gain series show high levels of heterogeneity, besides patterns associated to the risk metrics utilized. In summary, in light of so many patterns and indications, the adoption of an active posture by an investor, besides being complex, might bring very divergent results associated with levels of gain and risk.

Usually an investing strategy starts by defining the proportions to be invested in risk-free and risky assets and then choosing the proportions to invest in each class of risky assets. In line with the argument of Haslem (2009), after defining the proportion allocated to the specific category of Ibovespa Active funds, the common investor would tend to allocate percentages to traditional funds with high capitalizations. A second recourse, requiring greater mastery of statistical measures of the return distribution of each fund, would lead to less trivial choices and allocations. The investor would consider the performance of each fund in absolute terms in comparison with some benchmark or prioritize reduction of risk incurred by the portfolio.

The active and dynamic strategies proposed here are based on rebalancing a portfolio each four months in light of the performance over the preceding 36 months, measured by a specific metric, to construct one portfolio containing the 10 top-performing funds (winners) and another with the 10 worst-performing ones (losers). The compositions suggested can be equally weighted or value-weighted.

Table 2 contains the main statistics associated with the first moments of the return distributions of the portfolios composed of winners and losers, for the period from January 2001 to December 2007, based on the four metrics used here (Sharpe, Sortino, Treynor and Calmar), for both equally and value-weighted compositions. It also shows the performance metrics of these portfolios along with five general market indexes (Ibovespa, IBRX, IBRX-50, FGV-100 and FGV-E) and three sector-specific benchmarks, for industry (INDX), electric energy (IEE) and telecommunications (ITEL). Tables 3 and 4 are analogous, with the difference being the periods analyzed. Table 3 contains only data from 2008, while Table 4 contains data from 2009. The reason for this division into temporal subsamples is the non-stationary behavior of the financial market due to the crisis in 2008.

The comparisons based on the metrics calculated from the monthly returns of the portfolios or benchmark assets can be made in view of the equivalence of the transaction costs in the different investment programs.

More specifically, the monthly returns of each fund were calculated by the net variation of the closing value of the investment shares, determined on the final trading day based on the net asset value, so that they already include the deductions for i) management charges, which range from 0.75% to 6.00% a year, and ii) performance fee, charged according to the profitability targets defined in the bylaws of each fund.

The only charge usually not computed in the NA value is the initial charge or front-end load, but this is not charged by the majority of the funds analyzed here, and is very modest when charged. In other words, the direct transaction costs are already included when using the quotations to calculate the returns.

Since the comparisons here are between funds' active strategies and stock market benchmarks, it is also necessary to consider the tax burden. Brazil has a tax on financial operations (IOF), which for investments in funds is levied at declining rates with increasing periods when the time between the investment and redemption is less than 30 days. Since the rebalancing here is every four months, there is no IOF charged. Finally, the gain from investment funds that invest more than 67% of their portfolio in equities is subject to income withholding tax of 15%, levied at the time of redemption. The same tax applies on the gains from direct trading of shares.

For all the periods, the same order of size was obtained for the values of the metrics analyzed here for portfolios composed of the same funds, with the difference being the composition technique. In other words, there appear to be no significant systematic differences because of adopting an equally weighted or value-weighted composition strategy.

Tabela 2

Estatísticas descritivas básicas dos *portfolios* dinâmicos de fundos de investimento vis-à-vis benchmarks setoriais e de mercado (janeiro de 2001 a dezembro de 2007)

<i>Portfolios dinâmicos equal weighted</i>										
Pior performance						Melhor performance				
		Calmar P	Sharpe P	Sortino P	Treynor P		Calmar M	Sharpe M	Sortino M	Treynor M
Ganho	Média	1,395%	1,347%	1,292%	1,309%		1,964%	1,960%	2,042%	1,943%
Risco	Desvio padrão	7,133%	7,142%	7,168%	7,128%		6,177%	6,110%	5,972%	6,048%
	Downside risk	4,498%	4,531%	4,601%	4,550%		3,471%	3,435%	3,300%	3,376%
	Drawdown	51,597%	51,978%	52,746%	52,233%		36,039%	35,174%	33,841%	35,193%
	Beta de mercado	0,940	0,940	0,944	0,938		0,771	0,762	0,743	0,752
Performance	Sharpe	0,176	0,169	0,161	0,164		0,295	0,298	0,319	0,298
	Sortino	0,279	0,266	0,250	0,257		0,525	0,530	0,576	0,534
	Treynor	0,013	0,013	0,012	0,012		0,024	0,024	0,026	0,024
	Calmar	0,024	0,023	0,022	0,022		0,051	0,052	0,056	0,051
<i>Portfolios dinâmicos value weighted</i>										
Pior performance						Melhor performance				
		Calmar P	Sharpe P	Sortino P	Treynor P		Calmar M	Sharpe M	Sortino M	Treynor M
Ganho	Média	1,390%	1,372%	1,286%	1,357%		1,898%	1,884%	1,913%	1,876%
Risco	Desvio padrão	7,254%	7,238%	7,203%	7,224%		5,554%	5,636%	5,471%	5,621%
	Downside risk	4,550%	4,556%	4,581%	4,558%		3,120%	3,127%	3,032%	3,112%
	Drawdown	50,977%	51,152%	51,456%	51,240%		30,645%	30,786%	45,148%	30,638%
	Beta de mercado	0,955	0,952	0,948	0,950		0,640	0,646	0,631	0,644
Performance	Sharpe	0,172	0,170	0,159	0,169		0,317	0,309	0,324	0,309
	Sortino	0,275	0,271	0,250	0,267		0,563	0,558	0,585	0,558
	Treynor	0,013	0,013	0,012	0,013		0,027	0,027	0,028	0,027
	Calmar	0,025	0,024	0,022	0,024		0,057	0,057	0,039	0,057
<i>Benchmarks de mercado</i>						<i>Benchmarks setoriais</i>				
		FGV100	FGV-E	IBOV	IBRX	IBRX50		IEE	INDX11	ITEL
Ganho	Média	1,954%	1,861%	1,415%	1,917%	1,875%		1,494%	2,213%	0,070%
Risco	Desvio padrão	6,312%	7,328%	7,485%	6,583%	6,752%		8,512%	6,488%	8,161%
	Downside risk	3,546%	4,363%	4,808%	3,788%	3,882%		5,252%	3,846%	5,959%
	Drawdown	35,448%	41,539%	57,209%	37,131%	38,404%		58,788%	33,978%	54,807%
	Beta de mercado	0,788	0,915	1,000	0,836	0,848		0,911	0,688	0,009
Performance	Sharpe	0,287	0,235	0,170	0,270	0,257		0,159	0,320	-0,009
	Sortino	0,512	0,394	0,265	0,469	0,447		0,258	0,539	-0,012
	Treynor	0,023	0,019	0,013	0,021	0,020		0,015	0,030	-0,078
	Calmar	0,051	0,041	0,022	0,048	0,045		0,023	0,061	-0,001

Tabela 3

Estatísticas descritivas básicas dos *portfolios* dinâmicos de fundos de investimento vis-à-vis benchmarks setoriais e de mercado (janeiro de 2008 a dezembro de 2008)

<i>Portfolios dinâmicos equal weighted</i>										
Pior performance						Melhor performance				
		Calmar P	Sharpe P	Sortino P	Treynor P		Calmar M	Sharpe M	Sortino M	Treynor M
Ganho	Média	-4,589%	-4,560%	-4,456%	-4,893%		-4,734%	-4,707%	-4,668%	-4,838%
Risco	Desvio padrão	10,269%	10,447%	10,226%	10,280%		10,284%	10,581%	10,292%	10,305%
	Downside risk	10,080%	10,186%	9,961%	10,343%		10,207%	10,348%	10,143%	10,259%
	Drawdown	51,282%	52,220%	50,869%	52,774%		51,122%	51,356%	50,566%	50,628%
	Beta de mercado	1,029	1,051	1,025	1,039		1,027	1,053	1,026	1,018
Performance	Sharpe	-0,463	-0,453	-0,452	-0,492		-0,477	-0,461	-0,470	-0,486
	Sortino	-0,472	-0,464	-0,464	-0,489		-0,480	-0,471	-0,477	-0,488
	Treynor	-0,046	-0,045	-0,045	-0,049		-0,048	-0,046	-0,047	-0,049
	Calmar	-0,093	-0,091	-0,091	-0,096		-0,096	-0,095	-0,096	-0,099
<i>Portfolios dinâmicos value weighted</i>										
Pior performance						Melhor performance				
		Calmar P	Sharpe P	Sortino P	Treynor P		Calmar M	Sharpe M	Sortino M	Treynor M
Ganho	Média	-3,522%	-3,880%	-3,427%	-4,752%		-4,291%	-4,400%	-4,394%	-4,591%
Risco	Desvio padrão	10,140%	10,562%	10,125%	9,938%		10,014%	10,410%	9,954%	10,145%
	Downside risk	9,126%	9,665%	9,037%	10,029%		9,832%	10,093%	9,849%	10,075%
	Drawdown	45,365%	48,781%	45,227%	51,417%		47,163%	48,807%	47,218%	48,634%
	Beta de mercado	0,983	1,033	0,980	1,004		0,979	1,020	0,976	0,993
Performance	Sharpe	-0,364	-0,383	-0,355	-0,495		-0,445	-0,439	-0,458	-0,469
	Sortino	-0,404	-0,419	-0,398	-0,491		-0,453	-0,453	-0,463	-0,472
	Treynor	-0,038	-0,039	-0,037	-0,049		-0,046	-0,045	-0,047	-0,048
	Calmar	-0,081	-0,083	-0,079	-0,096		-0,095	-0,094	-0,097	-0,098
<i>Benchmarks de mercado</i>						<i>Benchmarks setoriais</i>				
		FGV100	FGV-E	IBOV	IBRX	IBRX50		IEE	INDX11	ITEL
Ganho	Média	-3,557%	-2,999%	-4,311%	-4,360%	-4,522%		-1,251%	-4,892%	-2,489%
Risco	Desvio padrão	8,019%	8,239%	9,743%	10,017%	10,259%		7,229%	11,582%	7,228%
	Downside risk	8,058%	7,748%	9,662%	9,849%	10,119%		5,741%	11,267%	5,948%
	Drawdown	44,662%	43,127%	50,663%	50,814%	52,223%		26,422%	58,622%	33,677%
	Beta de mercado	0,796	0,839	1,000	1,021	1,041		0,570	1,143	-0,249
Performance	Sharpe	-0,465	-0,384	-0,460	-0,452	-0,457		-0,196	-0,437	-0,368
	Sortino	-0,462	-0,409	-0,464	-0,460	-0,463		-0,247	-0,449	-0,447
	Treynor	-0,047	-0,038	-0,045	-0,044	-0,045		-0,025	-0,044	0,107
	Calmar	-0,083	-0,073	-0,088	-0,089	-0,090		-0,054	-0,086	-0,079

Tabela 4

Estatísticas descritivas básicas dos *portfolios* dinâmicos de fundos de investimento vis-à-vis benchmarks setoriais e de mercado (janeiro de 2009 a dezembro de 2009)

<i>Portfolios dinâmicos equal weighted</i>										
Pior performance						Melhor performance				
		Calmar P	Sharpe P	Sortino P	Treynor P		Calmar M	Sharpe M	Sortino M	Treynor M
Ganho	Médio	4,947%	4,916%	4,806%	4,949%		5,004%	5,037%	4,936%	5,049%
Risco	Desvio padrão	6,044%	6,020%	0,000%	5,954%		4,695%	4,898%	4,796%	4,899%
	Downside risk	1,264%	1,264%	6,059%	1,222%		0,803%	0,803%	0,804%	0,803%
	Drawdown	3,285%	3,285%	1,038%	3,285%		2,652%	2,652%	2,652%	2,652%
	Beta de mercado	1,019	1,014	0,036	1,004		0,780	0,817	0,799	0,817
Performance	Sharpe	0,798	0,796	0,000	0,810		1,040	1,003	1,004	1,005
	Sortino	3,815	3,790	0,773	3,949		6,081	6,123	5,988	6,137
	Treynor	0,047	0,047	3,531	0,048		0,063	0,060	0,060	0,060
	Calmar	1,468	1,459	0,046	1,469		1,840	1,853	1,815	1,857
<i>Portfolios dinâmicos value weighted</i>										
Pior performance						Melhor performance				
		Calmar P	Sharpe P	Sortino P	Treynor P		Calmar M	Sharpe M	Sortino M	Treynor M
Ganho	Médio	5,296%	5,292%	5,025%	5,298%		4,991%	4,990%	4,947%	5,033%
Risco	Desvio padrão	6,385%	6,380%	6,428%	6,348%		6,081%	5,596%	6,106%	5,591%
	Downside risk	1,107%	1,107%	1,283%	1,094%		1,567%	1,262%	1,578%	1,262%
	Drawdown	2,776%	2,776%	3,542%	2,776%		4,119%	4,119%	4,119%	4,119%
	Beta de mercado	1,056	1,055	1,071	1,050		0,980	0,890	0,982	0,884
Performance	Sharpe	0,810	0,810	0,763	0,815		0,800	0,870	0,790	0,878
	Sortino	4,673	4,669	3,822	4,729		3,107	3,856	3,056	3,890
	Treynor	0,049	0,049	0,046	0,049		0,050	0,055	0,049	0,056
	Calmar	1,864	1,862	1,384	1,864		1,182	1,182	1,171	1,192
<i>Benchmarks de mercado</i>						<i>Benchmarks setoriais</i>				
		FGV100	FGV-E	IBOV	IBRX	IBRX50		IEE	INDX11	ITEL
Ganho	Médio	5,153%	4,434%	4,900%	4,394%	4,381%		3,613%	5,289%	2,765%
Risco	Desvio padrão	6,135%	4,741%	5,742%	5,210%	5,382%		3,572%	7,464%	6,223%
	Downside risk	1,447%	0,817%	1,396%	1,305%	1,387%		0,618%	2,544%	3,271%
	Drawdown	3,731%	2,561%	3,487%	4,201%	4,454%		1,497%	8,105%	8,570%
	Beta de mercado	0,996	0,789	0,991	0,882	0,908		0,265	1,180	-0,196
Performance	Sharpe	0,820	0,909	0,832	0,820	0,791		0,977	0,692	0,425
	Sortino	3,475	5,273	3,422	3,273	3,070		5,646	2,031	0,808
	Treynor	0,050	0,055	0,048	0,048	0,047		0,132	0,044	-0,135
	Calmar	1,348	1,683	1,370	1,017	0,956		2,331	0,637	0,308

Figures 3 and 4 show that the funds with equally weighted portfolios tend to present greater cumulative gains. The equally weighted portfolios composed of the 10 winners according to the Sortino metric generated net real gains of 390% near the end of 2007, greater than the 360% observed for the same value-weighted portfolio. The losses accrued with the crisis caused the returns from the two compositions to fall to around 130% in 2008, before rising again in 2009, when the cumulative gain of the equally weighted portfolios was 330%, versus approximately 300% for the value-weighted composition.

From the graphs it can be seen that the winning funds, according to any of the performance metrics, consistently beat the Ibovespa since the start of the series in 2001.

Although a detailed study of the active management arithmetic of this panel of funds, as developed by Fama & French (2010), is necessary for the Brazilian market, the temporal evolution of the portfolios composed of winners indicates a significant performance difference in relation to the Ibovespa.ⁱ

In counterpart to the evidence that funds with better performance adopt successful active strategies, the majority of the funds classified here as losers adopted a passive strategy of tracking the Ibovespa, implying cumulative returns practically the same as of that market index.

The statistics reported in Tables 2, 3 and 4 show a very uniform pattern between the portfolios constructed with winning funds based on the different performance measures, with the same observation applying to the portfolios of losers. This evidence corroborates the inference from observing Figures 3 and 4 that managers prioritize good performance in all the metrics analyzed here rather than just the Sharpe ratio, which is most commonly used by investors.

This preference can be due to a robustness desire by investors, or their lack of knowledge of other more refined performance measures, or because it is considered satisfactory to consider only one metric, making the adoption of active strategies less costly for Brazilian funds.

In the period from 2001 to 2007, the winning funds composed portfolios able to provide average monthly gains near 1.9%, well above the 1.3% to 1.4% for portfolios formed of losers, none of which managed to beat the benchmarks used, except the ITTEL.

The portfolios with the best performing funds only did not beat the INDX in the period, and obtained a result nearest the gain of the FGV-100.

Belying the limited “maxim” that greater returns are associated with higher risk levels, in general the portfolios formed of funds classified as winners presented lower values for all the risk metrics used, with the highlight being the unilateral metric given by the downside risk and for cumulative declines captured by the drawdown measure. Because the losing funds in our sample have passive strategies, this shows that the systemic risks captured by the market beta for the portfolios with these funds was greater, with a value of approximately one.

Figure 3: Cumulative performance of the equally weighted dynamic portfolios composed of Brazilian stock investment funds (January 2001 to December 2009)^{a, b, c, d, e}

^a Cumulative performance: net cumulative real return of each dynamic portfolio composed of funds during the period from January 2001 to December 2009, 108 observations

^b **Calmar B** and **Calmar W** dynamic portfolios: Equally weighted portfolios, rebalanced every four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Calmar ratio calculated from the monthly time series observed over the past 3 years

^c **Sharpe B** and **Sharpe W** dynamic portfolios: Equally weighted portfolios, rebalanced every four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Sharpe ratio calculated from the monthly time series observed over the past 3 years.

^d **Sortino B** and **Sortino W** dynamic portfolios: Equally weighted portfolios, rebalanced every four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Sortino ratio calculated from the monthly time series observed over the past 3 years

^e **Treynor B** and **Treynor W** dynamic portfolios: Equally weighted portfolios, rebalanced every four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Treynor ratio calculated from the monthly time series observed over the past 3 years

Figure 4: Cumulative performance of the value-weighted dynamic portfolios composed of Brazilian stock investment funds (January 2001 to December 2009) (January 2001 to December 2009) ^{a, b, c, d, e}

^a Cumulative performance: net cumulative real return of each dynamic portfolio composed of funds during the period from January 2001 to December 2009, 108 observations

^b **Calmar B** and **Calmar W** dynamic portfolios: Value-weighted portfolios (weighted by the average net asset value), rebalanced very four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Calmar ratio calculated from the monthly time series observed over the past 3 years

^c **Sharpe B** and **Sharpe W** dynamic portfolios: Value-weighted portfolios (weighted by the average net asset value), rebalanced very four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Sharpe ratio calculated from the monthly time series observed over the past 3 years.

^d **Sortino B** and **Sortino W** dynamic portfolios: Value-weighted portfolios (weighted by the average net asset value), rebalanced very four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Sortino ratio calculated from the monthly time series observed over the past 3 years

^e **Treynor B** and **Treynor W** dynamic portfolios: Value-weighted portfolios (weighted by the average net asset value), rebalanced very four months, composed of the 10 stock funds with best and worst performance, respectively, according to the Treynor ratio calculated from the monthly time series observed over the past 3 years.

The portfolios made up of the best-performing funds had slightly lower risk than the sectorial and market benchmarks, except for the INDX according to the Treynor and Calmar ratios, so that these portfolios had better risk-adjusted performance than all the benchmarks based on all the metrics.

In 2008, all the portfolios of funds suffered considerable losses and became more volatile than the benchmarks, according to all the measures used, with the exception of drawdown, according to which the Ibovespa, IBRX, IBRX-50 and INDX suffered greater cumulative declines from the crisis than did the value-weighted portfolio of losing funds. The equally weighted portfolios with winning funds, which in the economic boom period up to 2007 presented the best indicators, in 2008 registered sensitivity values to oscillations in the market risk premium greater than 1, indicating a high level of systemic risk. With respect to the other risk measures, there was no pattern among the various portfolios.

A non-trivial finding is that the funds with worst performance, when aggregated, provided portfolios with lower monthly losses than the portfolios composed of winning funds. Only the value-weighted portfolios composed of losing funds suffered losses compatible with the market benchmarks. Because of this behavior, only these value-weighted portfolios formed of losers had performance measures compatible with those observed for the benchmarks analyzed.

Nevertheless, despite presenting acceptable levels of loss and performance, this strategy of investment weighted by the size of the funds with low performance track records should not be characterized as a typical hedge operation in periods of economic turbulence, because of the strong positive correlation with the Ibovespa and other benchmarks. The levels of loss and performance were compatible and not necessarily much less than those observed for the benchmarks, while the IEE, a traditional and widely used hedge instrument, presented much lower levels for these correlations. The other assets analyzed here presented losses three or four times those of the IEE, associated with levels of cumulative loss and systemic risk approximately double that index.

For 2009, Table 4 reflects a qualitative pattern similar to that observed in Table 2, covering the period from 2001 to 2007, when the fund portfolios outperformed the benchmarks, except the FGV-110 and INDX. With respect to the risk metrics, only the IEE had levels substantially lower than the portfolios. This sectorial index was the only one to present better Calmar and Treynor ratios than those obtained by the portfolios of winning funds.

Based on the other performance yardsticks, the equally weighted portfolio composed of funds with the best Calmar ratio beat all the suggested benchmarks.

The graphic and statistical analysis, in temporal subsamples, allowed inferences on the strategies for composing the portfolios of funds suggested here associated with times of economic boom and crisis, besides allowing comparison of the gain, risk and performance of these strategies with other passive investment strategies involving market or sectorial benchmarks.

For example, observance of the detailed composition of each portfolio rather than the outputs associated with their return distribution revealed a high level of persistence, in the sense that some funds were consistently ranked as winners or losers. Furthermore, this persistence was robust to the performance metric used. In this respect, Table 5 contains the ranking of funds that stood out the most positively and negatively. Since we rebalanced the portfolios based on the performance over the preceding 36 months, the first of the 27 quarterly [typo: should be quadrimestral] rebalancings occurred on December 31, 2000. For each rebalancing and each performance metric we generated a ranking of the 10 best and worst performers, and from that we assigned points, with the first fund (best or worst) receiving 10 points and the tenth in the ranking receiving 1 point.

Tabela 5

Ranking dos fundos de investimento em ações no Brasil top 20 com melhor e pior performance
risco-retorno (janeiro de 1998 a dezembro de 2009)^a

Fundo (código)	Pontuação	Participação (%) entre os 10 fundos com melhor performance	Fundo (código)	Pontuação	Participação (%) entre os 10 fundos com pior performance
dyna	778	93%	alfa	836	77%
smal	539	74%	sant4	615	57%
safr2	526	81%	alfa2	406	38%
gera	490	81%	abn1	368	34%
pros	408	78%	bb3	284	26%
ip	377	81%	slw	264	24%
grad	281	59%	safr6	264	24%
come	267	37%	brb	231	21%
brad1	254	48%	itau2	211	20%
hg	253	67%	hsbc3	202	19%
fama	247	56%	caix	197	18%
safr4	218	52%	unib5	195	18%
brad6	189	56%	legg4	179	17%
coin	176	33%	coin	176	16%
gap	153	22%	unib1	158	15%
crsu	123	30%	brad3	155	14%
oppo	98	30%	banr1	120	11%
elit	85	37%	voto1	110	10%
safr3	84	33%	bane	106	10%
itau10	67	19%	safr3	101	9%

^a Durante o período compreendido entre janeiro de 1998 e dezembro de 2009, para cada *portfolio* construído, houve 27 rebalanceamentos quadrimestrais com base na série temporal observada nos últimos 3 anos. Em cada rebalanceamento, foram rankeados os 10 fundos com melhor e com pior performance de acordo com os índices de Calmar, Sharpe, Sortino e Treynor. A pontuação atribuída a cada fundo segue uma regra genérica ad hoc, segundo a qual o fundo com maior índice de Sharpe, por exemplo, recebe 10 pontos, o segundo 9 pontos e assim sucessivamente até que o décimo fundo receba 1 ponto. Esse critério de pontuação é aplicado com base nos demais índices risco-retorno, tanto para os fundos com melhor performance, quanto para os que possuam pior performance.

During the period from January 1998 to December 2009, each portfolio constructed was rebalanced 27 times, at four-month intervals, based on the monthly time series over the previous 3 years. In each rebalancing, we ranked the 10 funds with the best and worst performance according to the Calmar, Sharpe, Sortino and Treynor ratios. The score attributed to each fund followed a general ad hoc rule, according to which the fund with the highest ratio received 10 points, the second 9 points, and so on until the tenth best fund received 1 point. The scoring was analogous for the worst-performing funds and the same scoring criterion was applied based on the other risk-return indexes.

Each fund could receive up to 270 points for each performance metric in the ranking of the best, for a theoretical maximum of 1,080 points based on the four ratios (Sharpe, Sortino, Treynor and Calmar). Analogously, we applied the same scoring scheme to the worst funds.

The first finding that stands out is that of the ten funds with the highest number of points for best performance, eight were also among the top ten in cumulative return. For the losers, seven of the ten worst performers were among the ten funds with the lowest cumulative return. In other words, although this is not an expected trivial result, the funds with active management provided greater cumulative gains and did so by paying heed to performance metrics other than just the Sharpe ratio, also observing the Sortino, Treynor and Calmar measures, among others, for a more robust analysis.

The funds that provided the lowest cumulative gains still imposed risk on their investors, so that the risk-adjusted return was very low.

In terms of persistence, except for *come* and *brad1*, the other funds ranked best for performance accounted for between 59% and 93% of the 27 rebalancings based on each of the four metrics. This persistence was lower among the losing funds. Except for *alfa* and *sant4*, the others participated in 19% to 38% of the rebalancings.

This persistence was even stronger considering more parsimonious portfolio composition strategies, in which the investor opts to acquire and monitor only five funds, be they winners or losers.

Since the choice of the number of funds to be acquired was ad hoc, it is important to analyze the robustness of the evidence regarding the change in terms of adopting this composition with fewer funds.

In general lines, the analysis of portfolios only considering the top five winning funds produced slightly higher cumulative returns, but this improvement was offset by higher risk, so the risk-adjusted performance metrics were roughly the same for the strategies of acquiring the five or ten top-performing funds. For the funds with the worst performance, the differences were even smaller in the levels of gain, risk and overall performance.

Finally, Table 6 shows the maximum and minimum values of the financial and accounting statistics of the funds among the ten with the greatest participation among the best and worst performers.

Tabela 6

Estatísticas descritivas financeiras dos grupos contendo os fundos de investimento em ações no Brasil com melhor e pior performance

		Métricas de Retorno		Métricas de risco				Métricas de 3º e 4º momentos		Métricas de performance				Métricas contábeis
		Retorno líquido real acumulado	Retorno líquido real médio	Desvio padrão	Downside risk	Beta de mercado	Drawdown	Assimetria	Curtose	Sharpe	Sortino	Treynor	Calmar	PL médio (R\$ milhões)
Top 10														
Grupo com melhor performance	Máximo	1609,201%	2,566%	11,503%	6,264%	0,950	65,236%	2,625	21,048	0,315	0,530	0,037	0,054	409,77
		(pros)	(pros)	(pros)	(brad1)	(brad1)	(gera)	(pros)	(pros)	(dyna)	(dyna)	(dyna)	(dyna)	(dyna)
	Mínimo	428,647%	1,593%	6,898%	4,095%	0,586	40,590%	-0,799	1,408	0,176	0,254	0,017	0,030	6,79
		(brad1)	(brad1)	(dyna)	(dyna)	(dyna)	(dyna)	(brad1)	(gera)	(brad1)	(brad1)	(brad1)	(brad1)	(pros)
Grupo com pior performance	Máximo	158,400%	1,126%	9,612%	6,897%	1,016	62,686%	-0,483	3,689	0,119	0,169	0,012	0,021	117,38
		(s a fr6)	(s afr6)	(ita u2)	(a l fa)	(i tau2)	(s lw)	(abn1)	(abn1)	(s a fr6)	(s a fr6)	(s a fr6)	(hs bc3)	(ita u2)
	Mínimo	5,193%	0,490%	7,698%	5,536%	0,785	53,148%	-0,820	1,738	0,053	0,071	0,005	0,009	2,63
		(a lfa)	(a lfa)	(brb)	(brb)	(brb)	(hsbc3)	(a lfa)	(brb)	(a l fa)	(a lfa)	(a l fa)	(a lfa)	(s lw)

The finding of a considerable difference in the performance levels is trivial, but what explains this amplitude? Except for the risk measured by the standard deviation, the other risk measures (downside, drawdown and market beta), the volatility of the winning funds fluctuates, so that the maximum and minimum risk levels are below the respective levels observed for the losers, which also provide much lower average and cumulative gains.

5. CONCLUSION

Among the various ways of composing portfolios, these may or may not involve optimization of metrics associated with the distribution of returns. Nevertheless, the strategy can be simpler and more accessible to a common investor when composing a portfolio with assets in equal proportions or weighted by volume.

In this sense, the adoption of an active strategy of investing in a variety of stock mutual funds can be supported by relying on performance rankings and persistence analyses. In this context, this article examines dynamic composition strategies with quadrimestral frequency involving portfolios containing 10 winning funds (best performers) or 10 losing funds (worst performers).

To summarize, in economic scenarios characterized as booms, or even recovery of financial markets, the adoption of active strategies of forming portfolios with equal participation of funds classified as winners can provide increased average monthly gains and reduce the risk associated with diversification, thus enhancing the performance in relation to market or sectorial benchmarks.

This finding is robust to the use of different performance metrics to select the funds. In comparison with the Ibovespa, from 2001 to 2007, the average net gains of portfolios containing winning funds exceeded 1.9%, a value above the 1.4% of the market. The risk measured by downside risk was 3.4%, below the respective value of 4.8%. The cumulative decline of the Ibovespa reached 57%, greater than that shown by the portfolios, of 35%. Finally, the performance of the market according to the Sortino ratio was approximately 0.26, about half that of the portfolios with winning funds. Only the industrial sector index provided values compatible to those of these portfolios of funds.

In scenarios of financial crisis, as in 2008, the electric power sector worked as a hedge, presenting lower losses, smaller risk levels, and consequently the best performance indicators. The majority of the strategies involving funds were dominated in nearly all the gain-risk criteria by sectorial or market indexes. Only the value-weighted portfolios composed of losing funds had values comparable to those observed for the benchmarks analyzed.

This evidence, counterintuitive under basic hypotheses on the distribution of financial returns, can be associated to a typical behavior of investors in large passive funds indexed to the Ibovespa, who have a greater level of inertia, lesser financial knowledge and/or information. Analogously, investors in active winning funds can be characterized by a more dynamic profile, so they realized profits before the decline caused by the crisis, penalizing these funds more besides having better knowledge, demanding that managers obtain good performance not only according to the Sharpe ratio, but also according to other more refined metrics.

The level of persistence observed, uncommon in more developed markets like that of the United States, can be interpreted not necessarily as a signal of inefficiency of the financial market, but rather one of the expertise of managers, as analyzed in Matos & Silva (2012).

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¹ See Sirri & Tufano (1998) for a more comprehensive discussion of this line of research.

¹ This specific literature on mutual funds also examines the history of this industry and its institutional aspects.

¹ A traditional framework developed by Sharpe (1964), Lintner (1965) and Mossin (1966).

¹ Using a sample of daily data on 109 investment trusts during a 10-year period, the performance rankings were calculated based on the indexes of Sharpe and Sortino, excess return on Cornish-Fisher VaR, excess return on VaR, and excess return on expected shortfall. The results obtained based on Spearman correlations suggest that the choice of the performance measure does not have a significant impact on the ranking of investment funds in the United Kingdom.

¹ Passbook savings accounts earn the Reference Rate (*Taxa Referencial*, or TR) and a fixed percentage of 0.5% per month. They earn a lower average annual return than the SELIC rate (Central Bank benchmark rate). Since this greater return can be understood as a premium for the risk incurred, the yield on passbook savings accounts, which are less risky than investment in government bonds, can be considered the most advisable proxy. More relevant still than this point is the fact that the volatility of the net return on savings accounts can be easily compared to the interest rates in developed economies, assuming a level of 7% a year, while the volatility of American Treasury Bill is roughly 3.1% and the SELIC rate nearly 10% a year, considering quarterly data from 1998 to 2007.

¹ Widely used by academics and financial market agents, this index was first called the reward-to-variability ratio. Only in 1994 did it first receive the name of William Forsyth Sharpe.

¹ Following Duarte (1997), Castro & Baydia (2009) present an updated and thorough discussion of risk and performance measures.

¹ For the American market, from 1999 to 2008, 54% of the actively managed funds with high capitalization did not manage to outperform the S&P 500.

¹ In the working paper by Matos & Silva (2011), the significance of the outperformance associated with randomness or management is analyzed for the period from 2005 to 2010, with daily frequency, considering a panel of approximately 200 stock investment funds.

¹ In the working paper by Matos & Silva (2011), the significance of the outperformance associated with randomness or management is analyzed for the period from 2005 to 2010, with daily frequency, considering a panel of approximately 200 stock investment funds.