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IDENTIFYING THE PREVALENCE OF NEGATIVE BETA COEFFICIENTS IN THE BRAZILIAN STOCK MARKET

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ABSTRACT

The present study aimed to identify the prevalence of negative beta coefficients in the Brazilian stock market, with a specific focus on verifying their stability over ten years (2013-2022), based on a quali-quantitative descriptive research. Considering the importance of the beta coefficient for investors looking to form a portfolio of stocks with reduced risks, the research first analyzed the years 2013 to 2017 to determine the presence of negative betas, and then, in the subsequent period (2018-2022), identify their stability. The methodology of the article was initiated from the collection and analysis of the historical quotations of companies listed on the Brazilian stock exchange (B3) during the ten years (2013-2022). In total, 85 lawsuits prevailed in the period described. Using the formula derived from the CAPM model and with the aid of simple linear regression, the beta coefficients of each stock were calculated in the first five years, considering the Bovespa index as a reference for the market, and then the same calculation was applied in the subsequent five years. Subsequently, the coefficients were classified into three categories, following the postulate of Gitman (2010): betas between 0.5 and 1; above 1 and less than 2; greater than 2. The results support the hypothesis that there was no prevalence of beta-negative in the time analyzed. However, most of the beta coefficients found were between 1 and 2, indicating a superiority of stocks with sensitivities close to market fluctuations. In addition, the research revealed that the beta coefficients analyzed, specifically 53.3% of them, tended to show some stability over the time studied. However, stocks that showed significant variations over time were identified, which may indicate changes in the performance of these companies. It is concluded that, although negative betas were not found in the Brazilian stock market between 2013 and 2022, the stability of the stock coefficients over time proves to be an important characteristic when analyzing risk. This knowledge is crucial for investors looking for diversification strategies and risk management of their stock portfolios.

Keywords: Beta coefficient. Stability of Betas. Brazilian Stock Market.

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INTRODUCTION

The beta coefficient is an indicator for the composition of stock portfolios, giving their investors the ability to understand the evolution of their price according to the variations of the stock market. This coefficient is included in the *Capital Asset Pricing Model* (CAPM), by Sharpe (1964) and Lintner (1965), which also encompasses other indicators, such as risk-free rate and stock market return.

For Araújo *et al.* (2004), the CAPM model is important for the evaluation of stocks, having wide use and recognition in the financial world, justified by its simplicity.

In research carried out by Osei (2002) in an African country, two theories of equilibrium of expected returns considered for the study are exposed: CAPM, mentioned above, and Ross' (1976) *Arbitrage Pricing Theory* (APT). The author goes on to explain that the CAPM model only predicts that the safety attribute, the beta coefficient, determines the differences in the expected return.

As Schivinski (2002) explains, there are two types of risk, systematic and unsystematic, and their distinction is important when studying the beta coefficient. Thus, for the author, the beta coefficient is used to measure the sensitivity of a stock when compared to the stock market, so the risk it represents is systematic, also called market risk (events that affect stocks in a generalized way), and cannot be controlled or eliminated. On the other hand, unsystematic risk, on the other hand, is specific to an area, inherent to the action, and can therefore be eliminated with the diversification of the stock portfolio (Ross *et al*., 2008).

Macedo (2019) explains that for a corporation to achieve value maximization, further studies are necessary for decision-making regarding its investments, financing, and dividend distribution. With this indicator, related to the CAPM model, the shareholder has the ability to make decisions with more information and basis about the business, enabling strategic decision-making according to their profile, whether aggressive or conservative.

The importance of the beta coefficient lies in the fact that it is responsible for assisting the investor in decision making, bringing information and support about the business, then adjusting its strategy for the composition of the stock portfolio (Ross *et al.*, 2015).

Based on calculations using market reference indexes, which depend on the shareholder's benchmark, such as the São Paulo Stock Exchange Index (Ibovespa), the beta coefficient can have a value equal to, greater than or less than 1 or even equal to 0.

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Such values dictate whether the stock is indifferent to market changes, whether it oscillates according to the market, whether it is more sensitive than it or whether it oscillates contrary to it (Assaf Neto, 2018).

Conservative investors look for less volatile stocks, with lower risk and, therefore, accept stocks with lower returns. Aggressive investors, on the other hand, seek greater exposure to risk, because, despite this, they expect to have greater profitability (Cardozo *et al*., 2019).

In view of the theoretical importance of beta coefficients for the composition of stock portfolios and evidence (Reilly; Norton, 2008; Ross *et al*., 2015; Schivinski, 2002; Silva *et. al*., 2012) that negative beta coefficients are reduced in the stock market, the problem of this research is given by: What is the prevalence of companies whose beta coefficients in the national stock market were negative in the period from 2013 to 2022?

With the development of this research, it is assumed that there is a reduced percentage participation of companies with negative beta coefficients in the national stock market during the aforementioned period. There is a hypothesis that negative beta coefficients are less prevalent, as they classify stocks with this index as defensive and, therefore, with a variation in return below the market proportion.

Given the relevance of the negative beta coefficient, which brings benefits to the stock portfolio, if the interest of the investor in stocks is to reduce the risk of his stock portfolio, this research aims to identify the percentage of national companies whose beta coefficients found were negative in a five-year period (2013-2017).

In addition, the research seeks to verify the stability of the beta coefficients, that is, to verify whether a given stock presents, in different periods (2018-2022), the same beta coefficient.

To this end, this article is structured in the following sections: introduction, theoretical framework, methodology, presentation and analysis of data, results, limitations and future trends, in addition to final considerations.

THEORETICAL FRAMEWORK

FINANCIAL ASSETS

By knowing the characteristics of the stocks found in a stock market, the investor has the ability to plan the way he will allocate his available financial resources, according to his objectives, validity and risk profile he is willing to take (CVM, 2019).

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Financial investment occurs when the investor invests financial resources, seeking to enhance the profitability of the stock, its liquidity, and risk (Cardozo *et al*., 2019).

Tavares (2019) explains that the challenge of the financial area lies in the allocation of the investor's financial resources in a way that maximizes returns and minimizes risks.

Meira *et al*. (2019) present financial assets in two broad groups, characterized as fixed income securities and variable income securities. Having low risks, the assets of the first group, consequently, have reduced expected returns, are associated with the basic interest rate in the national economy, functioning as a kind of loan, and those who buy such securities already have an idea of how much their asset will yield. For the same authors, in variable income, there is an increase in risk and profitability because they do not have guarantees and function as a kind of company.

The process of choosing the assets to assemble the portfolio has two stages, according to Markowitz (1952): the first begins with observation and experience, ending with what is believed about the future performance of the assets analyzed; and the next stage that starts with the relevant beliefs about future performance and ends with the choice of portfolio.

The expected return of a stock portfolio is considered a random variable, which makes it impossible to be sure of its results until it is effectively observed, thus creating a scenario of uncertainty about returns. Because the return is a random variable, the analysis of the portfolio should not be disregarded. In reality, decisions must be made based on studies and carefully to identify the strengths and weaknesses of the stocks to be chosen and, thus, build a promising investment portfolio, according to the investor's preferences and characteristics.

TYPES OF INVESTORS

It is necessary to identify the different types of investors, who describe their attitudes, influencing the results to be obtained with financial investments, according to their propensity for risk, in a personal way. In the literature, three investor profiles are known: prone, indifferent and risk-averse.

The risk-prone (or bold) investor seeks the highest returns, even if this brings greater risks, they use variable income to achieve their goals. The risk-indifferent seeks higher returns, risking a little more to increase equity, but without taking so many risks.

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Finally, the profile of risk-averse investors is conservative, renouncing higher returns because they do not want to take risks (Assaf Neto, 2018).

Markowitz's (1952) belief that the investor aims, in reality, to maximize the profitability for a certain risk that admits or minimize the risk of a pre-established profitability is emphasized. It is then analyzed to identify the portfolios that best fit the investor's objectives.

A portfolio formed to obtain the highest return may not be considered optimal, because the combination of assets when diversifying depends on the investor's style of risk aversion. The shareholder may be in favor of taking greater risks in search of greater return growth, or the opposite may happen (Oliveira, 2013).

CAPM MODEL

The CAPM exposes the return of a stock taking into account the return of the market portfolio, thus making it possible to make known the cost of equity, that is, the return expected by the investor of his equity (Silva, 2021). The findings of Sharpe (1964) and Lintner (1965) served as a basis for other models developed later, such as the local CAPM, adjusted local, hybrid, among others (Costa, 2019).

In relation to variable income and, in particular, stocks, it is the most used in the stock market, helping in decision-making regarding risk by explaining the profitability expected by investors (Araújo, Oliveira and Silva, 2012).

Thus, as previously exposed, in the studies of Markowitz (1952) diversification can reduce risk, but the risk versus return ratio of assets individually was not discussed . Thus, Costa (2019) explains that this understanding helped the outline of the model of Sharpe (1964) and Lintner (1965) with regard to investor preference: they opt for higher returns and lower risks.

Sharpe (1964) and Lintner (1965), precursors of the CAPM model, were able to relate risk and profitability with a linear equation, given by:

$$\mathbf{E}(\boldsymbol{R}) = \boldsymbol{Rf} + \boldsymbol{\beta}\,(\boldsymbol{Rm} - \boldsymbol{Rf}) \qquad (\mathbf{01})$$

where:

$E(R)$ it is the expected profitability;

Rf is the interest rate on risk-free assets;

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β it is the risk associated with the investment;

Rm It is the profitability of the stock market.

The interest rate on risk-free assets is one of the variables in the CAPM formula and is used to encourage investors to acquire risky assets. As the investor has the requirement to be remunerated when buying an asset for the period that he will be without the resource and the risk that he is exposed, this variable () demonstrates the profitability that such a risk-free asset generates and, at the end of the equation, the profitability that he can have when investing in a higher risk project will be found (Costa, 2019).Rf

According to Silva (2021), still on , the author describes it as the security given to the investor to know the minimum profitability he will have at the end of the established investment time. An example used for the aforementioned variable is the rate of the Special Settlement and Custody System (SELIC), which means the basic interest rate that moves the Brazilian economy (Dornelas, 2019).Rf

Investors are expected to make their choices according to their degree of risk aversion. By using the CAPM Model, it is possible to determine the investor's profitability by market risk, which can be calculated based on the systematic risk, provided by the beta coefficient, found in different stocks, varying along with the profitability of the stock market (Santos and Fontes, 2011).

For Macedo (2019), the CAPM model is important, because with it it is possible to calculate the cost of capital and assess the feasibility of certain investments based on the variable analyzed.

Beta Coefficient

As previously discussed, the non-systematic risk is eliminated from the stock portfolio through diversification, while the systematic risk cannot be eliminated (also called non-diversifiable risk), therefore, it is remunerated in the form of the beta coefficient (Pereira, 2019).

Changes in the interest rate, inflation, growth or decline of the economy are some of the factors that affect stocks in general and the beta coefficient is responsible for quantifying the response of its rate of return to these factors in relation to the response of the market's portfolio rate of return to these same factors (Schivinski, 2002).

The beta coefficient, found in formula (01) can be estimated from a linear regression between stock returns and stock market returns, represented by a stock portfolio that

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represents the stock market at a given time, thus allowing the analysis of stock behavior with market changes (Costa Jr *et al*., 1993).

Alternatively, the beta coefficient can also be found when we divide the covariance of the stock with the stock portfolio, by the variance of the market portfolio, as they explain (Elton *et al*., 2004):

$$\boldsymbol{\beta = \frac{Cov\ (rp, rb)}{Var\ (rb)}} \qquad \textbf{(02)}$$

where:

β is the beta coefficient;

rp it is the profitability of the stock;

rb it is the profitability of the market;

$Cov\ (rp, rb)$ covariance of the profitability of PR in relation to RB;

$Var\ (rb)$ is the variance of rb.

The value found in the beta coefficient indicates the increase in profitability, called risk premium, necessary to adjust the return of the stock according to the systematic risk. It can be affected when there are few stock transactions, thus causing a lack of synchronism in stock trading. To have a more accurate calculation, it is recommended to use daily or weekly quotations over a period of approximately five years in linear regression (Costa, 2019; Pereira, 2019; Silva, 2021).

When the beta coefficient is equal to zero, the stock is indifferent to market volatility. If the beta coefficient is equal to 1, it indicates that the stock fluctuates according to the stock market. A beta coefficient greater than 1 expresses that the stock is more volatile than the stock market index, so the stock has high risk. A beta lower than 1, on the other hand, means that the risk is contrary to the variation of the stock market, and can bring benefits to the stock portfolio if the investor's interest is to reduce the risk of his stock portfolio (Assaf Neto, 2018). The negative beta coefficient indicates that the asset moves in the opposite way to the market. Thus, when the stock market presents higher returns, the stock reduces its profitability, and, therefore, in a stock market with falling returns, the negative beta is indicative of positive profitability.

According to Assaf Neto (2018), the beta coefficient reflects the movement of the stock price in relation to the stock market, allowing the identification of aggressive assets, with higher risk, and defensive ones, with lower risk. When the market goes through a

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crisis, they become more volatile and, as a result, the coefficients tend to increase (Resende and Sales, 2021).

METHODOLOGY

This research was built based on quali-quantitative criteria, based on data extracted from books and articles, as well as information from the stock exchange for historical stock prices. According to the classification criteria presented by Vergara (1997), the present research can be classified as descriptive, as it is based on the application of a model to estimate the beta coefficient. The objective of descriptive research is to determine the characteristics in a sample or a phenomenon, also establishing possible relationships between the variables.

SAMPLE

The non-probabilistic sample is defined based on the stock choices of companies that participated in all Ibovespa theoretical portfolios in the period from 2013 to 2017. For this sampling, the table prepared by Economatica was used as a basis, which listed the stocks that have already participated in the Bovespa index in the period from December 1997 to November 2022, totaling 214 assets.

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Table 1 – Stocks that have already participated in the Ibovespa between Dec/1997 and Nov/2022[3]

ABEV3	BMTO4	CPSL3	ENBR3	JBSS3	PETR4	SHAP4	TRJC6
ACES4	BNCA3	CRFB3	ENEV3	JHSF3	PETZ3	SLCE3	TRPL4
AEDU3	BPAC11	CRGT5	ENGI11	KLBN11	PMAM4	SMLS3	TSEP4
AGEI3	BPAN4	CRTP5	EPTE4	KLBN4	POMO4	SMTO3	TSPC3
ALLL11	BRAP4	CRUZ3	EQTL3	LAME4	POSI3	SOMA3	TSPC6
ALLL3	BRDT4	CSAN3	ERIC4	LAND3	PRIO3	SUBA3	UBBR11
ALPA4	BRFS3	CSIP6	EVEN3	LCAM3	PRML3	SULA11	UGPA3
AMBV4	BRKM5	CSNA3	EZTC3	LIGT3	PRTX3	SUZB3	UGPA4
AMER3	BRML3	CSTB4	FIBR3	LIPR3	PTIP4	SUZB5	UNIP6
ARCE3	BRPR3	CTAX4	FLRY3	LOGG3	QUAL3	SYNE3	USIM3
ARCE4	BRTP3	CTIP3	GEPA4	LREN3	RADL3	TAEE11	USIM5
ARCZ6	BRTP4	CVCB3	GETI4	LWSA3	RAIL3	TAMM4	USIM6
ARZZ3	CASH3	CYRE3	GETT11	MGLU3	RAIZ4	TBLE6	VALE3
ASAI3	CCRO3	DASA3	GFSA3	MMXM3	RCTB31	TCOC4	VALE5
ATMP3	CESP5	DURA4	GGBR4	MRFG3	RCTB41	TCSL4	VBBR3
AZUL4	CESP6	DXCO3	GNDI3	MRVE3	RDCD3	TELB3	VCPA4
B3SA3	CEVA4	EBEN4	GOAU4	MULT3	RDOR3	TELB4	VIIA3
BBAS3	CGAS5	EBTP3	GOLL4	NETC4	RENT3	TIMS3	VIVO3
BBAS4	CIEL3	EBTP4	HAPV3	NTCO3	REPA4	TLCP4	VIVO4
BBDC3	CLSC4	ECOR3	HGTX3	OGXP3	RLOG3	TMAR5	VIVT3
BBDC4	CMET4	EGIE3	HYPE3	OIBR3	RRRP3	TMAR6	VIVT4
BBSE3	CMIG3	ELET3	IGTA3	OIBR4	RSID3	TMCP4	VVAR11
BEEF3	CMIG4	ELET6	IGTI11	PALF3	RUMO3	TNEP4	WEGE3
BESP4	CMIN3	ELPL4	INEP4	PCAR3	SANB11	TNLP3	WHMT3
BIDI11	COGN3	EMAE4	IRBR3	PCAR4	SAPR11	TNLP4	YDUQ3
BIDI4	CPFE3	EMBR3	ITSA4	PDGR3	SBSP3	TOTS3	
BISA3	CPLE6	EMBR4	ITUB4	PETR3	SDIA4	TPRC6	
Quantidade de ações de dez/1999						214	

Source: Economatica Insights (2023)

Next, a filter was carried out to identify the stocks that made up the theoretical portfolios throughout the 10-year period (2013 to 2022), with the history of stock prices found on the *Advanced Financial Network* (ADVFN) Brasil website, a stock investment portal of the Brazilian stock exchange. Thus, 85 stocks were defined, in addition to the Ibovespa (appendix A).

Despite the use of a sample of 85 stocks and the Ibovespa, eight other stocks (whose tickers are BRML3, BRPR3, CLSC1, ENBR3, GETT3, GETT4, GETT11 and SULA11) that lasted during the ten-year period on the stock exchange could not be used since the price histories were not available in the ADVFN Brazil database.

As it is a simple linear regression model, the returns of the shares and the Ibovespa in the same period of time were also obtained, as follows:

[3] There is a divergence in the initial year of the research, as the title refers to the beginning of the research in 1997, but at the end of the table the year 1999 is the initial year.

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$$R_e = \frac{P_t}{P_{t-1}} \quad (03)$$

where:

R_e it is the expected profitability;

P_t is the price in the period t;

P_{t-1} is the price in the period t – 1.

For this calculation, the historical quotations were filtered, keeping only the first and last quotation of each of the 120 months observed. Such a procedure is done due to the extensive amount of daily quotes, in an attempt to smooth out fluctuations and avoid problems of correlation of returns. With the adjusted monthly quotations, the value of the beta coefficient (02) of each stock in relation to the Ibovespa was calculated by applying a simple linear regression.

In order to verify the existence of a significant difference between the variables and, therefore, to reject the null hypothesis, the p-value was verified. For this, we selected the actions whose p-value in the two periods (2013-2017 and 2018-2022) indicate that the relationship is statistically significant, resulting in a sample of 15 actions, as shown in Table 1.

The p-value for each term tests the null hypothesis that the coefficient is equal to zero, that is, it generates no effects. A p-value classified as low (less than or equal to 0.05) indicates that we can reject the null hypothesis, being significant to the model, justified that the changes in its value are related to changes in the response variable (Gujarati; Porter, 2011). It was found that the *p-value* values obtained in the regression process were less than 0.05, supporting that this relationship is statistically significant.

DATA ANALYSIS

Table 1 shows the beta coefficients in descending order of their values, classified based on the interpretation of Gitman (2010). In addition to betas, the R-squared and p-value of each stock are also available.

Table 1 – Coefficients beta, R2, *p-value* and Gitman classification in the period from 2013 to 2017

Code action	Beta	R-2	*p-value**	Classification
USIM5	3,154	0,517	9.6357E-11	Over 2
GOLL4	2,256	0,404	4,973E-08	
PETR4	2,253	0,699	9.5094E-17	
PETR3	2,057	0,635	2.6963E-14	

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BBAS3	2,000	0,739	1.4494E-18	1 a 2
LIGT3	1,530	0,443	6.5135E-09	
CMIG4	1,370	0,401	5,781E-08	
BBDC4	1,326	0,648	9.4197E-15	
FPC6	1,309	0,520	8.2486E-11	
BBDC3	1,158	0,548	1.4038E-11	
ITSA4	1,120	0,682	4.7217E-16	
ITUB4	1,031	0,630	3.9927E-14	
EZTC3	1,014	0,399	6.2153E-08	
LREN3	0,845	0,429	1.3952E-08	0,5 a 1
MULT3	0,756	0,415	2.7566E-08	

Source: Prepared by the authors, 2024/*significant at 5%

Although negative beta coefficients are important for the construction of defensive stock portfolios in the literature (Reilly; Norton, 2008; Ross et al., 2015; Schivinski, 2002; Silva *et. al.*, 2012), they are reduced in the stock market. The results found support the research hypothesis that negative beta coefficients are scarce in the stock portfolio of the Brazilian market.

Table 1 describes the non-prevalence of negative beta coefficients in the Brazilian stock market in the years 2013 to 2017. Therefore, of the 15 resulting actions, with a view to identifying their beta coefficients, it was not possible to identify the prevalence of negative coefficients in the period analyzed.

Next, in order to verify the stability of the beta coefficients – that is, whether a given stock presents, in different periods (2013-2017 and 2018-2022), the coefficients were compared.

Table 2 shows the beta coefficients in descending order, according to Gitman's (2010) classification of the beta coefficient, in addition to the values for R-squared and p-value between 2018 and 2022.

For the construction of Table 3, only the stocks that were stable were maintained, that is, considering beta coefficients above 2, between 1 and 2, or even between 0.5 and 1, the stocks that maintained the same characteristic.

Table 2 – Coefficients beta, R2, *p-value* and Gitman classification in the period from 2018 to 2022

Code action	Beta	R-2	p-value*	Classification
GOLL4	2,104	0,571	3.00614E-12	Over 2
LIGT3	1,629	0,553	1.02481E-11	1 a 2
PETR3	1,436	0,712	2.45873E-17	
PETR4	1,400	0,695	1.42942E-16	
EZTC3	1,384	0,538	2.67725E-11	
USIM5	1,354	0,480	8.51972E-10	
BBAS3	1,235	0,576	2.08291E-12	
BBDC4	1,193	0,702	7.22766E-17	

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BBDC3	1,172	0,714	2.03317E-17	
LREN3	1,172	0,644	1,228E-14	
CMIG4	1,150	0,504	2.09206E-10	
ITUB4	1,122	0,730	3.87723E-18	
MULT3	1,093	0,599	4.00298E-13	
ITSA4	1,062	0,775	1.82077E-20	
FPC6	0,815	0,421	2.1154E-08	0,5 a 1

Source: Prepared by the authors, 2024/*significant at 5%

Table 3 – Coefficients beta, R2, *p-value* and Gitman classification in the period from 2018 to 2022 of the stocks that remained stable

Code action	Beta	R-2	p-value*	Classification
GOLL4	2,104	0,571	3.0061E-12	Over 2
LIGT3	1,629	0,553	1.0248E-11	
EZTC3	1,384	0,538	2.6773E-11	
BBDC4	1,193	0,702	7.2277E-17	
BBDC3	1,172	0,714	2.0332E-17	1 a 2
CMIG4	1,150	0,504	2.0921E-10	
ITUB4	1,122	0,730	3.8772E-18	
ITSA4	1,062	0,775	1.8208E-20	

Source: Prepared by the authors, 2024/*significant at 5%

As a result, the study showed that approximately 46.7% of the shares were not stable in the period from 2013 to 2022, they are: USIM5, PETR4, PETR3, BBAS3, CPLE6, LREN3, MULT3. On the other hand, the actions listed in Table 2, making up the other 53.3% of the sample, were constant according to Gitman's (2010) interpretation, since they remained in their classifications.

The financial sector showed more stable stocks during the study, holding 4 out of 15 stocks in the sample, namely: ITSA4, BBDC3, BBDC4 and ITUB4. Next, we have the public utility/electricity sector, which had two stable stocks (CMIG4 and LIGT3) when comparing the first period (2013-2017) with the second (2018-2022).

Barsi (2022) highlights five sectors of the stock market that remain more perennial in the long term, developing the so-called "BEST". The acronym "BEST" is formed by the segments of: banking, energy, sanitation, insurance and telecommunications. The reason capable of explaining such stability of the sectors mentioned is that, as they are essential for the population, the demand for them will always be stable.

Even so, it is necessary to highlight that, because the stock segment is perennial, it does not mean that it does not suffer adversity, and the investor should always analyze other factors of the company before making his decision regarding the investment he will make (Tondo, 2023).

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RESULTS, LIMITATIONS, FUTURE TRENDS AND DISCUSSION

In line with the above, no negative betas were found, so we can postulate that the stocks in the sample moved in the same direction as the market. Despite this, it is interesting to explain that LREN3 and MULT3 shares presented in the first period a beta coefficient lower than 1, which means that the returns obtained with them will be less proportional than the market oscillation.

In addition, it is important to point out that some stocks suffered significant changes in their betas, which helped to not obtain a homogeneous result for all companies in the sample. For example, we can mention USIM5, which in the first five years presented a β= 3.154, that is, while the market was undergoing a change, this stock reflected such change 3.154 times more. In the second cut, it obtained a β= 1.354, leaving it with a lower risk and the changes that occurred almost equal to the market.

Schivinski (2002) contributes to this understanding when he discusses the beta greater than one unit, characterizing a higher risk in relation to the market portfolio and, thus, remunerates the investor for the additional risk in a way that is more than proportional to the market return. He continues:

> Thus, if a beta is equal to 1.30, for example, an average appreciation of 10% in the market portfolio determines an expectation of profitability of 13% in the stock. On the other hand, if the market suffers a 10% devaluation, the expected return on the asset will be -13%, indicating greater risk (Schivinski, 2002, p. 63).

Banco Bradesco's common share (BBDC3) proved to be the most stable in the years analyzed, with a negative difference of 0.014 between the first and second periods. With this, it is understood that, for an investor looking for stability, it is the most suitable, ensuring a variation in profitability close to that of the market. CMC Markets [?][4], a stock broker, argues that a long-term investor tends not to look for very volatile stocks, sometimes prioritizing companies that carry a beta close to or lower than one. A more aggressive investor, such as buy *and sell* (in Portuguese), who makes short-term moves, may be more interested in more volatile stocks that reach betas of 2, 3 or higher.

The temporal universe chosen for the present work (2013 to 2022) can be considered as a limitation. Events that happened during this period, such as the COVID-19 pandemic, which caused several abnormalities in the country, can affect the stock market

[4] It was not possible to find the author and year of publication of the article, therefore, following the ABNT rule, [?] is used.

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and its quotations, which generate changes in the results found for the beta and, consequently, investors' portfolios.

Not only that, another limitation found during the research is the source of data for stock analysis, since, as explained earlier, some stocks that, despite lasting in the ten years, were not possible to be evaluated, since they left the stock exchange in the present and, thus, their historical quotations are not available.

Thinking about the future of their finances, an investor should always analyze companies in the long term to reach their own investment conclusions, knowing that general events may affect the company's development in the future. Constant monitoring of the performance of actions helps to achieve the objectives stipulated by the acquirer.

FINAL CONSIDERATIONS

Based on studies on the stock market, this article covered the concepts of financial assets, types of investors, CAPM model and, finally, the beta coefficient.

The research did not identify national companies in which the beta coefficients were negative in a five-year period (2013-2017), unlike the studies (Reilly; Norton, 2008; Ross et al., 2015; Schivinski, 2002; Silva et al., 2012) in which negative beta coefficients are reduced in the stock market. In addition, it verified the stability of the same indicator in different periods (2018-2022).

Confirming the hypothesis above, the number of stocks that have a negative beta is low. In the period surveyed, only four stocks showed negative betas in the first five years, but they did not remain stable in the following years. As they did not remain negative, the survey problem is answered with a percentage equal to zero, since between 2013 and 2022, no company prevailed a negative beta coefficient in the Brazilian stock market.

Regarding the identification of the stability of the stocks whose p-value was less than or equal to 0.05, confirming the significance of the non-null hypothesis, in a sample of 15 stocks, a percentage of stability of 53.3% was obtained. This percentage thus describes that 8 of the 15 actions in the 2018-2022 period maintained the same characteristics of the beta coefficient in relation to the previous five years.

With this, we can infer that the stability of the coefficients in a little more than half of the stocks studied indicates consistency in the profitability of such stocks in the face of variations in the Ibovespa over the years. The results help investors who want portfolios

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with stocks that have greater predictability and constancy in behavior and, consequently, in their return results.

Of the stocks that showed stability in the period of this article, the presence of beta coefficients with values between 1 and 2 was identified, that is, the sensitivity of such stocks is greater than the market oscillations (represented here by the Bovespa Index). This means that stocks carry relatively higher risks, but investors also expect higher returns.

Only one of the eight stable stocks presented a beta coefficient with a value above 2, thus characterizing a stock with high risk in the face of market fluctuations, but of equal proportion, it should remunerate the investor in times of positive changes in market valuation.

Conclusively, this research proved to be relevant by expanding the knowledge about the beta coefficient and their stability in the national stock market, emphasizing the importance of analyzing the systematic risk, present in stocks, at the time when the investor elaborates his strategies to build his investment portfolio. The results achieved indicate the possibility of them working as a starting point for future studies on the Brazilian stock market, which seek to make a correlation between the findings of the beta coefficient with other indicators, in order to deepen the investigation of the risks and predictions of the performance of the stock portfolio. This article contributes to the understanding of the behavior of financial assets in the Brazilian stock market based on the beta coefficient and, likewise, enables greater efficiency in investment management by presenting new perspectives for the analysis of assets.

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REFERENCES

1. Araújo, D. L., et al. (2004). O risco de mercado do agronegócio brasileiro: Uma análise comparativa entre os modelos CAPM e GARCH-M. Gestão Org. Available at https://periodicos.ufpe.br/revistas/gestaoorg/article/view/21566/18260. Retrieved on April 4, 2024.

2. Araújo, E., Oliveira, V., & Silva, W. (2012). CAPM em estudos brasileiros: Uma análise da pesquisa. RCO. Available at https://www.revistas.usp.br/rco/article/view/52659. Retrieved on May 24, 2023.

3. Assaf Neto, A. (2018). Mercado financeiro (14th ed.). São Paulo, Brazil: Atlas.

4. Barsi Filho, L. (2022). O rei dos dividendos (1st ed.). Rio de Janeiro, Brazil: Sextante.

5. Bovespa e BM&F: Cotações Grátis da Bolsa de Valores SP. (2024). Advanced Financial Network Brasil. Available at https://br.advfn.com. Retrieved on May 1, 2024.

6. Cardozo, T., et al. (2019, December). Análise do perfil de investidores brasileiros. ConBRepro. Available at https://aprepro.org.br/conbrepro/2019/anais/arquivos/09292019_140900_5d90e7fc62875.pdf. Retrieved on June 10, 2023.

7. Costa Jr., N., et al. (1993). Estimação do beta de ações através do método dos coeficientes agregados. FGV. Available at https://bibliotecadigital.fgv.br/ojs/index.php/rbe/article/download/590/7940/0. Retrieved on June 15, 2023.

8. Costa, V. A. M. da. (2019). Estudo comparativo dos modelos de precificação do custo de capital próprio de países emergentes aplicados em ativos do mercado brasileiro: CAPM, CAPM global, CAPM local, CAPM local ajustado, CAPM híbrido ajustado, Damodaran e G-S [Master's thesis, Universidade Federal de Minas Gerais]. Available at https://repositorio.ufmg.br/handle/1843/32622. Retrieved on April 20, 2024.

9. Dornelas, L. N. de D. (2019). SELIC: O mercado de dívida pública no Brasil [Doctoral dissertation, Universidade Federal de Uberlândia]. Available at https://repositorio.ufu.br/handle/123456789/24624?mode=full. Retrieved on May 8, 2024.

10. Elton, E. J., et al. (2004). Moderna teoria de carteiras e análise de investimentos. São Paulo, Brazil: Atlas.

11. Evrard, H. S., & Cruz, J. A. W. (2016). Indicadores financeiros e de mercado para previsão do retorno de ações do Ibovespa entre os anos de 2003 e 2013. Sociedade, Contabilidade e Gestão. Available at https://revistas.ufrj.br/index.php/scg/article/view/13369/9191. Retrieved on September 24, 2023.

Revista ARACÊ
ISSN: 2358-2472

12. Gitman, L. J. (2010). Princípios de administração financeira (12th ed.). São Paulo, Brazil: Pearson Prentice Hall.

13. Gujarati, D. N., & Porter, D. C. (2011). Econometria básica (5th ed.). Porto Alegre, Brazil: AMGH Editora.

14. Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. JSTOR. Available at http://links.jstor.org/sici?sici=0034-6535%28196502%2947%3A1%3C13%3ATVORAA%3E2.0.CO%3B2-7. Retrieved on September 24, 2023.

15. Macedo, R. L. (2019). Avaliação de modelos de precificação de ativos no mercado acionário brasileiro: Ações do Banco do Brasil S.A (BBAS3) [Master's thesis, Pontifícia Universidade Católica do Rio de Janeiro]. Available at https://www.maxwell.vrac.puc-rio.br/46314/46314.PDF. Retrieved on March 30, 2024.

16. Markowitz, H. (1952). Portfolio selection. The Journal of Finance, 7(1), 77–91. Available at https://www.jstor.org/stable/2975974. Retrieved on March 27, 2024.

17. Meira, L. A., et al. (2019, December). Criptomoedas: Moedas, ativo financeiro ou uma nova tulipa. EARL, 10(3). Available at https://portalrevistas.ucb.br/index.php/EALR/article/view/10310. Retrieved on May 30, 2023.

18. Mercado de valores mobiliários brasileiro (4th ed.). (2019). Rio de Janeiro, Brazil: Comissão de Valores Mobiliários. Available at https://www.gov.br/investidor/pt-br/educacional/publicacoes-educacionais/livros-cvm/livro_top_mercado_de_valores_mobiliarios_brasileiro_4ed.pdf/view. Retrieved on September 30, 2023.

19. Oliveira, F. A. S. de. (2013). Desempenho da otimização robusta de carteiras no mercado acionário brasileiro [Master's thesis, Universidade Federal de Minas Gerais]. Available at https://repositorio.ufmg.br/handle/1843/BUOS-9F4GN8. Retrieved on April 6, 2024.

20. Osei, K. A. (2002). Asset pricing and information efficiency of the Ghana Stock Market. African Economic Research Consortium. Available at https://www.researchgate.net/publication/46452252_Asset_pricing_and_information_efficiency_of_the_Ghana_Stock_Market. Retrieved on March 11, 2024.

21. Pereira, R. de A. S. (2019). Estimação de coeficientes beta de criptomoedas em relação a índices de moedas digitais, índices de ações e índice de moedas fiduciárias em relação ao dólar americano [Master's thesis, Pontifícia Universidade Católica do Rio de Janeiro]. Available at https://www.maxwell.vrac.puc-rio.br/projetosEspeciais/ETDs/consultas/conteudo.php?strSecao=resultado&nrSeq=46884@1. Retrieved on April 18, 2024.

Revista ARACÊ
ISSN: 2358-2472

22. Raio X do índice Ibovespa nos últimos 25 anos. (2023). Economatica Insights. Available at https://insight.economatica.com/raio-x-do-indice-ibovespa-nos-ultimos-25-anos. Retrieved on April 10, 2024.

23. Reilly, F. K., & Norton, E. A. (2008). Investimentos (7th ed.). São Paulo, Brazil: Cengage Learning.

24. Resende, K. C., & Sales, G. A. W. (2021). Comportamento do coeficiente beta das ações brasileiras no período da crise gerada pela pandemia da Covid-19. Redeca, 8(10). Available at https://revistas.pucsp.br/index.php/redeca/article/view/53510. Retrieved on June 18, 2023.

25. Ross, S. A., et al. (2008). Administração financeira (8th ed.). Porto Alegre, Brazil: AMGH Editora.

26. Ross, S. A., et al. (2015). Administração financeira (10th ed.). Porto Alegre, Brazil: AMGH Editora.

27. Ross, S. A. (1976). The arbitrage theory of capital asset pricing. Journal of Economic Theory, 13(3), 341–360. Available at https://www.top1000funds.com/wp-content/uploads/2014/05/The-Arbitrage-Theory-of-Capital-Asset-Pricing.pdf. Retrieved on April 10, 2024.

28. Santos, J. O. dos, & Fontes, R. J. S. (2011). Análise da relação entre o coeficiente beta, o índice de alavancagem D/E e a taxa de retorno de ações ordinárias de uma amostra de empresas listadas no Ibovespa. Contabilidade Vista & Revista. Available at https://www.redalyc.org/articulo.oa?id=197026199007. Retrieved on June 1, 2023.

29. Schivinski, T. (2002). O efeito da divulgação das demonstrações financeiras sobre o retorno das ações e avaliação do modelo CAPM no mercado de capitais brasileiro [Master's thesis, Universidade Federal de Santa Catarina]. Available at https://tede2.pucsp.br/handle/handle/24880. Retrieved on June 8, 2023.

30. Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. Journal of Finance, 19(3), 425–442. Available at https://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.1964.tb02865.x. Retrieved on May 24, 2023.

31. Silva, G., et al. (2012). Custo de capital no setor alimentício brasileiro: Um estudo comparativo entre o CAPM tradicional e o CAPM alternativo. Revista Alcance. Available at https://www.redalyc.org/pdf/4777/477748601007.pdf. Retrieved on April 5, 2024.

32. Silva, M. D. da. (2021). Análise da relação entre o retorno de carteiras de mercado e o retorno das ações de empresas do setor de petróleo no período de janeiro de 2015 a março de 2021 [Repository, PUCSP]. Available at https://tede2.pucsp.br/handle/handle/24880. Retrieved on April 5, 2024.

Revista ARACÊ
ISSN: 2358-2472

33. Stock beta. (n.d.). CMC Markets. Available at https://www.cmcmarkets.com/en-gb/trading-guides/stock-beta. Retrieved on May 30, 2024.

34. Tavares, R. de S. (2019). Seleção de carteiras: Escolha entre modelos baseada em critérios simples e persistência de performance [Master's thesis, Universidade Federal do Rio Grande do Sul]. Available at https://lume.ufrgs.br/handle/10183/196477. Retrieved on May 2, 2024.

35. Tondo, S. (2023, November 10). Como funciona o método BEST do milionário Luiz Barsi para investir na bolsa. e-Investidor. Available at https://einvestidor.estadao.com.br/investimentos/metodo-best-luiz-barsi-o-que-e-como-funciona/. Retrieved on May 30, 2024.

36. Vergara, S. C. (1997). Projetos e relatórios de pesquisa em administração. São Paulo, Brazil: Atlas.

APPENDIX A - TABLE WITH SECTOR, COMPANY NAME AND STOCK EXCHANGE CODE OF THE SHARES THAT REMAINED ON THE STOCK EXCHANGE BETWEEN 2013 AND 2022.

Sector	Company Name	Code on the Stock Exchange
--	Bovespa Index	IBOVESPA
Non-Cyclical Consumption/ Beers and Soft Drinks	Ambev SA	ABEV3
Cyclical Consumption/ Fabrics, Apparel and Footwear	São Paulo Alpargatas SA	ALPA4
Cyclical Consumption/ Trade/ Miscellaneous Products	Americanas SA	AMER3
Cyclical Consumption/ Trade/ Fabrics, Apparel and Footwear	Arezzo Indústria e Comércio S.A.	ARZZ3
Finance/ Financial Intermediaries/ Banks	Banco do Brasil SA	BBAS3
Finance/ Financial Intermediaries/ Banks	Banco Bradesco S.A.	BBDC3
Finance/ Financial Intermediaries/ Banks	Banco Bradesco S.A.	BBDC4
Non-Cyclical Consumption/ Processed Foods/ Meat and Meat Products	Minerva S.A.	BEEF3
Finance/ Financial Intermediaries/ Banks	Pan Bank	BPAN4
Basic Materials/ Mining/ Metal Minerals	Bradespar S.A.	BRAP4
Non-Cyclical Consumption/ Processed Foods/ Meat and Meat Products	BRF S.A.	BRFS3
Basic Materials/ Chemicals/ Petrochemicals	Braskem S.A.	BRKM5
Industrial Goods / Transportation / Highway Operation	CCR S.A.	CCRO3
Public Utility / Gas	Cia Gás São Paulo - COMGAS	CGAS5

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Financial/ Miscellaneous Financial Services	Cielo S.A.	CIEL3
Public Utility/ Electric Energy	Cia Energética Minas Gerais - CEMIG	CMIG3
Public Utility/ Electric Energy	Cia Energética Minas Gerais - CEMIG	CMIG4
Public Utility/ Electric Energy	CPFL Energia S.A.	CPFE3
Public Utility/ Electric Energy	Cia Paranaense Energia - COPEL	CPLE6
Petroleum. Gas and Biofuels / Exploration. Refining and Distribution	Cosan S.A.	CSAN3
Basic Materials/ Steel and Metallurgy/ Steel	National Steel Company	CSNA3
Cyclical Consumption/ Civil Construction/ Developments	Cyrela Brazil Realty S.A. Empreendimentos Participações	CYRE3
Health / Serv.Méd.Hospit. Analysis and Diagnostics	Diagnostics of America S.A.	DASA3
Industrial Goods/ Transportation/ Highway Exploration	Ecorodovias Infraestrutura e Logística S.A.	ECOR3
Public Utility/ Electric Energy	Centrais Elétricas Brasileiras S.A.	ELET3
Public Utility/ Electric Energy	Centrais Elétricas Brasileiras S.A.	ELET6
Public Utility/ Electric Energy	Emae Empresa Metropolitana Águas Energia S.A.	EMAE4
Industrial Goods/ Transportation Material/ Aeronautical and Defense Material	Embraer S.A.	EMBR3
Public Utility/ Electric Energy	Eneva S.A.	ENEV3
Public Utility/ Electric Energy	Energisa S.A.	ENGI11
Public Utility/ Electric Energy	Equatorial Energia S.A.	EQTL3
Cyclical Consumption/ Civil Construction/ Developments	Even Builder Incorporator S.A.	EVEN3
Cyclical Consumption/ Civil Construction/ Developments	Ez Tec Empreendimentos Participações S.A.	EZTC3
Health / Serv. Avg. Hospital, Analysis and Diagnostics	Fleury S.A.	FLRY3
Public Utility/ Electric Energy	Rio Paranapanema Energia S.A.	GEPA4
Cyclical Consumption/ Civil Construction/ Developments	Gafisa S.A.	GFSA3
Basic Materials/ Steel and Metallurgy/ Steel	Gerdau S.A.	GGBR4
Basic Materials/ Steel and Metallurgy/ Steel	Metalúrgica Gerdau S.A.	GOAU4
Industrial Goods/ Transportation/ Air Transportation	Gol Linhas Aereas Inteligentes S.A.	GOLL4
Health/ Trade and Distribution/ Medicines and Other Products	Hypera Pharma	HYPE3
Industrial Goods/ Industrial Machinery and Equipment	Inepar S.A. Ind Construções	INEP4
Financial/ Diversified Holdings	Itausa Investimentos Itaú S.A.	ITSA4
Finance/ Financial Intermediaries/ Banks	Itaú Unibanco Holding S.A.	ITUB4
Non-Cyclical Consumption/ Processed Foods/ Meat and Meat Products	JBS S.A.	JBSS3
Cyclical Consumption/ Civil Construction/ Developments	JHSF Participações S.A.	JHSF3

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Basic Materials/ Wood & Paper/ Pulp & Paper	Klabin S.A.	KLBN4
Public Utility/ Electric Energy	Light S.A.	LIGT3
Public Utility/ Electric Energy	Eletrobrás Participações S.A.	LIPR3
Cyclical Consumption/ Trade/ Fabrics, Apparel and Footwear	Lojas Renner S.A.	LREN3
Cyclical Consumption/ Trade/ Appliances	Luiza S.A. Magazine (Luiza Store)	MGLU3
Non-Cyclical Consumption/ Processed Foods/ Meat and Meat Products	Marfrig Global Foods S.A.	MRFG3
Cyclical Consumption/ Civil Construction/ Developments	MRV Engenharia Participações S.A.	MRVE3
Financial/ Real Estate Exploration	Multiplan Empreendimentos Imobiliários S.A.	MULT3
Non-Cyclical Consumption/ Personal Use and Cleaning Products	Natura and Co Holding S.A.	NTCO3
Communications/ Telecommunications	Hi	OIBR3
Communications/ Telecommunications	Hi	OIBR4
Non-Cyclical Consumption/ Trade and Distribution/ Food	Brazilian Distribution Company	PCAR3
Cyclical Consumption/ Civil Construction/ Developments	PDG Realty S.A. Empreendimentos e Participações	PDGR3
Petroleum. Gas and Biofuels/ Exploration. Refining and Distribution	Petróleo Brasileiro S.A. Petrobras	PETR3
Petroleum. Gas and Biofuels/ Exploration. Refining and Distribution	Petróleo Brasileiro S.A. Petrobras	PETR4
Industrial Goods/ Transportation Equipment/ Road Supplies	Marcopolo S.A.	POMO4
Information Technology/ Computers and Equipment	Positivo Tecnologia S.A.	POSI3
Health / Serv.Méd.Hospit. Analysis and Diagnostics	Qualicorp Consultoria e Corretora de Seguros S.A.	QUAL3
Health/ Trade and Distribution/ Medicines and Other Products	Raia Drogasil U.S.	RADL3
Cyclical Consumption/ Miscellaneous/ Car Rental	Localiza Rent A Car	RENT3
Cyclical Consumption/ Civil Construction/ Developments	Rossi Residencial S.A.	RSID3
Finance/ Financial Intermediaries/ Banks	Banco Santander Brasil S.A.	SANB11
Public Utility/ Water and Sanitation	Basic Sanitation Company of the State of São Paulo	SBSP3
Non-Cyclical Consumption/ Agriculture/ Agriculture	SLC Agrícola S.A.	SLCE3
Non-Cyclical Consumption/ Processed Foods/ Sugar and Alcohol	São Martinho S.A.	SMTO3
Public Utility/ Electric Energy	Transmissora Aliança De Energia Elétrica S.A. – TAESA	TAEE11
Communications/ Telecommunications	Brazilian Telecommunications – Telebras	TELB3

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Communications/ Telecommunications	Brazilian Telecommunications – Telebras	TELB4
Communications/ Telecommunications	TIM S.A.	TIMS3
Information Technology/ Programs and Services	Totvs S.A.	TOTS3
Public Utility/ Electric Energy	Cia Transmissão Energia Elétrica Paulista	TRPL4
Petroleum. Gas and Biofuels/ Exploration. Refining and Distribution	Ultrapar Participações S.A.	UGPA3
Basic Materials/ Chemicals/ Miscellaneous Chemicals	Unipar Carbocloro S.A.	UNIP6
Basic Materials/ Steel and Metallurgy/ Steel	Usinas Siderúrgicas Minas Gerais S.A. – USIMINAS	USIM3
Basic Materials/ Steel and Metallurgy/ Steel	Usinas Siderúrgicas Minas Gerais S.A. – USIMINAS	USIM5
Basic Materials/ Steel and Metallurgy/ Steel	Usinas Siderúrgicas Minas Gerais S.A. – USIMINAS	USIM6
Basic Materials/ Mining/ Metal Minerals	Vale S.A.	VALE3
Cyclical Consumption/ Trade/ Appliances	Grupo Casas Bahia S.A.	VIIA3 (new name: BHIA3)
Communications/ Telecommunications	Telefônica Brasil S.A.	VIVT3
Industrial Goods/ Machinery and Equipment/ Motors, Compressors and Others	WEG S.A.	WEGE3