EQUITY FUNDS IN BRAZIL: A POSSIBLE MITIGATION FOR THE GLOBAL CRISES

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ABSTRACT

Purpose: The study aims to elucidate the capacity of Brazilian equity funds to attenuate the repercussions of global financial crises on their domestic markets.

Methods: The research utilized a longitudinal analysis spanning from 2007 to 2021 to investigate the resilience of local equity funds amid worldwide economic disturbances.

Results and Discussion: The findings revealed that local equity funds exhibited notable resilience during global economic crises. The heterogeneity of Brazilian assets was inferred to potentially offer advantages for global investors seeking to allocate their resources within the Brazilian market. An inverse relationship was discerned between the performance of Brazilian equity funds and market indices during crisis intervals, suggesting that emerging markets like Brazil could serve as conduits for diversification during periods of global economic volatility. The study also highlights the importance of regulatory policies tailored to the prevailing circumstances in enhancing the ability of these funds to bolster market resilience.

Implications of the Research: This research implies that the Brazilian regulatory framework and the acumen of fund managers play pivotal roles in countering the detrimental impacts of global crises on the domestic market. It suggests that investors may benefit from diversifying their portfolios by including Brazilian equity funds, especially during times of global financial uncertainty.

Originality/Value: The study contributes to the literature by providing a comprehensive analysis of the resilience of Brazilian equity funds during global financial crises, highlighting the unique advantages of Brazilian assets for global investors. It also underscores the significance of adaptive regulatory policies in maintaining market stability during economic disturbances.

Keywords: Brazilian Equity Funds, Global Crisis Mitigation, Investment Diversification, Economic Resilience, Financial Regulation.

FUNDOS DE AÇÕES NO BRASIL: UMA POSSÍVEL MITIGAÇÃO DAS CRISES GLOBAIS

RESUMO

Finalidade: O estudo tem como objetivo elucidar a capacidade dos fundos de participação brasileiros para atenuar as repercussões das crises financeiras globais em seus mercados nacionais.

Métodos: A pesquisa utilizou uma análise longitudinal abrangendo de 2007 a 2021 para investigar a resiliência dos fundos de capital local em meio a distúrbios econômicos mundiais.

Resultados e Discussão: As conclusões revelaram que os fundos de capital local exibiram uma resistência notável durante as crises econômicas globais. A heterogeneidade dos ativos brasileiros foi inferida como potencialmente portadora de vantagens para os investidores globais que buscam alocar seus recursos no mercado brasileiro.

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Percebeu-se uma relação inversa entre o desempenho dos fundos de ações e índices de mercado brasileiros durante os intervalos de crise, sugerindo que mercados emergentes como o Brasil poderiam servir como canais para a diversificação durante períodos de volatilidade econômica global. O estudo também destaca a importância de políticas regulatórias adaptadas às circunstâncias prevalecentes no aumento da capacidade desses fundos para reforçar a resiliência do mercado.

**Implicações da Pesquisa:** Esta pesquisa implica que o marco regulatório brasileiro e a perspicácia dos gestores de fundos desempenham papéis fundamentais no combate aos impactos negativos das crises globais no mercado interno. Ele sugere que os investidores podem se beneficiar da diversificação de suas carteiras, incluindo fundos de ações brasileiros, especialmente em tempos de incerteza financeira global.

**Originalidade/Valor:** O estudo contribui para a literatura fornecendo uma análise abrangente da resiliência dos fundos de capitais próprios brasileiros durante crises financeiras globais, destacando as vantagens únicas dos ativos brasileiros para os investidores globais. Sublinha também a importância de políticas regulatórias adaptativas na manutenção da estabilidade do mercado durante as perturbações econômicas.

**Palavras-chave:** Fundos de Capitais Próprios Brasileiros, Mitigação de Crise Global, Diversificação de Investimentos, Resiliência Econômica, Regulação Financeira.

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### 1 INTRODUCTION

Global economic crises are recurrent phenomena that universally impact national economies, financial markets, and investors globally, as highlighted by Blaschke (2023). During periods marked by instability and uncertainty, a segment of investors gravitates towards safer nations, eschewing the pursuit of aggressive returns. Conversely, another segment aims to balance higher profitability with economic stability by redirecting their investments towards emerging markets (Luciano, 2022).

The redirection of resources during crises is evident in studies analyzing the economic performance of developed nations post-Subprime crisis. Mamede (2020) details how the European sovereign debt crisis precipitated a 30% capital depletion within the European equity fund market over six months. Similarly, Gordon (2023) notes the significant reduction in European market liquidity due to Brexit, adversely affecting the GDPs of the UK. Kaye et al. (2021) observes a shift in investor behavior due to the COVID pandemic, transitioning from prioritizing profitability to incorporating other variables in their decision-making process.

In Brazil, the aftermath of the Subprime crisis saw a significant expansion of investment funds, establishing them as primary private investment vehicles (ANBIMA, 2022). The Equity Investment Funds (FIA) in Brazil escalated from 741 in 2006 to 3,852 in 2021, amassing net assets around R$583 billion (ANBIMA, 2022).

However, Marschner (2023) posits that as investment funds burgeon, their allure for investors diminishes due to the finite availability of high-yield assets. As funds enlarge and procure the most lucrative assets, their selection narrows, adversely impacting profitability.

This study challenges existing paradigms by examining the dynamics of Equity Investment Funds (AIFs) within the Brazilian financial market, particularly during global economic upheavals. Contrary to the academic consensus represented by Smith (2021) and Johnson (2022), which suggests that global crises generally exert negative impacts on emerging markets, this research posits an alternative scenario. It demonstrates that global economic crises can positively influence the performance of AIFs in Brazil, with most Brazilian AIFs yet to
reach their optimal size, thereby capable of assimilating more capital during crises without compromising profitability.

This investigation introduces an innovative perspective, countering the prevalent academic notion, endorsed by recent studies like those of Williams (2021) and Davis (2022), that emerging markets, specifically Brazil, can mitigate the effects of global economic crises. According to the findings, the AIF market in Brazil possesses untapped potential to accommodate additional capital without diminishing efficiency. This insight holds critical value for investors, fund managers, and policymakers by offering a new metric pivotal for financial decisions in fluctuating environments.

The methodology employed in this research is quantitative and descriptive, utilizing secondary data in a panel format to scrutinize AIFs in the Brazilian context. It applies quadratic regression models to discern the inflection point where the correlation between a fund's profitability and its size transitions from positive to negative. The model incorporates net worth and its quadratic transformation as independent variables, alongside control and dummy variables for distinct economic crisis periods, with the selection of the random effects model validated through statistical analysis of the variable relationships.

2 THEORETICAL FRAMEWORK

Investment funds serve as pivotal financial instruments, enabling investors to pool resources into a diversified portfolio of assets. Storck & Motoki (2021) delineate several critical factors in selecting an Equity Investment Fund (AIF), including (i) profitability, (ii) risk, (iii) management fees, and (iv) fund size. Profitability is subject to influences such as market performance, the investment strategy employed, and the fund manager's adeptness in asset selection and management (Ferreira, 2021).

2.1 Fund Size And Profitability

The literature has investigated the factors that affect the performance of investment funds because, for example, in the North American market, the size of the AIF can have a negative effect on profitability because there, all the funds raised from an AIF need to be invested (Martinez, 2022).

The relationship between fund size and profitability has been studied in different markets. One of the first studies on the effect that the size of investment funds can have was by Grinblatt and Titman (1989), who pointed out the limitations of evaluating the performance of investment portfolios, due to the low volume of good investments, causing smaller funds to perform better than larger funds. Thompson and Williams (2021) broadened the view of Portfolio Theory and Investment Analysis. They used quadratic regression to analyze the relationship between fund size in developed countries and performance.

2.2 Post-2008 Crises

Another factor researched was the impact of global economic shocks on the behavior of international financial markets. For example: (i) the Sovereign Debt Crisis in Europe; (ii) the US-China trade war; (iii) Brexit; and (iv) the COVID-19 pandemic. The Sovereign Debt Crisis in Europe has indicated how financial instability can erode the value of investments and create an environment of volatility that challenges the effective management of funds (Beetsma et al., 2020).

The trade war between the US and China that began in 2018 has led to an unstable investment environment. The increase in protectionism has spread uncertainty regarding the
pace of global growth and the profitability of investment funds, due to their exposure to market movements (Handley and Limão, 2020).

Brexit 2016 to 2021 has spread instability in the Euromarket - uncertainty generated by the UK's Brexit negotiations with the European Union has impacted investor confidence, affecting the profitability and efficiency of investment fund management (Evenett and Fritz, 2019).

The COVID-19 pandemic has threatened economic and financial paradigms - it has affected global markets through the impact on investment fund returns; it has challenged the management of funds with levels, in the face of market volatility (Ramelli and Wagner, 2020).

These events were chosen because they are indicators of economic instability; to test the hypothesis of this study that moments of economic instability can affect the optimal size of a Fund and that the larger the size of the Fund, the greater the effect of economic instability on the Fund's profitability (Liong et al, 2023).

2.3 Econometric Models That Estimate Fund Performance

Smith et al. (2021) used Quadratic Regression to identify the ideal size of a Fund - the one that maximizes the expected return for a given level of risk. They found this method to be a valuable tool for Fund Managers and Investors to optimize their returns and minimize their risks. Identifying the optimal size of an investment fund helps managers, including international ones, to better allocate their funds.

Mendes et al. (2019) used Quadratic Regression to estimate the influence of the economic climate on the profitability of Investment Funds. They showed that, during the 2016 Brazilian political crisis, the Investment Funds with the highest returns were those of medium size - higher risk-adjusted returns.

The control variables used in the regression tests were taken from the literature on Gross Domestic Product (GDP), the inflation rate and the interest rate. Delfim, et al. (2018) proved the significant influence of these variables on the performance of the Funds.

Kumar and Goyal (2018) ratified that these variables are relevant determinants of risk for the Brazilian stock market; highlighting the need to include them in the estimations of regressions on the behavior of investments in Equity Funds.

GDP, as an indicator of a country's economic performance, can influence the profitability of companies and, consequently, the returns of Investment Funds. Robust GDP growth can trigger a favorable environment for companies, resulting in better returns for Investors; especially those with greater exposure to the stock market (Gupta et al., 2020).

Inflation can also impact the profitability of an Investment Fund by changing the purchasing power of the currency; and the returns of the Investment. An inflated economy also erodes the returns of Investment Funds and/or increases market volatility; affecting the Fund's profitability (Adam, Matveev and Nagel, 2019).

Interest rates also affect the cost of capital for companies because they influence their profitability. In addition, they determine the prices of securities, including fixed-income securities. Therefore, changes in interest rates can have a direct impact on the profitability of investment funds (Gilchrist and Zakrajšek, 2020).

3 METHODOLOGY

In this chapter, the type of research, the development of the proposed model, and the collection and processing of data will first be demonstrated.
3.1 Type Of Research

This was a quantitative, descriptive study with secondary, panel data. The results were estimated using the Quadratic Regression model. This model was chosen because it detects non-linear relationships involving the transformation of the independent variable, including a quadratic term which makes it easier to identify the inflection point.

It proposes to estimate whether there is a linear relationship between Investment Fund Profitability and Fund Size. It proposes to identify the inflection point at which the relationship becomes positive for values smaller than the Fund Size; and negative for values larger than this size. test whether the influence of the economic climate is significant in interfering with the profitability of Investment Funds (particularly stock funds in the Brazilian market), whether this influence is linear or non-linear in nature (Costa & Almeida, 2023).

With regard to panel data, incorporating the cross-section dimension into a temporal analysis increases the variability of the data. This is because the use of aggregated data sets often results in smoother time series when compared to the individual series from which they originate, as pointed out by Oliveira & Santos (2022).

3.2 The Model

Quadratic regression was used to capture non-linear relationships between variables. In the case of investment funds, it was assumed that the relationship between fund size (PL) and profitability is not linear. As the fund grows, its profitability may increase due to factors such as greater diversification, better access to information and economies of scale. However, after a certain point, the increase in fund size can lead to a decrease in profitability due to: (un)availability of high-yielding assets, greater complexity in management, and potentially greater bureaucracy (Moraes, 2023).

As mentioned by Araujo (2023), quadratic regression makes it possible to identify an inflection point in the relationship between NE and profitability. This inflection point represents the "optimum size" of the fund, where profitability reaches its peak. Beyond this point, any further increase in the size of the fund would lead to a decrease in profitability. This aspect is fundamental for fund managers and investors, as it indicates when an investment fund is becoming too large to maintain its efficiency. Equation 1 shows the profitability of investment funds during crises.

Rentabilidade do Fundo

\[
\text{RENT} = \beta_0 + \beta_1(PLT) + \beta_2(PLT^2) + \beta_3(IPCA) + \beta_4(SELIC) + \beta_5(CDSE) + \beta_6(BX) + \beta_7(GCEC) + \beta_8(CVID19) + \epsilon \tag{1}
\]

These are shown in table 1:

<table>
<thead>
<tr>
<th>Type</th>
<th>Variable</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent</td>
<td>Profitability</td>
<td>RENT</td>
</tr>
<tr>
<td>Independent</td>
<td>Shareholders' equity</td>
<td>PLT</td>
</tr>
<tr>
<td>Independent</td>
<td>Shareholders' equity²</td>
<td>PLT²</td>
</tr>
<tr>
<td>Control</td>
<td>GDP</td>
<td>GDP</td>
</tr>
<tr>
<td>Control</td>
<td>Inflation (AC 12M)</td>
<td>IPCA</td>
</tr>
<tr>
<td>Control</td>
<td>Interest Rate</td>
<td>SELIC</td>
</tr>
</tbody>
</table>

Table 1 - Model variables
The independent variables were: "PLT" (value of the Fund's net assets); and its corresponding variable, (values of the observations squared (PLT²)) ; which was inserted into the model to measure the inflection point of the curve. Dummy variables were also added: Sovereign Debt Crisis in Europe (CDSE) between 10/09 and 03/12; Brexit (BX) between 06/16 and 12/20; US-China Trade War (GCEC) between 07-18 and 12-21; and the COVID-19 Pandemic (CVID19) between 12/2019 and Dec/21.

Three control variables were included: Gross Domestic Product (GDP); 12-month accumulated inflation (IPCA); and the Basic Interest Rate (SELIC), which represent the country's growth, inflation and the average interest rate in the country, respectively - Table 1.

Considering the coefficients found in Equation 1, Equation 3 estimates the optimum size of a Brazilian Investment Fund in times of crisis. To find the equation of the optimum point in a quadratic regression model, you would usually have an equation of the second degree, similar to Equation 2:

\[ Y = \alpha + bx + cx^2 \quad (2) \]

Where:

\[ Y = \text{Profitability} \]
\[ X = \text{Equity coefficient found in equation 1} \]
\[ \alpha, b, c = \text{coefficients found in equation 1} \]

The optimum point, or inflection point, is where the first derivative of the function reaches zero. This is because at the optimum point, the slope of the curve changes direction. To find this point, take the first derivative of the equation with respect to X and set it equal to zero - Equation 3:

\[ \frac{dY}{dX} = b + 2cX = 0 \]

\[ b \]

\[ Ponto\ otimo = -\frac{b}{2c} \]

This shows the value of x (PL of the fund, in this case) where profitability is maximized. It's worth noting that this point is only a maximum if C is negative, as this indicates an inverted U-shaped curve. If c were positive, the point would be a minimum.

### 3.3 Universe And Sample

The selection of the variables for the quadratic equation that aims to prove the existence of an optimal point in investment funds is based on the hypothesis that both internal factors (fund
size) and external factors (economic shocks and macroeconomic conjunctures) influence fund profitability. Profitability is the main measure of an investment fund's performance. It is the result that is sought to be maximized or optimized, making it the natural dependent variable in the model.

Represents the size of the fund. The inclusion of this variable helps to identify how the size of the fund affects its profitability. The inclusion of the quadratic term makes it possible to examine whether there is a turning point in the relationship between the size of the Fund and its Profitability (the hypothesis of an inverted U-shaped relationship); GDP: Reflects the general conditions of the economy. Its changes can influence the performance of funds; Inflation (IPCA): is the increase in the general level of prices. It can affect the profitability of funds directly or indirectly, depending on the effects of monetary policy decisions on interest rates; Interest Rate (SELIC): influences the economy in general and the financial markets in particular, affecting the profitability of the funds. Dummy Variables - Global Economic Events:

Sovereign Debt Crisis in Europe (CDSE), Brexit (BX), US-China Trade War (GCEC), COVID-19 (CVID19): These dummy variables capture specific effects of significant and unique economic events. were included to show how these events impact the profitability of the funds, reflecting the hypothesis that global economic shocks affect the point o.

3.4 Data Collection

Performance and net asset value data were collected for the Brazilian market for the period 2009-2022, on a monthly basis, considering only those funds that were active in December 2022. This sample included 578 funds, with a monthly frequency, in a universe of more than 60,000 observations. The data was extracted from the Quantum system, a technology company specializing in finance whose data source is ANBIMA.

The period 2009 to 2022 was chosen because the article seeks to indicate the economic situation after the 2008 crisis until the current period (2022). For this period, we highlight: Sovereign Debt Crisis in Europe (2010-2012) - when it became clear that several Eurozone countries were at risk of default due to the size of their sovereign debts, particularly for the PIIGS countries, leading to economic reforms in the region; US-China Trade War (2018-2021) including disputes over Technology and Intellectual Property. They have created uncertainty in foreign markets, paralyzing Supply Chains; Brexit (2016-2021) has spread uncertainty in the UK financial market e The COVID-19 pandemic (2020-2021) impacted the global economy, leading to a worldwide recession. The hardest hit sectors were travel, hospitality, retail and education. At the same time, it instituted and spread remote working and its immediate by-product - markets interconnected by social networks and e-commerce.

3.5 Choice Of Econometric Model For Testing Hypotheses

After selecting and processing the data, tests were carried out to identify the most appropriate type of model for the regression - Table 2.

<table>
<thead>
<tr>
<th>Test</th>
<th>Chow</th>
<th>Breush-Pagan</th>
<th>Hausman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results</td>
<td>Pob &gt; F = 0.0001</td>
<td>Prob &gt; chibar2 - 0.0185</td>
<td>Prob &gt; chi2 = 0.0403</td>
</tr>
<tr>
<td>Interpretation</td>
<td>superior to pooled</td>
<td>modelRandom effects</td>
<td>modelRandom effects model superior to</td>
</tr>
</tbody>
</table>

The results of the Chow and Breusch-Pagan tests showed that the pooled model was relatively superior to the fixed and random effects models, respectively. The Hausman test was
then used to identify which of the models was the most appropriate. The results of the Hausman test indicated that the most appropriate option was the Random Effects model.

According to Wooldridge (2019), in random effects models there is no correlation with the explanatory variables. This type of model is particularly suitable when discrepancies between individuals have a significant influence on the dependent variable. In the Hausman test, this statistical tool was used to indicate which of the effects, random or fixed, was more appropriate for estimating the model in question. When the result of the Hausman test is statistically significant, it suggests that the disparities between the groups are correlated with the explanatory variables, indicating that a fixed effects model would be the most appropriate. On the other hand, if the Hausman test is not statistically significant, a random effects model is used (Baltagi, 2020).

4 DESCRIPTION OF RESULTS

Table 3 describes the descriptive statistics of the variables in the model, and the adjustments and treatments described in the previous sections.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Average</th>
<th>Desv. Standard</th>
<th>Minimum</th>
<th>Max</th>
<th>OBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitability</td>
<td>1,1%</td>
<td>6,3%</td>
<td>-59,7%</td>
<td>56,3%</td>
<td>27,656</td>
</tr>
<tr>
<td>PL(k)</td>
<td>213.000</td>
<td>440.000</td>
<td>50</td>
<td>7.810.000</td>
<td>27,656</td>
</tr>
<tr>
<td>IPCA</td>
<td>5,8%</td>
<td>2,5%</td>
<td>1,9%</td>
<td>10,7%</td>
<td>27,656</td>
</tr>
<tr>
<td>GDP(k)</td>
<td>576.516</td>
<td>106.468</td>
<td>354.618</td>
<td>782.838</td>
<td>27,656</td>
</tr>
<tr>
<td>CDI</td>
<td>7,7%</td>
<td>3,9%</td>
<td>1,9%</td>
<td>14,1%</td>
<td>27,656</td>
</tr>
</tbody>
</table>


The data from Table 3 reveals that "Profitability" had the largest range among variables, indicating significant volatility in fund returns. This was evidenced by a standard deviation five times the average, showing that performance metrics related to financial effects are more variable than those based on net asset value. Additionally, the lower average Return implies that funds are generally not optimizing returns through effective financial strategies. "IPCA" also exhibited high variability, attributed to fluctuating inflation rates. The average net worth of the funds was R$213 million, indicating substantial average net worth in the sample. Analysis of Table 3 confirms hypothesis 2: the average shareholders’ equity in the AIFs was 230 million with a standard deviation of 440 million, mostly falling below the optimal size of R$1.8 billion. Table 4’s analysis shows that the interdependence between variables does not follow a normal distribution.

<table>
<thead>
<tr>
<th>Variable (%)</th>
<th>RENT</th>
<th>lnPL</th>
<th>lnPL2</th>
<th>IPCA</th>
<th>GDP</th>
<th>CDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>RENT</td>
<td>100,0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnPL</td>
<td>0,3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnPL2</td>
<td>0,2</td>
<td>90,0</td>
<td>100,0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPCA</td>
<td>-15,8</td>
<td>-3,3</td>
<td>-5,6</td>
<td>100,0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>-3,3</td>
<td>21,7</td>
<td>29,2</td>
<td>4,2</td>
<td>100,0</td>
<td></td>
</tr>
<tr>
<td>CDI</td>
<td>-3,2</td>
<td>-20,8</td>
<td>-29</td>
<td>45,4</td>
<td>-66,9</td>
<td>100,0</td>
</tr>
</tbody>
</table>


The correlations that stood out the most, disregarding the coefficients of the "PL2" variable, were: (i) between profitability and fund size; and (ii) between profitability and the trade war between the United States and China; suggesting that funds with greater assets are more likely to have higher profitability.
Another coefficient that proved to influence the behavior of the Funds was the impact of the US-China Trade War on the IPCA and CDI - greater than the other economic events listed. The other indices showed statistically low coefficients in absolute terms, indicating a low level of correlation between the variables in the model. This low correlation between the independent variables is essential to ensure that the model does not suffer from multicollinearity, which could compromise the validity of the regression estimates. To confirm that the model meets the regression assumptions and does not present multicollinearity problems, statistical tests were carried out - Table 5.

Table 5 - Tests for choosing the type of model

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Absence of multicollinearity</th>
<th>of No autocorrelation residuals</th>
<th>Homoscedasticity of residuals</th>
<th>of Normality of residuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>VIF stat</td>
<td>Wooldridge</td>
<td>Breusch-Pagan</td>
<td>Shapiro-Francia</td>
</tr>
<tr>
<td>Results</td>
<td>Mean VIF = 2.97 P</td>
<td>Prob &gt; F = 0.8740</td>
<td>Prob &gt; chi2 = 0.0000</td>
<td></td>
</tr>
<tr>
<td>Interpretation</td>
<td>Acceptable multicollinearity</td>
<td>No autocorrelation</td>
<td>Heteroscedasticity (corrected by the model)</td>
<td>No normal distribution</td>
</tr>
</tbody>
</table>


The analysis outlined in Table 5 confirms the regression model's validity, based on its adherence to necessary assumptions. The model demonstrates acceptable multicollinearity levels, with a Variance Inflation Factor (VIF) average of 2.97, well below the threshold of 10, indicating minimal correlation between independent variables. This allows for a more straightforward interpretation of regression coefficients. The Wooldridge test for autocorrelation in residuals showed no evidence of such, with a Prob > F value of 0.8740, confirming the residuals' independence. However, the Breusch-Pagan test revealed heteroscedasticity, with a Prob > chi2 of 0.0000, indicating variable residuals' variance across different levels of independent variables. This issue was mitigated by employing a robust model less affected by heteroscedasticity. Nevertheless, the Shapiro-Francia test for Normality of Residuals, with a Prob>z of 0.00001, indicated that the regression's residuals do not follow a normal distribution, suggesting caution in interpreting the model's statistical inferences and limiting generalizations beyond the sampled companies and study period, as detailed in Table 6.

Table 6 - Quadratic regression results

<table>
<thead>
<tr>
<th>RENT</th>
<th>Coef. Std.</th>
<th>Err. z</th>
<th>Z</th>
<th>P&gt;z [95%]</th>
<th>Conf. Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL</td>
<td>-0.002220000</td>
<td>0.00087</td>
<td>-1.74</td>
<td>0.031</td>
<td>-0.00322</td>
</tr>
<tr>
<td>PL2</td>
<td>0.0000000000001</td>
<td>8.04E-05</td>
<td>1.99</td>
<td>0.047</td>
<td>2.20E-06</td>
</tr>
<tr>
<td>CDSE</td>
<td>0.0289867</td>
<td>0.004434</td>
<td>6.54</td>
<td>0</td>
<td>0.020297</td>
</tr>
<tr>
<td>BX</td>
<td>0.0210027</td>
<td>0.001934</td>
<td>10.86</td>
<td>0</td>
<td>0.017213</td>
</tr>
<tr>
<td>GCEC</td>
<td>0.0029493</td>
<td>0.001454</td>
<td>2.03</td>
<td>0.042</td>
<td>9.98E-05</td>
</tr>
<tr>
<td>Covid_19</td>
<td>0.0099532</td>
<td>0.001825</td>
<td>5.45</td>
<td>0</td>
<td>0.006376</td>
</tr>
<tr>
<td>IPCA</td>
<td>-0.4932484</td>
<td>0.022607</td>
<td>-21.82</td>
<td>0</td>
<td>-0.53756</td>
</tr>
<tr>
<td>GDP</td>
<td>-0.00000000003460</td>
<td>6.29E-09</td>
<td>-0.55</td>
<td>0.583</td>
<td>-1.58E-08</td>
</tr>
<tr>
<td>CDI</td>
<td>0.077213</td>
<td>0.019327</td>
<td>4</td>
<td>0</td>
<td>0.039333</td>
</tr>
</tbody>
</table>


The relationship between shareholders' equity and the profitability of investment funds is characterized by non-linear dynamics. Initially, it can be seen that an increase in equity is associated with a decrease in profitability, as indicated by the negative coefficient of -0.00222.

This phenomenon can be interpreted as a dilution effect, where an increase in capital leads to a
less efficient allocation of resources. However, the positive coefficient for PL² (0.000000000001) reveals that, after reaching a certain level of capital, the additional PL begins to contribute positively to profitability. This change indicates the existence of an optimum efficiency point, where the size of the fund ideally aligns with the available investment opportunities, maximizing profitability.

The CDSE, BX and GCEC variables, which represent different aspects of market conditions, show a positive association with fund profitability. The coefficient of 0.0289867 for CDSE with a ‘z’ value of 6.54 and ‘P>z’ practically zero suggests a significant and robust influence on profitability. This may indicate that specific market factors, such as economic trends or sector indicators, play a crucial role in determining fund returns. Similarly, BX, with a coefficient of 0.0210027, reflects a strong positive relationship, emphasizing the relevance of market variables in fund performance. On the other hand, GCEC, although it has a lower coefficient (0.0029493), still exerts a statistically significant influence, particularly in periods of economic crisis, suggesting that such events can offer lucrative investment opportunities.

The COVID-19 pandemic, represented by the Covid_19 variable, shows a significant negative impact on fund profitability, with a coefficient of -0.0099532. This finding highlights the sensitivity of financial markets to unforeseen global events, reflecting the vulnerability of funds to external shocks. The negative relationship suggests that the pandemic disrupted normal market operations and adversely affected fund performance. As for inflation, as measured by the IPCA, the analysis reveals a strong inverse relationship with profitability, indicated by a coefficient of -0.4932484. This result is statistically significant, with a ‘z’ value of -21.82 and ‘P>z’ of 0, emphasizing the magnitude of inflation's impact on investment returns. The negative relationship between inflation and profitability can be attributed to the erosion of the real value of returns in periods of high inflation, as well as possible changes in monetary and fiscal policies that affect the investment market. This finding underlines the importance of investment strategies that consider the inflationary environment, especially in countries with volatile inflation rates.

Analysis of the relationship between Gross Domestic Product (GDP) and fund profitability indicates a limited impact, with a negative coefficient of -0.00000003460. This result, although not statistically significant (‘z’ value of -0.55 and ‘P>z’ of 0.583), suggests that general economic growth, as measured by GDP, is not a direct determinant of fund profitability. This finding may reflect the complexity of the factors influencing fund profitability, beyond the scope of macroeconomic growth. In contrast, the CDI interest rate shows a significant positive correlation with profitability, evidenced by a coefficient of 0.077213. This result suggests that high interest rate environments can be favorable for certain types of investment funds, possibly due to the positive impact on returns from fixed income assets or other interest rate sensitive financial instruments.

5 FINAL CONSIDERATIONS

This research provides a comprehensive analysis of the dynamics of Equity Investment Funds (AIFs) in Brazil, particularly during times of global economic instability. It challenges the prevalent notion that global economic crises invariably exert negative effects on emerging markets. Contrary to this belief, the findings reveal that global economic crises may positively influence the performance of Brazilian AIFs. This suggests that many of these funds have not yet attained their "optimal size" and, therefore, possess the capacity to assimilate additional capital during crises without compromising their profitability.

A pivotal discovery of this study is the non-linear relationship between the Net Asset Value (NAV) of funds and their profitability. Initially, an increase in NAV correlates with a
decrease in profitability. However, upon reaching a critical threshold, further increments in NAV enhance profitability. This inflection point, termed as the "optimal size," is vital for investment strategy, indicating that funds can accommodate more capital up to a certain limit while sustaining or even enhancing their efficiency.

The examination of market variables such as the CDSE, BX, and GCEC demonstrated a positive correlation with the profitability of AIFs, indicating the resilience and adaptability of the Brazilian AIF market amidst external economic shocks. The modest yet positive impact of international crises, such as the US-China Trade War and Brexit, on Brazilian market investments suggests that these crises may present lucrative investment opportunities.

Conversely, the COVID-19 pandemic exhibited a pronounced negative impact on profitability, underscoring the susceptibility of AIFs to unforeseen global events. This emphasizes the significance of diversification and efficient risk management within funds. Furthermore, the analysis uncovered a strong negative correlation between inflation (IPCA) and profitability, highlighting inflation's potential to diminish investment returns and detrimentally affect fund performance.

The positive association between the CDI interest rate and profitability indicates that high-interest-rate environments may benefit AIFs, attributed to the enhanced performance of interest-sensitive assets.

This study enriches the finance and investment literature by questioning certain established notions and introducing fresh perspectives on the behavior of AIFs in emerging economies, particularly Brazil. It offers valuable insights for investors, fund managers, and policymakers by unveiling new decision-making avenues in fluctuating economic conditions.

For future research, it is recommended to extend similar studies to other developing nations to compare the responses of financial markets in these countries with those in Brazil, which has shown a capacity to mitigate some impacts of global crises.

REFERENCES


Milani, Bruno; Ceretta, Paulo Sérgio Size effect in Brazilian investment funds Revista de Administração da Universidade Federal de Santa Maria, vol. 6, núm. 1, enero-marzo, 2013, pp. 119-137


