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Anchoring effect in managerial decision-making in accountants and managers: an experimental study

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Abstract

The objective of this work was to analyze, by means of an experiment, if the type (positive or negative) and the level (simple or complex) of economic-financial information influence the anchoring effect of accountants and managers in a process of managerial decision-making. To do so, an experimental methodology targeting a sample of 86 Accountants, 68 Managers and 118 people with different professional activities (control group) was used. The results showed, in the first test without differentiation of factors (type and level), that about 96% of the participants have the anchoring effect, leaning towards minimum and maximum estimates of sales revenue, operating expenditure and result. In addition, the ANOVA and the Approximate Permutation Test brought significant evidence that the anchoring effect in minimum projections can be influenced by the type of information, not being significant for anchoring in maximum projections and for the level of information on both estimates (minimum and maximum). Finally, the conclusion is that positive information increases the anchoring effect and negative information decreases the anchoring effect in minimum estimates in relation to the low anchor.

Keywords: Anchoring. Decision-making. Cognitive biases. Behavioral finance. Behavioral economics.

Introduction

Human behavior in decision-making processes has been the focus of several different studies in the field of Behavioral Economics and Finance (Costa, Carvalho, & Moreira, 2018) that want to understand the influence of psychological, behavioral and cognitive traits in decision-making. Therefore, the studies in Behavioral Economics and Finance want to scrutinize how individuals make decisions and how they interact or influence other individuals, organizations, markets and society (Birnberg & Ganguly, 2012). Taking into account this literature, it is possible to infer that psychological and cognitive forces affect the individual and group behaviors, therefore it is necessary to gather the important characteristics that influence the decisions, going beyond the assumption of perfect rationality (Hirshleifer & Teoh, 2009).

In this context, the concept of heuristic has been discussed and used to refer to errors of judgment and strategies of simplification which people, unconsciously, rely on to make decisions, especially in uncertain and complex conditions (Busenitz & Barney, 1997; Caputo, 2014; Tversky & Kahneman, 1974). In this sense, Tversky and Kahneman (1974) presented the anchoring effect as a heuristic, depicted by the disproportionate influence that a value initially presented has on the decision-makers, i.e., estimates and judgments of the decision-maker lean towards and are influenced by the value displayed, which is called the anchor.

Having this in mind, the anchoring effect is an important bias to be researched, since it influences the processes of managerial and financial decisions (Costa, Carvalho, Moreira, & Prado, 2017), since there is a tendency for individuals to make insufficient estimates based on an initial value (Tversky & Kahneman, 1974). Furthermore, there is a research deficit in the field of managerial decision-making involving the anchoring bias (Serfas, 2011). For Schade and Koellinger (2007), there is still a great need of empirical studies on the relevance of heuristics, such as anchoring, specifically those having entrepreneurs as subjects.

With that being said, one needs to understand that the anchoring effect may adversely affect the business, since a decision may have been supported in insufficient and subjective values or information (Caputo, 2014), which can incite erroneous estimates of important variables like the profit (Schade & Koellinger, 2007). In this way, the behavioral research can improve the structure and the manner through which the content of financial information can be optimized and made available for the intended use, through the understanding of how managers and stakeholders in companies use information in their decision-making process (Birnberg & Ganguly, 2012).

In this sense, it is observed that managers use simplifying heuristics, being affected by the anchoring effect, something that may influence their behavior and decisions. This happens because the exploitation of business opportunities requires from the entrepreneur the ability to make decisions in complex situations, without thoroughly knowing all relevant facts and probabilities (Schade & Koellinger, 2007). Therefore, what is observed is that decisions are not totally rational and that the information is used only partially, or even ignored (García, 2013), allowing the decision-making process to be simplified by heuristics, including by means of the anchoring effect (Tversky & Kahneman, 1974).

These facts unleash a debate on the relationship of the anchoring effect in the use of financial and economic information in decision-making processes. Furthermore,

there is a need to understand how economic-financial information, available to make decisions, influences the anchoring effect displayed by the decision-maker, due to the fact that this information may have positive or negative trends, while also being presented in a simple and complex manner, thus increasing or decreasing the anchoring effect. This raises the following question: does the Anchoring Effect, displayed by managers and accountants in managerial decision-making processes, undergo changes when taking into account the complexity and the type of economic-financial information presented?

With that being considered, the present work emerges as an intent to analyze, by means of an experiment, if the type (positive or negative) and the level (simple or complex) of financial and economic information influence the anchoring effect presented by accountants and managers in a process of making business decisions.

Literature Review

The anchoring effect was introduced by Tversky and Kahneman (1974) in a pioneering work, which reports on judgment under uncertain conditions. The authors argue that people make estimates based on an initial value, which is adjusted to produce a final response, and that these adjustments are insufficient, because they are biased towards the initial values, i.e., different starting points produce different estimates. Previously, a study published by Edwards (1954) showed how people process probabilistic information. Its main conclusion was that people do not update their prior probabilities sufficiently when they get additional information in the form determined by the Bayes' Theorem, something that can be described as a procedure for reviewing and updating the probability of occurrence of an event in the light of new information or evidence (Everitt & Skrondal, 2010), in other words, it can be understood as learning process. The author coined the term conservatism to describe this behavior (Shapira & Shaver, 2014).

In a wide array of situations, people make their estimates from an initial value which is then adjusted to produce the final response. This phenomenon is called anchoring, since different starting points produce different estimates, hence causing a tendency towards the initial values. Moreover, anchoring not only occurs when the starting point is given beforehand, but also when the estimate is based on some result derived from incomplete calculations (Tversky & Kahneman, 1974). In this regard, when there is a need to estimate a value whose magnitude is unknown, people often begin to identify some initial default number (anchor), which is then adjusted upwards or downwards to reflect the information and subsequent analysis (Pompian, 2012). Therefore, consequences of anchoring can be explained by three different perspectives, which is to say: through anchoring and adjustment, through selective accessibility and through a change of attitude. Also, irrelevant anchors produce similar effects on judgment decisions, in comparison with anchors that have informational relevance (Furnham & Boo, 2011).

One of the most common explanations for the anchoring phenomenon is that the anchor value creates, at least temporarily, the possibility that the to-be-assed amount can be close to this value (Green, Jacowitz, Kahneman, & McFadden, 1998). In this sense, Caputo (2014) underlines that the anchor effect is a phenomenon in which individuals, to make estimates, tend to rely more on subjective and irrelevant information

and data. However, Epley and Gilovich (2006) argue that, even after 30 years of research on anchoring, it remains unclear why adjustments are not enough. On the other hand, Epley and Gilovich (2001) say that anchoring exists in judgments under conditions of uncertainty, showing that there are distinct anchoring effects, produced by different mechanisms and self-generated anchors.

For Tversky and Kahneman (1974), the initial value can be somehow suggested or it can also be the result of some partial calculation or of the thought itself. Therefore, this phenomenon may have significant implications for risky business decisions (Schade & Koellinger, 2007). Schade and Koellinger (2007) mention the example of the entrepreneur who, when estimating the potential profit of his new business, takes into account media business reports. For the authors, even though the entrepreneur is aware that the results presented by the media may be positively biased, since media reports are predominantly of successful companies, he insufficiently adjusts his own estimate, in other words, he has a tendency to overestimate the result, anchoring himself on the values presented by the media.

Addressing the insufficiency of adjustments, Epley and Gilovich (2006) gathered evidence that the adjustment is forced and that anything that increases one's willingness or ability to look for more precise estimates tends to reduce the magnitude of the anchoring bias based on an adjustment. With that, they stat that anchorage is not a unitary phenomenon, rather the product of at least two different mechanisms.

The anchor can be seen in the discussions about negotiation, in which the negotiators anchor themselves in a certain position, where unacceptable offerings are introduced as anchors. Therefore, anchors affect the standards that represent concepts and categories, influence the mapping of the stimuli values to the scales of judgment, hence influencing the judgments of all stimuli (Kahneman, 1992). In addition, Jacowitz and Kahneman (1995) describe a method for the quantitative study of anchoring effects in estimate tasks, where the subjects in an anchored condition first judge whether a specified number (the anchor) is higher or lower than the true value, before they proceed to estimate each quantity.

A standard exemplification of the anchoring effects, in any estimate of objectives or responses related to the payment provision, is to show that a yes/no question induces a polarization when responding to a subsequent open-ended question. Therefore, it is possible that the anchor can influence the monitoring of the open question, pulling the response towards the anchor (Green et al., 1998). For Green et al. (1998), one can expect stronger anchoring effects when primitive beliefs are weak or absent and also weaker anchoring effects when primitive beliefs are well established. With that, the anchor is present in several situations.

The work of Hurd (1999) has shown, in studies carried out with people to check the anchoring bias in real estate assessment, that the non-experimental data in eight categories of assets, and the experimental data on real estate values, presented anchoring effects.

The results of the experiments performed by Kaustia, Alho, and Puttonen (2008) presented a great anchoring effect in the long term regarding the respondents' expectations on stock yielding, i.e., their estimates are influenced by an initial value. In relation to financial investments, Serfas (2011) has found that the cognitive biases had an impact and actually distorted, systematically and significantly, the judgments and deci-

sions, including the anchoring itself. Furthermore, the authors demonstrate that the mean value was estimated at similar scales for both high and low anchoring positions, indicating that neither the way one incorporates the anchor, nor the level of professional experience, induce a substantial difference regarding the existence of cognitive bias.

In his research, Neumann, Roberts, and Cauvin (2011) found that the individual, when using financial and non-financial information in decision-making, anchors himself in the information presented first and on the more important or more familiar financial measures. Briefly put, the research showed that participants are anchored in the first information listed, even if they do not have a financial trait; that participants anchor themselves on measures which are more important for shareholders, regardless of the presentation order.

In relation to the accounting aspects, the levels of average profit create an anchor that serves as a basis for the assessment of new investments (Shapira & Shaver, 2014). The authors argue that the average performance values are relevant and accessible, and that these characteristics, when combined, make managers more likely to be anchored on these means when making investment decisions, therefore not adjusting their estimates to obtain better estimates. In this way, the results of this study suggest that anchoring affects the decision regarding the investment strategy. Furthermore, the study of Luppe and Fávero (2012) identified the presence of anchoring bias in the net profit estimate, pointing to a strong evidence of the presence of anchoring bias in the judgment of accountants. Therefore, the authors showed that anchoring effects are significant when it comes to estimating a financial-accounting variable; that low anchors are more influential in the respondents' estimates than high anchors, possibly due to the magnitude of the numbers presented; and that the greater the uncertainty over a certain value, the more the estimates are assimilated towards an arbitrary value (anchor).

Methodology

Experimental Design

The experiment tries to ascertain the major causes of variations of a measured response, find the conditions which give rise to a maximum or minimum response, compare the responses obtained in different configurations of controllable variables and find a mathematical model, in order to predict the future responses (Dean & Voss, 1999). More specifically, the experimental methodology deployed in the fields of behavioral economics, finance and accounting tries to observe the human choices based on data field or controlled laboratory experiments (Birnberg & Ganguly, 2012). Therefore, the experimental research in those fields is applied under controlled conditions, allowing researchers to study human behavior in situations that, under simplified terms, mimic those encountered in markets and in other forms of economic interaction (Kahneman & Smith, 2002).

Also, the work is an experimental research applied to accountants and managers of companies, whose intent is to understand if the type and level of managerial information influence the anchoring effect of these individuals. To do so, the research

had the participation of a random sample comprised of 86 Accountants, 68 Managers and 118 people with diverse professional activities, who formed the control group.

The experiment was outlined and conducted through the Internet. For this, a computerized system for measuring the anchoring bias in a simulated business environment was built, in which the information was presented to this research's respondents in a decision-making process on whether or not to open a subsidiary of a company. In addition, an internet-based research has the ability to collect data on the actual behaviors, expanding the research's scope beyond the samples that only use university and laboratory studies (Gosling & Mason, 2015).

The proposed experiment exposed this research's subjects to situations in which they had to make a managerial decision on whether or not to open a branch of a commercial company. To do that, information of economic-financial nature of the three-year matrix was made available, which was used to measure the anchoring effect. Based on the information made available, the research's subjects were asked to perform a minimum and maximum projection of the following variables: sales revenue, operating expenses and result (profit or loss), to the to-be-open branch of a fictitious company. With this, the estimates presented by the research's subjects gave subsidies to analyze the anchoring effect, through the relation of those projections with the lowest values (low anchor) and highest values (high anchor) presented by information. Thus, it is expected that the individual anchors his minimum projection in the low values presented and his maximum projection in the higher values showed for each variable to be estimated.

Taking this into consideration, the experiment has, as its intrinsic factor, the professional activity of the research's subject, i.e., if he is an accountant or company manager, in addition to relying on a control group, constituted by several professionals and students. As experimental factors of treatment, one has the type of information and the level of information. The type of information is comprised of information such as positive and negative information, i.e., positive information is the one that can positively influence the decision, such as increased revenue and profit, and the negative information is the one that can influence the decision negatively, such as decreased revenue and losses. The level of information is formed by simple and complex information, having the mind the way through which information is made available and how the volume of information is presented to individuals.

Based on experimental factors, it is a factorial experiment of 2 x 2 type, generating four separate treatments. Including the intrinsic factor, professional activity, it is a factorial experiment, with fixed effect, encompassing three factors, with intrinsic factors having two levels each, and the extrinsic factor presenting three levels, since it considers the control group as well, known as 2 x 2 x 3 (Dean & Voss, 1999), which causes a combination of twelve distinct applications of twelve treatments. The experimental treatments regarding the type and level factors can be seen in Table 1.

Table 1: Details of the treatments applied to the subjects of the research.

TREATMENTS	LEVEL OF INFORMATION	TYPE OF INFORMATION
Treatment 1	Simple	Positive
Treatment 2	Simple	Negative
Treatment 3	Complex	Positive

Treatment 4	Complex	Negative

Source: Outlined by the authors.

According to Table 1, the value 0 was assigned to simple information, the value 1 for complex information, the value 0 for positive information and the value 1 for negative information, with the division being the following: a) treatment 1 has simple information (factor level = 0) and positive information (factor type = 0); b) treatment 2 has simple information (factor level = 1) and negative information (factor type = 1); c) treatment 3 has complex information (factor level = 1) and positive information (factor type = 0); and d) treatment 4 has complex information (factor level = 1) and negative information (factor type = 1).

Also, the treatments were applied to the subjects of the research in a totally randomized way, by means of a computerized system, via the Internet, which held the draw of one of the treatments for each individual participant, whether he is an accountant, manager or participant in the control group. The random distribution, by means of draws, ensures that the results are not influenced by unknown sources (Dean & Voss, 1999).

For the random application of the experiment, a computerized system outlined, via the internet, simulating a business environment, where the information was presented to the experimental units. The use of the internet environment in research efforts has been growing and is justified due to the fact that it gathers a larger sample than research in traditional environments, because they are less expensive, have external validity and allow a high degree of automation for the experiment (Reips, 2002a, 2002b; Skitka & Sargis, 2006).

The anchoring effect has been measured by quantitative methods (Jacowitz & Kahneman, 1995) and by anchoring indexes (Caputo, 2014) with the intent to understand the patterns of the anchors established by individuals. This study uses two variables to measure the anchoring effect. The first variable is based on the anchoring index used by Caputo (2014), obtained by the following equations:

$$x = |Est - Anc|$$

$$IA = \frac{x - Min}{Max - Min}$$

In which x represents the difference between the estimate (Est) and the anchor determined in the experiment (Anc). The anchoring index (*IA*) was normalized, in which Min represents the minimum estimate of a variable performed by an individual for a given treatment and Max represents the maximum estimate performed by individuals within that same treatment. The anchoring index will be used for the low anchors and the high anchors. The closer to 0 the greater the anchor and the closer to 1 the smaller anchor. Based on this, the General Index of Low Anchoring (IABG) was found through the mean of the anchoring indexes, obtained in the low estimates of sales revenue, operating expenses and result, and the General Index of

High Anchoring (IAAG) derived from the mean of the anchoring indexes found in high estimates of the variables.

Statistical Analysis of the Experiment

The statistical approach consisted of estimating normal linear models for the experiment's response variable of interest. For such an approach, all the interactions of the three factors under analysis in each model were gathered, with these being following: professional profile (accountant, manager and others), type of information (positive or negative) and level of information (simple or complex). Thus, all the inferences took as reference the significance level of 10%.

In this way, the diagnosis of the normal models was performed with plots and hypothesis testing of the residues of each model. The graphic instruments were the quantile-quantile plot of the residues and the residual plot versus the values predicted by the model. In addition, the Shapiro-Wilks test was complementarily used alongside the quantile-quantile plot, to check the approximate normality of residues, and the Fligner-Killeen test (Conover, Johnson, & Johnson, 1981) was used as a complementary aid to the residual plot versus the adjusted values, to assess the homogeneity of the variance of residues between the groups.

To assess the consistency of the results of the normal model, when there was evidence of a violation of any of the residue-related hypotheses, approximate permutation tests were applied. These tests are valid alternatives to the analysis of variance, where the assumptions of normality or random sampling are violated and where there is evidence of the presence of outliers (Hayes, 1998). For each estimated model, the maximum number of possible permutations sampled was locked at ten million and until the standard error was less than 0.01% of the estimated value-*p*.

Within this context, the *p*-values of the F test are deemed robust when facing deviations from the normality hypothesis of residues. Meanwhile, it was important to establish a contrast with the results, given the several deviations detected in the hypotheses about the residue of a normal model. Furthermore, the *p*-values obtained with approximate permutation tests are, in general, more appropriate in cases of non-normality of residues and when the presence of outliers is found.

All analyzes were implemented using the R language (R Core Team, 2017) and some libraries developed for this language, particularly the *lmPerm* package developed by Wheeler and Torchiano (2016), which uses permutation tests to obtain p-values for the linear models available in the R language.

Results and Discussion

The research resulted in 272 participants, among them 86 Accountants (profile 1), 68 Business Managers (profile 2) and 118 people who formed the control group (profile 3), who were randomly handed one of the four treatments, comprised by factors level (simple or complex) and type (positive or negative) of financial and economic information.

Furthermore, it should be noted that the response variables General Index of Low Anchoring (IABG) and General Index of High Anchoring (IABC) were obtained by averaging the Anchoring Indexes obtained by means of a minimum and maximum projections of sales revenue, operating expenditure and result. Thus, the closer the

index is to 0 the greater is the individual's anchoring. Generally speaking, the individuals showed, on average, a high anchoring index, as highlighted in Table 2.

Table 2: Results of the level of Mean Anchoring.

Variables	Median Observed	Mean values observed	Individuals who presented IABG ≤ 0,5 and IAAG ≤ 0,5
General Index of Low Anchoring (IABG)	0,1332	0,1659	96,69%
General Index of High Anchoring (IAAG)	0,1597	0,1820	95,96%

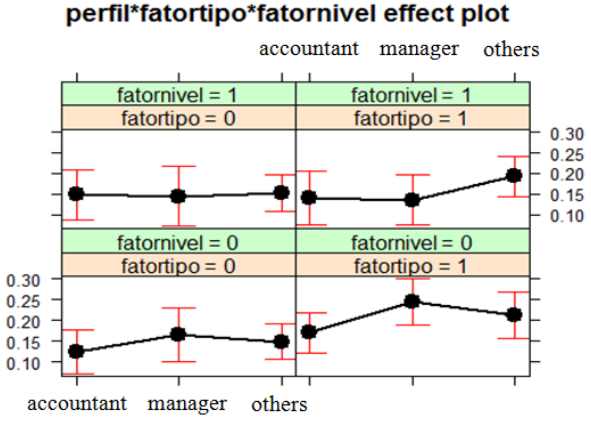
Source: Outlined by the authors.

As shown in Table 2, the medians for IABE and IAAG were, respectively, 0,1332 and 0,1597, but the means were 0,1659 and 0,1820. Therefore, it is observed that the means, both for the IABG and IAAG, are closer to 0, showing that the majority of individuals researched presented the anchoring effect. Thus, it is observed that individuals are both subjected to low anchors and high anchors (Serfas, 2011). Also, it can be observed that the low anchors ($\bar{x}$ = 0,1659) are more influential in the estimates of the respondents than high anchors, demonstrating that there is a greater tendency among individuals to be anchored in low anchors, a result that matches the findings of Luppe and Fávero (2012).

Furthermore, the anchor can be confirmed by the fact that 96.69% of the subjects researched presented indexes lower than 0,50 for the IABG and 95.96% presented indexes below 0,50 for the IAAG, showing that information with low anchors and information with high anchors were considered as anchors, respectively, for the minimum and maximum projects. With this, a high index of individuals whose projections lean towards the anchor was observed, corroborating the existing literature (Caputo, 2014; Jacowitz & Kahneman, 1995; Luppe & Fávero, 2012; Serfas, 2011).

Also, by means of an exploratory plot analysis of effects, it can be seen, in Figure 1, the behavior of the mean of the General Index of Low Anchoring for the groups of participants (accountants, managers and others) in relation to each of the four treatments, whose means were all lower than 0,5, showing that most participants were anchored in the information available in all treatments.

Figure 1: Effect plot of the mean comparison of the General Index of Low Anchoring (IABG) for each group of participants in relation to the treatments.

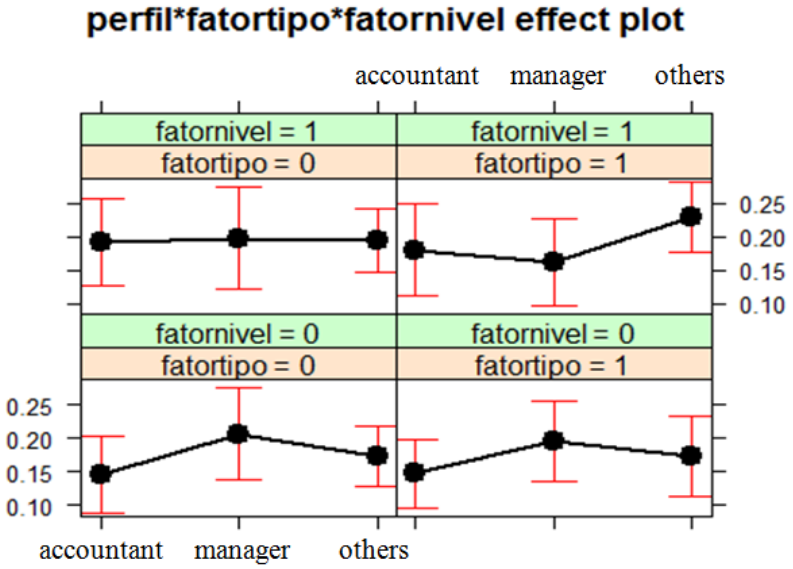


Caption: fatornivel = 0 (simple information); fatornivel = 1 (complex information); fatortipo = 0 (positive information); fatortipo = 1 (negative information); profile 1 = accountant; profile 2 = manager and profile 3 = others (control group). The closer to 0 the greater the anchoring.
Source: Outlined by the authors through the output of R.

As shown in Figure 1, the means of the IABG for all professional profiles were closer to 0, pointing out to the anchoring effect in the projections made. This phenomenon shows that individuals tend to be anchored, regardless of their professional experience, thus corroborating the findings of Serfas (2011). It is observed, qualitatively, that the mean of the accountant remained among the lowest in all treatments, being noticeably similar.

Complementarily, an effect plot for the response variable General Index of High Anchoring was elaborated, as shown in Figure 2, where it is observed that the means of the aforementioned index also were lower than 0,50 for all professional profiles in all four treatments, demonstrating that the individuals also anchored their maximum projections in the high anchor, regardless of treatment.

Figure 2: Effect plot of the mean comparison of the General Index of High Anchoring (IAAG) for each group of participants in relation to the treatments.



Caption: fatornivel = 0 (simple information); fatornivel = 1 (complex information); fatortipo = 0 (positive information); fatortipo = 1 (negative information); profile 1 = accountant; profile 2 = manager and profile 3 = others (control group). The closer to 0 the greater the anchoring.
Source: Outlined by the authors through the output of R.

As shown in Figure 2, the means of the IAAG are found between 0,15 and 0,25, values that are closer to 0, hence suggesting that individuals are anchored in the high anchor, a phenomenon that can also be seen with anchoring in low anchors (Figure 1). Also, it can be observed, qualitatively, a similarity between the trends of the IABG means of each professional profile (accountant, manager and control group) obtained

by the minimum projections (Figure 1) and the IAAG means obtained by maximum projections (Figure 2), consubstantiating the literature which says that the individual leans towards the anchors (Tversky & Kahneman, 1974), performing their estimates insufficiently, either upwards or downwards (Pompian, 2012)

In addition to the exploratory analysis, the following were performed: ANOVA (Analysis of Variance) and the Approximate Permutation Test for all interactions of the factors (Profile, Type and Level) in relation to the response General Index of Low Anchoring (IABG) and General Index of High Anchoring (IAAG), in order to obtain responses if the factors and their interactions influence the means of the indexes. Thus, Table 3 shows the ANOVA for IABG.

Table 3: Analysis of variance for the General Index of Low Anchoring.

Sources of Variation	GL	SQ	QM	FC	p-value
Profile	2	0,041	0,0205	1,206	0,3009
Type	1	0,103	0,1025	6,022	0,0148**
Level	1	0,028	0,0277	1,627	0,2032
Profile x Type	2	0,011	0,0053	0,315	0,7302
Profile x Level	2	0,056	0,0281	1,651	0,1940
Type x Level	1	0,039	0,0393	2,309	0,1298
Profile x Type x Leve	2	0,011	0,0055	0,325	0,7227
Residues	260	4,427	0,0170		

Notes: *** < 0,01; ** < 0,05; * < 0,10

Source: Outlined by the authors.

As shown in Table 3, the only significant factor was the Type (p-value = 0,0148), suggesting that the positive or negative information influences the anchoring of the individuals researched. To emphasize the results, the approximate permutation for the IABG was conducted, as shown in Table 4.

Table 4: Analysis of variance for the General Index of High Anchoring.

Sources of Variation	GL	SQ	QM	p-value
Profile	2	0,0477	0,0238	0,2491
Type	1	0,0780	0,0780	0,0325**
Level	1	0,0383	0,0383	0,1353
Profile x Type	2	0,0129	0,0064	0,6853
Profile x Level	2	0,0431	0,0215	0,2847
Type x Level	1	0,0468	0,0467	0,0988*
Profile x Type x Level	2	0,0111	0,0055	0,7230
Residues	260	4,4271	0,0170	

Notes: *** < 0,01; ** < 0,05; * < 0,10

Source: Outlined by the authors.

The results of the approximate permutation test (Table 4) indicate that the data provide evidence that the mean of the anchoring indexes obtained by means of projections of gross revenue, operating expenditure and result can be influenced by the type of information (p-value = .0325), corroborating the ANOVA results. Also, the Tukey Multiple Comparison Test (p-value = 0,0350) suggests that there are signifi-

cant differences between the means of the General Indexes of Overconfidence in relation to the type of information.

In this way, it can be inferred that there are differences in low anchoring among the individuals who received positive information in contrast with those who received negative information, and this anchoring was measured by the General Index of Low Anchoring. Although, with both types of information, the IABG means were closer to 0, demonstrating the anchoring of individuals, the positive information, on average, generated a greater anchor ($\bar{x}$ = 0,1475) than negative information did ($\bar{x}$ = 0,1854). With this, it is assumed that positive economic-financial information increases the anchoring and the negative one decreases the anchoring for minimum projections. This fact may have consequences in the managerial decision-making process, since anchoring in positive information may trigger the presence of overconfidence (Russo & Schoemaker, 1992) and, consequently, predispose the individual to an error in their decision-making, even when venturing into a business (Schade & Koellinger, 2007).

Complementarily, the ANOVA was performed to assess if there are differences in the means of the General Index of High Anchoring, in relation to the factors and their interactions, as shown in Table 5.

Table 5: Analysis of variance for the General Index of High Anchoring.

Sources of Variation	GL	SQ	QM	FC	p-value
Profile	2	0,050	0,0249	1,283	0,279
Type	1	0,000	0,0001	0,008	0,929
Level	1	0,035	0,0346	1,781	0,183
Profile x Type	2	0,020	0,0101	0,519	0,596
Profile x Level	2	0,048	0,0237	1,221	0,297
Type x Level	1	0,000	0,0003	0,020	0,889
Profile x Type x Leve	2	0,013	0,0063	0,326	0,722
Residues	260	5,061	0,0194		

Notes: *** < 0,01; ** < 0,05; * < 0,10

Source: Outlined by the authors.

As shown in Table 5, the ANOVA results indicate that the data do not provide enough evidence that the factors under study have some influence on the mean of the sum of the anchoring indexes obtained by means of the projections obtained by the experiment. In addition, according to Table 6, the approximate permutation test was conducted to confirm if there are no differences between the means in relation to factors and their interactions.

Table 6: Approximate Permutation Test for the General Index of High Anchoring.

Sources of Variation	GL	SQ	QM	p-value
Profile	2	0,0367	0,0183	0,3915
Type	1	0,0007	0,0007	1,0000
Level	1	0,0230	0,0230	0,2787
Profile x Type	2	0,0182	0,0091	0,6271
Profile x Level	2	0,0464	0,0232	0,3044
Type x Level	1	0,0000	0,0000	0,9739
Profile x Type x Level	2	0,0127	0,0063	0,7238
Residues	260	5,0610	0,0194	

Notes: *** < 0,01; ** < 0,05; * < 0,10

Source: Outlined by the authors.

Table 6 shows that there was no significance to any factor and no interaction between them, in other words, the results of the approximate permutation test, in turn, indicate that the data do not provide evidence that the factors under study have some influence on the mean of the sum of the anchoring indexes obtained from projections. With this, the results show that the factors, including the type of information, do not affect the high anchoring.

Before this reality, the presence of anchoring is both found in minimum projections in relation to the low anchor, as in maximum projections in relation to the high anchor. Meanwhile, the type of information influences the anchoring for projections in relation to the low anchor, but do not influence the anchoring for projections in relation to the high anchor. Therefore, it can be inferred that the type of information (positive or negative) tend to influence the anchoring of individuals in minimum projections, not influencing the anchoring in maximal projections. Such circumstances can be justified by overconfidence, since individuals tend to anchor in a value, not making the necessary adjustments (Russo & Schoemaker, 1992). With this, it is suggested that low anchors emphasize specifically the type of information (positive or negative), thus allowing a better adjustment in projections than low anchors.

Considering the above, the anchors may impact and distort a decision to be taken (Serfas, 2011). With positive information, the anchor may lead the individual to take make a detrimental decision, since this kind of information exposes the decision maker to a win-win situation. On the other hand, the negative information may also lead the subject to a decision that is not consistent with reality, since this type of information can imply a certain danger, making him assume a conservative position, not suitable to the real environment. Also, in both cases, individuals tend to overestimate the results, anchoring in the values presented (Schade & Koellinger, 2007), since adjustments are often insufficient (Tversky & Kahneman, 1974) and forced (Epley & Gilovich, 2006).

Finally, the anchoring bias can lead individuals to be anchored in values that do not represent the best information to take the best managerial decision, since people tend to be anchored in the first information presented, regardless if that information is financial or non-financial (Neumann et al., 2011). Such is the case of estimating future results based on profits from previous years (Luppe & Fávero, 2012; Shapira & Shaver, 2014), which are insufficient, given that managers do not seek enough information to obtain the best estimates (Shapira & Shaver, 2014), opening the possibility to affect the decision to be taken or the business (Caputo, 2014).

Conclusions

The Anchoring Effect is the tendency that individuals show by conducting their estimates in line with a value made available beforehand, called anchor (Tversky & Kahneman, 1974). Based on this, the study had the objective of analyzing, by means of an experiment, if the type (positive or negative) and the level (simple or complex) of financial and economic information influence the anchoring effect of accountants and managers in the managerial decision-making process.

Using an exploratory analysis of the response variables General Index of Low Anchoring (IABG) and General Index of High Anchoring (IAAG), it was possible to identify that about 96% of the participants obtained anchoring indexes lower than 0,50, thus presenting the mean anchoring effect in their projections of sales revenue, operating expenditure and result (profit or loss). This finding is consistent with studies on the anchoring effect (Caputo, 2014; Jacowitz & Kahneman, 1995; Luppe & Fávero, 2012; Serfas, 2011), where the authors found evidence that individuals are predisposed to this heuristic.

Furthermore, the results of the Analysis of Variance (p-value = 0,0148) and the Approximate Permutation Test (p-value = 0.0325) brought evidence that the type of information (positive and negative) can influence the mean of the General Index of Low Anchoring, not presenting any significant evidence that General Index of High Anchoring can be influenced by the type of information. Therefore, it can be inferred that there are differences in the low anchoring average, among individuals who received positive information in contrast with those who received negative information, suggesting that positive financial and economic information increase the anchoring and the negative decrease the minimum projections of sales revenue, operating expenditure and result. Also, it can be inferred that anchoring in positive information may predispose the individual to overconfidence (Russo & Schoemaker, 1992), thus impairing the decision to be taken.

Additionally, the data do not provide evidence that the factors profile (accountants, managers and control group) and level of information (simple and complex) and the interactions between the factors have an influence on the mean of the indexes of low and high anchoring obtained by means of projections.

However, regardless of the anchor, the adjustments to the estimates are insufficient (Tversky & Kahneman, 1974), since individuals anchor themselves in the information presented, regardless of its form (Neumann et al., 2011). This fact may lead the decision maker to anchor in values that do not represent the best information to make the decision required, which, in a certain way, can affect the management or business (Caputo, 2014).

Finally, it is concluded that the individuals researched tend to be anchored and the type of information influences the anchoring in minimum projections in relation to the low anchor and does not influence the anchoring in the maximum projections in relation to the high anchors. Also, it is concluded that there is no significant evidence that the level of information has an influence on the anchoring effect of accountants and managers when making management decisions. Moreover, another result obtained is that the type of information can influence the anchoring in the estimation of accounting variables such as sales revenue, operating expenses and result, and also practically, since it constitutes itself as an embryonic parameter for the construction of information, which, when displayed to decision-makers, minimize the anchoring effect.

The limitations of the work are found in the sample obtained and the difference in the number of respondents per profile, caused by the complexity of the experiment and the lack of interest of the people to participate in it and, also, in some issues encountered with the residues of data, since the data were obtained through the spontaneous manifestation of the respondents. For future studies, the suggestion is to simpli-

fy the experiment, changing the form of presentation of financial and economic information, replicating it to a larger number of individuals.

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APPENDIX A – Detailing the Experiment

Figure A1 - Home screen of the experiment.

Figure A2 - Economic-financial information (simple and positive) presented to treatment 1.

Para dar suporte a sua decisão de abrir ou não a filial, algumas informações anuais sobre a Matriz e sobre os dados econômicos são apresentados a seguir:

Faça seus cálculos aqui...

INFORMAÇÕES	2013	2014	2015
Receita Bruta de Vendas dos últimos 3 anos da Matriz	460.000,00	600.000,00	780.000,00
Despesas operacionais dos últimos 3 anos da Matriz	78.000,00	100.000,00	120.000,00
Lucro dos últimos 3 anos da Matriz	63.000,00	75.000,00	90.000,00
PIB (acumulado em 12 meses) dos últimos 3 anos	2%	4%	3%
Inflação (acumulada em 12 meses) dos últimos 3 anos	7%	6%	5%
Taxa de juros (acumulada em 12 meses) dos últimos 3 anos	11%	10%	9%

Source: the author.

Figure A3 - Economic-financial information (simple and negative) presented to treatment 2.

Para dar suporte a sua decisão de abrir ou não a filial, algumas informações anuais sobre a Matriz e sobre os dados econômicos são apresentados a seguir:

Faça seus cálculos aqui...

INFORMAÇÕES	2013	2014	2015
Receita Bruta de Vendas dos últimos 3 anos da Matriz	780.000,00	700.000,00	630.000,00
Despesas operacionais dos últimos 3 anos da Matriz	140.000,00	126.000,00	120.000,00
Lucro/Prejuízo dos últimos 3 anos da Matriz	10.000,00	2.000,00	(3.000)
PIB (acumulado em 12 meses) dos últimos 3 anos	2%	4%	3%
Inflação (acumulada em 12 meses) dos últimos 3 anos	7%	6%	5%
Taxa de juros (acumulada em 12 meses) dos últimos 3 anos	11%	10%	9%

Source: the author.

Figure A4 - Economic-financial information (complex and positive) presented to treatment 3.

Para dar suporte a sua decisão de abrir ou não a filial, seguem abaixo o Balanço Patrimonial e a Demonstração do Resultado da Matriz, referentes aos três últimos exercícios:

Faça seus cálculos aqui...

BALANÇOS PATRIMONIAIS findos em 31/12

em Reais

ATIVO	2013	2014	2015	PASSIVO	2013	2014	2015
Ativo Circulante				**Pasivo Circulante**			
Disponibilidade	46.300	41.400	90.800	Fornecedores	72.600	86.000	190.900
Contas a Receber	86.900	116.900	164.500	Obrigações Trabalhistas	1.100	3.800	7.600
Estoques	115.100	195.200	287.900	Impostos a Pagar	3.550	8.550	12.950
				Empréstimos	63.000	21.900	17.200
Total do Circulante	**248.300**	**353.500**	**543.200**	**Total do Circulante**	**140.250**	**120.250**	**228.650**
Ativo não Circulante				**Passivo não Circulante**			
Investimentos	-	300	300	Empréstimos L.P.	-	44.300	29.700
Imobilizado	43.800	37.600	31.700	**Total do Passivo não Circulante**	-	**44.300**	**29.700**
Intangível	1.150	1.150	1.150				
Total do Ativo não Circulante	**44.950**	**39.050**	**33.150**	**Patrimônio Líquido**			
				Capital Social	70.000	70.000	70.000
				Reservas de Lucro	83.000	158.000	248.000
				Total Patrimônio Líquido	**153.000**	**228.000**	**318.000**
Total do Ativo	**293.250**	**392.550**	**576.350**	**Total do Passivo + PL**	**293.250**	**392.550**	**576.350**

DEMONSTRAÇÃO DO RESULTADO DOS EXERCÍCIOS DE

em Reais

		2013	2014	2015
	RECEITA BRUTA	460.000	600.000	780.000
(-)	Dedução da Receita Bruta			
	(-) Impostos sobre Vendas	(37.000)	(54.000)	(78.000)
=	**RECEITA LÍQUIDA**	**423.000**	**546.000**	**702.000**
(-)	Custo das Mercadorias Vendidas	(280.000)	(360.000)	(482.000)
=	**LUCRO BRUTO**	**143.000**	**186.000**	**220.000**
(-)	Despesas Operacionais	(78.000)	(100.000)	(120.000)
=	**LUCRO/PREJ. ANTES DO RESULTADO FINANCEIRO**	**65.000**	**86.000**	**100.000**
(+/-)	Resultado Financeiro	(2.000)	(11.000)	(10.000)
=	**LUCRO OU PREJUÍZO DO EXERCÍCIO**	**63.000**	**75.000**	**90.000**

INFORMAÇÕES	2013	2014	2015
PIB (acumulado em 12 meses) dos últimos 3 anos	2%	4%	3%
Inflação (acumulada em 12 meses) dos últimos 3 anos	7%	6%	5%
Taxa de juros (acumulada em 12 meses) dos últimos 3 anos	11%	10%	9%

Figure A5 - Economic-financial information (complex and negative) presented to treatment 4.

BALANÇOS PATRIMONIAIS findos em 31/12

em Reais

ATIVO	2013	2014	2015	PASSIVO	2013	2014	2015
Ativo Circulante				**Pasiivo Circulante**			
Disponibilidade	46.300	41.400	90.800	Fornecedores	95.600	112.000	191.900
Contas a Receber	86.900	86.900	114.500	Obrigações Trabalhistas	1.100	3.800	5.600
Estoques	115.100	155.200	187.900	Impostos a Pagar	3.550	8.550	9.950
				Empréstimos	63.000	51.900	68.200
Total do Circulante	**248.300**	**283.500**	**393.200**	**Total do Circulante**	**163.250**	**176.250**	**275.650**
Ativo não Circulante				**Passivo não Circulante**			
Investimentos	-	300	300	Empréstimos L.P.	30.000	44.300	51.700
Imobilizado	43.800	37.600	31.700	**Total do Passivo não Circulante**	**30.000**	**44.300**	**51.700**
Intangível	1.150	1.150	1.150				
Total do Ativo não Circulante	**44.950**	**39.050**	**33.150**	**Patrimônio Líquido**			
				Capital Social	70.000	70.000	70.000
				Reservas de Lucro	30.000	32.000	29.000
				Total Patrimônio Líquido	**100.000**	**102.000**	**99.000**
Total do Ativo	**293.250**	**322.550**	**426.350**	**Total do Passivo + PL**	**293.250**	**322.550**	**426.350**

DEMONSTRAÇÃO DO RESULTADO DOS EXERCÍCIOS DE

em Reais

		2013	2014	2015
	RECEITA BRUTA	780.000	700.000	630.000
(-)	Dedução da Receita Bruta			
	(-) Impostos sobre Vendas	(78.000)	(70.000)	(63.000)
=	**RECEITA LÍQUIDA**	**702.000**	**630.000**	**567.000**
(-)	Custo das Mercadorias Vendidas	(540.000)	(490.000)	(440.000)
=	**LUCRO BRUTO**	**162.000**	**140.000**	**127.000**
(-)	Despesas Operacionais	(140.000)	(126.000)	(120.000)
=	**LUCRO/PREJ. ANTES DO RESULTADO FINANCEIRO**	**22.000**	**14.000**	**7.000**
(+/-)	Resultado Financeiro	(12.000)	(12.000)	(10.000)
=	**LUCRO OU PREJUÍZO DO EXERCÍCIO**	**10.000**	**2.000**	**(3.000)**

INFORMAÇÕES	2013	2014	2015
PIB (acumulado em 12 meses) dos últimos 3 anos	2%	4%	3%
Inflação (acumulada em 12 meses) dos últimos 3 anos	7%	6%	5%
Taxa de juros (acumulada em 12 meses) dos últimos 3 anos	11%	10%	9%

Figure A6 - Questions to measure the anchoring effect.