INVESTMENT PORTFOLIOS IN AN EMERGING ECONOMY: DIVERSIFICATION AND RISK ASSETS

Summary

This empirical study shed light on the investment portfolio of Brazilians through a behavioral approach. The study intent to find personal characteristics that can drive the level of diversification and lead investors to allocate resources in risky assets in Brazil, deepening the discussion about investment decisions within an emerging economic context. The study has a unique and heterogeneous database of individual financial allocation in Brazil. We observed under-diversified portfolios allocated primarily on traditional and safety assets. Results suggests that the investment decisions of Brazilian can receive influences of psychological biases defined in behavioral finance theory.

KEY WORDS: diversification, risk assets, behavioral finance, emerging economy.

1. Introduction

The growth of the financial market in recent years has led to greater availability of financial products and services in order to meet a new range of customers and investors. Among the new products, those for the financial allocation require special attention because they offer new diversification possibilities and financial strategies for investors. According to Modern Theory of Finance, which has been built since the 70s, when several investment opportunities are available in the financial market investors diversify their investments mitigating risks and maximizing rates of return (Markowitz, 1952).

Modern Theory of Finance analyze the investors decisions based on assumptions, among them, the market efficiency and individual rationality, where investor decisions are perfectly rational based on correct analysis of available information (Fama, 1970) (Shiller, 1999).

However, it is noteworthy that the vast part of investors do not have diversified portfolios, and many invest without regard to the risk-return relation. Noting that dissonance between the practice and the Modern Theory of Finance, some studies have begun to question the investors' rationality presenting psychological factors affecting financial decisions, furthermore, the emotional factors leading investor decisions.

Pioneering study of 1979 state that financial decisions based on emotions or psychological influences can lead investors to allocate their financial resources in higher-risk investments and under-diversified portfolios (Kahneman e Tversky, 1979).

The discussion about the rationality of investors in the finance literature leads to the concept of Behavioral Finance, which analyzes investors' decisions under psychology and finance theories to better understand the factors that drive financial decisions.

The Brazilian financial market has a crescent number of investors and several investment possibilities, offering conservative investments such as savings and fixed income funds, to risky investments via capital markets and structured products. Through the prism of the Modern Theory of Finance, the Brazilian investor should allocate their financial resources in a rational and diversified way. On the other hand, according to Behavioral Finance Theory, the Brazilian investor can make decisions under psychological bias choosing under-diversified or risky portfolios.

Few empirical studies analyze the Brazilians investment decisions and the intrinsic characteristics that lead to portfolio diversification and investment in risk assets. Considering the size and sophistication of the financial market in Brazil, it is important to analyze what drives investment decisions providing new subsidies to improve the financial education process of Brazilians and provide new tools for market participants to develop products more adequate to investors.

In this context, the main objective of our study is to analyze how Brazilian investors are investing their financial resources among several possibilities available in the market, and seek the factors that can influence the level of portfolios diversification and the financial allocation in risk assets.

The paper is organized as follows: The first is dedicated to the study motivation. The second part is dedicated to the underlying literature of financial theories and behavioral influences. The third presents the data and the methodology applied. The fourth is dedicated to results and discussion. The fifth part of the study is devoted to conclusion and the sixth presents the references.

2.   Underlying theories

The Modern Theory of Finance states that investors act rationally seeking to minimize risks and maximize returns through the process of diversification of their investments. The theory built from a neoclassical microeconomic approach whose central paradigm is the rationality of economic agents (Yoshinaga et al., 2008). In this sense, individuals who operate in the financial markets must have ability to process the information available and to make rational decisions consistent with the concept of Expected Utility (Von Neumann, 1947).

However, along over thirty years many studies evidence investors allocating financial resources in under-diversified portfolios and unbalanced, i.e. portfolios concentrated within an average of two or three assets (Blume and Friend, 1978) (Barber and Odean 2000) (Polkovnichenko, 2005; Goetzmann and Kumar, 2008). Thus, a new theoretical approach of finance goes on to consider the individual's behavior in the investment decision.

In this context, the Behavioral Finance Theory appears with the aim of improving the modern theory of finance introducing studies with psychological and behavioral approaches (Lintner, 1998) (Kimura, Basso and Krauter, 2006).

Important studies in the Behavioral Finance Theory present the investors decisions driven by psychological needs, following the Maslow's Hierarchy of Needs. The Hierarchy of Needs is a concept of motivational behavior, one of the most important motivation theories in psychology studies. In this concept, humans actions and decisions are explained by five levels of human needs, starting from the basic physiological needs to achieve the top level of needs, the self-actualisation (Maslow, 1943), as presented in Figure 1. At each level of Hierarchy of Needs, the human being receives psychological influences that affect their decisions adding the set of needs that man seeks to meet throughout life.
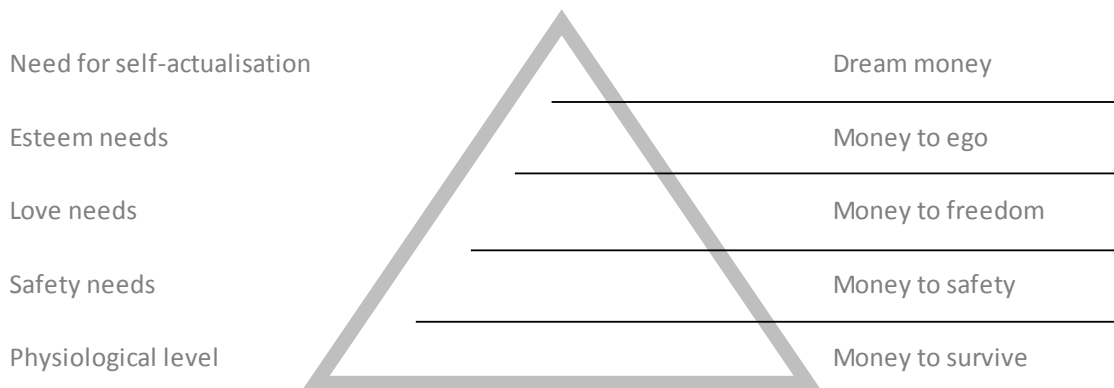
Figure 1: Maslow's Hierarchy of Needs

Need for self-actualisation

Esteem needs

Love needs

Safety needs

Physiological level

Source: Hierarchy of Needs Maslow (1943). Prepared by the authors.

In the context of investments, arises the concept of Behavioral Portfolio Theory, visually presented in Figure 2, connecting the Maslow's hierarchy of needs with traditional financial theories (Shefrin and Statman, 2000) (De Brouwer, 2009).

Figure 2: Behavioral Portfolio Theory

Need for self-actualisation   Dream money

Esteem needs   Money to ego

Love needs   Money to freedom

Safety needs   Money to safety

Physiological level   Money to survive

Source: Prepared by the authors.

The connection between the theory of behavioral finance and the traditional theory of finance resulted in three approaches by which investors can be conducted in the investment decision-making process (Shefrin e Statman, 2000).

The first approach is the Safety-first Portfolio Theory, whereby the investors essentially receive the influence of the second level of Maslow's hierarchy. On the safety-first approach the investor aims to minimize the likelihood of financial distress Pr(W<s), where investor aims to maintain its level of wealth (W) above the subsistence level (s), i.e. above the first

level Maslow's hierarchy of needs. Investors concentrates its investments in under-diversified portfolios allocated primarily on traditional and low risk assets.

The second is the PS/A (Theory, Security, Potential and Aspiration Theory). The second theory follows the concepts of Safety-First theory adding an intrinsic potential of investor. The potential is the individual aspiration to achieve the highest level of Maslow's hierarchy of needs. Security is the major guide of financial decisions, but the investor receive an input from the need to self-actualisation. The potential and aspiration leads the investor to create a target point of wealth, a desire for higher levels of wealth. The central difference in this second approach is in the interpretation of the variables. Specifically, the subsistence level (s) is replaced by a more general aspiration level (A)[1]. Based on this approach the investor can allocate portions of their investments in risk assets seeking for higher return. Despite the investor has a potential aspiration to wealth, it keeps major fraction of its wealth in traditional and low risk assets in their portfolios.

The third and final approach, BPT-AS (Theory, Security, Potencial and Aspiration Theory + Prospect Theory). It is the complement of the two previous approaches to the Prospect Theory (Kahneman and Tversky, 1979). Investors are driven by security instinct but invest in different assets seeking for higher rates of return and higher levels of wealth. The difference in this approach is the addition of all cognitive biases in financial decision-making. Cognitive biases in investment is an interference in mental processes generating decision biases that may violate the axioms of rationality leading investors to allocate their resources in investments that generate lower rates of return or to assume higher levels of risk. Among the biases are: loss aversion, anchoring, availability, herd behavior, local trend and overconfidence (Kahneman and Tversky, 1979) (De Bondt e Thaler, 1994).

Loss aversion may present only when the investment has gained, imposing a desire to preserve the achieved return. In investments facing losses, investors tend to take greater risks because it believes it can recover past losses relocating in riskier assets (Köbberling and Walker, 2005). Psychological biases can affect the self-control misleading the comprehension about what they are dealing.

Anchoring is a behavioral bias that biased decisions toward the initial values, i.e., a limitation in the decision-making process, leaving the investor tied to a past target return, a result of a payoff in a past time (Jacowitz and Kahneman, 1995). Furthermore, the individual may invest based on available information, called availability bias, where investors do not examine other alternatives or additional information to allocate financial resources. Individual evaluate the chance to some event happen from the comparable events occurred previously (Barberis and Thaler, 2003).

Herd Behavior drive investors to replicate decisions made by other investors. The belief is that other investors are investing with more information, thus, when an individual makes a

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[1] Model details in (Shefrin e Statman, 2000) and (Arzac e Bawa, 1977)

decision based on what the other investor did, he undervalue the information available in the market (Bikhchandani and Sharma, 2000). Local knowledge can also present as an investment decision bias if the investor choose to allocate their resources only in markets where it already has a level of information and greater familiarity (Coval and Moskowitz, 1999).

The overconfidence bias could lead investors to believe that has comparative advantage in analysis and valuation assets relative to the market, holding losing positions (Plous, 1993).

Few empirical studies seek to understand the Brazilian investor behavior in the light of Behavioral Finance. The discussion in the literature is intriguing and a stimulation source of research to understand whether Brazilian investors allocate their financial resources following the model of rationality or they are driven by psychological factors.

In the United States several studies analyses the portfolio diversification and investments in risky assets of individual investors. The theories of diversification apparently not correctly describe investors decisions given that US investors analyzed based on the Survey of Consumer Finances 1983 have under-diversified portfolios (Kelly, 1995). As a possible explanation for investor behavior, the overconfidence bias can affect investment decisions and lead investors to less diversified portfolios and greater exposure to risk assets. Kelly (1985) tests the effect of various investors' characteristics in the level of portfolio diversification, among them: age, education level, occupation, risk profile. However, none of the personal characteristics is significant to improve the understanding of investors' decisions.

Complementary study using 2006 data Survey of Consumer Finances between 1992 and 2001 seek to find the determinants of equity investment in the US market (Shum and Faig, 2006). Shum and Faig (2006) include investors' characteristics to better understand the financial allocation. Authors note a great heterogeneity in the financial allocation, identifying that the decision to hold equities in the investors' portfolio is positively correlated with the total investment, age, risk attitude and some reasons for savings, as retirement. Investors aged up to 50 years old tend to have more equities in their portfolios. As investors exceed the age of 50 years they reverse the tendency leading to a reduction in the number of equities. In addition, the total investments and savings have positive effects on hold equities in the portfolio.

Study conducted in 2008 analyzes the American investor behavior and observes poorly diversified investment portfolios (Goetzmann and Kumar, 2008). Authors note that the low level of diversification is associated with the young investor with lower income, less education and less sophisticated. From the perspective of Behavioral Finance, Goetzmann and Kumar (2008) state that investment decisions are consistent with the overconfidence bias, trend behavior and local bias.

International studies provide a strong base for empirically support our testing and allows us to compare the investment portfolios of Brazilians, the level of diversification and investment in risky assets.

3.   Data and Methodology

We use a novel and heterogeneous database composed by 500 Brazilian investors and 2,224 investments observations to attend our empirical investigation. Our database provide sufficient details to deep discussion the investment decisions of Brazilians.

We construct our database based on Brazilian Supreme Electoral Court (TSE-*Tribunal Superior Eleitoral*) website. TSE website maintain the investment portfolios of candidates for political position of mayors and councilors in the year 2012 for all Brazilian states.

Investors are Brazilians with heterogeneous occupations and not linked to policy. By opting for candidacy for a political position in Brazil, the candidate must publish all their assets and investments in the Supreme Electoral Tribunal website. We understand that there may be a selection bias in the study sample but that is the only database publicly available, at least as we know. Moreover, we believe that the impact is minimized by the sample size, the heterogeneity in occupation of these people and the differences in their investment portfolios, serving as a good proxy for investment portfolios of Brazilians.

Our database report detailed allocation in different assets with at least 17 thousand Reais and maximum of 11 million Reais of investments. Moreover, account for personal characteristics, such as age, gender, marital status, education level, living in the capital city or countryside and total investment. The total investment of investors in this study are in natural logarithm to capture the variation between investment portfolios without distorting the results.

The average age of investors, presented in Table 1, is 53 years old, with minimum of 30 years and a maximum of 87 years old. These investors allocate their resources in 4 different types of assets on average, with minimum investment of 1 and a maximum of 13 different assets. Observing the number of investments, we can realize the Brazilian investor is under-diversified.
Among all investors, 435 are men and 75 are women, 344 investors are married, 391 have higher education, and 56% of them reside in capital cities.

Table 1: Summary Statistics of investors' characteristics

	Age (years)	Total Investment (R$)	Number of investments
Mean	53	731.669,55	4,45
Median	54	462.067,64	4
Std. Dev.	11	988.523,13	1,76
Min	30	17.577,52	1
Max	87	11.186.074,14	13
N	500	500	500
	N	%	
Man	425	85%	
Woman	75	15%	
Married	344	69%	
Not Married	156	31%	
High Education	391	78%	
Not High Education	109	22%	
Capital City	282	56%	
Coutryside	218	44%	

Source: TSE – Tribunal Superior Eleitoral 2012. Prepared by the authors.

Table 2 shows the allocation of Brazilian investors in different assets. Investors allocate most of their investments in residential real estate, followed by vehicles and urban land. Table 2 shows the under-diversified portfolios and a conservative allocation with approximately 70% allocated to traditional and low risk assets. Important to highlight the resource allocated in vehicles, a durable that traditionally does not generate positive financial return.

Financial investments represent around 15% of the total polarized in fixed income assets, reinforcing the evidence of the conservative investor profile.
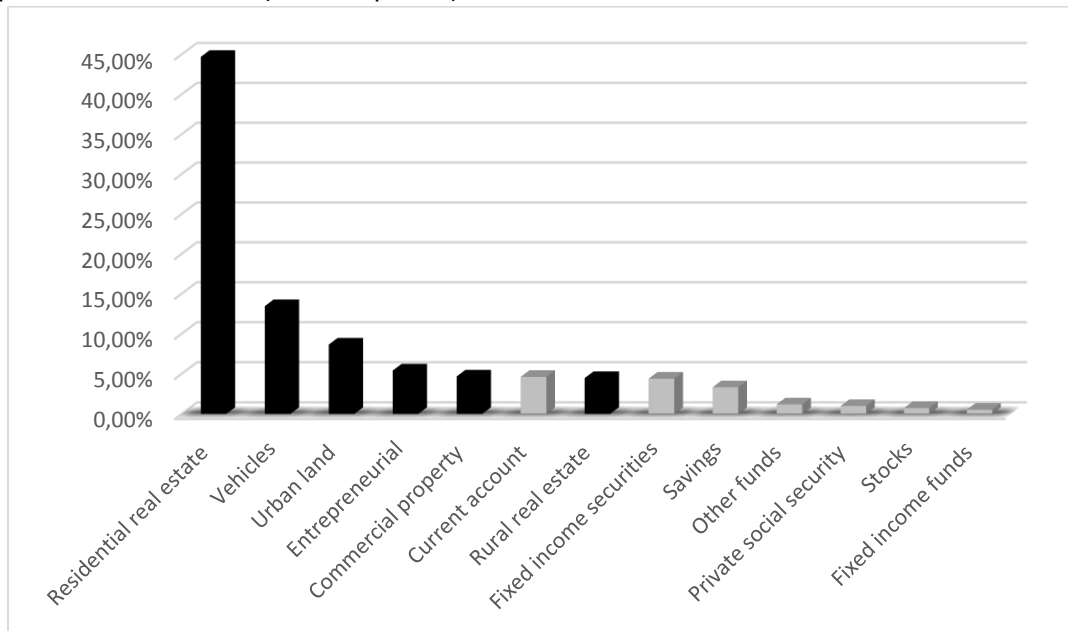
Table 2: Asset Allocation (% Participation)

Residential real estate	44,70%	Capitalization	0,36%
Vehicles	13,46%	Loans to third parties	0,31%
Urban land	8,66%	Miscellaneous equipment	0,27%
Entrepreneurial	5,42%	Livestock	0,26%
Commercial property	4,68%	Equity Mutual Funds	0,22%
Current account	4,62%	Other goods	0,19%
Rural real estate	4,48%	Telephone line	0,10%
Fixed income securities	4,40%	Investments abroad	0,04%
Savings	3,32%	Club Membership	0,03%
Other funds	1,18%	Repo operations	0,02%
Private social security	0,99%	Boats	0,02%
Stocks	0,73%	Jewelry, painting, object art,	
Fixed income funds	0,53%	collectors, antique, etc.	0,02%
Consortium	0,49%	Hedge funds	0,01%
Improvements	0,46%	Gold	0,01%

Source: TSE – Tribunal Superior Eleitoral 2012. Prepared by the authors.

Graph 1 graphically presents the main investments made by investors.

Graph 1: Asset Allocation (% Participation)

Source: TSE – Tribunal Superior Eleitoral 2012. Vertical bars in black represent the non-financial investments; the gray vertical bars represent financial investments. Prepared by the authors.

Stratifying the sample by total investments, we observe that there is a thin shift in assets allocation. As increases the total investments, decline allocation in residential real estate and vehicles, and increase allocation in rural properties, entrepreneurial and financial allocation. However, the investor portfolio remain under-diversified.
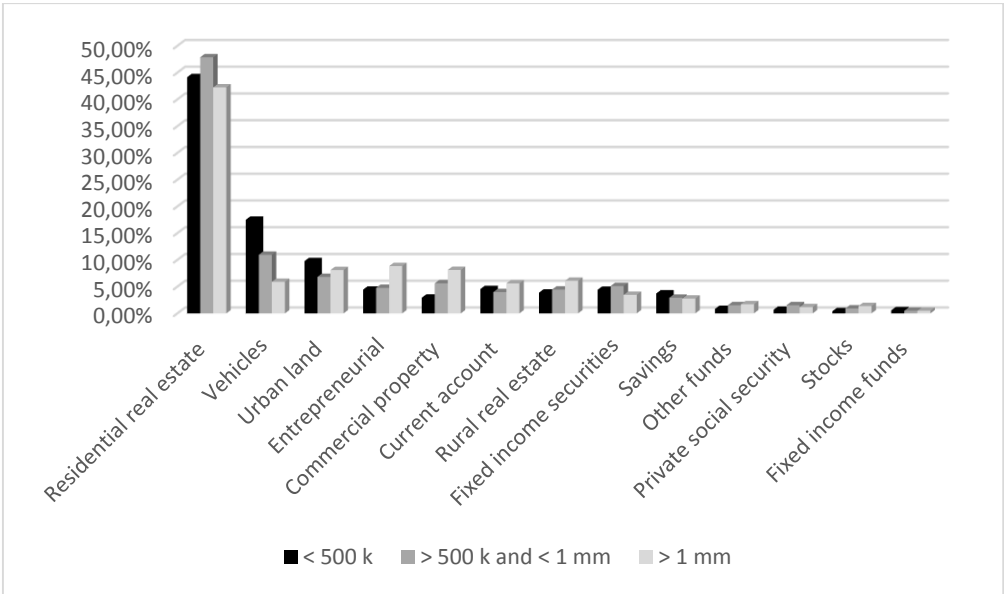
Table 3: Allocation of the main investments by total investment (in R$)

Investment	< 500 k	Δ%	> 500 k and < 1 mm	Δ%	> 1 mm
Residential real estate	44.14%	8.42%	47.86%	-11.76%	42.23%
Vehicles	17.50%	-37.48%	10.94%	-46.16%	5.89%
Urban land	9.75%	-30.20%	6.81%	18.93%	8.09%
Entrepreneurial	4.43%	7.67%	4.77%	85.21%	8.84%
Commercial property	2.94%	91.43%	5.62%	44.27%	8.11%
Current account	4.55%	-12.47%	3.98%	40.64%	5.60%
Rural real estate	3.89%	14.62%	4.45%	36.73%	6.09%
Fixed income securities	4.42%	15.59%	5.10%	-32.25%	3.46%
Savings	3.72%	-21.47%	2.92%	-5.11%	2.77%
Other funds	0.82%	85.37%	1.53%	11.35%	1.70%
Private social security	0.67%	126.68%	1.52%	-22.76%	1.17%
Stocks	0.40%	128.71%	0.91%	49.43%	1.36%
Fixed income funds	0.57%	-14.64%	0.49%	-0.45%	0.49%

Source: TSE – Tribunal Superior Eleitoral 2012. Prepared by the authors.

Graph 2 graphically presents the changes in asset allocations as it increases the total investments.

Graph 2: Changes in asset allocations as it increases the total investments

Source: TSE – Tribunal Superior Eleitoral 2012. Prepared by the authors.

3.1. Diversification Metrics

To estimate the level of portfolio diversification we follow the diversification metric presented by Blume and Friend, 1978. The metric analyzes the investor allocation compared to a market portfolio.

Blume and Friend, 1978, analyze stock portfolios of US investors using the capital market index as benchmark to measure the diversification index. Whereas the Brazilian investor allocates little financial resources in stocks and the absence of a market benchmark for these investors, we made an adjustment in the metric and created a market portfolio based on means and medians allocations of all investors in our database.

Our adaptation analyzes the deviation of the individual allocation in each asset compared to the mean and median allocation of all investors of the sample in each asset. Thus, assuming that the mean and median portfolio is a good representation of portfolio allocation of the Brazilians, the mean and median of all investors in each asset is the benchmark in our study.

We understand that our adaptation can be understood as a specification error because there is not a benchmark publicly available, however, examine how individual investors differ from mean and median allocation of all investors can be a good starting point to better understand the factors leading Brazilian investors to diversify their portfolios.

According to the metric, the lower index measured by Equation 1 and 2, the greater the portfolio diversification.

Thus, the level of portfolios diversification are measured by Equation 1 and Equation 2:

$$DImean_i = \sum_{i=1}^{N} (wi - wBenchmeani)^2 \qquad \text{Equation 1}$$

$$DImedian_i = \sum_{i=1}^{N} (wi - wBenchmediani)^2 \qquad \text{Equation 2}$$

Where:

$DImean_i$ is the diversification index using mean of investor i
$DImedian_i$ is the diversification index using median of investor i
N is the number of securities held by the investor
w_i is the portfolio weight assigned to investment type i in the investor portfolio
$wbenchmean_i$ is the mean weight assigned to an investment type i in the benchmark portfolio
$wbenchmedian_i$ is the median weight assigned to an investment type i in the benchmark portfolio

3.2. Metrics of Investment in Risk Assets

Whereas Brazilian investors have concentrated portfolios in low risk assets, we seek to understand what drives investors to take a divergent allocation. We use higher risk investments and personal characteristics to pursuit factors that can lead investors to allocate financial resources in different assets. Stocks, equity mutual funds and entrepreneur are risk investments in our study.

We measure the level of allocation in risky assets via two procedures:

The first procedure considers the weighted sum of risk assets contained in each individual portfolio. The formula allows us to observe the relative percentage of total investments allocated in risky assets.

Equation 3 present the formula for measuring the level of risk allocation:

$$Irisk_i = \sum_{i=1}^{N} \left(\frac{Wrisk_i}{Total_i} \right) \qquad \text{Equation 3}$$
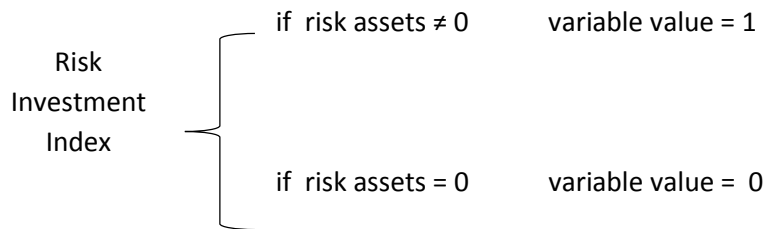
Where,

$Irisk_i$ is the risk taking index of investor i
$Wrisk_i$ is the sum of all risk investment of investor i
$Total_i$ is the sum of all investiments of investor i

The second procedure to measure the allocation in risky assets follow Shum and Faig (2006) which adds a dichotomous variable that takes 1 if investor invest in risk assets or 0 if the investor has no risk assets on their investment portfolio.

	if risk assets ≠ 0	variable value = 1
Risk Investment Index		
	if risk assets = 0	variable value = 0

Finally, to find the factors that influence investors to adopt a more diversified portfolio we developed an OLS regression model using the diversification index measured by Equation 1 and Equation 2 as explained variables. As explanatory variables, we use the investors' characteristics: age (Ω), gender (λ), level of education (δ), residence (θ) (capital city or countryside), marital status (ξ) and total investment (Ψ). The objective of this regression model is to capture some intrinsic characteristic leading for a diversified allocation. The regressions relied on the application of robust White Matrix.

Equation 1 as explained variable:

$$DImean_{i,t} = \beta_{0i,t} + \beta_1 \Omega_{i,t} + \beta_2 \lambda_{i,t} + \beta_3 \delta_{i,t} + \beta_4 \theta_{i,t} + \beta_5 \xi_{i,t} + \beta_6 \Psi_{i,t} + \varepsilon_{i,t}$$

Equation 4

Equation 2 as explained variable:

$$DImedian_{i,t} = \beta_{0i,t} + \beta_1\Omega_{i,t} + \beta_2\lambda_{i,t} + \beta_3\delta_{i,t} + \beta_4\theta_{i,t} + \beta_5\xi_{i,t} + \beta_6\Psi_{i,t} + \varepsilon_{i,t}$$

Equation 5

Similar to equations 4 and 5, to find the factors that influence investors to allocate resources in risk assets we developed two regression models to verify the impact of age (Ω), gender (λ), level of education (δ), residence (θ) (capital city or countryside), marital status (ξ) and total investment (Ψ) on the decision to allocate financial resources in risk assets. The first regression is an OLS regression and has the explanatory variable measured by the first risk metric procedure, Equation 3. The second regression, made under the second risk metric procedure, has dichotomous explained variable, so we adopted a Probit model. The regressions relied on the application of robust array of White.

Equation 3 as explained variable:

$$Irisk_{i,t} = \beta_{0i,t} + \beta_1\Omega_{i,t} + \beta_2\lambda_{i,t} + \beta_3\delta_{i,t} + \beta_4\theta_{i,t} + \beta_5\xi_{i,t} + \beta_6\Psi_{i,t} + \varepsilon_{i,t}$$

Equation 6

Procedure 2 dichotomous explained variable:

$$Probitrisk_{i,t} = \beta_{0i,t} + \beta_1\Omega_{i,t} + \beta_2\lambda_{i,t} + \beta_3\delta_{i,t} + \beta_4\theta_{i,t} + \beta_5\xi_{i,t} + \beta_6\Psi_{i,t} + \varepsilon_{i,t}$$

Equation 7

4. Results

Our results provide new insights to better understand how Brazilian investors allocates its financial resources. Results indicate that investors have under-diversified portfolios concentrated mainly in traditional and low risk assets.

The average rate of diversification estimated by Equation 1 is 0.2153. The diversification index using the benchmark portfolio composed by the median allocations, Equation 2, present an average diversification rate around 0.5023. Despite the difference between the

two models, we observe that the difference extends to all individual portfolios in proportional magnitude preserving the comparative power between the models. Table 4 shows diversification rates in quartiles, quartile 1 (Q1) indicates investors with higher levels of diversification. The diversification index becomes smaller as we move from the second quartile to fourth quartile.

There is a significant difference between investors with high diversification index, first quartile, and investors located in the fourth quartile for both metrics diversification. However, the differences must to be statistically significant to give consistency to the inferences.

To test for significant statistical differences between the investors with greater diversification rates and investors with smaller diversification rates, we conducted a t-test of means between Q1 and Q4 groups.

Table 4: Descriptive statistics of diversification rates

	DImean	Q1	Q2	Q3	Q4
Mean	0.2153	0.0560	0.1103	0.2037	0.4911
Median	0.1536	0.0582	0.1070	0.2019	0.4385
Std. Dev.	0.1926	0.0157	0.0204	0.0315	0.1849
Min	0.0192	0.0807	0.0807	0.1537	0.2719
Max	0.9124	0.1534	0.1534	0.2709	0.9124
N	500	125	125	125	125
	DImedian	Q1	Q2	Q3	Q4
Mean	0.5023	0.2934	0.4193	0.5270	0.7697
Median	0.4673	0.2992	0.4172	0.5227	0.7796
Std. Dev.	0.1865	0.0531	0.0286	0.0370	0.1062
Min	0.1584	0.1584	0.3695	0.4673	0.6113
Max	1.0000	0.3694	0.4672	0.6094	1.0000
N	500	125	125	125	125

Source: Prepared by the authors

T-test compares the rates of portfolios diversification in the first quartile, which have higher diversification rates, with the lower diversification rates located in fourth quartile. The test revealed a statistically significant difference at 1% with t-stat <0.000 for both models, ensuring that investors distributed in the first quartile had significantly different portfolios than investor located in the fourth quartile. T-test validates the inferences for each group in the regression models.

The regression models intend to get aspects that can lead investors to increase the diversification level and characteristics that can drive investors to increase exposure of their portfolios in risky assets.

Table 6 present the results of the four regression models. Columns (1) and (2) identify the characteristics of investors that can lead to a more diversified portfolio. Columns (3) and (4) present the characteristics that lead investors to invest greater financial resources in risk assets.

Table 6: Regression Table for models of diversification and investment in risky assets. (1)(2) OLS regression model with diversification index measured by Equation 1 and Equation 2 as explained variable and the variables Age (Ω), gender (λ), education level (δ), residence (θ) (capital city or countryside), marital status (ξ) and total investment (Ψ) as variables explanatory. (3)(4) Regression models to verify the impact of Age (Ω), gender (λ), education level (δ), residence (θ) (capital city or countryside), marital status (ξ) and total investment (Ψ) in risky assets. Regression (3) an OLS regression has explained the variable measured by Equation 3. Regression (4) is a Probit model that analyze the impact of the explanatory variables on the level of investment in risky assets. The regressions relied on the application of White Robust Matrix.

Equation	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	PROBIT
	Diversification		Risk assets	
Variables	IDmean	DImedian		
Age (Ω)	0.001	0.000	-0.002***	-0.013**
	(1.31)	(0.12)	(-3.29)	(-2.39)
D. Man (λ)	0.002	-0.011	0.036**	0.467***
	(0.07)	(-0.47)	(2.47)	(2.68)
D. HighEducation (δ)	-0.049**	-0.004	-0.031	0.172
	(-2.16)	(-0.22)	(-1.58)	(1.19)
D. CapitalCity (θ)	-0.012	0.020	0.005	0.108
	(-0.71)	(1.17)	(0.34)	(0.90)
D. Married (ξ)	-0.083***	-0.037**	-0.032*	-0.205
	(-4.11)	(-1.97)	(-1.87)	(-1.61)
Ln Total Investment (Ψ)	0.020*	-0.011	0.032***	0.249***
	(1.74)	(-1.05)	(3.23)	(3.59)
N	500	500	500	500
Adjusted R-squared	0.0565	0.0048	0.0776	
Pseudo R-squared				0.0504

Source: Prepared by the authors

The results displayed in Table 6 indicate effects of investor characteristics in the level of portfolio diversification, as well as the propensity to invest in risky assets. The characteristics of Brazilian investors play an important role in investment decisions, results supports the findings in international studies.

Higher education influence investors to higher levels of portfolio diversification. The result has statistical significance and follows evidences found by Goetzmann and Kumar (2008) for American investors. Marital status also positively affects the level of portfolio

diversification. Married investors tend to have more diversified portfolios than single investors do.

Goetzmann and Kumar (2008) observe more diversified portfolios in the United States as it increases the total investment, contrary that we found in Brazil. In Brazil higher financial resources does not necessarily lead to a more diversified portfolios. In the presence of new financial resources, the Brazilian investors maintain its resources in the same types of investments, e.g., if the investor allocates its resources in residential real estate, land and savings, he will not necessarily allocate in other assets in the presence of new financial resource, investor allocates more resources in the same types of assets.

Comparing the results concerning on investment in risky assets, we can see a greater number of personal characteristics affecting investment decisions of Brazilian investors. The equation models 6 and 7 seek the characteristics of investors that lead them to invest in risky assets. For both models, column (3) and (4) of Table 6, the age may indicate higher risk exposure. The evidence accompanying the results found in the study of Shum and Faig (2006) in the United States, showing that younger investors tend to invest more in risky assets.

The model also shows that the male investor has 43% more likelihood to invest in risky assets than female investors, highlighting the discussions on gender and investment decisions. Married investors tend to exhibit less risk and maintains conservative portfolios. As expected, as increase the total investments, the greater will be the investment in risky assets, once more in line with Shum and Faig (2006) results.

Our results, following international studies, suggest that Brazilian investors in our dataset cannot follow the complete model of rationality assumed by the Modern Finance Theory. Evidences suggests that their investment decisions are subject the psychological interference defined in Behavioral Finance theory, leading to poorly diversified portfolios. In addition, behavioral biases can lead the investor to allocate resources in risky assets regardless the risk factors.

Analyzing by Shefrin and Statman (2000) study, our results suggest that Brazilian investor has financial decisions consistent with the BPT-AS Theory approach (Theory, Security, Potencial and Aspiration Theory + Prospect Theory). Investors can be moved essentially by the security instinct, but a potential aspiration to higher levels of wealth can lead the investor to invest a portion of its assets in risky assets seeking for higher rates of return.

Results presenting the Brazilian investors less diversified, with high concentration portfolios in traditional and low-risk assets, but investing a fraction of its resources in risk assets support the possibility that the investor may be subject to psychological biases in financial decision.

Personal characteristics that lead investors to take greater risk may be related to individual overconfidence, a behavioral bias that lead investors to believe that your ability to process

information are better than other investors, leading to greater risk exposure. The age can be strongly related with overconfidence, given that younger investors tend to take greater risks. Goetzmann and Kumar (2008) and Kelly (1985) indicate overconfidence bias as an important factor that affect the financial decision.

Married and high-educated investors are more conservative and invest less in risky assets. The results reinforce the theory of safety-first. In addition, the under-diversified portfolios concentrated in traditional assets may be influenced by the herd effect, a psychological bias that lead investor to invest only in well-known assets and local assets.
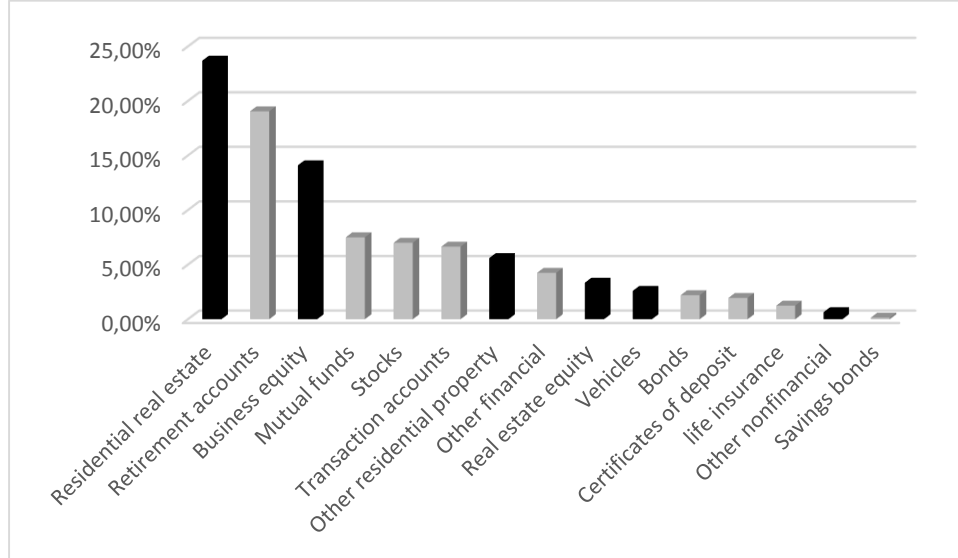
Although our results are in line with the results of international studies examining the investor in the United States, there is a significant difference in terms of allocation of resources among Brazilians and Americans investor. Most of the Americans investment is concentrated in financial assets, while most of Brazilians investment is concentrated in non-financial assets. The Federal Reserve Bulletin 2012 reveals the American investor focused on financial investments. Table 7 and Chart 3 presents the investor allocation in United States.

Table 7: Asset Allocation held by investors in the United States (% of Portfolio)

Investment	%	Investment	%
Residential real estate	23.70%	Real estate equity	3.35%
Retirement accounts	19.05%	Vehicles	2.60%
Business equity	14.10%	Bonds	2.20%
Mutual funds	7.50%	Certificates of deposit	1.95%
Stocks	7.00%	life insurance	1.25%
Transaction accounts	6.65%	Other nonfinancial	0.65%
Other residential property	5.60%	Savings bonds	0.15%
Other financial	4.25%		

Source: Federal Reserve Bulletin 2012. Prepared by the authors.

Graph 3: Percentage Allocation of the major investments held by US investors

Source: Federal Reserve Bulletin 2012. Vertical bars in black represent the non-financial investments; the gray vertical bars represent financial investments. Prepared by the authors.

5.   Conclusion

This empirical study examines the level of portfolio diversification of Brazilian investors, focused on aspects that can influence the portfolio diversification, and the intrinsic characteristics that can lead investors to allocate financial resources in risky assets, furthering the discussion on the investment decisions within an emerging economic context. Moreover, the study shed light in possible cognitive influences built by behavioral finance theory.

From a new and heterogeneous database composed of 500 Brazilian investors and 2,224 observations of investments, it became clear that the Brazilian investors allocate their resources in under-diversified portfolios concentrated on average in only four different types of investments. In addition, investors allocate approximately 92% of their resources in low-risk assets. Brazilians investments are polarized in fixed income assets reinforcing the conservative investor profile.

Results suggest that the characteristics of investors studied can play an important role in the Brazilian investment decisions. The results indicate that investors endowed with higher education tend to have a higher rate of portfolio diversification. In addition, married investors tend to have more diversified portfolios, distributing its resources in different assets.

Investment decisions of Brazilian lead to a low portfolio diversification allocated primarily in low-risk assets, and it may be related to limitation of investor rationality theory

advocated by the Modern Theory of Finance. Economic, sociological and psychological concepts may play an important role to explain the economic decisions in real life. Thus, investment decisions may be subject to behavioral influence defined in Behavioral Finance literature.

Among the characteristics that lead the investor to allocate resources in risk assets are age, gender, marital status and education level.

Although the study achieve the proposed objectives, there are caveats that need to be identified, such as the possible bias generated by the investment database and the benchmarks adopted. These issues do not invalidate the evidence obtained during this study, but serve as a warning to the possibility of new evidence by the improvement in the dataset.

As a suggestion for future studies, apply or develop models that best explain the relationship between investment decisions and the effects of psychological biases defined by Behavioral Finance. New studies can contribute significantly to better understand the purpose of this study and the replication of the study covering a larger number of investors' portfolios.

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