Cognitive Biases and Audit Professional Skepticism: A Sample from Portugal

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Abstract

Auditors must possess characteristics that allow them to achieve the level of professional skepticism required for the profession. Despite previous literature's main emphasis on auditors' traits and experience as the main factors influencing auditor's level of professional skepticism, the relevance of cognitive biases effect on skepticism has grown increasingly in importance over the last decades with the emergence of behavioral finance. This dissertation aims to understand to what extent certain cognitive biases – outcome, confirmation, overconfidence and availability biases affect Portuguese auditors and whether these also have an effect on auditors' level of professional skepticism. All the data collected refers to the year of 2022 and was obtained through a survey distributed to Portuguese auditors working in Big 4 audit firms (i.e., Deloitte, PWC, EY and KPMG). This dissertation confirms previous studies suggesting that auditors in higher hierarchical positions tend to have higher levels of professional skepticism and be less susceptible to cognitive biases. Furthermore, it concludes that cognitive biases, namely outcome, confirmation and overconfidence biases have an effect on the professional skepticism level of Portuguese auditors. Availability bias did not produce an effect on professional skepticism. Therefore, it is pivotal that these biases are taken into consideration by audit firms to address audit quality issues and keep up with increasingly higher standards.

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Resumo

Os auditores devem possuir características que lhes permitam atingir o nível de ceticismo profissional exigido pela profissão. Apesar da literatura anterior enfatizar as características e a experiência dos auditores como os principais fatores que influenciam o nível de ceticismo profissional do auditor, a relevância do efeito dos enviesamentos cognitivos no ceticismo tem crescido cada vez mais nas últimas décadas com a introdução das finanças comportamentais. Esta dissertação tem como objetivo perceber em que medida certos enviesamentos cognitivos – enviesamento de resultados, de confirmação, de excesso de confiança e de disponibilidade afetam os auditores portugueses e se estes também afetam o nível de ceticismo profissional dos auditores. Todos os dados recolhidos referem-se ao ano de 2022 e foram obtidos através de um inquérito distribuído a auditores portugueses que trabalham em empresas de auditoria Big 4 (i.e., Deloitte, PWC, EY e KPMG). Esta dissertação confirma estudos anteriores que sugerem que auditores em posições hierárquicas mais altas tendem a ter níveis mais elevados de ceticismo profissional e são menos suscetíveis a enviesamentos cognitivos. Além disso, conclui que os enviesamentos cognitivos, nomeadamente enviesamentos de resultado, de confirmação e de excesso de confiança, têm efeito no cepticismo profissional dos auditores portugueses. O enviesamento de disponibilidade não produziu efeito sobre o ceticismo profissional. Por conseguinte, é fundamental que estes sejam tidos em consideração pelas empresas de auditoria de modo a combater problemas de qualidade e de forma a acompanhar padrões de exigência cada vez mais elevados.

Título: Enviesamentos Cognitivos e Ceticismo Profissional em Auditoria – Uma amostra de Portugal

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Palavras-Chave: Enviesamentos Cognitivos; Ceticismo Profissional; Auditoria; Portugal

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Glossary

α	Cronbach's index of reliability
b	Estimated value of unstandardized regression coefficient
β	Estimated value of standardized regression coefficient
ACCA	Association of Chartered Certified Accountants
AICPA	Association of International Certified Professional Accountants
ANOVA	Analysis of Variance
CI	Confidence Interval
GPS	Global Positioning System
IAASB	International Auditing and Assurance Standards Board
ISA	International Standard on Auditing
IP	Internet Protocol
M	Sample mean
OECD	The Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
OR	Odds Ratio
p	p-value
PCAOB	Public Company Accounting Oversight Board
R²	Multiple correlation squared; measure of strength of association
SAS	Statements on audit standards
SD	Standard Deviation

1. Introduction

Auditors act as agents of transparency, ensuring that all financial statements of an entity are free from misstatements (International Auditing and Assurance Standards Board, 2012). This not only benefits the company through the detection of fraud or errors, but also all the stakeholders involved, by impartially advising them. Over the years, the US's Public Company Accounting Oversight Board (PCAOB) has identified several issues with regard to the compliance with audit standards. These deficiencies were caused by lack of necessary due diligences that would end up in undetected misstatements. Several measures have been implemented to enhance credibility, relevance, and transparency of audits, namely the use of specialists in certain areas other than auditing and accounting (Public Company Accounting Oversight Board, 2020).

To properly exercise the profession of auditor, one must possess knowledge on the area, show integrity, have communication skills, and duly apply professional skepticism across all stages of the audit process (AICPA, 2006). In fact, audit regulators have identified the lack of professional skepticism to be the main cause of audit failures (Beasley et al., 2001) and the main reason of criticism towards auditors (Anderson & Wolfe, 2002).

What factors can jeopardize an auditor's level of professional skepticism? For many years the pillars of auditors' personal skepticism, required for the profession, were mostly reliant on auditor's specific traits (Hurtt et al., 2010), the rewards and incentives scheme provided by the companies (Nelson, 2009) and the level of seniority of the audit professionals (Luft, 1993).

Although the accuracy of the studies mentioned in the previous paragraph cannot be denied, the extent to which they are complete has certainly been questioned. Over the last decades, the traditional paradigm of finance has changed with the introduction of the concept of behavioral finance. In this approach, the existence of heuristics and cognitive biases are added to the understanding of the decision-making process of individuals (Tversky & Kahneman, 1973). Existing research on behavioral finance indicates that finance professionals can, sometimes, deviate from rationality in their decision-making process (Statman et al., 2006). This deviation has to do with the existence of cognitive biases, that can have a negative impact on a person's judgments and decisions. Following the introduction of this psychology-based finance theory, some academics, in the field of audit, started investigating the impact that different biases can have during audit engagements, for example hindsight bias (Anderson et al., 1993) and anchoring bias (Kinney & Uecker, 1982). Despite the different biases studied, similar findings were reached by different authors (Brazel, 2016; Glover, 2005), and a transversal conclusion

became consensual, which is that cognitive biases can affect audit professional skepticism (Nelson, 2009).

Regardless of the ever-evolving principles and rules set by audit regulators (e.g., European securities and markets authority in the European Union and the Securities and exchange commission in the US) that aim to improve professionals' skeptical abilities, the presumption that an auditor's decision-making process is always going to be rational is utterly false. And the reason for that relies upon the existence of cognitive biases. Cognitive biases are variables often dismissed in the decision-making process of an auditor, but whose ability to compromise the effectiveness of the traditional pillars of skepticism is quite significant (AICPA, 2021). Potential costs of these biases include financial scandals, as seen in the past decades, that can completely ruin the reputation of a firm and even lead to its end. After all: "The real problem isn't conscious corruption. It's unconscious bias" (Bazerman et.al., 2002, p.3).

Furthermore, prior research has focused on the impact that culture can have on auditor's judgmental decisions, primarily in terms of how auditors coming from culturally different backgrounds follow international methodologies and procedures (Patel et al., 2002). Nonetheless, it is still not clear what is the impact that an auditor's culture has on his or her predisposition to fall for a bias, especially when presented with a more complex decision-making problem. All things considered: Can cognitive biases impact audit professional skepticism of Portuguese auditors? Do these biases play a role in achieving the desired level of professional skepticism? Which cognitive biases tend to jeopardize auditor's professional skepticism the most? These are the questions that this dissertation aims to answer.

1.1 Problem Statement

To assess the impact that cognitive biases can have in the professional skepticism of audit professionals, I used a survey-based approach. To measure professional skepticism, I used Hurtt's (2007) professional skepticism scale, which is widely recognized as the best skepticism scale for audit purposes, with no clear substitute so far (Boritz et al., 2018). By merging my personal experience within the field of audit with ACCA's (2017) study on the most significant cognitive biases impacting auditors, I decided to focus my study in four biases, namely: confirmation bias, outcome bias, overconfidence bias, and availability heuristic bias. To assess auditors' propensity towards these biases, I used tests from past research (i.e., Brazel, 2016; Wason, 1968; Tversky & Kahneman, 1973). Ultimately, this research intends to answer the following question: "How can cognitive biases affect professional skepticism in Portuguese

audit professionals?" Furthermore, this problem statement can be divided into three distinct sub-questions:

RQ1: To which cognitive biases are Portuguese auditors exposed to the most?

RQ2: Is there a relationship, amongst Portuguese auditors, between cognitive biases and levels of skepticism?

RQ3: Which cognitive biases tend to compromise professional skepticism the most?

This research can contribute to expand Portuguese research on the impact that cognitive biases can have on audit professional skepticism. Even though there is some Portuguese research on each of these variables individually, meaning cognitive biases in Portuguese auditors (Costa, 2020) and the professional skepticism of Portuguese auditors (Oliveira, 2014), there are no studies assessing the correlation between these two variables. Besides that, we are now living in a world in which transparency and reliability of information have become key to every aspect in life. This investigation aims to shed some light on how cognitive biases might be preventing auditors from enhancing their professional skepticism, thus failing to live up to the increasingly higher standards set by audit regulators, governments, and even by society. In doing so, it can create more awareness about cognitive biases, not only within the auditing industry, but in all sectors of the business spectrum, and about what repercussions they can carry for firms if not properly addressed.

Following this introductory chapter, I will conduct a more detailed analysis of each variable under study, with the aim of expanding the readers' understanding on the topic. Therefore, in Chapter 2, I will present the literature review of audit, professional skepticism and the scales used to measure it, cognitive biases and cognitive biases impact on professional skepticism. In Chapter 3, I will explain the methodology used in the research by defining the sample and describing the scales used to measure the variables under study. Then, in Chapter 4, results will be presented. In Chapter 5 results will be analysed and discussed. Moreover, this chapter also expands on the main findings of this investigation and how aligned they are to existing literature. It also aims to present the implications and limitations of this study, shedding some light on how this investigation can be the steppingstone for future research. Lastly, in Chapter 6, I do an overall conclusion of this dissertation.

2. Literature Review

2.1 Audit

The term audit is quite broad and comprises different types of audits. It is important to distinguish the two main types of financial audit: external and internal. In an internal audit, internal auditors are "obligated to be alert to the signs and possibilities of fraud" (Hillison et al., 1999, p. 351). Since internal auditors have a continuous presence in the company and are part of the company, they possess a better understanding of the internal controls and a better ability to detect the symptoms behind fraud inside the company, also providing suggestions of potential improvements (OECD, 2022).

In contrast, external auditors do not normally have a continuous presence with just one company, but rather with different clients throughout the years. Thus, their understating of the internal controls designed and implemented by firms is not as deep as internal auditors. The main goal of external auditors is to investigate material misstatements in the financial statements and make sure that the compliance with all statutory obligations is in place (OECD, 2022).External auditors are the ones responsible for conducting the audit engagements, acting as public interest agents, supervising and reporting on a firm's compliance with all the mandatory regulations. The purpose of an audit is to enhance users' degree of confidence in the financial statements (ISA, 2010). And, to perform the audit, external auditors are responsible for detecting material misstatements whether due to errors or fraud (IAASB, 2012).

But how important is financial auditing to society? Audit institutions are considered one of the eight pillars of a national integrity system, preventing and protecting against corruption (Dye & Stapenhurst, 1998). The modern world has witnessed several corporate scandals over the past decades, being Xerox, Enron, and WorldCom some of the most flagrant cases (Toms, 2019). Financial reporting and auditing mitigate the occurrence of such cases of fraud by providing an outside look into the company's operations (Arens et al., 2008), improving its internal systems and controls, which ultimately confers the necessary credibility for all the stakeholders involved. Moreover, Brown and collaborators (2013) investigated the relationship between political corruption and firm value. Their findings revealed that strong audit monitoring can mitigate the negative firm value effects of political corruption within the US.

In terms of future perspectives, some say that financial auditing is getting outdated and becoming less relevant as the concern with other topics, beyond just historical financial data, is significantly increasing. Historically, the audit of financial statements has been a pivotal factor for investors when making investment decisions. However, over the past years, with the

significant technological developments that have occurred, markets now automatically adjust based on current events (BDO, 2022), which allows investors to rely on other sources of data to make their decisions, rather than just the financial statements. Furthermore, the audit of non-financial elements like climate change impact or cybersecurity is getting increasingly more important and demanded by the stakeholders (Kolk, 2010). Nowadays, over 90% of the biggest global firms issue sustainability reports (KPMG, 2013). Therefore, audit practices must keep adapting to keep up with todays and future demands.

2.2 Audit Professional Skepticism

Professional skepticism is a concept inherently tied to the job of an audit professional. A subject that is consistently under professional standards discussions and reviews to meet the expectations of higher-quality audit reports (PCAOB, 2008). However, these theoretical principals can, sometimes, be much more difficult to apply in practical terms. In fact, audit regulators, entities that review the work of audit firms, pointed out lack of professional skepticism as the major source of malpractice claims against auditors (Anderson & Wolfe, 2002) and as the primary cause of audit failure (Carmichael & Craig, 1996).

Although there is no universal and fully consensual definition of professional skepticism, many consider that it is: ''an attitude that includes a questioning mind, being alert to conditions which may indicate possible misstatements due to error or fraud, and a critical assessment of audit evidence'' (IAASB, 2012).

Previous studies have been fairly inconsistent in defining professional skepticism (Nelson, 2009). Nonetheless, there are clearly two main approaches used to describe this concept. On the one hand is an approach that considers that auditors, in order to be skeptical, should enter an audit engagement with a neutral perspective, assuming that the client's assertions are neither honest nor dishonest (Hurtt, 2010). On the other hand, is an approach that considers that auditors should enter an engagement with a presumptive doubt mindset, assuming a certain level of dishonesty, inattentiveness, or incapacity on the side of the client (Hogarth & Einhorn, 1992). The latter theory clearly showcases a more forensic mindset than the former.

Starting with the neutral perspective of professional skepticism, Hurtt's (2007) definition of professional skepticism focuses on a series of traits and characteristics of auditors that can be divided into six different dimensions, namely: search for knowledge, suspension of judgment, self-determining, interpersonal understanding, self-confidence, and questioning mind. The primary focus of Hurtt's research was to examine if there is an optimal combination of traits that would maximize auditor's level of professional skepticism. Another example of the neutral

perspective is Cushing (2003), who defines professional skepticism as a measure of accuracy regarding the assessment of the risk level, suggesting that both suspicious and trusting auditors are inherently biased, thus less skeptical. In a general way, the neutral perspective theory relies on the idea of "trust but verify" (Quadackers et al., 2014).

Within the presumptive doubt perspective, for Hogarth and Einhorn (1992), a skeptic is someone who highly emphasizes negative evidence and discredits the contrary. As another example, for McMillan and White's (1993) approach, an auditor's level of skepticism depends on how sensitive someone is to evidence that reduces the risk of failing to detect financial misstatements. Lastly, there are other perspectives beyond these two main ones, such as Carcello and Neal (2000) follow a different approach characterizing professional skepticism from an outcome perspective, indicating that more skeptical outcomes are due to more presumptive doubt measures being implemented or conducted during the audit.

Audit regulators are more likely to follow the presumptive doubt perspective in their inspections as it is often highlighted that the reason for audit failure relies on the lack of professional skepticism practices adopted by auditors (Nelson, 2009).

2.3 Scales to measure professional skepticism

There are two main scales in the literature to measure audit professional skepticism: Hurtt's (2010) professional skepticism scale and the interpersonal trust scale (Rotter, 1967). The first scale has been used by the vast majority of researchers studying skepticism in the field of audit (Khan & Oczkowski, 2019) and it has proven to be consistently reliable in measuring skepticism when following a neutral perspective of skepticism. The second most used scale, the interpersonal trust scale, was designed to reflect the presumptive doubt assumption (Rotter, 1967). As mentioned above, it is more focused on a forensic analysis approach, as it includes variables like suspicion, trust, and dishonesty (Nelson, 2009).

In this research, I adopted the neutral perspective of professional skepticism. Even though I agree that having a presumptive doubt perspective may offset the asymmetry of information between the auditor and the client (Nelson, 2009), I also consider this theory derives from the false premise that resources are always abundant, when, in fact, the vast majority of audit engagements have tight deadlines and budgets (Otley & Pierce, 1996). Furthermore, it also ignores the relationship between the audit team and the client, as it showcases lower levels of trust (Quadackers et al., 2014).

2.4 Heuristics and cognitive biases

Heuristics are defined as cognitive processes, either conscious or unconscious, that ignore part of the information to simplify the decision-making process. Thus, it can easily be associated with a higher propensity for error (Mousavi & Gigerenzer, 2017). Nonetheless, prior research suggests that the use of heuristics in the decision-making process is not always bad and that, in fact, sometimes the easiest solution is to default to heuristics as a way of simplifying the decision-making process (Lau & Redlawsk, 2001). The issue is when heuristics lead to systemic errors, which are called cognitive biases. The fact that heuristics can be seen as a double-edged sword has led to an increase in empirical research on the different types of heuristics and what cognitive biases these can lead to.

Cognitive biases are ''tendencies to think or feel in certain ways that can lead to systematic deviations from a standard of rationality or good judgment" (Baker & Puttonen, 2017, p. 109). The first major research performed within the scope of the discipline of heuristics and (cognitive) biases was conducted by Kahneman and Tversky (1973) with the introduction of three heuristics that affect the decision-making process: the representativeness, the availability, and the anchoring-and-adjustment heuristics. The first heuristic explained how similarities of properties tends to confuse people regarding the probability of an outcome. The second focused on how the ease of information coming to mind affects people's judgments and decisions. The last one focused on the impact that an initial value has on the final outcome of a decision.

Moreover, Kahneman and Tversky (1979) also introduced the concept of prospect theory, which aimed to explain why investors, sometimes, perceive gains and losses differently, giving a higher emphasis to gains than losses. Following the introduction of this theory, Thaler (1980) argued that some of the ideas in prospect theory could also be useful in a riskless choice scenario. After that, many studies in the field of finance and management started to emerge, at first with a heavier focus on cognitive biases' impact in the investment market decision-making and, later, on the effect of these biases on the decision making of auditors. A myriad of biases was studied over the last decades covering different areas of expertise. In this research, we will be focusing on some of cognitive biases that are considered the most relevant for auditors.

2.5 Cognitive biases relevant for auditing

As stated in the previous subsection, cognitive biases often function as shortcuts to decision-making, permitting a fast, but not always accurate, decision. Considering the tight deadlines of a big part of audit engagements, the asymmetry of information between parties, and the limited

resources often at disposal, it makes the profession of auditor very prone to cognitive biases (Smith & Kida, 1991).

In this dissertation the cognitive biases under study were selected based on the ACCA (2017) report, which highlights thirteen relevant cognitive biases for auditors. Of these thirteen, I selected four to further investigate in this dissertation. These were the ones that I could relate to more based on my experience as auditor. The four biases under study are: confirmation bias, overconfidence bias, availability bias, and outcome bias. Confirmation bias is defined as people's tendency to look for information that confirms their initial thoughts or preconceptions (Wason, 1960). Overconfidence bias occurs when individuals overestimate their abilities to perform certain tasks, deriving from a misleading assessment of their skills, which ultimately makes them consider themselves as above average (Kruger, 1999). Availability bias is a cognitive bias in which individuals make decisions based on information that comes quickly to their mind (Tversky & Kahneman, 1973) because the information is more frequent, recent, or extreme (Markman & Medin, 2002). Lastly, in the outcome bias, people evaluate the value of other's actions on the basis of the outcome rather than on the rationale that led to that action (Baron & Hershey, 1988).

2.6 Cognitive biases' impact on audit professional skepticism

The four biases under study in this dissertation have been shown to impact audits in general and audit professional skepticism in particular. Brazel and collaborators (2016) concluded that auditors, normally with higher positions, evaluate the members of their team differently based on the outcome of their actions, and not on whether the rationale used to perform the audit procedures was deemed as reasonable. Furthermore, their study also suggested that staff members, already anticipating that the outcome of their decision will have an impact on their evaluation, will sometimes neglect skeptical practices.

Confirmation bias can severely jeopardize the quality of an audit engagement in the sense that preparers of the analytical review of the audit may over rely on information that confirms their initial thoughts and ignore information that contradicts them (Glover et al., 2005). This is a particularly dangerous situation because it can result in unidentified material misstatements. And, in case the audit engagement is reviewed by regulators and this incongruencies are found, it can lead to heavy sanctions to the audit firm (Glover et al., 2005).

Overconfidence bias can manifest in many ways throughout the audit engagement. In an initial stage of the audit, having an overly confident judgement regarding the risk assessment of the client can lead to insufficient challenge of management assumptions (Fay & Montague,

2015) and search for confirming documentation, which ultimately compromises the desired level of professional skepticism. Furthermore, auditors that are overconfident on their abilities may neglect the use of specialists, which can lead to a false sense of security regarding the quality of the output (Owhoso & Weickgenannt, 2009). Establishing short delivery deadlines, planning fallacy, is also a good example of being overconfident (Moore & Schatz, 2017).

Availability bias can negatively impact professional skepticism by influencing auditors' judgements with information that comes easier and is more accessible to their mind. The most common example is the "same as last year" mentality, in which the audit team conducts the same substantive analytical procedure approach as from the prior year, without even considering if there are any current year specificities that should change the approach taken (Koch et al., 2016). Additionally, accepting the available management justifications without refuting and confirming it with independent third parties can also be considered an illustrative example of the impact of this bias.

2.7 Empirical expectations

Similarly to the results obtained in previous literature, I expect Portuguese auditors to be highly subject to the biases in study. Moreover, I believe that Portuguese auditors in higher positions will be more susceptible to all the biases than those in lower positions. The reason for that being that with higher positions comes more complex decisions, thus mental shortcuts are an easier solution to default to. Regarding the impact that the cognitive biases under study will have in audit professional skepticism, I expect all biases to be negatively correlated to professional skepticism. Lastly, since this is an exploratory study, I have no particular expectation concerning which biases affect auditor's skepticism the most.

3. Data and Methodology

3.1 Research Strategy and Design

I aimed to test the effect of behavioral biases on auditors' professional skepticism in Portugal. As previously assessed in the literature review, no research on this topic has been made at the Portuguese level with most past studies being performed in the US. Previous research in this field (e.g., Brazel, 2016; Tversky & Kahneman, 1973; Wason, 1968) was primarily conducted using experimental research, but due to time and resources constraints, I decided to conduct a correlational study using a survey. This allowed me to obtain a significant amount of data, for different variables, in a relatively short amount of time.

The applied survey was divided into three distinct sections. In the first section, respondents were asked demographic, academic background, and professional experience questions, which were used to both compare auditors and as control variables when studying the relationship between cognitive biases and audit professional skepticism. In the second section, participants were exposed to some tests and a hypothetical scenario to assess their proneness towards the cognitive biases under study. In the last section, respondents were asked a series of questions to assess their level of professional skepticism.

3.2 Procedure

To gather information regarding the relationship between cognitive biases and professional skepticism in Portuguese auditors, this study used a survey. Since the target group of this research were Portuguese auditors, the questionnaire was prepared in Portuguese using Qualtrics, a web-based software. The survey was divided into three sections.

The first section intended to gather demographic information about the participants, which was going to be mainly used as control variables. For instance, auditors with different levels of seniority can be differently impacted by cognitive biases (Brazel, 2016). Job position, academic background, level of education, job level of satisfaction, and gender were also covered in this section.

The second section comprehended a series of questions, mainly adaptations of well-grounded experiments conducted in the literature, which allowed me to infer participants' susceptibility to cognitive biases. Cognitive biases were assessed using different methods. To assess the confirmation bias, I used an adaptation of Wason's (1968) experiment. For the availability bias, I replicated Kahneman and Tversky's (1973) experiment. For the outcome bias I asked participants a question based on a small hypothetical scenario adapted from previous research on the topic (Brazel, 2016). Lastly, to measure the overconfidence bias, I asked a few general knowledge questions retrieved from Coane and Umanath's (2021) database and asked respondents to provide their degree of confidence in answers they provided to the questions.

The last section focused on the dependent variable under study, audit professional skepticism. To assess this variable, I adapted Hurtt's (2007) professional skepticism scale, a scale that is widely used in studies addressing the professional skepticism issue within the field of audit (Boritz et al., 2018).

3.3 Participants

The survey was mainly distributed via personal connections within audit firms, the vast majority being employees of Big 4 companies (i.e., Deloitte, PWC, EY and KPMG). These connections then spread the survey inside their companies through the pass-along method (i.e., snowball sampling), a form of word-of-mouth communication, in which they would forward the email containing the survey to their colleagues. Since the target population of this research is quite narrow, this method was deemed as appropriate and efficient (Teitler, Reichman, & Sprachman, 2003). To ensure that the people responding to the survey were indeed part of the desired target group, an initial question to the survey was added to exclude participants who were not working in the field of audit. Furthermore, some responses were obtained with direct approaches via LinkedIn message.

The number of valid responses to the survey was 176, from a total of 231 responses. According to Fraenkel and Wallen (2009), the sample size for a correlational study should not be lower than 30. From a sample of 231 responses, 8 were excluded due to incorrect input of information, 21 were excluded as they were not working in the field of audit, 11 were excluded due to failing the attention check question included in the survey, and, lastly, since the questions concerning the availability bias asked participants about the frequency of English words, those who stated that their English level was below intermediary were not included in the final sample, which accounted for 15 responses. In total, 176 responses were considered valid.

Firstly, demographic information was retrieved from the survey. Out of the 176 respondents deemed appropriate for further analysis, 48.9% were female. In terms of the job position held by the participants, the responses comprehended four different positions, namely: junior/staff, senior, manager and senior manager. As expected, due to the hierarchical structure of auditing firms and high levels of turnover (Nouri & Parker, 2020), most of the answers came from employees in junior positions (57.4%). No answers from directors or partners were recorded. Concerning the level of study of the participants, most had a Master's degree (52.3%). Regarding the area of study, some of participants selected more than just one option as they had degrees in different areas. Out of the 176 respondents, most selected management (47.2%) and/or accounting (18.8%). For a full summary of statistics, please refer to Table 1 in Appendix B.

Lastly, it is important to acknowledge the importance of ethics in the process of data collection. Research is a multi-stage process and ethics are central to the research process. It is therefore pivotal that researchers consider the various ethical issues at different levels of this

process (Bickman & Rog, 2009). In this research I considered the ethical principles referred by Shamoo and Resnik (2015), of which I would highlight confidentiality and freedom for this section of data collection. Two sentences were included in the beginning of the survey stating that all data collected from the participants was done anonymously and the other sentence stating that the participants were free to leave the survey anytime they wanted to. Confidentially was guaranteed by not collecting personal data such as email, company information, GPS or IP data.

3.4 Independent Variables

Outcome Bias. To assess the outcome bias, respondents were exposed to a hypothetical audit scenario, an adaptation of Brazel's and collaborators (2016) experiment. In this hypothetical situation, a staff member of the team asks to use more time and resources to further investigate a potential financial misstatement. Inherently, the client's normal activities would likely be disrupted, as they would also spend more time helping and providing the required information to the auditors. Participants were also told that the budget of the audit engagement was already reaching its limit. In the version used in this study, participants assumed the role of the manager of an audit engagement evaluating the staff member instead of being the staff member to better adapt the scenario to the research question. Following this hypothetical scenario, and similarly to what was done in Brazel's and collaborators (2016) experiment, respondents were asked to consider two situations: 1) "A misstatement is found", 2) "No misstatement was found".

In Brazel's and collaborators (2016) experiment, participants were presented with some questions after the hypothetical scenario, for example: "What effect will the time that you and the client spent on the follow up have on your performance evaluation?", questions focused on seeing if participants were aware of the impact that the outcome of the situation would have on managers, when evaluating their performance. As this study focused on how auditors perceived the staff member depending on the outcome of the situation, a different question was presented with the purpose of understanding if participants' evaluation review of the staff member would change depending on whether or not a misstatement was found. The following question was used: "In which situation would you evaluate the staff member more positively?". When answering this question participants would have to reply on an 11-point scale, from -5 (*staff member does not find a material misstatement*) to +5 (*staff member finds a material misstatement*), with 0 as a neutral point (*would not affect how I evaluate the staff*). Participants who answered anything but 0 were deemed as biased, since it demonstrates that the outcome of

the situation played a role when evaluation the performance of the staff member. Consequently, those who answered 0 were considered not biased.

Confirmation Bias. For the purpose of studying the confirmation bias among audit professionals, I opted for the widely known Wason selection task. In this experiment, developed by Wason (1968), people are presented with four different cards, with the following characters: A, D, 4, 7. Then, they are provided with the following statement: "If a card has a vowel on one side, then it has an even number on the other side". The purpose of this experiment is for respondents to choose to turn the two cards that can best test the prior mentioned statement. As per the research conducted by Wason (1968), only 4% of the respondents identified the correct solution (A and 7), whereas 46% chose cards A and 4 and 28% just chose A. Since this experiment is quite famous, and many people may already know the answer without understanding the reasoning behind it, I decided to conduct a similar test, following the same Wason selection task approach, but with the following information in the cards: "Letter D"; Letter A"; "Number 4"; "Number 8". Then, respondents were presented with the statement: "If a card has the letter D on one side, then it has the number 4 on the other side" and asked to choose the two cards that would best test this statement. The correct solution in this case would be to turn cards: "Letter D" and "Number 8". Notice that turning the "Letter A" card would be irrelevant as the condition does not mention any information regarding what should appear on the other side of the card "Letter A". Moreover, it is also unnecessary to turn the card with "Number 4" since the condition stated is unilateral, meaning that the problem only indicates that if there is the letter D on one side there must be the number 4 on the other. Thus, the condition is not necessarily valid the other way around.

Participants who selected the combination of cards: "Letter D" and "Number 4" were considered to be subject to confirmation bias as they shown a tendency to confirm what was already mentioned in the problem statement.

Overconfidence Bias. The level of overconfidence of the respondents was measured through a series of general knowledge questions retrieved from Coane and Umanath's (2021) database of general knowledge questions, ranked in terms difficulty level. I decided to take five items from the item pool and selected them in order to cover a wide range of difficulty levels. To do so, all the questions included in the database were split into quintiles based on the perceived level of difficulty, afterwards one question per quintile was selected. Participants were asked to select the option they believed was the correct one from two possible answers.

Contrary to the approach followed by Coane and Umanath's (2021), in which four answer options were provided, in this research only two options were given so that it was faster for participants to answer the questions. The answer options provided in the survey included the correct answer and the incorrect answer with the highest error rate according to Coane and Umanath's (2021) database[1]. Besides answering the questions, respondents were also asked to indicate their level of confidence on the correctness of each answer, on a sliding scale ranging from 50% (random answer) to 100% (certain). Both the order of questions and answer options were randomized. These are two of the five questions asked (please see the full survey on Appendix A for all questions):

1- "What is the term for someone who doubts but does not deny the existence of God?" Answer options: "Agnostic" and "Atheist".

2- "What is the longest river In Asia? " Answer options: "Yangtze" and "Ganges".

The overconfidence bias was quantified following a similar approach to Olsson's (2014), in which the average correct answers per participant was subtracted to average level of confidence inputted. Nonetheless, since the sole purpose of this study was to check if a participant was deemed as biased or not, this variable was converted from a continuous variable into a dichotomous variable, meaning if the difference was positive the participant was considered biased. In case the difference was negative, or zero participants were considered unbiased.

Availability Bias. To assess how participants overestimate the importance of the information that is made available to them, I decided to replicate Kahneman and Tversky's (1973) experiment, by asking the participants the following question: "In the English language, are the following letters more likely to occur as the first or third letter of a word?", and then presented them with five different letters ("K", "L", "N", "R", "V"). The original study concluded that 69% of the participants selected the first position option for three or more of these letters, when, in fact, all of them are more common in the third position of a word. This phenomenon emphasizes the fact that people normally extrapolate their answers based on the frequency or probability that some words come to their mind.

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[1] Due to a mistake, the wrong answer options provided for questions 4 and 5 (Cognitive biases assessment 2 in Appendix A) were different from the options offered by Coane & Umanath (2021).

Participants who failed at least three out of the five questions, meaning that had more incorrect than correct answers, were considered biased. Logically, those who got more correct than incorrect answers were considered not biased.

3.5 Dependent Variable

The purpose of this research is to investigate how different cognitive biases impact audit professional skepticism. Thus, professional skepticism is defined as the dependent variable in this study. To assess participants' level of professional skepticism, I used an adaptation of Hurtt's (2007) professional skepticism scale. In adapting the scale, I selected a sample of 18 questions out of the 30 that compose the scale, with the main purpose of avoiding a lengthy and tedious survey and to increase its level of responsiveness. Since the Hurtt professional skepticism scale comprehends six different dimensions, the criterion I used was to choose the three questions, in each dimension, that ranked the highest in terms of factor loadings. With this approach I intended to compromise as little as possible the reliability of the scale.

The participants were asked to evaluate the extent to which they agreed with the provided statements using a 7-point Likert scale, from 0 (*Strongly disagree*) to 6 (*Strongly agree).* This set of questions aimed to shed some light on the auditor's predisposition to 1) search for knowledge, 2) suspend judgment when making a decision, 3) accept what is said or seen at face value, 4) understand why other people behave the way they behave, 5) be self-confident, and 6) pose questions upon hearing or seeing something.

3.6 Control Variables

Control variables were added to the research as previous literature shows a relationship between them and cognitive biases:

Gender: Previous studies suggest that men are more likely to fall for the confirmation bias in complex decision-making situations (Meyers-Levy, 1989). Also, men are considered to be more overconfident than women (Beyer, 1990).

Level of education: To analyze if there is a difference in results between auditors with distinct levels of education (high-school, Bachelor, Master, PhD, MBA, post-graduation, other), participants were asked to report their level of education. Bhandari and Deaves (2006) found that individuals with higher levels of education tend to be more overconfident than those with a lower degree of education. These authors further found that individuals tend to be particularly overconfident when their area of knowledge matches with the area of the decision.

Study background: This variable was added to explore if there is a difference among auditors with different study backgrounds. Participant's background, whether it is accounting, finance, management, or other could affect the decision-making process under different circumstances.

Years of experience: Participants were asked how many years of experience they had as an audit professional. This variable was included as it has been found that audit professionals with more years of experience tend to be less impacted by cognitive biases (Brazel, 2016).

Job position: Participants were asked about their current job position as an auditor. This variable is most of the time linked to years of experience. People in higher positions are likely to be less impacted by biases, due to higher experience and expertise (Brazel, 2016). This variable was added to account for the cases in which people do not actually progress, career wise, as I would expect these people are more prone to fall for cognitive biases.

Job level of satisfaction: Variable added to assess if there is a difference between auditors who are satisfied and those who are not satisfied with their job. My intuition says that those not happy with their job might be less keen on complying with professional skepticism practices.

3.7 Regression

With the aim of verifying the relationship between different cognitive biases and the level of audit professional skepticism, the following linear regression model was used:

$$Y_i = a + \beta_{1\ Outcome\ Bias\ i} + \beta_{2\ Confirmation\ Bias\ i} + \beta_{3\ Overconfidence\ Bias\ i} + \beta_{4\ Availability\ Heuristic\ Bias\ i} + \theta X + \varepsilon_i$$

In this equation, *Y* represents the outcome variable: level of audit professional skepticism, *i* represents a given individual, while α represents the baseline level of audit professional skepticism, β1 to β4 represent the coefficients of different biases defined as main predictor variables, and θ*X* comprehends the control variables, namely: (i) years of experience, (ii) job position, (iii) study background, (iv) level of education, (v) gender, and (vi) job level satisfaction. *ε* stands for the error term and *i* the number of observations.

4. Results

4.1 Scale reliability

The scale used in this study, Hurtt's (2010) professional skepticism scale, was already tested and considered reliable by prior literature (Hussin & Iskandar, 2014). Furthermore, it is widely

recognized as the most reliable scale, within the field of audit, to measure professional skepticism (Khan & Oczkowski, 2019). Nonetheless, considering that a reduced version of the scale is used, I decided to conduct a reliability analysis with Cronbach's α. The reduced version of Hurtt's professional skepticism scale, adopted in this study, presented an overall α of 0.92, which is considered very reliable in terms of internal consistency (Gliem & Gliem, 2003). The original version of the scale presented an α of 0.82 (Hurtt, 2010). Similar to what had happened in Hurtt's study, there were professional skepticism dimension questions that had a Cronbach α between 0.60 and 0.70, thus, being considered questionable in terms of internal consistency (Gliem & Gliem, 2003). In the original study, conducted by Hurtt (2010), only the questioning mind dimension presented a Cronbach alpha below 0.7, whereas, in this research, the self-determining, questioning mind, and self-confidence dimensions presented a score below 0.7. In this study only the overall reliability of the scale, deemed as excellent (Gliem & Gliem, 2003), will be considered. For more detailed information please refer to Table 1.

Table 1

Reliability Statistics

	Cronbach's α	*N* of Items
Questions in Total	.92	18
Self-Determining Questions	.67	3
Suspension of judgment Questions	.73	3
Search for knowledge Questions	.86	3
Interpersonal Understanding Questions	.89	3
Questioning mind Questions	.67	3
Self-Confidence Questions	.62	3

4.2 Summary statistics

In terms of cognitive biases, for all the four biases in study more than half of the participants were deemed as biased. Furthermore, outcome and overconfidence biases presented distributions with skewness close to -1, thus being considered moderately skewed. Confirmation bias presented a skewness of -0.184, which suggests that the data for this variable is fairly symmetrical. Lastly, availability bias presented a skewness of -2.138, meaning that the data for this variable is highly skewed to the left (Cain et al., 2016). As for kurtosis, outcome, overconfidence and confirmation biases have distributions with a negative kurtosis value, indicating that the distributions have lighter tails than the normal distribution, whereas availability bias has a distribution with a positive kurtosis indicating that the distribution has

heavier tails than the normal distribution (Cain et al., 2016). For full details regarding the summary statistics please refer to Table 2 in the Appendix B.

Concerning the professional skepticism score of the participants, the average score across respondents was 85.9 out of 108 (*SD* = 13.09). Converting to a 100 scale, being 100 the maximum level of skepticism possible, the mean score among audit professionals was 79.3, higher than Hurtt's (2010) results, who got a result of 75 among professional auditors. When assessing the professional skepticism per job position, it is visible that the professional skepticism score tends to increase the higher the job position is. Audit juniors have an average professional skepticism score of 73.2, senior auditors an average score of 86.3, managers present an average professional skepticism score of 88.2 and, lastly, senior managers an average score of 95. For full details regarding the summary statistics please refer to Table 3 and Table 4 in the Appendix B.

Regarding the level of job satisfaction, the average score across all participants was 5.55 (*SD* = 2.62) in a scale from 0 to 10. When analyzing the breakdown of the level of satisfaction per job position one can see that there is a positive relationship between the higher the audit job position is and the level of satisfaction with the job. The average level of job satisfaction among audit juniors was 4.21, for senior auditors this average score increased to 6.86, managers presented an average score of 7.94 and, lastly, senior managers had an average level of satisfaction of 8.75. For full details regarding the summary statistics please refer to Table 5 in the Appendix B. When assessing the biases per level of job satisfaction one can note that the percentage of biased respondents tends to decrease the higher the level of satisfaction with the job is. This phenomenon is particularly evident for confirmation and outcome biases. Please refer to Table 6 in Appendix B for a full breakdown of the percentages.

4.3 Are Portuguese Auditors Biased?

The first question that this research intended to respond is whether Portuguese auditors are biased. To so, a series of questions was asked to participants via the survey. The four cognitive biases in the study were dichotomized, meaning that, depending on how well Portuguese auditors answered to the questions they were either considered as biased or not biased. For confirmation bias, as shown in Table 7 in the Appendix B, it is noticeable that only 54.6% of the participants fell for this bias, choosing the answer that best supported their initial belief. Additionally, it is also noticeable that 71.0% of respondents differently evaluate the quality of someone's decision based on its outcome, presenting outcome bias. Furthermore, 71.6% of the Portuguese auditors inquired shown signs of overconfidence on the answers provided to the

four questions presented in the survey. Lastly, the bias which presented higher results was the availability bias, as 86.4% of the participants did not chose the correct answer to all the availability bias related questions, thus being considered biased.

Moreover, when assessing the percentage of biased respondents per the current audit position that they possess, for the confirmation, outcome and overconfidence biases the percentage of biased respondents decreased as the job position was higher, apart from the Senior Manager position (which had few answers). However, for the availability bias results were quite stable across all job positions. Please refer to Table 2.

Table 2

Percentage of Bias per Current Audit Professional Position

	Current Audit Professional Position			
	Junior/Staff	Senior	Manager	Senior Manager
Availability Bias	87.13%	87.76%	83.33%	87.50%
Confirmation Bias	71.29%	30.61%	18.89%	25.00%
Outcome Bias	88.12%	57.14%	27.78%	37.50%
Overconfidence Bias	84.16%	69.39%	55.56%	75.00%

Lastly, when assessing the percentage of biased respondents per the highest school level attained, one can see that for all the biases, except availability, participants whose highest level of education was a Bachelor were always more prone to biases. On the opposite side, the ones who had an MBA were the ones showing less susceptibility to biases. Please refer to Table 3.

Table 3

Percentage of Bias per Highest School Level Attained

	Highest School Level Attained			
	Bachelor	Master	MBA	Other
Overconfidence Bias	78%	68%	63%	100%
Confirmation Bias	61%	53%	38%	0%
Availability Bias	87%	88%	81%	100%
Outcome Bias	87%	64%	44%	100%

4.4 Better Understanding of Sample Characteristics

To a have a deeper understanding on what was impacting the level of cognitive bias showed previously, a regression between the control variables and each one of the cognitive biases was run. As the cognitive bias are dichotomous variables, four separate binary logistic regressions

were used to describe these relationships (see Table 8 in the Appendix B). The control variables included in each one of the models were highest school level attained, current audit professional position, years of audit job experience, level of satisfactions with audit work, and gender.

In what regards the availability bias, none of the controls included in the model seemed to have a significant impact on this bias ($p > 0.05$). The model showed a non-significant Hosmer and Lemeshow test results ($p > 0.05$), meaning that the model fits the data, and that there are no significant differences between the observed and the predicted (Bartley, 2014). However, the model also showed a non-significant omnibus test ($p > 0.05$), evidencing that the model including the predictors is not significantly better than if it only presented the constant (IBM, 2021).

The second bias in analysis was the outcome bias. For this bias, only one of the control variables, level of satisfaction with audit work, presented a significant result ($p < 0.05$). In accordance with this model, the more the auditor is satisfied with working in audit, the lower the probability of incurring in cognitive bias. In fact, if the level of satisfaction with audit increases by 1 unit, the odds of an auditor presenting outcome bias decrease by 0.751 (OR = 0.75, 95% CI [0.62, 0.91]). In this model, all the control variables explain 32.3% of variation on the outcome bias. In terms of goodness of fit, both the omnibus test and the Hosmer and Lemeshow test presented positive results, with the first one being significant ($p < 0.05$) and the second being non-significant ($p > 0.05$).

Moreover, for overconfidence bias, once again, none of the control variables was significant in explaining the variation in overconfidence bias. The tests of goodness of fit presented a non-significant omnibus test ($p > 0.05$) and a non-significant Hosmer and Lemeshow test ($p > 0.05$).

Lastly, for confirmation bias, the results are very similar to the ones presented for overconfidence and availability, with none of the control variables presenting a significant effect. The only variable that presents a marginal effect on these biases is current audit professional position, with $p = 0.083$. The results indicate that, if the auditors increase their job position, for example, if junior auditors become senior auditors, the odds of presenting confirmation bias decreases by 0.380 (OR = 0.380, 95% CI [0.127, 1.136]). In this case, the goodness of fit output demonstrates that the omnibus test is significant ($p < 0.05$) and that the Hosmer and Lemeshow test is also significant ($p < 0.05$). Moreover, the control variables in this model only explain 16.4% of variation in the confirmation bias.

4.5 Do cognitive biases impact audit professional skepticism?

To assess whether the cognitive biases under study impact the skepticism level of Portuguese audit professionals, I studied, individually, the impact that each of the independent variables (cognitive biases) and the control variables had on professional skepticism. To do so, I ran a correlation matrix with all the biases in study (see Table 9 in Appendix B).

Regarding cognitive biases, Table 9 in Appendix B, shows that confirmation, outcome, and overconfidence biases all have significant bivariate correlations with professional skepticism ($p < 0.05$). On the other hand, it also shows that availability bias does not ($p > 0.05$). Concerning the control variables, only gender does not appear to have a significant effect on professional skepticism. Moreover, it is visible in Table 9 in Appendix B that there is a very strong correlation between two control variables, years of job experience and audit job position ($r = 0.92$; $p < 0.001$), which represents a multicollinearity issue. To comply with OLS assumptions, I removed the variable years of job experience from further analysis. I chose to remove years of job experience rather than audit job position as the first presented a weaker correlation to professional skepticism.

Using an OLS model, I assessed the relationship between the multiple predictors (cognitive bias and controls), and the outcome variable (professional skepticism). Two scenarios were considered, the first only included cognitive biases and the second scenario also accounted for the controls. Considering the first model explicit on Table 4, without considering any controls, it is possible to understand that overconfidence bias, confirmation bias, and outcome bias present a significant predictive effect on professional skepticism ($p < 0.05$). Whereas, for availability the result is not significant ($p > 0.05$). This first OLS model shows a negative relationship between the significant cognitive biases and professional skepticism. Meaning that, the higher the auditor's confirmation ($b = -5.29$), outcome ($b = -10.78$), and overconfidence bias ($b = -6.16$), the less the auditor's scores in terms of professional skepticism. The percentage of the variation in professional skepticism that is explained by the four cognitive biases in scope is 31% ($R^2 = .31$)

The second OLS model used considers all cognitive bias and controls and is showed on Table 3. The controls used for this analysis were highest school level attained, current audit professional position, level of satisfaction with audit work, and gender. Similarly, to the results from the first OLS, availability bias does not present a significant result ($p > 0.05$) and outcome bias, overconfidence bias and confirmation bias still show a significant negative impact ($p < 0.05$). However, the relationship between these significant factors and professional skepticism

appears to be stronger when the model does not include the controls. When looking at the controls included in the model, there are only two control variables presenting a significant result, highest school level attained (b = 2.98, p < 0.05) and level of satisfaction with audit work (b = 1.90, p < 0.01). Furthermore, 51% of the variation in professional skepticism can be explained by the cognitive bias and the controls included in this second OLS model (R2 = .51).

Table 4

OLS Model with Cognitive Bias and Control Variables

	Model 1	Model 2
Availability Bias	$b = 1.60$ ($p = .54$)	$b = 4.63$ ($p = .43$)
Confirmation Bias	$b = -5.29$ ($p = .00$)	$b = -4.13$ ($p = .01$)
Outcome Bias	$b = -10.78$ ($p = .00$)	$b = -5.10$ ($p = .00$)
Overconfidence Bias	$b = -6.16$ ($p = .00$)	$b = -5.03$ ($p = .00$)
Highest School Level Attained	-	$b = 2.98$ ($p = .04$)
Current Audit Professional Position	-	$b = 1.38$ ($p = .30$)
Level of Satisfaction with Audit Work	-	$b = 1.90$ ($p = .00$)
Gender	-	$b = -.83$ ($p = .56$)
R^2	.312	.507
Adjusted R^2	.296	.484

4.6 Which cognitive bias impact professional skepticism the most?

With the previous analysis it was possible to understand that the biases portraying a significant impact on professional skepticism are outcome bias, confirmation bias, and overconfidence bias. The question that is now imposed is, amongst these three significant biases, which one impacts the professional skepticism level of Portuguese auditors the most.

To do this, I compared the b coefficients showed in both OLS models. In the first model, where the controls are not being considered, Table 5 shows that the cognitive bias with highest b coefficient is outcome bias. The b coefficient for this bias indicates that for one unit of increase in the outcome bias, the professional skepticism score of the audit professional decreases by -10.78 units. The b coefficient is lower for both overconfidence bias (b = -6.16) and confirmation bias (b = -5.29). Furthermore, I also compared the results from the 95% confidence interval for b These confidence intervals are overlapping between all variables, which indicates that, in fact, the differences found in the β coefficients are not significant.

In the second OLS model, the results were different. When accounting for controls, the bias with the highest β coefficient is outcome bias (b = -5.10), whilst overconfidence bias (b = -5.03) and confirmation bias (b = -4.13) present now a lower coefficient. However, the confidence intervals are overlapping for all the biases once again, meaning that, for the second OLS model, the differences encountered regarding the b coefficients are also not significant.

Table 5

OLS Model – 95% Confidence Interval for Beta

	Model 1	Model 2
Availability Bias	b = 1.60, 95% CI [-3.57, 6.76]	b = 4.63, 95% CI [0.16, 9.11]
Confirmation Bias	b = -5.29, 95% CI [-8.94, -1.65]	b = -4.13, 95% CI [-7.30, -0.96]
Outcome Bias	b = -10.78, 95% CI [-14.77, -6.78]	b = -5.10, 95% CI [-8.77, -1.44]
Overconfidence Bias	b = -6.16, 95% CI [-9.91, -2.40]	b = -5.03, 95% CI [-8.24, -1.82]
Highest School Level Attained	-	b = 2.98, 95% CI [0.21, 5.75]
Current Audit Professional Position	-	b = 1.38, 95% CI [-1.22, 3.98]
Level of Satisfaction with Audit Work	-	b = 1.90, 95% CI [1.17, 2.54]
Gender	-	b = -.83, 95% CI [-3.67, 2.00]

5. Discussion

5.1 Main Findings

This dissertation's purpose was to understand the impact that cognitive biases have in professional skepticism, among Portuguese auditors. Firstly, I focused on understanding whether Portuguese auditors were biased, and if so, which biases were the most common. Secondly, I assessed the relationship between the cognitive biases under study (outcome bias, confirmation bias, overconfidence bias, and availability bias) and professional skepticism. Lastly, I tried to understand which of the cognitive biases in study compromised professional skepticism the most.

When studying which biases Portuguese auditors are exposed the most to, the results were somewhat in line with my initial expectations. The results from the sample indicated that most of the participants are subject to all the biases. When assessing the cognitive biases per job position, it was noticeable that for the confirmation, outcome and overconfidence biases the percentage of individuals who were deemed as biased gradually decreased from junior to manager, even though not always in a linear way. These results reinforce Brazel's (2016) idea that employees with more years of experience are less susceptible to cognitive biases and is

against my initial expectation that was based on the idea that individuals in higher positions would default more easily to cognitive biases and tend to have more complex decisions. The reason for the opposing results may rely on work experience and on the continuous training that employees of audit firms are required to have, which may help to mitigate their susceptibility to biases (Morewedge et al., 2015). The same rationale cannot be applied to senior managers, whose percentage of bias was higher than managers' in the current study. A possible explanation for that can be the fact that only eight respondents were senior managers, therefore the results for this job position are not as reliable as for the other job positions.

Furthermore, the results from the sample indicate that gender does not have a significant impact on an individual's susceptibility to confirmation bias under complex decisions, opposing (Meyers-Levy, 1989) who suggested that men were more willing to fall for confirmation bias than women under complex decisions.

When breaking down the biases per level of education, once again for the availability bias the results are quite stable across all the levels of education, ranging between 81% and 88%. Nonetheless, for the remaining biases, the results descriptively suggest that participants who had an MBA or a Master's degree were less susceptible to biases than those who had a Bachelor's degree, which were the ones who appeared to be more biased. These results oppose Bhandari and Deaves' (2006) conclusions, which suggested that individuals with higher levels of education tend to be more overconfident than those with a lower degree of education.

Lastly, when assessing if the level of satisfaction played a role in one's level of bias, the analysis suggested that there was no linear relationship between these variables. However, it is visible that, overall, the percentage of participants who were deemed as biased tended to decrease the more they were satisfied with their job.

Moving to the relationship between cognitive biases and professional skepticism, I was expecting all the cognitive biases studied to have a negative relationship with professional skepticism, like it was concluded in previous literature (e.g., Brazel, 2016; Glover, 2005). My initial expectation was, in fact, aligned with previous literature and the results obtained in this study. I found that all biases, except availability bias, have a negative relationship with professional skepticism. The availability bias exception can be related to the fact that almost everyone was susceptible to it anyway (86.40%), so maybe there wasn't enough variation in it for it to have a relationship with skepticism. When conducting the OLS regressions to assess which predictors were more important in predicting the outcome variable, results suggested that controls do not explain the relationship between professional skepticism and the biases.

Lastly, when assessing which of the cognitive biases under study impacts auditors' professional skepticism the most, the results did not allow to draw any conclusions on this regard.

5.2 Implications

This research provides insightful findings not only to the academic literature but also to the corporate world. Auditing is pivotal for the correct functioning of the society (Dye & Stapenhurst, 1998), thus investigating factors that can affect audit quality is of high importance. No studies assessing the impact of auditor's cognitive biases on professional skepticism have been conducted in Portugal, which confers a level of uniqueness to this research. Furthermore, there are no studies including more than one cognitive bias when assessing its impact on professional skepticism, which affects the literature's ability to compare the impact of different biases. Furthermore, this research opens the door for future investigation of other cognitive biases capable of jeopardizing an auditor's skepticism level.

As stated in the beginning of the section, this dissertation can also be beneficial for the corporate world, especially for auditing firms in Portugal, as it sheds some light on the biases that their employees are the most prone to, and the implications that these have on professional skepticism. This research concludes Portuguese auditors are subject to biases, and that these biases are negatively associated with their level of professional skepticism. Therefore, by raising awareness on the effects of cognitive biases companies might start implementing more measures to combat this issue and fostering more reliable and higher quality audits.

5.3 Limitations and Future Research:

This dissertation has some limitations that should be acknowledged to foster future research. Firstly, it is important to realize that all the respondents of the survey were employees of the so called Big 4 auditing firms (i.e., Deloitte, PWC, EY and KPMG). In a certain way, this can be seen as a biased sample in the sense that these firms tend to "shape" their employees in a very standardized way through several learning courses and seminars (Huault et al., 2012). A less biased sample would include participants from other auditing firms, particularly with smaller size.

Secondly, the scale being used in this research is a reduced version of Hurtt's (2010) Professional skepticism scale, only including 18 out of the 30 items that are part of the scale. Hence, it is not possible to directly compare the results obtained in this study with previous literature. As stated in the data and methodology section, the reduced version was used to

increase the participants' response rate and their veracity, since larger surveys tend to be less appreciated by respondents (Jepson et al., 2005). Future studies should try to include the original version of the scale, even though it can compromise the number of answers obtained.

Furthermore, a small number of tests was used to assess a person's willingness to fall for a bias. For the outcome and confirmation biases, only one question was asked. For the overconfidence and availability bias, five different questions were asked, even though relating to the same exercise. One can say that it is insufficient to categorize a person as biased, even more if one is being considered biased by just not giving the correct answer to one question. Other factors, like the misinterpretation of the question, may have led auditors to choose the incorrect option. Also, instead of assessing the level of bias that exist within each cognitive bias, this research solely focuses on whether a person is deemed as biased or not. This approach was chosen as the study is short and multiple biases are being studied at the same time. Future studies should try to take a more extensive approach and investigate the effect that different levels of biases have on professional skepticism.

Moreover, data was gathered through the use of the survey method, which is has some disadvantages that come along with it. Firstly, there is no way to ensure that the answers provided are completely honest, secondly there may have been differences in interpretation of the questions which may have resulted in different answers. Furthermore, it is impossible to make sure which responses are unconscientiousness or not, which can compromise the validity of the data (Cantrell & Lupinacci, 2007).

Next, in this study, only Portuguese auditors were considered, hence it is not possible to extrapolate the results obtained in this research to other countries. It would be very interesting to perform similar studies in different countries of the world and compare the results obtained. Divergences in results could be explained by differences in cultural dimensions. The introduction of cultural dimensions to the study of cognitive biases and professional skepticism would be an enriching addition to current literature in this area of study. Adding to this, there is no significant prior literature on this topic concerning Portuguese auditors. Thus, I had to rely primarily on foreign studies to understand the effect that cognitive biases have on professional skepticism. Therefore, I performed the translation of cognitive biases experiments from English to Portuguese as well as the translation of Hurtt professional skepticism scale statements. Due to the specificities of each language and culture, I acknowledge the existence of translatability issues, which may have caused some information to be lost during the process (Cha et al., 2007).

This research is a cross-sectional study, meaning that the data was collected in a specific point in time. Because of that, it is not possible to determine causality between variables and it

is not possible to study the temporal relation between the cognitive biases and professional skepticism. Future research could be focused on trying to gather data regarding this relationship for a longer period of time, to be able to infer causality.

Lastly, this study primarily addressed the impact of these biases in auditors with a relatively low position in the hierarchical pyramid, as most respondents had a junior position and only a few were manager-level or above. Future research should try to gather more data regarding Portuguese auditors with higher positions to see to what extent does experience and expertise on the area does mitigate an auditor's pitfall for cognitive biases.

6. Conclusion

In line with previous literature from other countries, this dissertation's conclusion reinforces the idea that audit professionals are susceptible to cognitive biases and that these biases are negatively associated with an auditor's level of professional skepticism. As a final remark, I hope that this research contributes to shed some light on how impactful cognitive biases can be to the audit profession. Ignoring its existence may potentially lead auditors to unconsciously behave in an irrational manner and potentially compromise the compliance with the standards required for the profession.

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8. Appendix

Appendix A | Survey

Caro participante,

O meu nome é Daniel Almeida e encontro-me neste momento a desenvolver a minha tese no campo de *optimal decision making*. Este questionário tem o propósito de estudar a relação entre a forma como os auditores tomam decisões e o nível de ceticismo profissional que demonstram. Todos os dados serão recolhidos de forma anónima e usados exclusivamente para esta pesquisa. Por favor tenha em consideração que levará cerca de 7 minutos para concluir o questionário. A sua participação é voluntária e pode terminá-la a qualquer momento, mesmo após o começo, sendo que a sua participação é uma contribuição extremamente valiosa para a minha investigação.

Em caso de dúvidas sobre o estudo, não hesite em contactar-me através do email: s-dagalmeida@ucp.pt

Obrigado pela sua colaboração!

End of Block: Introduction

Start of Block: Demographics - Confirm audit profession

Por favor, confirme se trabalha na área de auditoria:

○ Sim, eu trabalho na área de auditoria (1)

○ Não, eu não trabalho na área de auditoria (2)

Skip To: End of Survey If "Por favor, confirme se trabalha na área de auditoria" = Não, eu não trabalho na área de auditoria

End of Block: Demographics - Confirm audit profession

Start of Block: Demographics - General

Por favor indique se trabalha numa Big 4 :

○ Sim, eu trabalho numa Big 4

○ Não, eu não trabalho numa Big 4

Por favor indique o mais recente nível de escolaridade atingido:

○ Ensino Secundário (1)

○ Licenciatura (2)

○ Mestrado (3)

○ MBA (4)

○ Outro (5) _____

Por favor indique a sua área de estudo:

☐   Finanças (1)

☐   Contabilidade (2)

☐   Auditoria (3)

☐   Economia (4)

☐   Gestão (5)

☐   Fiscalidade (6)

☐   Outro (7) _____

Por favor indique o seu cargo de trabalho atual:

○ Junior Auditor/Staff (1)

○ Senior (2)

○ Manager (3)

○ Senior Manager (4)

○ Director (5)

○ Partner (6)

Por favor indique o número de anos de experiência que tem em cargos de auditoria:

_____

Refira, por favor, qual o seu nível de satisfação relativamente à sua experiência de trabalho no ramo da auditoria:

	Nada Satisfeito	Muito Satisfeito
	0 1 2 3 4 5 6 7 8 9 10	
Nível de satisfação ()		

Por favor indique o seu género:

○ Feminino (1)

○ Masculino (2)

○ Prefiro não responder (3)

○ Outro (4) _____

Por favor indique qual o seu nível de proficiência em inglês.

○ Nativo (1)

○ Proficiente (2)

○ Avançado (3)

○ Intermediário (4)

○ Básico (5)

○ Nenhum (6)

Por favor selecione a opção "concordo plenamente" de forma a mostrar que está a prestar atenção à pergunta.

○ Discordo plenamente (1)

○ Discordo (2)

○ Concordo (3)

○ Concordo plenamente (4)

End of Block: Demographics - General

Start of Block: Cognitive biases assessment 1

Considere o seguinte cenário ao responder às questões que se seguem:

Está a trabalhar no ramo da auditoria e na sua equipa exerce a posição de *Manager*. Um dos membros do *staff* que está alocado à sua equipa informa-o que necessita de mais tempo e recursos para executar uma investigação mais aprofundada de um potencial *material misstatement*. Como consequência desta ação, as atividades normais do cliente serão, provavelmente, interrompidas, uma vez que estes irão necessitar de mais tempo a ajudar e a fornecer as informações necessárias à equipa de auditores.

Suponha ainda que a sua equipa já passou o budget alocado para o projeto.

Acaba por aprovar que o membro do *staff* despenda mais tempo e recursos a investigar a situação. Esta ação pode desencadear um de dois possíveis cenários:

1 - O membro da sua equipa realmente encontra um erro material.

2 - O membro da sua equipa não encontra nenhum erro material.

Em qual das situações avaliaria o membro do staff mais positivamente?

(-5 = Se não encontrar um erro material; 0 = Nenhum dos cenários influenciaria a minha avaliação; +5 = Se encontrar um erro material)

Se o staff não encontrar um erro material	Nenhuma das situações influenciaria a minha a avaliação	Se o staff encontrar um erro material
-5 -4 -3 -2 -1	0 1 2	3 4 5

Em que situação avaliaria melhor o membro da sua equipa mesmo considerando que este usou mais recursos do que o esperado ()	

End of Block: Cognitive biases assessment 1

Start of Block: Cognitive biases assessment 2

Nesta secção vão ser apresentadas 5 perguntas, de caráter generalista, com 2 opções de resposta. Por favor, escolha a opção que acha correta, e, seguidamente, indique o seu nível de confiança relativamente à resposta dada anteriormente.

Que nome se dá a uma pessoa que tem dúvidas mas não nega a existência de Deus?

○ Agnóstica (1)

○ Ateia (2)

Por favor, indique o seu nível de confiança relativamente à resposta dada na pergunta anterior.

50 55 60 65 70 75 80 85 90 95 100

Nível de confiança ()	

Budapeste é a capital de que país?

○ Hungria (1)

○ Roménia (2)

Por favor, indique o seu nível de confiança relativamente à resposta dada na pergunta anterior.

50 55 60 65 70 75 80 85 90 95 100

Nível de confiança ()	

Qual o nome do maior rio do continente asiático?

○ Yangtze (1)

○ Ganges (2)

Por favor, indique o seu nível de confiança relativamente à resposta dada na pergunta anterior.

50 55 60 65 70 75 80 85 90 95 100

Nível de confiança ()	

Ailurofobia é o nome que se dá a uma pessoa que tem medo de que tipo de animal?

○ Águia (1)

○ Gato (2)

Por favor, indique o seu nível de confiança relativamente à resposta dada na pergunta anterior.

50 55 60 65 70 75 80 85 90 95 100

Nível de confiança ()	

Que nome se dá ao jogo que o super computador Deep Blue foi programado para jogar?

◯ Tetris (1)

◯ Xadrez (2)

 Por favor, indique o seu nível de confiança relativamente à resposta dada na pergunta anterior.

50 55 60 65 70 75 80 85 90 95 100

Nível de confiança ()	

End of Block: Cognitive biases assessment 2

Start of Block: Cognitive biases assessment 3

Na língua inglesa, as seguintes letras são mais prováveis de ocorrer como a primeira ou terceira letra de uma palavra?

	Primeira letra da palavra (1)	Terceira letra da palavra (2)
Letra "K" (1)	○	○
Letra "L" (2)	○	○
Letra "N" (3)	○	○
Letra "R" (4)	○	○
Letra "V" (5)	○	○

End of Block: Cognitive biases assessment 3

Start of Block: Cognitive biases assessment 4

Para a próxima pergunta considere quatro cartas. Num dos lados de cada carta é mostrado um número, no outro uma letra. Considere a seguinte condição: "Se uma carta tem a letra D de um lado, então tem o número 4 do outro lado"

Por favor, selecione as duas cartas que escolheria virar de modo a confirmar a condição mencionada anteriormente

☐ Image:Número 4 (1)

☐ Image:Número 8 (2)

☐ Image:Letra D (3)

☐ Image:Letra A (4)

End of Block: Cognitive biases assessment 4

Start of Block: Professional skepticism assessment

Pode encontrar em baixo um conjunto de afirmações usadas pelas pessoas para se descrever. Por favor, selecione, para cada afirmação, a resposta que melhor o/a caracteriza. Não existem respostas certas ou erradas. Por favor, não despenda muito tempo em cada afirmação.

	Discordo completamente (1) (1)	(2)	(3)	(4)	(5)	Concordo completamente (6) (6)
Eu tendo a aceitar imediatamente o que as outras pessoas me dizem (1)	○	○	○	○	○	○
Eu não gosto de tomar decisões de forma precipitada (2)	○	○	○	○	○	○
Descobrir informação nova é algo divertido para mim (3)	○	○	○	○	○	○
Considero as ações que as pessoas realizam e as razões para essas mesmas ações algo fascinante (4)	○	○	○	○	○	○
Eu aprecio aprender (5)	○	○	○	○	○	○
Os meus amigos dizem-me que costumo questionar tudo o que vejo ou oiço (6)	○	○	○	○	○	○
Eu demoro o meu tempo a tomar decisões (7)	○	○	○	○	○	○
Eu tenho confiança em mim próprio/a (8)	○	○	○	○	○	○

Interesso-me pelas causas que levam aos comportamentos praticados pelas pessoas (9)	○	○	○	○	○	○
Considero que aprender é entusiasmante (10)	○	○	○	○	○	○
Frequentemente questiono as coisas que vejo ou oiço (11)	○	○	○	○	○	○
Não me sinto seguro/a de mim próprio/a (12)	○	○	○	○	○	○
Normalmente aceito as coisas que vejo, leio ou oiço sem me questionar (13)	○	○	○	○	○	○
Aprecio entender a razão para o comportamento das outras pessoas (14)	○	○	○	○	○	○
Estou seguro das minhas capacidades (15)	○	○	○	○	○	○
Não gosto de tomar decisões até ter conhecimento de toda a informação disponível (16)	○	○	○	○	○	○
Tendo a aceitar as explicações de outras pessoas sem as questionar (17)	○	○	○	○	○	○

Normalmente rejeito afirmações a menos que tenha provas de que são verdadeiras (18)	○	○	○	○	○	○
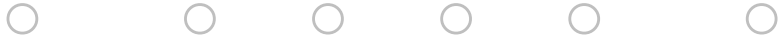
End of Block: Professional skepticism assessment

Appendix B | Tables

Table 1

Demographic Frequencies

	N	%
Gender		
Female	86	48.9%
Male	90	51.1%
Current Professional Position		
Junior Auditor/Staff	101	57.4%%
Senior	49	27.8%
Manager	18	10.2%
Senior Manager	8	4.5%
Highest Education Attained		
Bachelor Degree	67	31.8%
Master Degree	92	52.3%
MBA	16	9.1%
Other	1	0.6%
Study Field		
Finance	28	15.9%
Accounting	33	18.8%
Audit	20	11.4%
Economics	29	16.5%
Management	83	47.2%
Taxation	3	1.7%
Other	7	4.0%

Table 2

Cognitive Biases Summary Statistics (N = 176)

	Outcome Bias	Overconfidence Bias	Availability Heristic Bias	Confirmation Bias
Mean	.7102	.7159	.8636	.5455
Median	1.0000	1.0000	1.0000	1.0000
Std. Deviation	.45495	.45227	.34415	.49935
Skewness	-.935	-.966	-2.138	-.184
Std. Error of Skewness	.183	.183	.183	.183
Kurtosis	-1.139	-1.080	2.598	-1.989
Std. Error of Kurtosis	.364	.364	.364	.364

Table 3

Mean Value of Professional Skepticism Score per Current Audit Job Position

	Current Audit Professional Position				
	Junior/Staff	Senior	Manager	Senior Manager	Total
Professional Skepticism Score (scale until 108)	73.2	86.3	88.2	95.0	85.7
Professional Skepticism Score (scale converted to 100)	67.8	79.9	81.6	88.0	79.3

Table 4

Professional Skepticism Score – Descriptive Statistics

	Observations	Mean	Std. Dev.	Minimun	Máximum
Professional Skepticism Score	176	79.34	13.09	50	108

Table 5

Level of Job Satisfaction per Job Position

	Observations	Mean	Std. Dev.	Minimun	Máximum
Junior/Staff	101	4.21	2.31	0	10
Senior	49	6.86	1.98	3	10
Manager	18	7.94	1.16	6	10
Senior Manager	8	8.75	0.89	8	10
Total	176	5.55	2.62	0	10

Table 6

Level of Bias per Level of Satisfaction with Audit Work (in %)

	Level of Satisfaction with Audit Work										
	.00	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Confirmation Bias	75.0	100.0	72.7	70.0	40.0	61.1	57.7	47.6	37.5	36.4	41.7
Overconfidence Bias	100.0	62.5	86.4	90.0	70.0	94.4	57.7	61.9	50.0	81.8	75.0
Availability Bias	100.0	100.0	81.8	90.0	95.0	77.8	84.6	90.5	91.7	72.7	83.3
Outcome Bias	100.0	87.5	95.5	90.0	85.0	83.3	73.1	57.1	58.3	27.3	33.3

Table 7

Observation of Cognitive Biases in Percentage in Total Sample

	N	Percentage
Availability Bias	152	86.4%
Confirmation Bias	96	54.6%
Outcome Bias	125	71.0%
Overconfidence Bias	126	71.6%

Table 8

Cognitive Biases Binary Logistic Regression Results

	Availability Bias	Outcome Bias	Overconfidence Bias	Confirmation Bias
Highest School Level Attained	*Exp(B)* = 0.91 (*p* = .84)	*Exp(B)* = 1.01 (*p* = .97)	*Exp(B)* = 1.13 (*p* = .72)	*Exp(B)* = 1.30 (*p* = .43)
Current Audit Professional Position	*Exp(B)* = 0.70 (*p* = .64)	*Exp(B)* = 0.86 (*p* = .80)	*Exp(B)* = 0.60 (*p* = .35)	*Exp(B)* = 0.38 (*p* = .08)
Years of audit job experience	*Exp(B)* = 1.24 (*p* = .48)	*Exp(B)* = 0.75 (*p* = .24)	*Exp(B)* = 1.02 (*p* = .92)	*Exp(B)* = 1.06 (*p* = .78)
Level of Satisfaction with Audit Work	*Exp(B)* = 0.93 (*p* = .53)	*Exp(B)* = 0.75 (*p* = .00)	*Exp(B)* = 0.96 (*p* = .63)	*Exp(B)* = 0.91 (*p* = .24)
Gender(1)	*Exp(B)* = 0.70 (*p* = .43)	*Exp(B)* = 0.85 (*p* = .68)	*Exp(B)* = 0.89 (*p* = .74)	*Exp(B)* = 1.12 (*p* = .73)
Correct classification	86.8%	75.3%	69.0%	69.0%
Cox & Snell's R^2	.01	.23	0.04	.12
Nagelkerke's R^2	.02	.32	0.05	.16
Omnibus test	χ^2 (5) = 1.72, (*p* = .89)	χ^2 (5) = 44.75, (*p* = .00)	χ^2 (5) = 6.58, (*p* = .25)	χ^2 (5) = 22.73, (*p* = .00)
Hosmer & Lemeshow	χ^2 (8) = 1.94, (*p* = .98)	χ^2 (8) = 2.11 (*p* = .98)	χ^2 (8) = 7.27 (*p* = .51)	χ^2 (8) = 16.74 (*p* = .03)

Table 9

Correlation Matrix

Variables	Professional Skepticism Total Score	Highest School Level Attained	Current Audit Professional Position	Years of audit job experience	Level of Satisfaction with Audit Work
Professional Skepticism Total Score	1				
Highest School Level Attained	0.388**	1			
Current Audit Professional Position	0.532**	0.619**	1		
Years of audit job experience	0.494**	0.609**	0.922**	1	
Level of Satisfaction with Audit Work	0.604**	0.324**	0.591**	0.525**	1
Gender	-0.043	0.071	0.057	0.043	-0.060
Outcome Bias	-0.469**	-0.275**	-0.451**	-0.442**	-0.424**
Overconfidence Bias	-0.323**	-0.096	-0.194**	-0.173*	-0.154*
Availability Heristic Bias	-0.059	-0.011	-0.015	0.007	-0.062
Confirmation Bias	-0.369**	-0.146	-0.330**	-0.289**	-0.261**

Table 9

Correlation Matrix - Continuation

Variables	Gender	Outcome Bias Assessment	Overconfidence Bias Assessment	Availability Heristic Bias Assessment	Confirmation Bias Assessment
Professional Skepticism Total Score					
Highest School Level Attained					
Current Audit Professional Position					
Years of audit job experience					
Level of Satisfaction with Audit Work					
Gender	1				
Outcome Bias	0.027	1			
Overconfidence Bias	0.014	0.181[*]	1		
Availability Heristic Bias	0.059	0.050	0.017	1	
Confirmation Bias	-0.025	0.348[**]	0.235[**]	0.120	1