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INFLUENCE OF LEVEL OF STUDY AND GENDER ON RISK AVERSION AND LOSS ACCORDING TO PROSPECT THEORY

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ABSTRACT

The modern theory of finance presupposes efficiency of the markets, rationality of its agents and search for the maximization of utility. Behavioral finances challenge these assumptions, claiming that human beings are risk averse in tems of gain situations; however, individuals assume risk when dealing with losses, which is a loss aversion. The objective of this study is to verify whether there are differences regarding the degree of risk aversion and loss as a function of study time and gender. The prospects of Kahneman and Tversky were replicated to 396 students and 31 professors of the administration course of a university center of the state of Santa Catarina, Brazil. The data were analyzed in two steps: in the first, an analysis of the frequencies of the answers was made; In the second, the results were analyzed by groupings between teachers and students and by the gender of the respondents. The chi-square test was used to verify differences in responses. The results indicate that study time does not influence risk and loss aversion. In the comparative by gender, it was verified that this can affect the aversion to the risk, but not the losses. Women have shown greater risk aversion, but both are equally averse to loss.

Descriptors: Behavioral finance; Theory of Prospects; Risk aversion; Loss aversion.

1. INTRODUCTION

The main concepts of modern finance have emerged through the incorporation of the dominant paradigm of the rationality of its agents. A rational decision is one that is reflexive, deductive, slow, conscious, and subject to rules (Santos *et* Barros, 2011). The *Teoria da Utilidade Esperada* (TUE - Expected Utility Theory) is born under this premise. The TUE advocates that its agents be rational people, capable of imagining a precise ordering of decision alternatives, associating each of their actions with real value (Cappellozza *et* Sanchez, 2011). By doing so, the results are perfectly predictable, with no chance of errors.

For Halfeld *et* Torres (2001), in the late 1980s and early 1990s, modern finance theory began to wear out due to the constant financial market anomalies. The various events that have shaken the financial system all over the world have put this model increasingly in check. Financial crises, speculative bubbles, and rising stock prices, immediately followed by a sharp fall from rumors without apparently a plausible reason for doing so, caused another stream of thought to begin to emerge. In this scenario, Behavioral Finance Theory has been gaining notoriety and increasing adherence. The main premise of this new theory vehemently disputes the rationality that the mainstream defends.

Behavioral finance comes from the work of two Israeli psychologists, Daniel Kahneman and Amos Tversky, entitled Prospect Theory: an analysis of decision under risk, published in 1979. In this paper, the authors investigated human behavior and the way decisions are made in conditions of risk. The rationality of the human being was put in check and became increasingly weakened by the different experiments done by the authors. Kahneman *et* Tversky (1979) argue that decisions are influenced by biases and cognitive illusions, called heuristics, that lead humans to make mistakes. The mental process reduces reality to a simple model that allows the human being to make decisions quickly. This kind of attitude helps in many situations, but in others it leads to involuntary cognitive errors. Heuristics make us believe that the deci-

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sions made are the most appropriate, without actually being.

Kahneman *et* Tversky (1979) performed a series of problems involving gain and loss prospects with two alternatives each and asked people to decide on one according to their best judgment. After a series of tests, they proved that the human being is risk averse in gain situations, but takes risks in situations of loss. The test results clearly show the cognitive biases in the decisions and that the expected utility is usually not considered. Faced with two alternatives involving gain, one containing a guaranteed gain, although smaller, and the other a probability of gain, but greater, people usually choose the alternative that generates the certain and minor gain. Conversely, in choosing two prospects involving a guaranteed but smaller and probable but higher value prospect, people prefer the probable greater loss to the lower guaranteed loss. This gave rise to the two main concepts guiding prospect theory: risk aversion and loss aversion. Prospects that measure risk aversion are in the realm of the certainty effect. The intersection of the loss and gain prospects is in the domain of the isolation effect.

The objective of this work is to verify whether there are differences in the degree of risk aversion and loss due to the time of study and gender. The study was applied to students and professors of the undergraduate course in Administration of a University Center in state of Santa Catarina, Brazil. The manifestations of certainty, reflex, and isolation effects will be studied. It tries to answer the following questions: 1) Does the student's stage contribute to greater risk aversion? 2) Do students in the early stages of the management course tend to be more risk-averse and loss-oriented final-stage students or teachers? 3) Does the gender of people change the perception of risk?

The article contains, in addition to this introductory section, four others. The second section addresses the issues of behavioral finance theory and prospect theory that support the tests that will be applied to course students and teachers. The third section describes the methodology used in the paper. The fourth presents the results and the discussions, and finally the fifth deals with the final considerations.

2. THEORETICAL REFERENCE

Santos *et* Barros (2011) argue that traditional finance theories were constructed based on a neoclassical microeconomic approach whose central paradigm is the rationality of economic agents. They are skilled people who are able to correctly update their beliefs when receiving new information and their decisions are consistent with the concept of Subjective Expected Utility. It deals, therefore, with the vision of Homo Economicus, a man without feelings and motivated only by selfishness and ambition (Santos *et* Barros, 2011).

The Modern Theory of Finance has its beginning marked with the *Hipótese da Eficiência de Mercado* (HEM - Market Efficiency Hypothesis) and it was born in close relation with the Theory of the Expected Utility. HEM was originally conceived by Fama (1970), and according to this hypothesis, in the efficient market, bond prices reflect all available information and the only change that can occur is the result of new information. In this context, deviations between expected value and actual value are treated as momentary anomalies; however, the efficient market model will soon adjust, causing prices to return to normal. HEM's argument is that if there is a deviation between the real price of the asset and the price practiced in the market, an opportunity arises to obtain gains from arbitrage.

According to HEM, there is a balance in terms of competitive markets caused by the rationality of its agents. This is the classical view of the theory of modern finance which, according to Santos *et* Barros (2011), is based on human behavior assuming that people have preferences known, act on the basis of complete information and are perfectly rational, seeking to maximize the utility of their decisions. Malkiel (2003) disputes the idea of market efficiency. He states that, when new information comes up, the news spreads very quickly and is incorporated into the bond prices without delay. Thus, no technical analysis, even fundamentalist, helps investors, not allowing them to obtain higher returns than could be obtained by performing a randomly selected compatible risk portfolio (Malkiel, 2003).

Kimura *et al*. (2006) explain that human behavior is influenced by several psychological factors, which can distort the identification and perception of facts. According to the authors, this behavior leads to a decision based on individual judgments, in which the rationality defended by the utility theory cannot be obeyed. Yoshinaga *et al*. (2008) complement, expressing that there is a vast set of empirical evidence produced in the last decades that reveal that the available theories based on the rationality of the people are not able to explain the several phenomena regularly observed in the financial markets to the satisfaction.

Haufeld *et* Torres (2001) say that Behavioral Finance appears in this scenario as an attempt to perfect the Modern Finance Theory model by admitting that man

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is not totally rational, and that he often acts in an irrational way, has his decisions influenced by emotions and cognitive errors and almost always understands the same problem in different ways, depending on the way it is analyzed. Behavioral Finance unites the traditional concepts of microeconomics and corporate finance with the psychological and sociological concepts present in human behavior. His field of study seeks to identify how emotions and cognitive errors can influence the decision-making process of investors and how their behavior patterns can influence the market.

Yoshinaga *et al*. (2008) explain that the limit for arbitrage shows that irrational investors cause deviations from observed prices regarding the real value of assets and rational agents have restrictions to take advantage of the resulting opportunities for gain. They cite six factors that cause biases that are related to the beliefs of individuals: 1) overconfidence: because they rely too heavily on their estimation skills and they ignore the uncertainties in the process; 2) optimism: they fantasize their abilities and possibilities too much, and always believe that they can do better than they actually do; 3) representativeness: for many, the probability of occurrence of an event is related to the probability of occurrence of a group of events represented by the specific event; 4) perseverance: people usually have formed opinions and are reluctant to search evidence that contradicts their beliefs, and when they do, they view them with skepticism; 5) anchoring: people construct their estimates from an initial value, based on whatever information is provided to them; 6) availability: the most frequent and/or most likely events are the most remembered ones and people forget the less frequent events and improbable things.

The main concept worked out by Behavioral Finance is that of loss aversion. It is based on Kahneman *et* Tversky's (1979) finding that people feel much more the pain of loss than the pleasure of an equivalent gain. According to Haufeld *et* Torres (2001), this thesis contradicts the microeconomic precept of the Utility Theory, which assumes that investors evaluate the risk of an investment according to the change it provides in the level of wealth. The concept of loss aversion is often confused with risk aversion. But, according to Kahneman *et* Tversky (1979), the feeling of loss is much stronger in people and prevails.

The Theory of Prospects of Kahneman *et* Tversky (1979) was responsible for the emergence of the field of Behavioral Theories in finance. According to Yoshinaga *et al*. (2008) its bases are: a) gains and losses are evaluated against a neutral reference point; B) the potential results are expressed in terms of gain or losses relative to the fixed neutral point; C) the choices are governed by a value function in the form of an "S"; D) the way the problem is presented can change the neutral point of reference; E) human beings have a tendency to undervalue events of medium and high probability.

Kahneman *et* Tversky (1979) studied behavior through two domains: that of gains, when comparing problems involving guaranteed gain prospects and probable gain; and that of losses, when comparing problems of prospects with guaranteed loss and probable loss. In addition to these two situations, the authors have elaborated some problems involving decision-making prospects at risk. They involved two alternatives that said the same thing, but in different ways. From this logic, it was possible to observe some systematic behaviors, called effects. The certainty effect, according to Cappellozza *et* Sanchez (2011), refers to the valuation by the right options of gain compared to options that involve some uncertainty. Even if the uncertain option provides an expected utility of greater value, in win situations the psychological bias of the valuation of certainty translates into greater aversion to risk. The contrast of the certainty effect with prospects of loss generates the so-called reflection effect. It is observed that there is a behavior which can be characterized preferably in the field of losses. Generally, when the decision maker is faced with situations involving certain lower losses and probable higher losses, the preference lies in the probable higher losses (Cappellozza *et* Sanchez, 2011). From this effect comes the concept of loss aversion. The framing effect, treated by other authors as an isolating effect, is described by Cappellozza *et* Sanchez (2011) as the one that consists of the tendency for decision makers to mentally formulate their decision alternatives based on external aspects different from their objectives, leading to decisional inconsistencies. The choice for the alternative may be different depending on how the problem is exposed.

3. METHODOLOGY

To reach the proposed objective, a field research was carried out with students and professors of the administration course of a university center of the state of Santa Catarina, Brazil. The sample was chosen for convenience and therefore it is intentional and not probabilistic. The questionnaire used for data collection is a replica of the original model proposed by Kahneman *et* Tversky (1979), except for questions one to four elaborated in this paper to draw the profile of the respondents. The instrument has sixteen problems with two prospects each (A or B), which allow the analysis of three effects. The certainty effect: involves problems from number five to 12 containing, including only gain situations; Reflex effect: problems 13 to 16 containing loss situations; Isolation

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Effect: Problems 17, concerning probabilistic insurance and the prospects 18 to 20 Concerning a two-stage game.

Data collection took place on April 04 and 08, 2013 involving all the students present in the classroom at the time of the research and from April 04 to 12, 2013 with the teachers. All those involved responded voluntarily to the survey. Objectives were not revealed not to influence responses. The researcher only asked each participant to answer the questions according to their best judgment without worrying about having a right or wrong answer. The sample comprised 427 respondents, of whom 396 were students (64.5% of the total) and 31 professors (73.8% of the total).

The data were analyzed in two steps. The first involves a global analysis of the responses without the pretense of comparisons between groups. The objective was to verify the manifestation of the concepts aversion to risk and aversion to loss. For this step, frequency distribution and the non-parametric chi-square test were used in order to verify if the proportions of answers between the prospects of the problems present significant differences.

The second stage of the analysis was done in three different ways. The first, comparing all the phases involving only students. The second was done by grouping teachers and students. The grouping was done as follows: group 1 – students from 1st to 3rd phases; group 2 – students from 4th to 6th stages; group 3 – 7th and 8th grade students; group 4 – teachers. The objective was to verify whether there are significant differences between the respondents due to the study time. The third comparison was by gender, aiming to know whether this can influence risk aversion and loss aversion. This step of the analysis was supported by the non-parametric chi-square test. The tests were performed using SPSS software version 21. A 95% confidence interval was used, as well as significant differences whose asymptotic significance level was less than 5%.

The hypotheses tested are:

H1: Study time influences risk aversion;

H2: Study time influences loss aversion;

H3: Gender influences risk aversion;

H4: Gender influences loss aversion.

The chi-square statistic allows us to identify whether there is a difference between the groups analyzed; however, if it exists, it does not identify what this difference is related to. In the comparison by phase grouping it was possible to detect a point difference in one of the prospects. In order to know where the difference is in fact, post hoc tests were performed, taking group one as a control group, and then the other groups were compared in relation to it. Nonetheless, Field (2009) says that we must be careful with post hoc tests in order not to inflate the Type I error rate. Type I error occurs when we believe there is a true effect on the sample, but it does not exist. To eliminate this bias, we used the Bonferroni correction, which consists in dividing the critical significance value 0.05 by the number of tests performed (Field, 2009).

The study has some limitations. Due to the fact that the data collected in a sample for convenience and therefore non-random, and limited to a single higher education institution, the results cannot be generalized. They only point to a specific situation of a group of respondents from that course and that institution. It is possible that the replication of the study to another population of this or another institution produces different results.

Another factor to consider is the values of the prospects. They may be distant from the yield range of many sample elements. Income can be a key factor in risk-taking behavior. In addition, prospectuses are hypothetical and therefore without linking with real situations to most respondents. Such factors can lead to possible biases in the results indicated by the research.

4. RESULTS AND DISCUSSION

The first part of the analysis seeks to show a pattern of behavior among the interviewees, detecting whether they are more or less risk averse in situations of gain and more or less risk averse in situations of loss. The first 12 problems proposed by Kahneman *et* Tversky (1979) allow the certainty effects and isolation effect to be identified. Problems 5 through 12 involve sure-win prospects, and problems 13 through 16 refer to losses. The latter, when compared to opposite competing gain prospects, make it possible to detect the insulation effect. Table 1 shows the pairs of prospects, the proportion of responses, the chi-square statistic value, and the significance level (asterisked values are significant).

The Theory of Expected Utility says that decisions must be made based on the one that provides the greatest benefit. Between two alternatives, A and B, A should be chosen if U (A) > U (B), that is, A is preferable to B ($A \succ B$). The expected utility for problem five is denoted by 0.33 U (2500); 0.66 U (2400); 0.01 U (0) = 2409 > U (2,400) = 2.400; thus $A \succ B$. Table 1 shows that the choice of most participants was alternative B (67.2%) and not

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Table 1 - Percentage distribution of frequency of responses in prospectus and chi-square statistic

Alternative A = 32,8% 33% chance of winning $ 2,500.00 66% chance of winning $ 2,400.00 1% chance of winning $ 0.00	Alternative B = 67,2% [X2 = 50,61, (p < 0,001)]* 100% chance of winning $ 2,400.00
Alternative A = 47,8% 33% chance of winning $ 2,500.00 67% chance of winning $ 0.00	Alternative B = 52,2% [X2 = 0,85, (p > 0,05)] 34% chance of winning $ 2,400.00 66% chance of winning $ 0.00
Alternative A = 29,8% 80% chance of winning $ 4,000.00 20% chance of winning $ 0.00	Alternative B = 70,2% [X2 = 69,45, (p < 0,001)]* 100% chance of winning $ 3,000.00
Alternative A = 47,9% 20% chance of winning $ 4,000.00 80% chance of winning $ 0.00	Alternative B = 52,1% [X2 = 0,76, (p > 0,05)] 25% chance of winning $ 3,000.00 75% chance of winning $ 0.00
Alternative A = 23,7% 50% chance of winning a three-week trip to England, France and Italy. 50% chance of not winning anything	Alternative B 76,3% [X2 = 118,56, (p < 0,001)]* 100% chance of winning a one-week trip to England
Alternative A = 44,0% 5% chance of winning a three-week trip to England, France and Italy. 95% chance of not winning anything	Alternative B = 56,0% [X2 = 6,09, (p < 0,05)]* 10% chance of winning a one-week trip to England 90% chance of not winning anything
Alternative A = 29,3% 45% chance of winning $ 6,000.00 55% chance of winning $ 0.00	Alternative B = 70,7% [X2 = 72,71, (p < 0,001)]* 90% chance of winning $ 3,000.00 10% chance of winning $ 0.00
Alternative A = 63,1% 0.1% chance of winning $ 6,000.00 99.9% chance of winning $ 0.00	Alternative B = 36,9% [X2 = 29,41, (p < 0,001)]* 0.2% chance of winning $ 3,000.00 99.8% chance of winning $ 0.00
Alternative A = 73,8% 80% chance of losing $ 4,000.00 20% chance of losing $ 0.00	Alternative B = 26,2% [X2 = 96,51, (p < 0,001)]* 100% chance of losing $ 3,000.00
Alternative A = 54,5% 20% chance of losing $ 4,000.00 80% chance of losing $ 0.00	Alternative B = 45,5% [X2 = 3,39, (p > 0,05)] 25% chance of losing $ 3,000.00 75% chance of losing $ 0.00
Alternative A = 70,1% 45% chance of losing $ 6,000.00 55% chance of losing $ 0.00	Alternative B = 29,9% [X2 = 68,80, (p < 0,001)]* 90% chance of losing $ 3,000.00 10% chance of losing $ 0.00
Alternative A = 57,6% 0.1% chance of losing R $ 6,000.00 99.9% chance of losing $ 0.00	(Alternative B = 42,4% [X2 = 9,71, (p < 0,01)]* 0.2% chance of losing R $ 3,000.00 99.8% chance of losing $ 0.00

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A (32,8%), which provides a possibility of greater gain, even considering that there is a 1% chance of not winning anything. The chi-square test demonstrates that the difference in proportions between the responses is significant (p <0.001).

The answers to problem six were divided, revealing indifference. Note that alternative B presents only 1% more chance of gain than alternative A and a monetary value only 4% above. If analyzed closely, it is analogous to the previous problem; however, it eliminates 66% probability of gain of R $ 2,400.00 in both alternatives. By the expected utility rule, 0.33 U (2500) = 825 and 0.34 U (2.400) = 816, which means that A ≻ B. Alternative B had a slightly higher proportion of responses to alternative A, resulting in a non-significant statistical difference (p> 0.05). A probability of gain of only 1% made people present a behavior of almost indifference among the alternatives.

Problem seven confirms the behavior of not making a decision by the reasoning of the greatest utility. Option A would be more advantageous than B, since 0.80 U (4000) > U (3,000). The difference in the proportion of gain would be even greater and, even so, 70.2% opted for B, confirming the option for the right gain to the probable gain, even if the probable result is greater.

Problems nine and ten presented in Table 1 involve non-financial gains. The number nine presents in A 50% chance of winning a trip of three weeks to England, France and Italy and B 100% of winning a trip of a week to England. 76.3% opted for B and 23.7% for A, again demonstrating the option for the sure-win to the probable gain. This difference is significant (p <0.001). On the other hand, the ten A prospect reduces the chance of winning the trip from three weeks to only 5% and the ten B prospect reduces the probability of 100% to 10% of winning a trip of one week. Here again, even involving nonfinancial gain, it seems that the small difference in the probabilities of gain induces indifference among the alternatives. 56.0% opted for B and 44.0% for A. The difference was not significant (p> 0.05).

Problem 11 has a 45% chance of earning R$ 6,000.00 in prospectus A and 90% of earning R$ 3,000.00 in B. The two are equivalent (A ^ B): 0.45 U (6,000) = 0,9 U (3000). The proportion of responses B was 70.7% versus 29.3% for A. The difference is significant at p <0.001. Problem 12 maintains the same values as above but substantially reduces the chances of gain to the minimum point of 0.1% for A and 0.2% for B. In this case, 63.1% opted for A and 36.9% for B, indicating a statistically significant difference after p <0.001. These results indicate that, when there is a chance of winning, although it is almost unlikely, the choice falls on the higher value prospect.

The profiles of the responses of the earnings problems clearly demonstrate that the Expected Utility Theory was violated and, in most cases, the differences between the responses were statistically significant. This corroborates with the Behavioral Finance literature that says that the human being does not make his decisions always opting for the alternative that provides him with greater expected utility. The results of this research are in line with those found in the studies of Kimura *et al*. (2006) and Silva *et al*. (2009), as well as they are aligned with the pioneering work of Kahneman *et* Tversky (1979) with a few exceptions. The studies confirm that human beings are risk averse in situations of gain. They prefer to earn less, but a guaranteed gain to a greater probable gain.

Prospects that involve loss situations, when compared to their gain equivalents, make it possible to perceive the reflection effect. Kimura *et al*. (2006) explain that the reflection of prospects around zero reverses the order of preference. The way a problem is exposed changes its interpretation. Table 1 compares the responses obtained for each prospect involving loss situations with their respective gain equivalents.

Table 1 - Reflection Effect. Comparison of loss prospects with gain equivalents

Problem	Altern.	Loss Prospect	% Resp.	Problem	Altern.	Gain Prospect	% Resp.
13	A	80% de -R$ 4.000	73,88*	7	A	80% de +R$ 4.000	29,8
	B	100% de -R$ 3.000	26,2		B	100% de +R$ 3.000	70,2*
14	A	20% de -R$ 4.000	54,5	8	A	20% de + R$ 4.000	47,9
	B	25% de -R$ 3.000	45,5		B	25% de +R$ 3.000	52,1
15	A	45% de -R$ 6.000	70,1*	11	A	45% de + R$ 6.000	29,3
	B	90% de - R$ 3.000	29,9		B	90% de +R$ 3.000	70,7*
16	A	0,1% de -R$ 6.000	57,6**	12	A	0,1% de +R$ 6.000	63,1*
	B	0,2% de -R$ 3.000	42,4		B	0,2% de +R$ 3.000	36,9

* Significant at p <0,001

** Significant at p <0,01

Source: Authors

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All the problems involving situations of financial losses, except problem 16, present answers in the same proportions, but in the opposite direction. This proves the existence of the reflection effect. Likewise, it contributes to the hypothesis previously raised that small differences in probabilities, but now of loss, lead people towards indifference. It should also be noted that there seems to be a distinct propensity to always opt for the probable loss, even if it is greater, to the smaller and certain loss. The pleasure of loss is so strong that it prevails over the joy of a gain. The existence of risk-of-loss propensity, which gave rise to the so-called loss aversion, should be highlighted.

Kahneman *et* Tversky (1979) also tested how people act in risk-taking decision situations that do not involve immediate gain or loss. This is the problem of probabilistic insurance. In this hypothetical situation, the person pays half the premium of conventional insurance. However, if an accident occurs on an odd day, the insured would pay the other half of the premium and have the losses compensated. However, if the accident happened on an even day, the insured would receive the amount of the premium paid for and would not have the losses compensated. The option would be to buy or not probabilistic insurance. Only 36.4% of respondents would buy probabilistic insurance and 63.6% would not buy, indicating a conservative position of risk aversion. This difference is significant at p <0.001.

The isolation effect was proposed by Kahneman *et* Tversky (1979) because, in general, people tend to simplify the decision process by disregarding important information and they also do not consider the fact that the same problem can be presented in different ways, influencing the decision. The prospects involved a game where participants had a 75% chance of not moving into the second round. However, if they went on to the second stage, they would have the option to choose 80% chance of winning R$ 4,000.00 or 100% chance of a guaranteed gain of R$ 3,000 (Problem 18). In the next round, the player would receive another R$ 1,000.00 and would have the option to choose between 50% to win R$ 1,000.00 or 100% to win R$ 500.00 (Problem 19) and, in the last round, they would receive R$ 1,000.00 and would choose between a 50% chance of losing R$ 1,000 or 100% chance of losing R$ 500.00 (Problem 20). Table 2 shows the proportions of the responses to the isolation effect problems.

In analyzing Problem 18 by the expected utility, we have A = 0.25 U [0.80 U (4.000)] = 800 and B = 0.25 U [U (3.000)] = 750, A $\succ$ B. This problem is identical to problem 8 shown in Table 1. Here again, the choice falls on the guaranteed gain option, alternative B (74.9%, significant at <0.001). In addition to not evaluating the expected utility, people have neglected information that the game could end in the first stage. Problems 19 and 20 provide the same variation in net wealth. The person earns R$ 1,000.00 in the next round of the game and a further R$ 125.00 by choosing option A or B from problem 19 and, in the sequence he earns another R$ 1,000.00 and loses R$ 125 by choosing the option A or B of Problem 20. Again, there is confirmation that the fact that the choice lies in the guaranteed gain option (Problem 19, option B with 63.2%, significant at <0.001) and probable loss, although higher (Problem 20, option A = 60.9 %, significant at p <0.001). They ignore the fact that problems 19 and 20 are identical, but exposed in different ways, as well as they also ignore the fact that the variation in terms of net wealth, with the choices of the two options of problem 19 and 20, are zero.

The second part of the analysis aims to verify whether the progress in the time of studies and whether gender contributes to differences between the profiles of the answers. It begins by testing the hypotheses H_1 and H_2 to determine whether study time influences risk aversion and loss aversion. First the students' responses were tested between the eight phases of the course and, in the sequence, were made comparative by groupings. The latter involves students and teachers of the course divided into four groups: group one is composed of 159 students from the 1st to the 3rd phase; Group two is formed by 112 students from the 4th to the 6th phase; group three comprises 125 students from the 7th and 8th phases and group four is composed of 31 teachers of the course. Table 3 shows the results of the chi-square statistics between the eight phases of the course and between the groups.

Table 2 - Isolation Effect. Frequency of response of problems 18, 19 and 20.

Problem	A		B		Total	
	N	%	N	%	N	%
Problem 18	107	25,1	320	74,9*	427	100,0
Problem 19	157	36,8	270	63,2*	427	100,0
Problem 20	260	60,9*	167	39,1	427	100,0

* Significant at p <0,001
Source: Authors

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Table 3 - Chi-square statistics for differences between phase and phase groups

Problem	Difference between Phases (1st to 8th)			Difference between groups		
	X^2	df	p. value	X2	df	p. value
Gain 5	6,951	7	0,434	2,784	3	0,426
Gain 6	2,164	7	0,950	0,326	3	0,955
Gain 7	7,372	7	0,391	2,408	3	0,492
Gain 8	2,648	7	0,916	3,338	3	0,342
Gain 9	5,038	7	0,655	0,848	3	0,838
Gain 10	10,430	7	0,165	7,566	3	0,056
Gain 11	5,389	7	0,613	4,685	3	0,196
Gain 12	11,073	7	0,135	6,343	3	0,096
Loss 13	4,324	7	0,742	2,592	3	0,459
Loss 14	2,577	7	0,921	0,198	3	0,978
Loss 15	5,247	7	0,630	11,677	3	0,009*
Loss 16	2,257	7	0,944	0,298	3	0,960
Problem 17	5,513	7	0,598	4,823	3	0,185
Game 18	7,192	7	0,409	2,793	3	0,425
Game 19	5,344	7	0.618	6,417	3	0,093
Game 20	9,243	7	0,236	0,634	3	0,889

* Significant at p <0,01
Source: Authors

According to the results indicated in Table 3, it is verified that there is no association between the phases that the students study in relation to the risk aversion in the gain situations nor in the situations of loss, that is, there is no difference in the patterns of responses between students regardless of the stage in which they are in the course. However, there is an isolated difference in problem 15 in the comparative by groupings. Nonetheless, it is not possible to tell among which groups this difference lies. To discover it, group one was considered as the control group and the others were compared. In this case, the level of significance was reduced to 0.017 according to the Bonferroni correction. Table 4 shows the results of the paired group test for problem 15.

Table 4 - Comparison between Problem 15 groups (loss 15)

Comparative	X^2	df	p. value
Group 1 x 2	0,556	1	0,485
Group 1 x 3	1,786	1	0,227
Group 1 x 4	11,466	1	0,002*

* Significant at p <0,017 according to Bonferroni's correction
Source: Authors

It is possible to notice that this problem only presents significant difference between groups one and four. Most of the students opted for alternative A (75.5%), while the preference of teachers was for B (54.8%). Students prefer a 45% chance of losing R$ 6,000.00 and teachers risked a 90% chance of losing R$ 3,000.00. The usefulness of both prospects is exactly the same (losing R$ 2,700.00), but the lower probability of prospectus A was predominant in the choice of students, demonstrating a greater loss aversion. But because it is only an isolated case, the results indicate that the evolution in the study time does not contribute to the rational decision making according to the Theory of Expected Utility. Cognitive biases persist with study time.

Thus, H_1 is rejected because the study time does not influence risk aversion and H_2 is rejected, since the study time does not influence loss aversion. As described in the introductory part of this paper, the National Curriculum Guidelines of the Management Course assert that students must be able to make decisions as well as they must have competence and ability to operate with mathematical values and formulations present in the causal relationships between phenomena. Students and management professors make decisions that ensure a guaranteed gain, even being smaller, to a probable and greater gain, evidencing risk aversion. In situations of loss, they decide on the probable loss with greater value to the guaranteed loss of smaller value, evidencing loss aversion. Risk aversion and loss aversion persist regardless of study time.

These findings are consistent with the work done by Silva *et al*. (2009) in a similar study, however, involving students of the accounting sciences course of a public university and two private colleges of a city in the northeast of the country. In this study, the authors located some isolated differences in a comparative problem by phases and two comparative problems by groups, although the groups formed did not involve teachers. The

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results indicated that the student's position in the course does not change his or her perception of risk or loss aversion.

In another study, Araújo *et* Silva (2007) also verified whether study time influences risk aversion and aversion to loss. The comparatives involved only students, also divided into three distinct groups per phase. The article does not cite the course students take, only that they have disciplines that aid in the decision process, as well as work with mathematical formulation. They conclude that the analyzed sample shows no signs of risk aversion or propensity in the case of gains, but showed a risk propensity in situations of loss, confirming loss aversion.

The next step of the analysis tests the hypotheses H_3 and H_4 that seeks to verify whether the gender of people can influence in the aversion to risk and the aversion to loss. Table 5 presents the results of the chi-square statistic and the level of significance when men were compared to women.

Table 5 - Chi-square statistics for differences between genders

Problem	X^2	df	p. value
Gain 5	0,149	1	0,757
Gain 6	8,592	1	0,004*
Gain 7	0,826	1	0,397
Gain 8	8,33	1	0,005*
Gain 9	0,456	1	0,569
Gain 10	9,573	1	0,002*
Gain 11	2,389	1	0,136
Gain 12	21,901	1	0,000*
Loss 13	0,526	1	0,510
Loss 14	0,878	1	0,381
Loss 15	1,244	1	0,290
Loss 16	1,099	1	0,325
Problem 17	0,070	1	0,840
Game 18	6,184	1	0,014*
Game 19	0,032	1	0,920
Game 20	0,036	1	0,921

* Significant at p <0,05
Source: Authors

According to the aforementioned results, it can be verified that gender may have some influence on the degree of risk aversion. Five questions point to significant differences at p <0.05; all questions involved gain. The question is what caused the differences between the groups of men and women to detect who is more risk averse in this sample. Table 6 shows the percentages of responses obtained for each of the issues in which the gender impacted on significant differences. The columns labeled % in the option demonstrate the percentage distribution of the responses between men and women in the prospectus and the last two (gender %) show the percentage of gender responses among the prospects.

The questions present a similar pattern of responses according to the choice of the alternative. For these five problems, prospectus A was marked mostly by men and B by women. It seems that women tend to be more risk averse than men. However, problems 12 and 18 exhibited a slightly different behavior of responses within the gender. When analyzing the last two columns of Table 6 (% of gender), there is an identical pattern of responses for problems six, eight, and ten. However, it is noted that, in problem 12, a little more than half, among women, opted for prospectus A, where the probability of gain is insignificant (0.1%), only the value is higher (R$ 6,000.00 against R$ 3,000.00 from B). In problem 18, in both genders, the majority opted for alternative B, which provides a guaranteed gain, that is, both ignored the information that the game would have a 75% chance of finishing in the first phase and both did not reason accordingly with the greatest utility.

For this sample, gender may contribute to the degree of risk aversion in gain situations, confirming H_3. Women prefer the guaranteed gain to the probable and men risk the greater gain. In none of the questions involving losses, the gender contributed to present significant differences in the answers. The gender did not contribute, in this sample, to greater loss aversion, rejecting H_4. Men and women are equally averse to loss.

The study by Silva *et al*. (2009) also shows significant differences between the genders for four gain problems, but a significant difference for a loss problem was found. The authors also found that women show greater risk aversion when they emphasize a gain, preferring the guaranteed gain. On the other hand, on the issue of loss, women risk more by preferring the probable loss of greater value to the certain and lower loss, evidencing a greater loss aversion.

In another study involving 91 accountants and 425 students of accounting sciences, Melo *et* Silva (2010) also found that women are more risk averse in gain situations than men. Similarly to this work, they also did not find differences between the genders in terms of loss aversion. Women do not risk their earnings and men and women are equally averse to loss.

For Nelson (2012), the claim that women are more risk-averse than men is fundamentally a metaphysical assertion in terms of unobservable essences and traits and, therefore, cannot be empirically proven. For the author, the statistical data does not capture the whole reality, thus, the results based on statistical samples cannot be

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Table 6 - Distribution % of responses by gender of problems with significant differences

PROBLEM	PROSPECT	OPTION %		GENDER %	
		MEN	WOMEN	MEN	WOMEN
Gain 6	A	55,7	44,3	55,1	40,9
	B	41,4	58,6	44,9	59,1
Gain 8	A	55,9	44,1	55,1	41,1
	B	41,9	58,1	44,9	58,9
Gain 10	A	56,9	43,1	51,7	36,8
	B	41,8	58,2	48,3	63,2
Gain 12	A	57,2	42,8	74,4	52,5
	B	33,8	66,2	25,6	47,5
Game 18	A	58,9	41,1	30,4	20,0
	B	45,0	55,0	69,6	80,0

Source: Authors

generalized. The widespread acceptance of such statements seems to be rooted in confirmation bias and not in reality. The question is essentially on the way results are expressed. Not even this study, as previous ones, can generalize the results found; however, according to the data presented for these samples, women are more risk averse than men.

5. FINAL CONSIDERATIONS

The Theory of Modern Finance takes into account the rationality of its agents. This means that decisions are always taken for the greatest expected utility. This is still the dominant doctrine of finance. The Market Efficiency Hypothesis is born carrying this premise in its essence. However, the great quantity of news that often shakes the financial market has drawn attention from psychologists and practitioners in other areas to understanding these anomalies.

Kahneman *et* Tversky (1979) pioneered the way human beings act and found that people do not make their decisions in strictly rational ways. People simplify reality by creating mental models that make decisions easier. In this simplification, there are the cognitive biases, called heuristics, which distort facts and lead to mistaken decisions without them knowing it. The greater usefulness expected in decisions is often not observed. From these results pointed out by the work of Kahneman *et* Tversky (1979), the Behavioral Finance Theory arose. They found that the human being is risk averse in situations of gain, but, they take risks in situations of loss. This finding came about because, when the problem involves gain, people avoid risk by choosing the alternative that gives them the right gain, even if it is of lesser value. On the other hand, when it comes to a loss, people usually tend to decide for the alternative that results in probable loss of greater value, rather than the right loss of lesser value. This risk propensity in situations of loss generated the concept of loss aversion.

The objective of this study was to verify whether there are differences in the degree of risk aversion and loss as a function of study time and gender. A field survey was conducted with 396 students and 31 professors from the administration course of a university center in the state of Santa Catarina, Brazil. The study tested four hypotheses: H1 and H2 verified whether study time influences risk aversion and loss aversion, and H3 and H4 whether gender influences risk aversion and loss aversion, respectively. The questionnaire used to collect the data was a replica of the original model proposed by Kahneman *et* Tversky (1979).

The results of the first part of the analysis demonstrated the three effects detected in the study by Kahneman *et* Tversky (1979). In the certainty effect, it was verified in almost all the gain problems that the people opted for the alternatives with greater probability of gain, even if this one had a smaller value. The alternatives that provide greater expected utility, those that generate greater gains, did not obtain significant answers when compared with those of guaranteed gain. This fact proves the manifestation of the certainty effect. People act on cognitive biases and do not make rational decisions. In a single gain alternative the majority of responses fell on the greater and less likely gain. This problem refers to the 0.1% chance of earning R$ 6,000 in prospectus A or the 0.2% chance of earning R$ 3,000 in prospectus B. The difference in favor of alternative A was significant because when the probability of gain is almost nil or very small, people prefer to risk in an attempt to get the highest value.

The reflex effect was also verified with the loss prospects. Between two alternatives, one that results in a certain loss of lesser value and another that presents a probability of loss, but of greater value, the more signifi-

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cant answers fell on the probable loss. It was possible to observe this for all the problems of loss. It has also been found in both profit and loss prospects that, when differences in probabilities are small, people tend to show indifference. This was verified in problems six and eight of gain and problem 14 of loss.

This work has also identified the isolation effect. The four problems of decision making at risk have shown that most people ignore relevant information, not acting rationally. This effect also indicates that the decision is influenced by the way the problem is exposed.

In the second stage of the analysis, it was verified through the tests that the study time influences neither risk aversion nor loss aversion. In the comparison of students' responses by phase, no significant differences were detected in any of the problems. In the comparative by grouping, a point difference was found located specifically between group one, which involved the students of the first three phases of the course, with group four, formed by teachers. However, because it is a single problem, H1 and H2 were rejected, that is, study time does not affect the way decisions are made. Students and teachers presented the same pattern of responses evidencing risk aversion and loss aversion.

In the comparison of the responses by gender, the results pointed out differences in five gain problems, but no differences were observed in terms of loss problems. In gain situations, women tend to be more risk averse, confirming H3. They prefer a guaranteed gain, but of lesser value, to a probable gain of greater value. Men risked more for the probable and greater gain. However, both males and females obtained the same responses in terms of loss problems, rejecting H4. Gender does not influence loss aversion.

The findings of this study are consistent with previous studies. The implications in practical terms may fall into other fields of study, such as marketing with price disclosure policies, such as spot price in a number of interest-free installments, but in case the amount is paid in cash the customer has a promotional discount. If decisions are not rational in the field of finance, they will probably not be with other issues. This opens up creative opportunities to catch the attention of consumers. In the opposite sense, behavioral research can discover mechanisms for controlling cognitive bias, so that people make their decisions in a more rational way, avoiding compulsive consumption, which causes malaise and leads people to indebtedness and default.

The possibilities for research in behavioral finance are several. One suggestion would be to replicate this study involving students from different courses with different professional profiles, such as design, fashion, and architecture and to verify whether a more creative profile can influence risk aversion and loss aversion.

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