

The effect of incentives on the performance of multimarket investment funds under public management

O efeito dos incentivos sobre o desempenho de fundos de investimento multimercado sob gestão pública

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Keywords

Incentives.
Investment funds.
Performance.
Public and private management.

Abstract

This study aims to identify whether state-owned financial institutions' multi-asset funds employing the global macro strategy present performance compatible with that of private financial institutions. Incentive contracts influence managerial decisions, thereby impacting organizational performance. This study identified that state-owned financial institutions have adjusted their incentive policies, incorporating characteristics from the private sector to enhance performance. The research sheds light on this subject within the investment funds market, adopting an econometric model that correlates the performance and risk metrics of multi-asset funds using the global macro strategy. These funds are managed by state-owned and private financial institutions, represented by dummy and control variables. The findings indicate that state-owned institutions outperformed private ones in the period of analysis. Additionally, a positive relationship between the performance fee and the state-owned fund's performance was observed. The results of this research can help to improve the incentive systems of state-owned financial institutions. Furthermore, this study enriches the literature by providing evidence of the effects of incentive use in managing investment funds within the context of state-owned enterprises.

Palavras-chave

Incentivos.
Fundos de investimento.
Desempenho.
Gestão pública e privada.

Resumo

O objetivo desse estudo é identificar se fundos de investimento multimercado que utilizam estratégia livre de instituições financeiras públicas estão alcançando desempenho compatível ao de instituições financeiras privadas. Os contratos de incentivos influenciam as decisões dos gestores e por consequência o desempenho das organizações. Identificamos iniciativas de organizações públicas na utilização de incentivos característicos da iniciativa privada com o propósito de alcançar melhores níveis de desempenho. Diante da readequação de incentivos em instituições financeiras públicas, buscamos colocar luz sobre o tema sob a perspectiva do mercado de fundos de investimento. O modelo econométrico propõe relacionar medidas de desempenho e risco de fundos de investimento multimercado estratégia livre geridos por instituições financeiras públicas e privadas representada por variável dummy, e variáveis de controle. Identificamos desempenho superior de fundos de investimento sob gestão pública frente a fundos sob gestão privada, no período analisado, além de relação positiva entre desempenho de fundos públicos e taxa de performance. Os resultados desta pesquisa podem auxiliar no aperfeiçoamento do sistema de incentivos em instituições financeiras sob gestão pública. Acrescenta à literatura evidências sobre os efeitos da utilização de incentivos na gestão de fundos investimentos aplicados ao contexto de organizações públicas.

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Practical implications

The findings of this research can improve incentive systems in state-owned financial institutions, thereby contributing to better performance. The study reveals that state-owned financial institutions' multi-asset funds employing the global macro strategy outperformed their counterparts in the private sector.

1 INTRODUCTION

According to the literature, incentive contracts significantly influence managerial decisions and, consequently, organizational performance (Agarwal et al., 2003; Garicano & Rayo, 2016; Prendergast, 2008). In this context, state-owned organizations have adopted incentives characteristic of private institutions to enhance performance (Verbeeten & Speklé, 2015; Speklé & Verbeeten, 2014; Frey et al., 2013; Arellano-Gault & Lepore, 2011). This research aims to identify whether state-owned investment funds exhibit performance compatible with that of private financial institutions.

The performance of state-owned organizations has been the subject of research in several studies (Denhardt & Denhardt, 2015; Osborne et al., 2015; Alonso et al., 2015). The literature indicates inefficiencies in public management related to, among other aspects, the absence of a clear structure for measuring performance, the lack of individualization of results (Frey et al., 2013), low monitoring, the existence of a monopoly, and limited budget constraints (Bartel & Harrison, 2005).

State-owned financial institutions operate in priority areas for public policy (Costa, 2015). However, they often exhibit low profitability (Yeyati et al., 2004) or allocate resources based on political decisions at the expense of efficiency (La Porta et al., 2002) to address areas not served by the private sector and meet social objectives. Silva and Jorge Neto (2002) identified inefficiencies in these organizations due to the large number of employees and offices, contributing to increased administrative costs. Vinhado and Silva (2017) confirm these findings, associating the inefficiency of state-owned banks with the complexity of their organizational structure. Micco et al. (2007) observed lower profitability in state-owned banks in developing countries compared to their private sector counterparts.

These inefficiencies have prompted proposals for managerial reform based on incentives. The new public management emerges in this context, employing market principles and practices (Newberry & Pallot, 2004) and advocating that individuals' behavior will only be aligned with the organization's objectives when there is an institutional incentive framework (Arellano-Gault & Lepore, 2011).

According to Nielsen (2014), traditional bureaucratic controls on public management negatively impact efficiency. However, incentives play a crucial role in ensuring the good performance of public managers. They are essential for organizational growth, provided that goals and performance metrics are clear and straightforward (Speklé & Verbeeten, 2014). Therefore, the mechanisms typically employed by state-owned institutions must be replaced by result-oriented management based on goals and incentives (Verbeeten & Speklé, 2015).

Investors entrust their resources to financial managers with the expectation that they will make the best decisions (Funchal et al., 2016). Given the limited information and reduced possibility of monitoring, investors benefit from utilizing an incentive system to guide managers' actions (Aggarwal, 2008). Managers, by nature, tend to prioritize their own needs and desires, even if they are not aligned with the investors' objectives (Brown et al., 1996; Del Guercio et al., 2018).

Among the investment options available on the market, investment funds are the most widely used by Brazilians in terms of volume. Driven by investors' perception of security and the constant introduction of new products, the industry has achieved an average annual growth of approximately 23% since 1995, with over 15,000 funds (Milan & Eid Júnior, 2017). Over 900 financial institutions operate in the fund market, with 63% managing multi-asset funds (ANBIMA, 2023).

Matos et al. (2015) state that, although there is evidence of the relevance of the investment fund industry, the literature lacks a compatible volume of studies on various subjects, including the analysis of contracts with incentives and punishments in managing investment funds. The country is currently undergoing a period of criticism of public institutions, often related to inefficiency, and this work seeks to shed light on the topic from the perspective of the investment funds market.

Regarding financial institutions, the issue of the efficiency of state-owned institutions has inspired several initiatives to readjust incentives. This movement can be seen in events such as the establishment of performance-based variable remuneration applied to managers of state-owned banks (Tavares, 2018; Holanda, 2018), in addition to the recognition by these institutions of the importance of assessing individual performance as a strategy to enhance efficiency (Santos & Cardoso, 2002).

This quantitative research collected data on Brazilian financial institutions from the Quantum Axis database and surveyed monthly return and risk indices of multi-asset funds employing the global macro strategy, examining the period from January 2016 to January 2019. The data collected resulted in 2,680 funds. The definition of a "state-owned fund" is based on the concept of control, so investment funds managed by financial institutions with more than 50% of their voting capital under state control were considered. Among the institutions identified, only three – *Caixa Econômica Federal*, *Banco do Brasil*, and *Banco do Estado do Rio Grande do Sul (Banrisul)* – offered multi-asset investment funds that employed a global macro strategy in the period.

The results indicate that multi-asset funds with a global macro strategy managed by state-owned institutions performed better than their private sector counterparts. Therefore, there is evidence that introducing typical market incentives in public management encourages managers to enhance performance. Such results can contribute to the literature with new evidence about the applicability of the incentive system in public management,

opposing the results of studies by Osborne et al. (2015), Denhardt and Denhardt (2015), Alonso et al. (2015), who identified worse performance in state-owned institutions after the introduction of a business-like incentive system.

2 THEORETICAL FRAMEWORK

2.1 Agency problem and incentive contract

Agency theory aims to clarify the relationship between the principal and the agent, explaining potential conflicts of interest generated by this relationship. In the context of capital management, when investors entrust their capital to investment fund managers, they expect executives to achieve the set goals. Thus, managers must employ responsible strategies to satisfy investors' expectations, prioritizing long-term returns and avoiding unnecessary risks. However, managers may prefer to prioritize their own goals by taking risks to maximize performance fees for example (Roquete et al., 2016).

Although it is impossible to completely avoid bad managerial behavior, incentives are the best option for aligning executives' behavior with the organization's interests. Explicit incentives, such as bonuses and stock options, guide managers to avoid reductions in profits and shareholder value (Tirole, 2006). Among other characteristics, funds that achieved better performance were associated with greater financial incentives for managers, such as contracts that establish performance fees against benchmarks (inflation or stock market metrics) (Matos et al., 2015). Therefore, it is possible to conclude that better-performing funds benefit from paying higher fees, and current remuneration and future performance are correlated (Berk & van Binsbergen, 2015).

The variation in managers' performance-based remuneration was also associated with changes in the level of risk managed by investment fund portfolios (Chevalier & Ellison, 1997). According to studies by Cullen et al. (2012), managers who generate unsatisfactory returns for the fund tend to improve performance by adding risk to the portfolio or reducing it to contain losses.

Drechsler (2014) offers a new perspective by highlighting the importance of the fund manager's termination policy in their decision to take risks. In environments with a strict termination policy, investment fund managers tend to have a high aversion to risk. Therefore, negative returns on the funds lead to an increase in the manager's risk aversion. Conversely, in cases with a weak termination policy, the manager's risk aversion will be low, generating the opposite effect on the risk exposure of assets. Given the limited possibilities of contractual termination of managers in funds managed by state-owned institutions compared to the contractual relationships of managers in the private sector, we put forward the following hypothesis:

H₁: Managers of state-owned financial institutions' investment funds take more significant risks than their counterparts in the private sector.

2.2 Incentives in public management

The new public management perspective refers to applying business principles and practices in public administration. In this case, managers should be freed from bureaucratic restrictions to achieve high levels of efficiency. Thus, a combination of monitoring performance and incentives is suggested to ensure that managers focus on the principal's interests (Newberry & Pallot, 2004).

The business logic led to improvements in the internal efficiency of public organizations. However, it harmed the sustainable performance of these institutions (Osborne et al., 2015). In their review of new public management and new public service, Denhardt and Denhardt (2015) advocate the balance among organizational efficiency, democratic values, and the public interest. Therefore, the market model can be used in public management, as it is "an efficient way to direct governmental activity and expenditures toward the satisfaction of individual preferences" (Denhardt & Denhardt, 2015, p. 670).

Arellano-Gault and Lepore (2011) studied the transparency of Mexican federal agencies. The authors did not rule out that a system of punishment and reward is important in the development of these organizations. However, they consider such a system insufficient, arguing that various governmental institutions react differently to the same incentives, leading to different results than expected. Newberry and Pallot (2004) suggest that applying market-sector logic to public administration should be viewed cautiously. In their words, "it is not possible to transfer principal-agent models from the private sector to the public sector without considerable modification" (Newberry & Pallot, 2004, p. 261). According to Ashraf et al. (2014, p. 1), extrinsic or intrinsic incentives have a positive result on performance, with expanded effects when applied to "pro-socially motivated agents". Several studies aimed to verify the results of this proposal when implemented in public organizations (Verbeeten & Speklé, 2015; Speklé & Verbeeten, 2014; Nielsen, 2014).

As a consequence of questions regarding the effect of incentives usually adopted from the private to public administration, we seek to identify whether investment funds managed by state-owned financial institutions are performing at the same level as private investment funds. Thus, we propose the following hypothesis:

H₂: Investment funds from private financial institutions outperform their public sector counterparts.

3 METHODOLOGY

3.1 Database

The sample studied comprises multi-asset investment funds employing a global macro strategy, according to the ANBIMA classification. Data were collected from the Quantum Axis database. The study considered monthly data from January 2016 to January 2019, a period chosen based on the Brazilian Securities Exchange Commission (CVM) Instruction 555/2014, which restructured the classification of investment funds and established a maximum deadline for readjustment until 2016. The data collection resulted in 86 funds managed by state-owned financial institutions and 2,594 by private financial institutions.

Selection bias due to the difference in the number between private and state-owned investment funds was minimized utilizing the *teffects nmatch* (or nearest-neighbor matching) method. One control unit (private fund) was specified for each treatment unit (state-owned fund) that had the closest propensity score matching (Ramos, 2009).

Multi-asset funds employing a global macro strategy were chosen because their investment policy involves several risk factors, allowing managers to use numerous strategies to achieve the fund's performance goals (Yoshinaga et al., 2009). Among the subcategories of multi-asset funds, those employing a global macro strategy were chosen as they grant greater autonomy to the manager in defining the fund's strategy. Therefore, this characteristic makes it possible to highlight this professional's ability to manage risk and achieve better performance levels more clearly.

The concept of control was also used to define "state-owned investment funds". In the case of Brazil, control of an entity is exercised by the shareholder who holds more than 50% of the common shares (Garcia & Martins, 2015). The importance of this concept lies in its effect on the organization's management. In this type of shareholding structure, the transfer of decision-making power from the minority shareholder to the controlling shareholder is evident (Coutinho et al., 2006).

This research considered "state-owned investment funds" as those managed by financial institutions under state control, i.e., institutions where the state owns more than 50% of the voting capital. Development banks were excluded because, according to Resolution 394 of the Central Bank of Brazil, they are prohibited from establishing and managing investment funds. Thus, only three state-owned financial institutions are responsible for managing the state-owned multi-asset investment funds examined in this study: *Caixa Econômica Federal*, *Banco do Brasil*, and *Banco do Estado do Rio Grande do Sul (Banrisul)*.

3.2 Econometric model

The econometric model proposes to relate the performance and risk measures of multi-asset funds employing a global macro strategy managed by private and state-owned financial institutions, our variable of interest, represented by the dummy variable "state-owned" (1 for state-owned, 0 otherwise), and other control variables.

In this model, the explained variables are the performance of investment funds, represented by the gross return, Sharpe ratio, and Sortino ratio, as well as the risk variables, represented by volatility, downside risk, value-at-risk (VaR 95%), and conditional VaR indices. The calculation methods for these indices are provided in Appendices A and B.

The equation estimated in this study is:

$$Performance = \beta_0 + \beta_1 DummyStateOwned + \sum_{l=1}^b \gamma_l \cdot Control + \varepsilon \quad (3.1)$$

$$Risk = \beta_0 + \beta_1 DummyStateOwned + \sum_{l=1}^b \gamma_l \cdot Control + \varepsilon \quad (3.2)$$

This study questions the effect of incentives on the management of state-owned investment funds. The main analysis consists of observing the dummy variable 'state-owned' behavior on the dependent variables identified as proxies for performance and risk. If β_1 is positive and significant (equation 3.1), the fund managed by a state-owned institution possibly performs better than private ones; i.e., the incentives placed on managers in these institutions would be generating the desired positive effects on performance. If β_1 is positive and significant (equation 3.2), the fact that a fund is managed by a state-owned institution increases portfolio risk. The results of this study are presented first with panel data regression with fixed effects and subsequently with nearest-neighbor matching as a robustness test.

3.3 Performance metrics

The following performance metrics were used as dependent variables: Gross return, Sharpe ratio, and Sortino ratio. The gross return in this work was calculated through a fund's return over a period without excluding its administration fee. The rate of return is the simplest and most used indicator for checking performance, and

even implicitly, it assumes that the average historical return will be repeated (Varga, 2001). Gross return is a performance metric widely used in the literature (Storck & Motoki, 2021; Silva et al., 2019; Silva et al., 2018; Milan & Junior, 2014; Milani & Ceretta, 2012).

The risk factors involving a fund’s investment strategy are important elements in determining its performance (Bodson et al., 2010). However, the gross return does not consider volatility measures in its calculation, limiting the analysis of its results. To overcome performance verification restrictions for this measure, the Sharpe ratio was used, a measure with great academic acceptance (Milan & Junior, 2014). Its calculation involves the ratio between the risk premium paid by the asset and its volatility (Matos et al., 2015; Sharpe, 1966) and is widely used by managers. The Sharpe ratio stands out by relating return and risk, giving the manager the task of selecting the most efficient among several possible portfolios. This allows investors to decide the level of risk they are willing to accept (Milani & Ceretta, 2012).

Similar to the Sharpe ratio, the Sortino ratio weights the fund’s excess return (risk premium) by its volatility. The key difference lies in introducing the concept of downside deviation (or downside risk), which considers the standard deviation of returns unwanted by the investor. In other words, when considering downside risk as a measure of volatility for calculating returns, the investor only assesses the risk of obtaining performance below the Minimum Acceptable Return (MAR) (Maestri & Malaquias, 2018; Eid Júnior et al., 2005; Matos et al., 2015).

3.4 Risk metrics

Volatility is estimated through the standard deviation of the fund’s return rate. According to Jordan and Riley (2015), past return volatility as a risk metric can be an important determinant of the investment fund’s future performance, given that high levels of volatility are normally associated with the “deterioration of the investment opportunity set” (Dotsis & Vlastakis, 2016, p. 488). The standard deviation of excess returns encompasses the volatility of returns above and below a reference rate. Downside risk can be considered a more judicious risk metric, as it only considers returns below the minimum acceptable return (Eid Júnior et al., 2005).

Value-at-risk (VaR) represents the highest level of expected loss in an investment portfolio due to changes in market prices in a given period at a given probability (Pritsker, 1997). As a statistical risk metric, VaR can be considered an appropriate technique for this research, as it allows the assessment of possible losses as a consequence of investment performance, identifiable according to the dispersion of results (Matos et al., 2014). The conditional value-at-risk (CVaR), also known as average excess loss, is considered a more consistent measure as it aims to highlight possible losses that exceed VaR (Rockafellar & Uryasev, 2000). The CVaR shows the average return of the fund considering the 5% lowest returns in the period.

3.5 Independent variables

Appendix C lists the independent variables tested by our model that may influence the performance and risk of funds. First, the “state-owned” dummy variable is presented, followed by the control variables divided between “fund characteristics” and “target audience.” Furthermore, the expected effect of these variables on the performance and risk of state-owned financial institutions’ multi-asset funds employing a global macro strategy is indicated.

4 ANALYSIS OF RESULTS

4.1 Data description

This section provides descriptive statistics for the variables of interest. Table 1 presents the mean, standard deviation, minimum, and maximum return and risk variables stratified according to the type of financial institution managing the funds, either state-owned or private. Data were winsorized at 0.5% in each tail, resulting in 68,839 observations.

Table 1
Performance and risk rates of state-owned and private investment funds

Private funds					
Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Gross return	66,464	0.90	2.04	-11.32	11.61
Sharpe ratio	66,464	-6.38	5.99	-689.67	69.20
Sortino ratio	66,464	6.37	2.73	-15.49	277.27
Volatility	66,464	4.29	8.02	0.00	74.05
Downside risk	66,464	0.83	0.37	0.44	3.37
VaR 95%	66,464	2.04	3.81	0.00	35.16
Conditional VaR	66,464	0.36	0.73	-0.05	6.33
State-owned fund					
Gross return	2,375	0.88	1.70	-11.32	11.61

Table 1
Performance and risk rates of state-owned and private investment funds

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Sharpe ratio	2,375	-1.65	24.04	-689.67	64.26
Sortino ratio	2,375	8.54	34.76	-15.49	277.27
Volatility	2,375	3.31	6.41	0.00	74.05
Downside risk	2,375	0.79	0.33	0.44	3.37
VaR 95%	2,375	1.57	3.04	0.00	35.16
Conditional VaR	2,375	0.28	0.60	-0.05	6.33

Note: The benchmark used for calculation was the interbank deposit rate ("CDI" in Portuguese).

We conducted a mean difference test between state-owned and private funds for performance and risk variables. The data in Table 2 indicate a difference in performance and risk between these funds (except for gross return, which was not statistically significant in this test).

Table 2
Test of difference in means of performance variables of private and state-owned investment funds

Variable	Private	State-owned	Diff.	p-value
Gross return	0.899	0.876	0.0231	0.518
Sharpe ratio	-6.382	-1.647	-4.7354	0.000
Sortino ratio	6.373	8.537	-2.1636	0.002
Volatility	4.287	3.305	0.9816	0.000
Downside risk	0.832	0.785	0.0470	0.000
VaR 95%	2.036	1.570	0.4661	0.000
Conditional VaR	0.363	0.277	0.0855	0.000
N per group	66464	2375		
N total	68839			

Concerning return measures, the Sharpe and Sortino ratios of state-owned investment funds were higher than those of private funds during the analyzed period. Additionally, state-owned investment funds exhibited lower risks than their private counterparts across all examined measures. Public and private managers operate differently, influenced by the latitude they have to determine their strategy in achieving fund objectives and managing risks.

4.2 Regression analysis

Table 3 presents the estimation results of Equations 3.1 and 3.2, comparing the performance and risk of state-owned and private funds using the dummy variable "state-owned".

Table 3
Estimates of performance and risk determinants

Variables	Gross return	Sharpe	Sortino	Volatility	Downside risk	VaR 95%	CVaR
State-owned	0.0643 (0.8916)	6.5752** (2.6316)	0.2794 (0.1617)	-0.1702 (-0.3196)	-0.0020 (-0.1229)	-0.0808 (-0.3196)	-0.0047 (-0.0940)
Administration fee (%)	0.2131*** (5.2041)	1.5560 (0.8240)	-1.1043** (-2.2068)	1.0589*** (3.2154)	0.0208* (1.9342)	0.5028*** (3.2154)	0.1062*** (3.3922)
Performance fee	0.0080 (0.8483)	0.1238 (0.5155)	0.1973*** (2.9354)	0.0623 (0.7202)	0.0030 (1.0115)	0.0296 (0.7202)	0.0060 (0.6932)
Net redemption	-0.0001** (-2.3644)	-0.0011 (-0.6099)	0.0005 (0.8313)	-0.0001 (-0.2985)	-0.0000 (-0.6646)	-0.0000 (-0.2985)	-0.0000 (-0.8044)
Redemption rate (%)	0.0270*** (3.1178)	-0.7102 (-1.1459)	-0.4670*** (-4.3919)	0.0702 (1.0453)	0.0006 (0.3218)	0.0333 (1.0453)	0.0091 (1.5048)
ln (net equity)	0.0744*** (6.3188)	2.1116*** (2.6144)	0.9406*** (4.8556)	-0.0257 (-0.2794)	-0.0038 (-1.3204)	-0.0122 (-0.2794)	-0.0008 (-0.0951)
Age (months)	-0.0007*** (-3.6299)	0.0071 (0.6039)	-0.0228*** (-5.6512)	-0.0057*** (-3.4356)	-0.0001** (-2.1483)	-0.0027*** (-3.4356)	-0.0004*** (-2.7492)
Leverage	0.4082*** (9.0956)	18.1617*** (4.0530)	-3.1039*** (-2.9565)	0.9637*** (2.9133)	0.0138 (1.3447)	0.4576*** (2.9133)	0.1218*** (4.1246)
Big 4	0.0977 (0.8559)	32.7403*** (3.0875)	0.1922 (0.1342)	-5.7483*** (-6.0441)	-0.1715*** (-5.4071)	-2.7295*** (-6.0441)	-0.4337*** (-5.0369)
Closed-end funds	0.5788* (1.7897)	2.7207 (0.1561)	-8.0950 (-1.2345)	0.9964 (0.3716)	0.0529 (0.6671)	0.4731 (0.3716)	0.2099 (0.8144)
Pension entity	-0.0682 (-0.8450)	3.1690 (0.5974)	-1.0187 (-0.5222)	0.0891 (0.1098)	0.0108 (0.3821)	0.0423 (0.1098)	0.0164 (0.2161)
Watermark	-0.2122 (-1.3203)	2.2293 (0.4942)	-2.7168** (-2.3700)	-1.3689 (-0.9583)	-0.0537 (-1.1008)	-0.6500 (-0.9583)	-0.1318 (-0.9268)

Table 3
Estimates of performance and risk determinants

Variables	Gross return	Sharpe	Sortino	Volatility	Downside risk	VaR 95%	CVaR
Grace-period	-0.0006 (-0.0033)	5.6549 (1.4779)	-2.4428 (-1.4919)	1.8566 (1.1894)	0.0779 (1.4477)	0.8815 (1.1894)	0.1837 (1.2693)
Benchmark							
FR Pre / Index	0.3587** (1.9791)	1.3319 (0.5876)	-1.8137** (-2.1397)	1.4554 (0.9861)	0.0270 (0.5874)	0.6911 (0.9861)	0.1433 (1.0314)
Stock index	1.1861*** (4.1785)	-1.1931 (-0.2994)	-1.3784 (-0.9595)	12.2544*** (5.9297)	0.3940*** (4.2006)	5.8187*** (5.9297)	1.1832*** (5.4339)
Price index	0.2975*** (2.8631)	3.2632 (1.1562)	-1.2289 (-1.4021)	2.4310*** (3.1366)	0.0734*** (2.9277)	1.1543*** (3.1366)	0.2185*** (3.1928)
Target public							
Separate accounts for administrators	0.2684*** (3.7638)	-1.8859 (-0.7041)	2.1306 (1.3155)	1.5915*** (2.9974)	0.0312* (1.8122)	0.7557*** (2.9974)	0.1500*** (2.9290)
Separate accounts for administrators	0.1460 (1.6144)	11.3331** (2.1811)	-1.8926 (-0.9394)	-0.1953 (-0.2116)	-0.0256 (-0.7885)	-0.0927 (-0.2116)	-0.0103 (-0.1175)
Institutional investors	0.0193 (0.1616)	4.0082 (1.0328)	2.0635 (0.3669)	0.6988 (0.9408)	0.0092 (0.3752)	0.3318 (0.9408)	0.0667 (0.8941)
Private investors	0.2629*** (3.6599)	4.9413** (2.0269)	-3.3498*** (-3.0153)	0.7732 (1.5655)	0.0208 (1.2584)	0.3671 (1.5655)	0.1042** (2.1687)
Professional investors	0.3012* (1.8088)	9.3393*** (3.1534)	-4.0620 (-1.4442)	1.3971 (1.4442)	0.0353 (1.1995)	0.6634 (1.4442)	0.1664* (1.8986)
Separate account	-0.2839*** (-3.1534)	0.6817 (0.0921)	2.2760 (0.7373)	0.1069 (0.1230)	0.0134 (0.4568)	0.0508 (0.1230)	-0.0058 (-0.0746)
Private investors	0.2444*** (3.1769)	4.4054 (1.3747)	0.4351 (0.3406)	1.4277** (2.3017)	0.0383* (1.8315)	0.6779** (2.3017)	0.1425** (2.4328)
Annual fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Monthly fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.4438	0.0637	0.1773	0.0993	0.4713	0.0993	0.1098
AIC	252,853.7	752,379.9	638,852.4	474,023.3	14,071.8	371,480.5	143,331.8
Observations	68,839	68,839	68,839	68,839	68,839	68,839	68,839

Note: t-statistics are in parentheses. *, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

The numbers suggest that state-owned investment funds outperform private funds, rejecting hypothesis H₂. This finding is based on the Sharpe and Sortino ratios after the robustness test, which showed an increase in the performance of funds managed by state-owned financial institutions compared to private ones. These results contradict studies that indicated losses in state-owned funds adopting business-like incentives (Speklé & Verbeeten, 2014; Verbeeten & Speklé, 2015; Frey et al., 2013; Arellano-Gault & Lepore, 2011). The findings indicate that using typical market incentives when managing state-owned investment funds can lead to better performance. Additionally, it is possible to say that increasing the use of incentive contracts in the management of these funds may improve the competitiveness of state-owned organizations. However, other variables must be analyzed to enhance this conclusion, as shown in the results presented for the control variables.

After the robustness test, the regression results showed that state-owned investment funds exhibit lower risk than private funds, rejecting hypothesis H₁. Managers tend to manage the risk of their portfolios to avoid unwanted returns (Cullen et al., 2012), thus protecting themselves from possible risks of contract termination due to low performance (Drechsler, 2014). Managers of state-owned investment funds are taking less risk than private managers despite being less likely to be fired, contrary to what was proposed by Drechsler (2014).

Table 4
Estimates of performance and risk determinants (nearest neighbor matching)

	Coefficient	Standard error	z	P> z	[95% Confidence interval]
Return index					
Gross return	0.0489	0.0533	0.9200	0.3590	-0.0555 0.1535
Sharpe ratio	2.8221	1.1084	2.5500	0.0110	0.6496 4.9945
Sortino ratio	3.7927	1.3435	2.8200	0.0050	1.1593 6.4260
Risk index					
Volatility	-1.2396	0.1870	-6.6300	0.0000	-1.6062 -0.8729
Downside risk	-0.0317	0.0064	-4.9300	0.0000	-0.0444 -0.0191
VaR	-0.5886	0.0888	-6.6300	0.0000	-0.7627 -0.4144
Conditional VaR	-0.1199	0.0193	-6.2000	0.0000	-0.1578 -0.0820

5 CONCLUSION

State-owned institutions employ market incentives to enhance efficiency and performance. In Brazil, these institutions strive to adapt to market demands to remain competitive against private counterparts. The main analysis of this research examined whether these incentives were influencing the performance of state-owned financial institutions' multi-asset funds employing a global macro strategy, making them as profitable as similar private funds.

The results suggest that market incentives, particularly performance fees linked to managers' remuneration, are indeed contributing to enhancing the performance of state-owned investment funds, similar to how they have worked in the private sector. Considering the criticism directed at state-owned financial institutions, our findings show that incentives linked to manager remuneration can lead to better performance, thereby benefiting the organization by improving its position in the market and increasing investors' satisfaction.

Regarding risk management, although the literature indicates that managers in state-owned institutions might be more likely to expose their portfolios to risk due to the less rigidity of their termination policy, the results suggest a reduction in risk in state-owned investment funds compared to private ones.

As a suggestion for future research, we propose to examine whether similar results are found in other classes of investment funds or even in other years. Additionally, qualitative research should be conducted to further delve into the incentive system used by managers of state-owned organizations, including aspects such as the feeling of belonging to the institution.

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APPENDIX A. Methodology for calculating performance indices

Gross return

$$R_{gross_{T_1, T_n}} = \frac{(1 + R_{T_1, T_n})}{(1 - T_{Adm} * (\frac{N}{NT}))} - 1$$

Where:

$R_{gross_{T_1, T_n}}$ is the gross return of the fund in the period between the dates T_1 and T_n ;

R_{T_1, T_n} is the fund's return between the dates T_1 and T_n ;

T_{Adm} is the annual fund management fee;

N is the number of sub-periods between dates T_1 and T_n ; and

NT is the number of total sub-periods in a year.

Sharpe ratio

$$S_{T_1, T_n} = \frac{RF_{T_1, T_n} - RFR_{T_1, T_n}}{FV_{T_1, T_n}} * NT$$

Where:

S_{T_1, T_n} is the Sharpe ratio of the fund in the period between dates T_1 and T_n ;

RF_{T_1, T_n} is the average return of the fund between the dates T_1 and T_n ;

RFR_{T_1, T_n} is the average risk-free return of the asset between T_1 and T_n ;

NT is the number of total sub-periods in a year; and

FV_{T_1, T_n} is the fund's volatility between T_1 and T_n .

Sortino ratio

$$SOR_{T_1, T_n} = \frac{RF_{T_1, T_n} - RFR_{T_1, T_n}}{DR_{T_1, T_n}} * NT$$

Where:

SOR_{T_1, T_n} is the Sortino ratio of the fund in the period between the dates T_1 and T_n ;

RF_{T_1, T_n} is the average return of the fund between the dates T_1 and T_n ;

RFR_{T_1, T_n} is the average risk-free return of the asset between T_1 and T_n ;

NT is the number of total sub-periods in a year; and

DR_{T_1, T_n} is the downside risk of the fund between T_1 and T_n .

APPENDIX B. Calculation of risk indices

Volatility

$$FV_{T_1, T_n} = \sqrt{\frac{\sum_{i=2}^n (R_{T_{i-1}, T_i} - R_{T_1, T_n})^2}{N - 1}} * \sqrt{NT}$$

Where:

FV_{T_1, T_n} is the fund's volatility in the period between T_1 and T_n ;

N is the number of sub-periods between dates T_1 and T_n ;

R_{T_{i-1}, T_i} is the fund's return in the sub-period between the dates T_{i-1} and T_i ;

R_{T_1, T_n} is the average return of the fund between the dates T_1 and T_n ; and

NT is the number of total sub-periods in a year.

Downside risk

$$DR_{T_1, T_n} = \sqrt{\frac{\sum_{i=2}^n \min(0, R_{T_{i-1}, T_i} - RFR_{T_{i-1}, T_i})^2}{N - 1}} * \sqrt{NT}$$

Where:

DR_{T_1, T_n} is the downside risk of the fund between T_1 and T_n ;

N is the number of sub-periods between T_1 and T_n ;

R_{T_{i-1}, T_i} is the fund's return in the sub-period between T_{i-1} and T_i ;

RFR_{T_{i-1}, T_i} is the risk-free return in the period between dates T_{i-1} and T_i ; and

NT is the number of total sub-periods in a year.

Value-at-Risk

$$VaR_{95\%, T_1, T_n} = \frac{V_{T_1, T_n}}{\sqrt{12}} * \alpha_{95\%}$$

Where:

$VaR_{95\%, T_1, T_n}$ is the value at risk of the fund for 1 month, with 95% confidence, considering the historical volatility of the same fund in the period between T_1 and T_n ;

V_{T_1, T_n} is the annualized volatility of the fund between T_1 and T_n ; and

$\alpha_{95\%}$ is the quantile of 95% of the standard normal distribution rounded to 3 decimal places (1.645).

Conditional VaR

$$CVaR_{T_1, T_n} = -(R_F)$$

Where:

$CVaR_{T_1, T_n}$ is the conditional value at risk of the fund between the dates T_1 and T_n ;

F is the set with the 5% lowest fund returns in the period between T_1 and T_n ;

R_F is the average return of the fund considering the 5% lowest returns in the period between T_1 and T_n .

Note: The performance and risk rates form were retrieved from the methodology used to calculate the Quantum Axis database.

APPENDIX C. Independent variables

Variable	Definition	Expected effect	Reference
State-owned	Investment funds managed by state-owned financial institutions, i.e., organizations where the state controls more than 50% of their voting capital. Dummy variable, 1 for state-owned and 0 for private manager.	The fund managed by a state-owned institution performs equally or better than that managed by a private institution.	-
Fund characteristics			
Administration fee (%)	Fund manager's administration fee, charged per year.	The higher the fee, the lower the performance.	Matos et al. (2015); Maestri and Malaquias (2018); Malaquias and Eid Júnior (2014).
Performance fee (%)	Fee paid as a percentage of the fund's profitability that exceeds a pre-determined performance rate.	The higher the performance fee, the better the fund's performance.	Maestri and Malaquias (2018); Malaquias and Eid Júnior (2014); Wang et al. (2013).
Net redemption (days)	Minimum period for redemption of capital.	The longer the redemption period, the better the performance.	Agarwal et al. (2003).
Redemption rate (%)	Rate levied on the amount redeemed when redemption occurs before the deadline established by regulation.	The higher the redemption rate, the better the fund's performance.	Agarwal et al. (2003).
Ln (net equity)	Sum of the value of all securities and the cash value, minus obligations, on the data calculation date. Due to the dispersion of the data, the Napierian logarithm was used to minimize nonlinearity.	The larger the fund size (net equity), the better the performance.	Matos et al. (2012); Matos et al. (2015).
Age (months)	Age of the fund in months, on the data calculation date.	The older the fund, the worse the performance.	Wang et al. (2013).
Leverage	These funds can lose more than their net worth. The dummy variable determines leveraged funds according to ANBIMA classification (1 for leveraged funds and 0 otherwise).	Leveraged funds offer greater return and risk.	Yoshinaga et al. (2009).
Big 4	Dummy variable to determine whether the fund is audited by one of the Big4 (1) or not (0).	Funds audited by one of the Big 4 present better performance and lower risk.	Lawrence et al. (2011).
Closed-end funds	Dummy variable for determining closed-end funds where 1 means pen-end funds and 0 means closed-end funds, which are funds whose shares will only be redeemed at the end of the fund's duration.	Closed-end funds present better performance and higher risk.	Agarwal et al. (2003); Funchal et al. (2016).
Pension entity	Dummy variable, assuming 1 for pension entity and 0 otherwise.	Funds managed by pension entities present worse performance.	Lima (2008).
Watermark	We use the watermark as a reference for paying performance fees. If the manager exceeds this mark, they will receive the agreed remuneration. This dummy variable determines whether the investment fund has a watermark (1) or otherwise (0).	Funds with a watermark offer a lower risk.	Agarwal et al. (2003); Funchal et al. (2016).

APPENDIX C. Independent variables

Fund characteristics			
Grace period	Dummy variable, 1 when the fund has a grace period and 0 otherwise.	Funds with a grace period offer greater returns.	Agarwal et al. (2003).
Benchmark	Reference rate used to determine fund performance.	Fund returns exceed the benchmark.	Lawrence et al. (2011); Matos et al. (2015).
Benchmark FR Pre / index	Reference rate used to determine fund performance (IMA GENERAL, IMA-B 5+).	Fund returns exceed the benchmark.	Matos et al. (2015). Funchal et al. (2016); Bodson et al (2010).
Benchmark stock index	Reference rate used to determine fund performance (IBOVESPA, IBRX, IBRX50).	Fund returns exceed the benchmark.	Matos et al. (2015).
Benchmark price index	Reference rate used to determine fund performance (IGP-DI, IGP-M, IPC, IPCA).	Fund returns exceed the benchmark.	Matos et al. (2015).
Target public			
Separate accounts for administrators	Separate accounts for administrators' investments only. Dummy variable, 1 if the fund is exclusive for administrators and 0 otherwise.	Separate accounts for administrators offer lower risks.	Funchal et al. (2016).
Separate accounts for pension	Separate accounts to invest in social security. Dummy variable, 1 if it is a separate account for pension and 0 otherwise.	Separate accounts for pensions offer lower risks.	Funchal et al. (2016).
Institutional investors	Funds designed for financial institutions, insurance companies and open and closed supplementary pension entities, among other institutions (they can be qualified investors or not). Dummy variable, 1 if the fund targets institutional investors and 0 otherwise.	Funds for institutional investors offer lower risks.	Funchal et al. (2016).
Separate account	Separate accounts to manage resources from a single holder, who has to be a qualified investor. The dummy variable is 1 for a separate account and 0 otherwise.	Separate accounts for single holders offer less risk.	Funchal et al. (2016).
Private investors	Investors in the private banking segment. Dummy variable, 1 if a private investor and 0 otherwise.	Fund for investors in the private banking segment offer lower risk.	Funchal et al. (2016).
Professional investors	Financial institutions, insurance companies and capitalization societies, open and closed supplementary pension entities, individuals or legal entities with investments exceeding BRL 10 million and who certify in writing their investor status, investment funds, autonomous brokers, analysts and securities consultants authorized by the Brazilian securities exchange commission (CVM) investing their own resources, non-resident investors, dummy 1 for professional investors and 0 otherwise.	Funds for professional investors offer lower risk.	Funchal et al. (2016).
Qualified investors	Financial institutions, insurance companies and capitalization societies, open and closed supplementary pension entities, individuals or legal entities with investments exceeding BRL 1 million and who certify in writing their investor status, investment funds exclusively for qualified investors, portfolio managers, and securities consultants authorized by the Brazilian securities exchange commission (CVM), self-managed social security systems. The dummy variable attributes 1 for qualified investors and 0 otherwise.	Funds for qualified investors present lower risk.	Funchal et al. (2016).