
BALANCE SHEET FICTTTIOUS CASH HOLDINGS: AN EXPLORATORY
STUDY FOR PORTUGUESE MICRO COMPANIES

Carlota Coutinho Barbosa

Dissertation
Master in Management

Supervised by
PhD Prof. José António Moreira

2020

Abstract

The present study aims to analyse the determinants of the fictitious cash holdings, represented by a discrepancy between the accounted cash value and the actual one, of the Portuguese micro companies. This phenomenon results from the owner withdrawing cash from the company without business justification. Since the owner and the company are different entities, this occurrence is a (tax) fraud.

The literature does not offer empirical evidence that enhances the understanding of the fictitious cash holdings. Thus, this dissertation adds to the literature combining the perspectives on cash holdings and fraud and showing that this phenomenon exists, and it is quite widespread among micro companies.

The methodology adopted to study this situation is the estimation of a logit model to analyse the factors that account for the existence of fictitious cash holdings, through a sample of Portuguese micro companies for the period 2017-2018.

Results indicate that non-audited, inactive, small, family businesses are prone to present fictitious cash holdings. However, this study did not find empirical evidence that the number of owners/managers is a significant factor for the existence of phenomenon.

Keywords: Micro companies; Fictitious cash holdings; Cash holdings determinants; Fraud Triangle

JEL-Codes: E 26; E 62; H 26; K 34; M41

Resumo

O presente estudo visa analisar os fatores que influenciam a existência de saldos de caixa fictícios, representados por uma diferença entre o valor de caixa contabilizado e o valor real, nas microempresas portuguesas. Esta discrepância resulta da retirada de fundos da empresa pelo proprietário sem um documento subjacente a justificar. Uma vez que o proprietário e a empresa são entidades diferentes, esta ocorrência é considerada fraude (fiscal).

A literatura atual não oferece evidências empíricas que melhorem a compreensão da existência de saldos de caixa fictícios, nem do ponto de vista dos determinantes de saldos de caixa, nem da fraude. Assim, esta dissertação contribui para a literatura combinando ambas as perspetivas, além de mostrar que este fenómeno existe e está bastante difundido nas microempresas.

A metodologia adotada para estudar esta situação foi a estimação de um modelo logarítmico para analisar os fatores potenciadores de saldos fictícios de caixa, através de uma amostra de microempresas portuguesas para o período 2017-2018.

Os resultados indicam que as empresas familiares, não auditadas, inativas e de pequena dimensão são propensas a apresentar saldos de caixa fictícios. Contudo, o estudo não encontrou evidência empírica para concluir que o número de donos/gestores é um fator significativo para a existência deste fenómeno.

Palavras chave: Microempresa; Saldos de caixa fictícios;
Determinantes de saldos de caixa; Triângulo da Fraude

Table of content

Abstract.....	i
Resumo	ii
Table of content.....	iii
List of tables	v
1. Introduction	1
2. Literature Review	4
2.1 Cash holdings theories and its studies	4
2.1.1 Theories on cash holdings determinants.....	4
2.1.2 Studies on cash holdings determinants.....	7
2.2 Fraud elements and its studies	10
2.2.1 Models of Fraud elements	10
2.2.2 Relevant studies on fraud factors	11
3. The business and legal Portuguese contexts	14
3.1 Portuguese business context	14
3.2 Portuguese legal context	15
3.3 The vulnerability of micro companies to fraud.....	16
4. Methodological and data aspects	17
4.1 Methodology.....	17
4.1.1 The first model: expected cash holdings.....	17
4.1.2 The second model: determinants of fictitious cash holdings	19
4.2 Data selection	22
4.2.1 The data samples used	22
4.2.2 Subsample 1: audited companies	23
4.2.3 Subsample 2: micro companies.....	26
5. Empirical Results.....	29

5.1	Introduction	29
5.2	Results of the first model	29
5.3	Results of the second model	31
5.4	Other empirical results: robustness tests.....	34
6.	Conclusion	36
7.	Appendix.....	38
7.1	Appendix 1: Variables of the main models referred on the literature review on cash holdings.....	38
7.2	Appendix 2: Alternative analysis on the results of the second model	38
	References	41
	Webography	43
	Legislation on the topic consulted.....	44

List of tables

Table 1 - Descriptive statistics of the ratio cash/total assets	24
Table 2 – Descriptive statistics of the variables of the first model	25
Table 3 - Correlation matrix of the variables of the first model.....	25
Table 4 - Descriptive statistics of the variables of the second model.....	27
Table 5 - Correlation matrix of the explanatory variables of the first model	28
Table 6 - Results of the first model.....	30
Table 7 - Results of the second model	32
Table 8 - Results of the addition of the observation with DCS>1	34
Table 9 – Variables of the main models referred on the literature review on cash holdings	38
Table 10 – Additional results of the second model.....	39
Table 11 – Results of the equation 7.5	40

1. Introduction

“We are often asked by colleagues [accountants] about the existence of large values recorded in the 'Cash' account, which do not correspond to the truth [...] Some colleagues admit that the reason for the [non-]existence of these cash balances may be due to the withdrawal of funds, without being communicated to them, or to the absence of registration due to missing documents. Thus, these withdrawals may have been for the purpose of paying expenses or charges without any underlying document [...] and/or the withdrawals have been used to the advantage of those responsible for the companies.”

“Instituto para Apoio a Técnicos Oficiais de Contas”
(Accountants Supporting Institute), www.iatoc.org, João Colaço.

The aim of this dissertation is the analysis of the factors that account for the existence of fictitious cash holdings of the Portuguese micro companies, originated from the owner withdrawing cash from the company for personal reasons without an underlying document, as explained by the *Instituto para Apoio a Técnicos Oficiais de Contas*.

This phenomenon can be considered as fraudulent, once the company and the owner are two distinctive entities and thus with separate properties. Legally, the owner can appropriate the company's gains by distributing dividends, however that income is taxable. Therefore, when the owner retrieves the company's money without a business justification, that represents an income that will not be taxed by the Portuguese Tax and Customs Authority (AT), thus a tax fraud.

Anecdotal evidence, like the citation above, shows that this fraudulent act exists, and it is quite widespread among micro companies. Nevertheless, no known scientific study has approached the issue and looked at its determinants, even in international terms. Hence, this research, although exploratory, is a novelty that looks in a structured way to the determinants of this anti-social behaviour, taking advantage of the specific Portuguese context of micro companies. Therefore, the present study contributes to the literature by showing empirical evidence that support the citation and by highlighting the basic determinants that increase the opportunity for such a behaviour. Moreover, it may be of interest for tax authorities and for academics interested in these research lines.

The fictitious cash holdings are represented by a discrepancy between the value on cash account and the actual one existing in the company. Therefore, the cash account, that reflects the cash balance, fictitious or not, is inflated by the former. However, companies hold cash

for many reasons, thus high values in the cash account does not imply necessarily the presence of fictitious cash. Therefore, a model to compute the expected cash holding of the companies was performed, allowing the estimation of the predicted fictitious cash holdings. This model was based on the current literature on the determinants of cash holdings, which presents three main theories: Trade-off Theory, Pecking Order Theory (Myers, 1984) and Free Cash Flow Theory (Jensen, 1986).

The Trade-off Theory states that companies choose their cash holding levels based on the marginal benefits and marginal costs of holding cash, reaching the optimal level. According to Chang-Soo et al. (1998), Ferreira & Vilela (2004) and Opler et al. (1999) the benefits of retaining cash are the lower probability of financial distress, minimization of external financing costs and the immediate opportunity to invest in value added projects, without the need to convert assets in liquidity or incur in external financing constraints. However, by holding cash, companies incur in an opportunity cost once liquid assets have low returns.

The Pecking Order Theory, based on the studies of Myers & Majluf (1984) on asymmetric information, defend that managers prefer internal financing to external financing to minimise costs associated to the asymmetric information and external financing (Ferreira & Vilela, 2004; Myers, 1984; Chang-Soo et al., 1998). When internal financing is not available, managers privilege debt to equity due to high costs of the latter (Ross et al., 2010, p.583).

Finally, the Free Cash Flow Theory focus on the agency costs brought by the separation of the manager from the shareholders. According to Jensen (1986), managers hold cash to gain power over the company's investment decisions since they are not pressured to have good performances, and thus investing in projects that undermines the shareholders wealth.

Hence, companies may hold cash for any of the determinants underlying these theories. However, this study does not fit under them, because the cash does not exist. It disappeared from the company assets in a way that can be labelled as fraudulent. Thus, the Fraud Triangle Theory (Cressey, 1953) was adopted as the framework to understand the actions that lead to the cash disappearance. Many studies are developed under this theory, which states that three elements are present for a fraud to occur: pressure (force that motivates the individual to commit embezzlement), opportunity (a perceived situation favourable to commit fraud), and rationalization (self-justification of the act that the person otherwise would consider it wrong).

Wolfe & Hermanson (2004) (*apud* Alves, 2018; Rustiarini et al., 2019; Utami et al., 2019)

extended the Fraud Triangle, adding capacity (ability to undertake the fraudulent action) as a new factor that lead someone to commit fraud. Top managers and owners present a higher capacity to commit fraud due to their position and knowledge on the company controls, representing 29% of the cases analysed in small business from the Association of Certified Fraud Examiner (ACFE, 2018).

It is important to take into account that the kind of (fiscal) fraud this study analyses is very peculiar, given that the fraudster does not need to hide his/her action from anyone in the company, because him/her is the owner of the company. Moreover, in the type of companies studied, usually he/she is simultaneously the owner and the manager. Thus, only the AT is deceived with his/her actions.

The methodology adopted was the estimation of a model to compute the expected cash holdings, to further signal the companies with an observed value of cash holdings different than the estimated one. The companies with a positive difference were used to modelling a logistic model to explain the factors that account for the existence of fictitious cash holdings.

The empirical results of the analysis show that the presence of an auditor following the firm activity mitigates the opportunity for undertaking this kind of fraud; that inactive and small companies are more prone to present fictitious cash holdings; and that family ownership enhances such an opportunity since member may collude to extract funds of the company. However, the present study did not find empirical evidence that the number of owners/managers is a determinant of the existence of fictitious cash holdings.

The dissertation is structured as follows. In section 2, it is discussed the relevant literature on the topics of the study: subsection 2.1 exposes the main theories regarding the determinants of cash holdings and relevant studies on the topic; subsection 2.2 presents the fraud models and discusses the literature on factors that enhance fraud. Section 3 reviews the Portuguese business and legal context. Furthermore, in section 4, the methodology is proposed together with the underlying data sample, and in section 5 the empirical results are displayed and discussed. Finally, in section 6 a set of the main conclusions is outlined.

2. Literature Review

This section is structured in two main parts. First, subsection 2.1 exposes the three main theories on the determinants of cash holdings (subsection 2.1.1) and the relevant literature on this topic (subsection 2.1.2). In subsection 2.2 the main models explaining the fraud elements are presented (subsection 2.2.1), as well as the current studies on fraud factors (subsection 2.2.2). The literature discussed in this section will later be used as framework to develop the necessary models to study the fictitious cash holdings.

2.1 Cash holdings theories and its studies

2.1.1 Theories on cash holdings determinants

Three main explanations for the reasons why companies hold liquidity in their assets: Trade-off Theory, Pecking Order Theory (Myers, 1984) and the Free Cash Flow Theory (Jensen, 1986), are exposed next.

Trade-off Theory

The Trade-off Theory was developed for companies to determine their optimal capital structure to increase their value (Opler et al., 1999). This theory suggests the firm to change its capital structure gradually to achieve a targeted debt-to-value ratio (Myers, 1984), which consists of a trade-off between the marginal benefits and marginal costs of holding cash. Thus, to maximize the value of the company, the marginal benefit of liquid assets holdings needs to compensate the marginal cost of those holdings (Opler et al., 1999).

Three motives may lead firms to hold liquidity: transaction motive, precautionary motive, and speculative motive (Chang-Soo et al., 1998; Keynes, 1936, p.108).

The transaction motive refers to the importance of liquidity on everyday transactions between personnel and business, once the conversion of physical assets to liquidity not only involves costs but also takes time and, therefore, holding cash helps the firm to operate smoothly (Keynes, 1936, p.108-111; Opler et al., 1999).

By holding cash, firms have a lower probability of financial distress when facing adverse situations or presenting difficulties raising external funds due to a high cost of external financing, once the excess liquidity will support the unexpected losses (precautionary

motive). Therefore, the benefits of cash holdings are positively related to external financing costs, the variance of future cash flows, and the return on future investment opportunities (Chang-Soo et al., 1998; Ferreira & Vilela, 2004; Opler et al., 1999).

The speculative motive refers to cash holdings allowing the company to not decline investment opportunities (that add value to the company) due to financial constraints (Chang-Soo et al., 1998; Ferreira & Vilela, 2004; Opler et al., 1999). Moreover, when accessing for external funds or liquidation of the existing assets, holding cash helps to minimize the respective costs. (Ferreira & Vilela, 2004).

Nevertheless, holding cash has costs, once that not only liquid assets have low returns, leading to an opportunity cost of the capital invested in liquid assets, as also taxes increase the cost of holding cash, since the interest income from liquid assets is taxed twice (Chang-Soo et al., 1998; Ferreira & Vilela, 2004; Opler et al., 1999).

Therefore, firms that can raise internal funds easily, through liquid assets substitutes and cash flows (as source of liquidity), are expected to hold less cash. Moreover, due to economies of scale in cash management, large firms tend to hold less cash. In contrast, companies with high investment opportunities and high cash flows uncertainty prefer to hold liquidity to not face financial distress. Finally, leveraged companies may hold less cash since they have more ability to raise debt or may hold more cash to not incur financial distress while paying the amortizations (Ferreira & Vilela, 2004).

Pecking Order Theory

Supported by theoretical foundations on the asymmetric information enlightened by Myers & Majluf (1984), Myers (1984) developed the Pecking Order Theory, which explains the finance hierarchy preferred by the firms.

According to this theory, when financing is needed, firms usually privilege internal financing than external funds, and within the external financing, debt upon equity, in order to minimize financing costs and asymmetric information (Chang-Soo et al., 1998; Ferreira & Vilela, 2004; Myers, 1984). Asymmetric information happens when the manager and the owner(s) are different individuals, which implies that the manager has a greater knowledge of the company than the owner and investors (Myers & Majluf, 1984).

Asymmetric information may prevent a firm from obtain external financing due to the difficulty of the lender to ascertain the firm's credit quality (Pinkowitz & Williamson, 2001).

Issuing debt or equity, even with cash holdings, signals the investors that the company is not performing well, what leads to a decrease of the value that they would be willing to pay for the financial securities from that company, affecting the decision of the manager between issuing or investing (Myers & Majluf, 1984). For this reason, managers prefer internal financing than external.

When external finance is required, firms favour issuing debt than equity (Myers & Majluf, 1984). Two reasons explain this preference. First, the cost of debt is lower than the equity cost, since debtholders receive a fixed return lowering the risk (Ross et al., 2010, pp. 582-583). Second, if the management acts in the interest of the existent shareholders and of its own, the managers will refuse to issue new shares even if it means dropping a good investment opportunity, so they will not lose their position in the administrative board because of the new shareholders. Debtholders have no participation in the election of administrative bodies, ensuring the position of the current manager. When debt is not possible, managers issue hybrid securities such as convertible bonds, using equity as a last resort (Myers, 1984; Ross et al., 2010, p. 583).

Unlike the Trade-off Theory, the Pecking Order one does not suggest firms to have target cash levels, the optimal capital structure is equivalent to the optimal amount of net debt. In turn, cash is used as a buffer between retained earnings and investment needs (Ferreira & Vilela, 2004; Myers, 1984; Opler et al., 1999).

Nevertheless, like the Trade-off Theory, companies with high investment opportunities need more cash holding. However, large companies are, according to this theory, expected to hold more liquidity since they reveal more success as well as more cash flow, which opposes the Trade-off Theory. Regarding debt, it has a negative relation to cash holding once companies recur to debt when internal funds do not cover the investment (Ferreira & Vilela, 2004).

Free Cash Flow Theory

Jensen (1986) developed the Free Cash Flow Theory based on the agency relationship between the manager and the owner of the company studied by Jensen & Meckling (1976). According to this theory, by holding cash, managers are not pressured to obtain good performances and may invest in opportunities based on their personal objectives at the shareholder expense. Thus managers' power increases with the growth of the company and its assets (Opler et al., 1999). Hence, managers have an incentive to hold cash to obtain more control over the assets and thus on the firm investment decisions (Ferreira & Vilela,

2004; Jensen, 1986). However, managers may not act in the best interests of the owner(s), choosing investments based on their own interests, what leads to an agency problem.

An agency relationship is defined as a contract under which the agent (in this case, the manager) is engaged to act and make decisions in the best interests of the principal (the owner) that delegated the decision-making authority (Jensen & Meckling, 1976). To reduce the agency problem, the actions of the agent are monitored by the principal, which costs time and money. For that reason, Jensen (1986) defends that the excess of cash available for investment (the free cash flow) should be invested in projects with positive net present values to minimize the agency cost and the power of the manager (Chang-Soo et al., 1998).

According to this theory, large companies are expected to hold more cash, since a large number of shareholders lead to a lower control on managers, who will hold cash to obtain power over the assets and company's investment decisions, destroying shareholders' value by investing in negative net present value opportunities. Also, as debt has a monitoring effect, an unleveraged company will hold more cash (Ferreira & Vilela, 2004).

2.1.2 Studies on cash holdings determinants

Opler et al. (1999) conclude that small companies with high growth opportunities and risky activity hold more cash to invest in positive net present value opportunities without facing external financing constraints and uncertainty of cash flows, while companies with easy access to the capital market or/and credit rating tend to hold less liquidity, corroborating the Trade-off Theory. Ozkan & Ozkan (2004) study confirms these conclusions.

Dittmar et al. (2003) focus on the agency problems, trying to understand whether the managers' reasons to hold cash were personal or in the interest of the owner. The authors concluded that the high cash holdings corresponded to countries where the shareholders protection was weaker, that leads to high agency conflicts, corroborating the Free Cash Flow Theory. Moreover, Dittmar et al. (2003) did not find empirical evidence that managers hold more liquidity when the access to capital markets is more difficult in countries with poor shareholder protection; on the contrary, when the access to external funds was easy, firms would hold more liquidity, what contradicts the Opler et al. (1999) study.

Almeida et al. (2004) disagree with Dittmar et al. (2003) conclusion, stating that the propensity to hold cash is higher when firms expect to face financial constraints. Also, the

amount of cash the firm holds depends on the business cycle, that is, when negative economic crisis happens, financially constrained companies should increase the cash holding, while unconstrained firms should not (Almeida et al., 2004).

Moreover, Ferreira & Vilela (2004) results also confirms Opler et al. (1999) study, stating that the amount of cash held by companies is positively affected by the investment opportunity set and negatively by the amount of liquid asset substitutes and leverage, suggesting that agency conflicts between managers and shareholders do not play a determinant role in the determination of cash holdings, which contradicts the Free Cash Flow Theory that predict a negative relationship between investment opportunity set and cash holdings.

An interesting case is that Japanese firms hold high levels of cash compared to American companies, although that country has a bank-centred monitoring system, thus decreasing the asymmetric information and the agency costs, which according to the Pecking Order Theory and Free Cash Flow Theory would lead to firms hold less liquidity. Pinkowitz & Williamson (2001) study this phenomenon, noticing that German companies showed similar values to American firms, even though the former are more bank centred than capital monitored like the latter. A possible reason is the power of banks over the companies, that encourage the firm to have large cash holdings, since, in Japan, main bank operators are members of the companies' board. Based on the studies of Opler et al. (1999), Pinkowitz & Williamson (2001) add to the cash holding determinants a new one, the excess of cash, to explain the large amounts of liquidity in Japanese firms, concluding that bank power is indeed a cash holding determinant, since these firms held significantly more cash when bank power was high, making cash holdings a mechanism by which banks extract rents from firms.

Ferreira & Vilela (2004) found that banks are in a better position to ascertain the firm's credit quality and to monitor and control the firm's financial policies, cutting down the asymmetry and agency problems usually associated to other kinds of debt that result in higher indirect financing costs and external financing constraints, which goes according with Pinkowitz & Williamson (2001) studies.

Furthermore, deepening the conclusion of Pinkowitz & Williamson (2001) study, private companies should hold more cash than public ones, once their access to external capital markets is more limited and the banks are the main external financing source. However, empirical evidence of Mortal et al. (2020) study shows that private firms retain less cash holdings than public firms due to the high opportunity cost implied in the borrowing costs,

especially in countries with less developed debt markets. Additionally, the authors state that leveraged private companies may use internal funds to reduce the debt cost, since they are more limited in access to external funding. Thus, the opportunity cost of cash holdings outweighs the precautionary benefits of holding cash (Mortal et al., 2020).

According to Ozkan & Ozkan (2004), ownership structure is a determinant of the UK companies' cash holdings, proving that family businesses usually hold higher levels of cash. Moreover, Lozano & Yaman (2020) state that family businesses save less cash out of cash flow than non-family companies, which may indicate, according to Almeida et al. (2004), that family owned companies do not experience as much financial constraints as the non-family companies do, due to their lower information asymmetry and fewer agency costs.

In Portuguese listed companies, Farinha & Borges (2017) found similar conclusions to the Trade-off Theory and the studies of Ferreira & Vilela (2004) and Opler et al. (1999). Thus, cash holdings are positively related to growth opportunities, leverage and dividend payments, however negatively related with cash flow and longer debt maturity. Moreover, with the crisis of 2008, the authors detected a decrease in the significance of growth opportunities on the cash holdings' determinants due to the lack of growth opportunities or a delay in investment policies in the post-crisis period, and the use of cash flow as cash substitute.

The empirical evidence described suggests that in micro companies, likewise the sample that will be used in this study, there is a tendency to retain cash holdings to face unexpected constraints in the access to external funds. This situation is maximized in environments where the growth opportunities and the cash flow uncertainty are high. Regarding financial debt, the opinions in the literature on its relationship with cash holdings are divided: both leveraged and unleveraged micro companies may retain cash holding.

Hereby, being the most liquid asset within an organization, cash is subject to fraud. Management and employees may take opportunity to withdraw money from their company without an underlying document, leading to an accounted value for cash higher than the actual one, which is not considered by the above studies. These fictitious cash holdings originated from fraudulent acts are the focus of this dissertation. Thus, section 2.2 presents the factors that lead an individual to commit fraud.

2.2 Fraud elements and its studies

2.2.1 Models of Fraud elements

Most studies concerned about the analyses of the determinants that lead to individual to commit fraud are based on the Fraud Triangle Theory proposed by Cressey (1953), which states that three factors are present whenever fraud occurs: pressure, opportunity and rationalization.

Pressure, or incentive, is the force that motivates the individual to commit embezzlement. It can be a perceived non-sharable financial need, ego, lifestyle above the possible level, or an emotional state generated by fear, sadness, or greed (Dorminey et al., 2012, 2010; Máté et al., 2019; Wells, 2017).

Opportunity consists of a perceived situation favourable to commit fraud due to lack or weakness of internal controls. Albrecht et al. (2009) identified six factors that enables the prevention or detection of fraudulent behaviours: internal control, performance quality evaluation, discipline fraud perpetrators, management's access to information, management's awareness and capacity, and regular audit control. In small businesses, usually with family ownership, trust and management oversight enhance opportunity to fraudulent acts. In this type of business, a "trust culture" prevails, leading management not to implement internal controls (Bunn et al., 2019; Wells, 2017). Likewise, in small businesses, when the manager and the owner are the same person, the withdraw of assets (e.g. cash) for personal use may not even be considered by the self as a fraud, maximizing the opportunity to undertake the fraudulent action.

Rationalization is the "moment after", when the individual justifies for himself/herself the act as something that is correct, fair, temporary, or something that will be reversed. This way, the person avoids the sense of dishonesty, of wrongdoing, of guilty, that is always difficult to cope with (Baird & Zelin Ii, 2009). Some authors, such as Baird & Zelin Ii (2009), Choo & Tan (2007) and Ajzen & Beck (1991), deepened the meaning of rationalization by relating it to other theories like the Obedience Pressure (see Baird & Zelin Ii, 2009), the Theory of Planned Behaviour (see Ajzen & Beck, 1991) and the American Dream Theory (see Choo & Tan, 2007).

Wolfe & Hermanson (2004) (*apud* Alves, 2018; Rustiarini et al., 2019; Utami et al., 2019), extend the Cressey (1953) work into the Fraud Diamond Theory, adding a new component,

capacity, meaning that individuals need to have the ability to exploit existing fraud opportunities (Rustiarini et al., 2019). Capacity consists of position/function, intellectual capacity, confidence/ego, resilience to stress and guilt, and the skill to coerce and persuade others (Alves, 2018; Rustiarini et al., 2019; Utami et al., 2019).

Empirical evidence shows that top managers and owners, due to their high position and knowledge on internal weaknesses of organizational control, have a higher opportunity to commit fraud, especially in small business, where 29% of cases the fraud was committed by the owner/executive (ACFE, 2018). Therefore, the new factor of the Fraud Diamond Theory usually reflects owners and top managers' attributes.

Unlike the Fraud Triangle Theory, which focuses on individual or organizational behaviour separately, the Fraud Diamond Theory portrays the relationship of individuals and organizations simultaneously.

The Association of Certified Fraud Examiners (ACFE) created a taxonomy denominated Occupational Fraud and Abuse Classification System, also labelled as the Fraud Tree (ACFE, 2018; Wells, 2017), which classifies corporate fraud into three categories according to the schemes used by the fraudsters: corruption (misuse of influence in a business transaction to gain a direct or indirect benefit), asset misappropriation (theft or misuse of the organization's resources) and financial statement fraud (intentional misstatement or omission of material information in the organization's financial reports). The fictitious cash holdings phenomenon analysed in the current study tends to fall in the second and third of these categories.

2.2.2 Relevant studies on fraud factors

Due to its hidden nature, the empirical studies on fraud factors are scarce, despite its high occurrence in companies and the damage caused in the businesses and society.

Holtfreter (2005) analysed the characteristics of individuals who committed asset misappropriation, corruption and fraudulent statements, and the organizational characteristics associated with these three types of occupational fraud. The author concludes that in smaller, private companies, the most often undertaken categories of fraud were fraudulent statements and asset misappropriation; corruption tends to take place in larger organizations, particularly in publicly traded companies. However, as referred in section 2.2.1, the opportunity must be present for the crime to occur, independently of the

individuals' traits and motivations.

Hence, Suh et al. (2019) studied the relationship between 'opportunity reduction' and the likelihood of fraud occurrences, concluding that the exercise to combat fraud should focus on reducing the fraud opportunities by prevention and deterrence measures. The perceived effectiveness of anti-fraud controls contributes more to opportunity reduction than the existence of such mechanisms. This conclusion is corroborated by prior studies that suggests that to reduce opportunity, companies should increase the perceived probability of detection and punishment (ACFE, 2018; Albrecht et al., 2009; Dorminey et al., 2012, 2010). The studies of Rae & Subramaniam (2008) and Kumar et al. (2018) support this conclusion, stating that a perceived poor organizational culture towards fraud contributes to the rationalization of a fraudulent act.

Nevertheless, the responsibility for implementing internal controls is of the top management and owners (Rae & Subramaniam, 2008). Thus, managers may manipulate financial information and not follow the internal control policies (management override) to attain profitability. Thereby, mechanisms to combat fraud are penalized, making the detection of fraud harder (Chapple et al., 2007; Dorminey et al., 2012, 2010). According to the study of Suh et al. (2019), employees believe the occurrence of fraud is positively related to potential management overrides, unlike the collusion.

This contradicts the study of Free & Murphy (2015) which states that collusive groups may deliver the relevant tools to find fraud opportunities. Moreover, the authors identified three types of bonds that lead individual to co-offend, according to the nature of bonds between the members and the primary beneficiary: individual-serving functional bonds (by working together, opportunities to commit fraud are provided or enhanced); organizational-serving functional bonds (join to guarantee the success of the organization); and affective bonds (caused by loyalty of family bonds, deep friendship or ethnicity).

The study of Krishnan & Peytcheva (2019) support Free & Murphy (2015) conclusions, showing that auditors detect more fraud risk in family businesses than in non-family companies, and tend to not accept the formers as customers. However, a strong audit committee diminishes the likelihood of fraudulent acts in these companies. Moreover, the authors found that auditors detect more serious agency conflicts in family ownership businesses, since the family members may take opportunities to expropriate the resources of

the company at expense of minority shareholders, reducing its value.

Furthermore, Chapple et al. (2007), conclude that when the CEO also holds the position of chairperson of the board of directors, the magnitude of fraud increases, since the management has a higher capacity to conceal misappropriation.

The size of company also plays a role in creating opportunities to commit fraud, since smaller companies own fewer resources to implement internal controls, which increases the susceptibility to fraud, unlike larger companies that are more likely to report fraud due to fraud detection mechanisms (Johansson & Carey, 2016; Suh et al., 2019). This contradicts the study of Chapple et al. (2007) and Rae & Subramaniam (2008), that point out that large companies, due to the large number of transaction and agency costs, are more likely to provide more opportunities for fraud.

The empirical evidence described suggests that in micro companies, likewise the sample that will be used in this study, tend to offer more opportunities to fraud, despite having less resources, because of a lack of internal controls. This situation is expected to be maximized in cases where the owner and the manager are the same person, mainly in cases where the legal culture of the self does not allow to distinguish company property from personal property, diluting the sense of being committing fraud when taking for personal use company's assets.

3. The business and legal Portuguese contexts

As seen in the previous section, the determinants of cash holdings and factors that lead to fraudulent acts depend, beyond the companies' characteristics, on the countries' business, economic and legal contexts. In this section, the Portuguese business and legal contexts are outlined.

3.1 Portuguese business context

The Portuguese business context is mainly composed of micro, small and medium enterprises (MSME). The definition of MSME is stipulated in the ninth article of Decree-Law No. 98/2015 of June 2nd as companies that at the balance sheet date do not exceed two of the following three limits: employment 250 people, present an annual turnover of 40 million and total balance sheet of 20 million euros. According to the same article, for micro company these limits are: 10 people, annual turnover of 700 thousand and total balance sheet of 350 thousand euros.

Data reveals that, in 2018, Portuguese business structure was comprised of 99.9% MSME, 96.1% belonging to the category micro companies. MSME generate 77.8% of the employment and perform 56.2% of turnover, contributing in 59.9% to the national gross value added. Within the MSMEs, micro businesses generate 56.7% of the employment, contribute in 31.2% to the turnover and 35.4% to the gross value added (Pordata, 2020).

Like most of the European countries, in Portugal, micro companies are mostly family businesses and where the manager is usually the owner. Moreover, the academic qualifications, namely in social sciences, of the management in these companies are low.

Regarding financing, companies may resort to internal financing or external financing. Once the capital market is not well developed in Portugal, banks are the main source of external funds when needed. However, the access to bank credit may not be available to all micro companies, since the risk to borrow in these companies is higher due to their financial weakness and asymmetrical information (European Commission, 2017).

3.2 Portuguese legal context

Portuguese micro companies' financial information is prepared by the owners, managers, or a statutory accountant. They are obliged by law to prepare and make available the balance sheet and the income statement. The Tax and Customs Authority (AT) uses this information to estimate the income tax.

Moreover, according to the 63rd-C article of the Portuguese General Taxation Law (LGT), all companies are required to have at least one bank account through which payments and receipts relating to the business activity, and other movements to or in favour of taxable persons (e.g. movements relating to supplies, other forms of loans and advances to members) must be handled exclusively. To prevent fraud situations, AT may access all bank information or documents relating to these accounts. Besides, it is forbidden to pay or receive cash in transactions of any kind involving amounts equal to or greater than 3000 euros, and payments in respect of invoices or equivalent documents of a value of 1000 euros or more shall be made by means of payment that allows the identification of the respective recipient, namely bank transfer, personal check or direct debit (LGT, art. 63rdE). The same law stipulates that, for the purposes of calculating the above mentioned limits, all payments associated with sales or services are considered in aggregate, even if they do not exceed that limit if considered in a fractional manner.

The penalties for violating the obligations mentioned in the previous paragraph are prescribed in the 129th article of the Portuguese General Regime for Tax Offenses (RGIT), which provides that the lack of a bank account in legally provided cases is punishable by fine from 270 to 27000 euros. Failure to carry out movements (in the cases legally provided for) through a bank account or carrying out cash transactions that exceed the legally prescribed limits is punishable by a fine of 180 to 4500 euros.

When cash balances are large, that may lead AT to conduct an audit to confirm the actual value. In case a discrepancy to the actual value is found, there are tax and penalty implications.

Furthermore, according to 149th article of Portuguese Commercial Societies Code (CSC), when liquidating the company, the accounting documents need to be accredited, so the process can initiate. Therefore, if the value of the "cash" account does not correspond to the true value, this tends to constrain the liquidation due to separation and delivery of the company's assets. Thus, inactive companies may be seen as potential cases of past fraudulent

acts.

Finally, companies that, for two consecutive years, exceed two of the three following limits: total of balance sheet 1,500,000 €; total revenue 3,000,000 €; average number of workers 50, are obliged to have a statutory auditor to certify their financial information (CSC, art. 262nd-2; art. 278th-1, 3; art. 413rd - 1).

3.3 The vulnerability of micro companies to fraud

As mentioned in section 3.1, in micro companies, besides the owner and the manager being the same individual, the level of formation of the management is low. That may lead to the owner's lack of knowledge that the company and he/she are two different entities with separated property and the use of the company's assets for personal use is considered fraud.

Moreover, typical characteristics of micro companies, such as family ownership and small dimension, do not favour the existence of internal control due to lack of resources and the prevalence of a "trust culture", as seen in section 2.2. Also, the non-obligation of a statutory auditor in these companies enhances the opportunities to commit fraud, since the detection is less likely. Hence, micro companies are especially prone to fraudulent acts.

4. Methodological and data aspects

This section discusses the methodology adopted, starting by explaining the two regression models developed and their variables in subsection 4.1, followed by the analysis of the sample used in each model in subsection 4.2.

4.1 Methodology

To study the factors that account for the existence of fictitious cash holdings it is essential to signal which cash holdings are higher than the expected, because, as referred in section 2.1, companies have different motives to hold cash. Thus, the analysis is conducted in a two-steps process: the first one proposes and uses an econometric model to estimate the normal cash holdings that companies are expected to have in their balance sheets. The difference between the actual cash balance and that estimation represents “abnormal cash holdings” (e.g. Jones, 1991). If positive, it is taken as a sign that such a company has fictitious cash holdings.

The second step adopts a different and new econometric model to analyse the determinants of fictitious cash holdings, the focus of the study.

Subsection 4.1.1 discusses the variables and model adopted to estimate the abnormal cash holding of the companies; subsection 4.1.2 have a similar purpose, concerning the factors that influence the existence of fictitious cash holdings.

4.1.1 The first model: expected cash holdings

The multivariate model is defined as it follows:

$$CS^{it}/A^{it} = \beta_0 + \beta_1 NWC^{it}/A^{it} + \beta_2 FD^{it}/A^{it} + \beta_3 DIM^{it} + \beta_4 CF^{it}/A^{it} + \beta_5 DYEAR^{it} + \varepsilon^{it} \quad (4.1)$$

CS/A – is the cash balance of company, deflated by the total assets minus cash to reduce the heteroscedasticity (e.g. Opler et al., 1999; Ferreira & Vilela, 2004). By cash, it is considered only physical cash holdings (notes and coins), and not its extension of equivalents (e.g. bank deposits).

The independent variables are broadly supported by the Trade-off Theory. Given the Portuguese entrepreneurial context discussed above, where for most companies there is neither agency conflicts nor asymmetric information between the manager and the owner, this theory is the one that best explains their cash holdings decisions (e.g. Farinha & Borges, 2017)¹.

The explanatory variables are defined, and justified, as follows:

- **Net Working Capital (NWC):** is defined as current assets that can be used as cash substitutes, after weighting current liabilities and retrieving the cash holdings (e.g. Ferreira & Vilela, 2004). This variable serves as a proxy for the current assets that can be converted into immediate liquidity. Whether this conversion is possible at low costs when liquidity is needed, the pressure to hold cash is lower. Thus, a negative relationship between NWC and cash held is suggested by the Trade-off Theory, thus a negative coefficient is expected.
- **Financial debt (FD):** corresponds to the sum of current and long-term financing. Financial debt may present a negative or positive effect on a company's cash holdings, according to the Trade-off Theory. Unleveraged companies with difficulty in accessing external funds due to the asymmetry of information have larger cash amounts for precautionary reasons. Therefore, in this situation, a negative effect can be expected between financial debt and cash holdings. However, leveraged companies, due to the risk they pose to lenders, need to maintain higher cash amounts, since they may experience difficulties in accessing external liquid assets. In this case the expected sign of the coefficient would be positive. In this context, the present study does not anticipate the sign of the coefficient.
- **Dimension (DIM):** is defined as the logarithm of the total assets (e.g. Ferreira & Vilela, 2004). Theory suggests that there are economies of scale in corporate cash management, leading to larger companies having proportionally less cash than smaller ones, because they tend to have easier access to credit and fund raising. Therefore, a negative relationship is expected between the size of the company and the amount of cash it holds, leading to an expected negative coefficient.

¹ The summary of the variables chosen by the authors referred in Literature Review are displayed in the Appendix 1.

- **Cash flow (CF):** corresponds to earnings before taxes plus amortizations and depreciations (e.g. Farinha & Borges, 2017). The Trade-off Theory suggests that cash flow generation provides immediate liquidity, then serving as a substitute for cash holdings. Then, when a company generates more cash flow, less cash holdings are needed as a precaution, what leads to a negative relationship between cash flow and the amount of cash held. Therefore, a negative coefficient is expected.
- **Year (DYEAR):** is a dummy variable to mitigate the potential effects of using observations from different years, assuming the value 1 if the year is 2015 and 0 if 2016.

The independent variables, except the dimension and the year, were also deflated by total assets deducted from the cash (A), as the dependent one. Since the dependent variable and almost all independent variables are continuous, the model is estimated using the ordinary least squares method (OLS - Ordinary Least Squares). An “out-of-sample” technique is adopted: first, the coefficients of the model are estimated for period 2015-2016, using a subsample; second, these coefficients are applied to the data of the main sample for period 2017-2018, and the normal cash holdings are estimated.

As mentioned above, the difference between the actual cash balance, deflated by the total assets minus cash (A), and that estimation, represents the “abnormal cash holdings” (ACH):

$$ACH = observed\ CS/A - estimated\ CS/A \quad (4.2)$$

Fictitious cash holdings (FCH) are defined as positive ACH, i.e.

$$FCH = ACH > 0 \quad (4.3)$$

4.1.2 The second model: determinants of fictitious cash holdings

This is also a multivariate model, defined as it follows:

$$DCS^{it} = \beta_0 + \beta_1 FAM^{it} + \beta_2 NbM^{it} + \beta_3 ROC^{it} + \beta_4 SOC^{it} + \beta_5 DIM^{it} + \beta_6 STATUS^{it} + \beta_7 ACTIV^{it} + \varepsilon^{it} \quad (4.4)$$

DCS - is a dummy variable, taking value 1 if FCH is above the median, 0 otherwise.

The Fraud Triangle Theory (Cressey, 1953) underlies the development of this model. According to this theory, three elements are essential for the fraud to occur: the pressure of the fraudster, the opportunity to commit the fraud, and rationalization of the action to dilute the sense of dishonesty. As seen in the literature, unlike the remaining determinants, the opportunity to commit fraud in a company can be reduced and managed, and partly depends on the characteristics of the company. Thus, out of the three, opportunity tends to be the element that is company specific, and because of it the model is grounded on this element.

Opportunity is often associated with lack of control. Hence, as mentioned above, in non-audited companies, ownership that overlaps managership, family businesses or small companies, the opportunity should be greater. The model tests the determinants of such an opportunity. Therefore, the independent variables are factors that potentially are related to a change in the opportunity to commit fraud.

The independent variables are categorical (binary), corresponding to labels. The definition of the variables, and a justification for being part of the model are hereinafter presented.

- **Family Ownership (FAM):** companies managed by an administrative board that share a blood relationship are expected to have fewer control mechanisms (Krishnan & Peytcheva, 2019). Thus, the opportunities for managers/owners to commit fraud is higher, since their actions are not heavily controlled by the other members or the family might collude to retrieve funds from the company, mainly in cases of tax fraud, where the victim is the tax authority. A positive relationship between the existence of fictitious cash holdings and the company being a family business is expected, i.e. a positive coefficient. It is considered a family business when the members of the administrative board share at least one surname. This binary variable assumes the value 1 when assumed to be a family business and 0 otherwise.
- **Number of Owners/Managers (NbM):** when the manager is also the owner, a larger number of members in the administrative board may lead to a higher level of control over each other. Moreover, a single owner/manager is not controlled by internal forces. Therefore, it is expected a negative coefficient on this variable, since the opportunities to an owner/manager to commit fraud is lower. Although this variable may take many integer values, it was decided to transform it into a binary variable, taking the value 1 when the number of owners/managers is higher than the median of the sample and 0 otherwise.

- **Existence of a statutory auditor (ROC):** he/she exercises a (regular) control over the administrative board since the company's statements are analysed and, therefore, the probability to be caught when an illegal action is taken reveals to be high. Therefore, he/she shortens the perceived opportunity to commit fraud once the fraudulent act is soon discovered. Thus, a negative relation between the existence of an auditor and the presence of fictitious cash holdings is expected, and so a negative coefficient is expected in this variable. This variable takes the value 1 when the company is audited and 0 otherwise.
- **Type of society (SOC):** in single-member limited companies and most of the partnership limited companies the opportunity to commit fraud is higher than in joint-stock limited companies, due to the obligation of a statutory auditor in the last legal form (CSC, art. 262nd-2; art. 278th-1, 3; art. 413rd - 1). This variable takes the value 1 when the legal form is a partnership limited company or single-member limited company, and 0 otherwise. Thus, a positive coefficient is expected.
- **Dimension (DIM):** small companies do not have many resources to implement controls, leading to a higher opportunity to commit fraudulent acts. Moreover, a relationship of trust between the owner and the employees are characteristic in small businesses (Wells, 2017), thus internal controls tend to be not implemented. Thus, in small companies, the presence of fictitious cash holdings is more likely than in large companies. The variable is estimated based on the logarithm of the total assets, taking value 1 when the dimension is higher than the median and 0 otherwise.
- **Current situation (STATUS):** this variable controls for active vs. inactive situation of the company. Inactive companies usually do not have a statutory auditor or other control system, which increases the probability of a fraudulent action when they have assets. However, some of them may not close completely due to errors in their financial statements, caused by differences in the balance sheets assets and those that actually exist. Thus, inactive companies may signal of companies that had previous situations of fraud. Thus, this variable was included, taking the value 1 when the company is inactive and 0 otherwise. Therefore, a positive relation between this variable and the presence of fictitious cash holdings is expected.
- **Activity (ACTIV):** is considered as a variable of control of the activity sector. Its

consideration in the model is intended to retain eventual effects resulting from a specific sector. Since this is a variable of control, no expectations are proposed on the signal of the respective coefficient.

Since the dependent variable and the explanatory variables are binary, a probability model, such as the Logit model, is more suitable to estimate the determinants of fictitious cash holding than the OLS method adopted in the previous model (e.g. Chapple et al., 2007; Johansson & Carey, 2016; Suh et al., 2019).

4.2 Data selection

4.2.1 The data samples used

The samples were collected from SABI – Sistema de Análise de Balanços Ibéricos (Iberian Balance Analysis System), a proprietary from Bureau van Dijk, 2019 version, for the period from 2015 to 2018. To a better analysis of the samples and to eliminate undesirable effects resulting from the specificities of different sectors of activities, the companies selected are from the services industry.

Nevertheless, each type of service has a specific business model and constraints, and consequently companies react in a distinct manner, leading to differences regarding cash holdings. To overcome this problem, the sample selected belongs to the NACE-Rev.2 - *Nomenclature statistique des activités économiques dans la Communauté européenne* (General Nomenclature of Economic Activities of the European Communities)– section M, division 71 - Architectural and engineering activities, and technical testing and analysis sector. This sector was chosen due to its representativity within the services industry.

Nevertheless, within the same sector, differences may appear since the chosen one includes two subsectors: “architectural and engineering activities” (subdivision 711) and “technical testing and analysis” (subdivision 712). Thus, the variable **ACTIV** of the second model (equation 4.4) takes the value 1 if the company belongs to the subdivision 711, and 0 otherwise.

Given the “out-of-sample” technique adopted, a preliminary subsample (Subsample 1) was used for regressing the coefficients of the model. Assuming that companies with a statutory auditor (“audited companies”) are less likely to commit fraud because of the higher control

that he/she exercises over a company's activity, such a subsample, for the period 2015-2016, is composed of audited companies. Thus, the likelihood that the existence of frauds related to fictitious cash holdings, reflected in the financial statements, that could bias the estimation of the coefficients is reduced. From this phase only the estimated coefficients are collected.

Using such coefficients, the main subsample (Subsample 2), for period 2017-2018, is taken to estimate the expected (normal) cash holdings of each company.

The positive differences between the actual cash holdings values and those estimates are the observations of the dependent variable of the Logit model. Still using Subsample 2, composed of micro companies, the data for the explanatory variables and the estimation of such a Logit model, the preliminary step to analyse the determinants of fictitious cash holdings, was collected.

The focus on micro companies is justified by the weight these companies have on the Portuguese business structure, but also due to the higher probability of the presence of fictitious cash holdings, as referred in section 3.

An overview of Subsample 1, and its descriptive statistics, is presented in subsection 4.2.2; Subsample 2 is discussed in a similar way in subsection 4.2.3.

4.2.2 Subsample 1: audited companies

From a universe of 13,851 companies available in the period 2015-2016, section M, division 71, according to NACE – Rev.2, in SABI (2019) database, 321 were audited companies. For presenting unknown values in at least one of the years, the companies in this situation were eliminated only in the year whose values were not available. Hence, 16 companies were eliminated in 2015, and 15 companies in 2016. To reduce the loss of observations, the cash values that were not available, despite the existence of other variables' values, were considered as zero.

After the adjustments and eliminations, the sample is composed of 305 companies in 2015 and 306 in 2016 (611 observations). 42% of them are micro companies and 43% small companies. Around 80% of all are joint stock companies.

Some descriptive statistics

First, the percentage of cash in the companies' total assets and its evolution is analysed. Then, it is portrayed the descriptive statistics of the variables used in the model to estimate the expected (normal) cash holding. Finally, a correlation matrix of these variables is outlined.

Table 1 portrays the descriptive statistics of the ratio cash/total assets.

Table 1 - Descriptive statistics of the ratio cash/total assets

	All companies		Micro companies		Small companies	
	CS/TA 2016	CS/TA 2015	CS/TA 2016	CS/TA 2015	CS/TA 2016	CS/TA 2015
Mean	0.20%	0.41%	0.32%	0.83%	0.13%	0.13%
Median	0.01%	0.01%	0.00%	0.00%	0.02%	0.03%
Q1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Q3	0.09%	0.10%	0.07%	0.10%	0.10%	0.12%
Std. Dev.	0.66%	3.40%	0.96%	5.31%	0.35%	0.29%
N	306	305	124	124	136	135

Notes: CS is the physical cash holdings (notes and coins). TA is the total assets (including cash). CS/TA is the ratio between these two variables, representing the percentage of cash in the company's total assets.

According to table 1, in most of the audited companies, the cash represents a small percentage of their total assets. Moreover, on average, micro companies show larger percentages of cash in their assets, which aligns with the Trade-off Theory, that smaller companies tend to hold more cash. However, unlike the expected, most of the micro companies do not hold any cash or do it but in very small proportions relatively to their total assets.

Some micro companies show a proportion above 83% in 2015 that decreases in the next year. This reduction in the cash percentage might be due to the prohibition of transactions involving large amounts of cash, as referred in section 3.

Table 2 shows the descriptive statistics of the variables of the “normal” cash holdings predictive model.

Table 2 – Descriptive statistics of the variables of the first model

	2016			2015		
	Mean	Median	Std Dev	Mean	Median	Std Dev
CS/A (%)	0.26	0.02	0.93	0.86	0.02	10.62
NWC/A (%)	-15.94	9.05	202.98	-2.04	8.59	90.56
FD/A (%)	33.80	12.61	119.49	24.00	11.15	45.01
CF/A (%)	5.29	4.75	93.08	3.33	5.07	44.78
DIM	6.21	6.21	0.79	6.21	6.24	0.83
N	306			305		

Notes: CS is the cash balance, including only physical cash holdings; NWC is the net working capital, corresponding to the current asset deducted from the current liabilities and cash balance; FD represents the financial debt, being the sum of the current and long-term financing; CF is the cash flow, corresponding to the sum of the earnings before taxes and the depreciation and amortization; DIM is the size of the company, defined by the logarithm of the total assets. Variables CS, NWC, FD and CF are deflated by total assets deducted from the cash ($A=TA-CS$).

Although most of the observations display a positive NWC/A, on average this variable is negative, implying the presence of some extreme values. This difference between the values increases in 2016, as confirm by the standard deviation. The reduction of the average of NWC/A in 2016 might be due to an increase of current liabilities or a decrease in the current assets in that observations. These extreme values correspond to large companies, which represent less than 85% of the subsample 1.

The remaining variables are consistent in both years and the mean is similar to the median, thus not reflecting extreme values.

To prevent multicollinearity, table 3 presents the correlation coefficients.

Table 3 - Correlation matrix of the variables of the first model

	CS/A	NWC/A	CF/A	FD/A	DIM
CS/A	1				
NWC/A	-0.03	1			
CF/A	-0.59**	0.20**	1		
FD/A	-0.01	-0.12*	-0.34**	1	
DIM	-0.12**	0.18*	0.20**	-0.24**	1

Notes: The definition of the variables is the same as table 2. * means the value is significant at 5%. ** means the value is significant at 1%.

Analysing the correlation matrix, the values range between 0 and 59%, being the strongest

between CS/A and CF/A. Thus, the model to estimate the determinants of cash holdings do not show signs of multicollinearity since, for an efficient multiple linear regression method, the variables must show a correlation lower than 70%.

Moreover, it is possible to see that all explanatory variables are negatively correlated with the explained variable (CS/A), which is expected according to the Trade-off Theory (see section 4.1.1). However, the correlations between FD/A and NWC/A with CS/A are not significant, demonstrating the ambiguity in the relation with the dependent variable in the case of the former and maybe the extreme values in the second.

4.2.3 Subsample 2: micro companies

As mentioned above, this subsample is composed of micro companies. In the same universe of 13,851 companies referred to in subsection 4.2.2, 2449 were micro companies, a total of 4898 raw observations for the period 2017-2018. Because of missing data or null total assets, 79 observations were eliminated. Given the low representativeness and a potential different business context, two foreign societies were also eliminated. To reduce the loss of observations, the cash values that were not available (despite the existence of other variables' values) were considered as zero.

Merging this raw subsample with the sample of micro companies having fictitious cash holdings (positive ACH, as mentioned above), the subsample is composed of 1,853 observations. Around 3% are joint stock limited companies, and 4% have a statutory auditor. Concerning the characteristics of the companies, around 39% are deemed as family businesses; 74% have one or two managers/owners; 7% are inactive, and almost all have no statutory auditor. Also, companies with more than two owners/managers are mostly family businesses.

Some descriptive statistics

The descriptive statistics of the variables of the second model were calculated for all observations. Then, a separation of the sample according to the amount of fictitious cash holdings (FCH) is performed to analyse the statistics of the observations with FCH above the median (DCS=1) and lower (DCS=0). Finally, a correlation matrix is displayed.

Table 4 presents the descriptive statistics for all observations and their separation according to the amount of fictitious cash holdings.

Table 4 - Descriptive statistics of the variables of the second model

	All observations		DCS=0		DCS=1	
	Mean	Median	Mean	Median	Mean	Median
SOC	0.968	1	0.947	1	0.988	1
ACTIV	0.942	1	0.929	1	0.955	1
STATUS	0.100	0	0.062	0	0.140	0
ROC	0.039	0	0.064	0	0.014	0
FAM	0.389	0	0.376	0	0.401	0
NbMan	0.244	0	0.253	0	0.236	0
DIM	0.500	0	0.662	1	0.338	0
N	1853		926		927	

Notes: DCS takes the value 1 when FCH is above the median and 0 otherwise; SOC assumes the value 1 if partnership limited or single-member limited company and 0 otherwise; ACTIV takes the value 1 if the company belongs to subdivision 711 and 0 otherwise; STATUS assumes the value 1 when company is inactive and 0 otherwise; ROC takes the value 1 if audited company and 0 otherwise; FAM assumes the value 1 if family business and 0 otherwise; NbMan is the number of owner/managers, taking the value 1 when higher than the median and 0 otherwise; DIM is the company size, assuming the value 1 when higher than the median and 0 otherwise.

As referred above, most of the observations of the sample are active, partnership limited or single-member limited companies, without a statutory auditor. The administration board is not family related and it is composed by one or two members.

However, making the division according to the dependent variable (DCS), it is possible to see that most of the observations with DCS=1 correspond to companies with a size below the median (“smaller companies”). Also, the higher the FCH (DCS=1), the higher is the proportion of observations that correspond to inactive companies and the lower the number of observations with a statutory auditor.

Finally, to prevent multicollinearity, a correlation matrix was computed (see table 5).

Table 5 - Correlation matrix of the explanatory variables of the first model

	DCS	FAM	ROC	DIM	STATUS	NbMan	SOC	ACTIV
DCS	1							
FAM	0.04	1						
ROC	-0.12**	-0.08**	1					
DIM	-0.38**	0.00	0.18**	1				
STATUS	0.10*	-0.09**	-0.06*	-0.07*	1			
NbMan	-0.01	0.21**	0.22**	0.06*	0.03	1		
SOC	0.10**	0.07*	-0.93**	-0.16**	0.05	-0.23**	1	
ACTIV	-0.00	0.10**	-0.13**	-0.04	0.02	-0.00	0.12**	1

Notes: The definition of the variables is the same as table 4. * means the value is significant at 5%. ** means the value is significant at 1%.

Analysing the correlation matrix, a strong correlation is shown between ROC and SOC. Thus, one of them must be removed to obtain an efficient multiple linear regression due to the multicollinearity problem. The relation between these two variables is due to the obligation of joint-stock companies and some partnership limited companies to have a statutory auditor in the board (CSC, art. 262nd-2; art. 278th-1, 3; art. 413rd - 1). Thus, the variable ROC was chosen to remain in the model since this is the major expected factor to constraint the company from having fictitious cash holdings, as seen above.

As expected, DCS is negatively correlated with ROC and DIM, and positively with STATUS (see section 4.1.2). However, unlike the expected, the correlation values between NbMan and FAM with DCS are not significant, thus a direct relation between these variables is not showed. The insignificance of the correlation between NbMan and DCS might be because the members do not supervise each other, maybe for family reasons. This reason is corroborated by the relatively strong positive correlation between NbMan and FAM, meaning that a larger number of owner/managers are associated to family businesses. Besides that, the former variable is positively correlated with ROC, that constrain the opportunity to commit fraud.

5. Empirical Results

5.1 Introduction

In the previous section, the methodology to test the models was presented and developed, and it was described how the sample was characterized. The current section is divided in two parts, presenting, and discussing the statistical results obtained through the regression of the models and estimates.

The first part presents the estimation of the coefficients related to the determinants of cash holdings from the period 2015-2016. Similarly done by Ferreira & Vilela (2004), Opler et al. (1999) and Farinha & Borges (2017), the ordinary least squares method (OLS - Ordinary Least Squares), together with a “out-of-sample” technique, was used to estimate the determinants of cash holdings. To obtain reliable coefficients, only audited companies (of all dimensions) were considered when estimating the model. These coefficients were further used to estimate the cash holdings of the micro companies for the period 2017-2018 so the difference between the observed value and the estimates was calculated and taken as a proxy for fictitious cash holdings if positive.

The second part proposes to analyse the factors that account for the existence of fictitious cash holdings. Due to the binary nature of the variables, a Logit model was regressed. As explained, the sample used to estimate was composed by micro companies that had (potential) fictitious cash holdings, for the period 2017-2018.

The panel data technique was used for both models, the first for the period 2015-2016 and the second model for the period from 2017 to 2018. The choice of this technique is justified by the fact that it allows to combine the time series (different years) with the sectional series ("cross section"), overcoming the problems caused by sectional data estimates and thus enriching the empirical analysis (Gujarati, 2003).

5.2 Results of the first model

The results of the estimation of the coefficients of the factors that explains the amounts of cash holdings a company possess are presented in table 6. As mentioned in subsection 5.1, only audited companies were used in regressing this model.

Table 6 - Results of the first model

Variables	Expected sign	Coefficients	p-value
Constant	n.a.	0.085	0.000
NWC/A	-	0.006	0.022
FD/A	+/-	-0.033	0.000
CF/A	-	-0.070	0.000
DIM	-	-0.011	0.004
DYEAR	n.a.	-0.002	0.697
Nb of observations	611		
Adjusted R-squared	0.176		
Global significance	0.000		

Model: $CS^i/A^i = \beta_0 + \beta_1 NWC^i/A^i + \beta_2 FD^i/A^i + \beta_3 CF^i/A^i + \beta_4 DIM^i + \beta_5 DYEAR^i + \varepsilon$

Notes: The explained variable CS/A is the cash balance (notes and coins), deflated by total assets deducted from the cash ($A=TA-CS$); NWC is the net working capital, corresponding to the current asset deducted from the current liabilities and cash amounts; FD represents the financial debt, being the sum of the current and long-term financing; CF shows the cash flow, corresponding to the sum of the earnings before taxes and the depreciation and amortization; DIM is the size of the company, defined by the logarithm of the total assets. DYEAR assumes the value 1 when 2016 and 0 otherwise; NWC, FD and CF are deflated by total assets deducted from the cash ($A=TA-CS$).

According to table 6, the model is significant (global significance = 0.0). Moreover, the adjusted coefficient of determination (R-squared) is 17.6%. This value falls within the standards presented in studies about cash holdings determinants (e.g. Pinkowitz & Williamson, 2001).

Analysing the significance of the coefficients, for a significance level of 5%, only the coefficient for the variable DYEAR is not significant. Nevertheless, this is a control variable for the potential effects for using different years. All the other coefficients are significant at the usual level of significance.

The variable CF/A and DIM present a negative relationship with the cash holding as expected based on the literature (e.g. Ferreira & Vilela, 2004): companies that have cash flows as source of liquidity can raise internal funds easily thus holding less cash, and, due to economies of scale in cash management, large firms tend to hold less cash.

According to Ferreira & Vilela (2004), leveraged companies may hold less cash since they have more ability to raise debt or may hold more cash to not incur in financial distress while paying the amortizations, therefore the variable FD/A may have a negative or positive relation with the dependent variable, respectively. In the regression, the financial debt shows

a negative sign, meaning that the audited companies used to regress the model have ease at getting external financing. A possible reason is the decrease of asymmetric information, since the information of audited companies is considered reliable and trustworthy, thus allowing a company to obtain external financing (Pinkowitz & Williamson, 2001).

Contrary to expectations, the relation between the NWC/A and the cash holdings is positive, even though these variables were negatively correlated (see section 4.2.2). This means that though having net current assets that can be converted to liquidity, the company holds cash. However, that conversion may not be possible at low costs since it may imply the break of contractual relations. In other words, the literature, by suggesting a negative coefficient, expects the company to immediately convert customer debts and stocks of goods (or stop paying suppliers) in cash, which may be difficult for micro and small companies, which represent 85% of the sample, due to their low bargain power.

The positive coefficient of NWC/A remained even when the extreme values observed in section 4.2.2 were removed.

In sum, these results are substantially in line with the above discussed expectations.

5.3 Results of the second model

As referred in sections 4.1 and 5.1, the obtained coefficients were applied to the corresponding variable for the period 2017-2018 for the micro companies, to compute the expected cash holdings. A positive difference between the observed value and the estimate one is taken as sign for fictitious cash holdings.

Different versions of the model were regressed, with different subsamples taken from Subsample 2 (see subsection 5.4). The results were qualitatively similar to each other. The following table displays the results of the Logit model regressed with the extreme terciles defined by the amount of fictitious cash holdings (the first and the third), after removing the observation with $FCH > 1$. The working sample is, therefore, 1164 observations.

Table 7 - Results of the second model

Variables	Expected sign	Coefficients	p-value
Constant	n.a.	0.972	0.001
FAM	+	0.224	0.098
ROC	-	-0.792	0.041
STATUS	+	0.560	0.011
DIM	-	-1.563	0.000
NbMan	-	0.077	0.621
ACTIV	n.a.	-0.343	0.252
Nb of observations	1164		
McFadden R-squared	0.117		
Global significance	0.000		

Model: $DCS^{it} = \beta_0 + \beta_1.FAM^{it} + \beta_2.ROC^{it} + \beta_3.STATUS^{it} + \beta_4.DIM^{it} + \beta_5.NbMan^{it} + \beta_6.ACTIV^{it} + \varepsilon$

Notes: DCS takes the value 1 when FCH is above the median and 0 otherwise; FAM assumes the value 1 if family business and 0 otherwise; ROC takes the value 1 if audited company and 0 otherwise; STATUS assumes the value 1 when company is inactive and 0 otherwise; DIM is the company's size, taking the value 1 when higher than the median and 0 otherwise; NbMan is the number of owner/managers, assuming the value 1 when higher than the median and 0 otherwise; ACTIV takes the value 1 if the company belongs to subdivision 711 and 0 otherwise.

The model is significant for a significance level at less than 1%. To know the quality of the adjustment of the model, the regular r-squared is not suitable, so instead, a substitute r-squared (McFadden r-squared) is used to evaluate the explanation power of the model. For this model, the indicator presents a value of 11.7%, consistent with the empirical evidence using Logit models (Bartlett, 2014).

Although the value of the coefficients is not directly meaningful in the Logit models, its sign portrays the relation between the dependent variable and the explanatory ones. That is, a positive sign means that the variable increases the probability of the event to happen, in this case, the existence of fictitious cash holdings above the median.

Analysing the significance of the coefficients, most of them are significant at less than 5%. The exceptions are FAM, that is significant at less than 10%, and NbMan and ACTIV that are not significant. Nevertheless, the latter is a control variable, important to mitigate the effects resulting of different activity sectors.

The variable FAM was constructed based on assumptions, once the data for this variable was assembled with disperse information, namely the family names. The family relationship was

defined according to the names of the owners and if they share a common surname. Nevertheless, not always Portuguese couples have the wife taking the husband's surname, rather keeping their single surnames. Therefore, in these cases, the companies were assumed as non-family businesses, not corresponding to the correct position. Thus, because of this, the variable is measured with noise. Additionally, other situation that may add noise to the measurement may be when two (or more) members of the administrative board share the same surname and, by a sheer coincidence, are not truly blood (or matrimonially) related. Nevertheless, despite these measurement difficulties, the variable is significant at less than 10%, suggesting that family businesses tend to have more fictitious cash holdings.

The non-significance of NbMan suggests that the number of members in the board do not affect the opportunity to commit cash frauds and the underlying fictitious cash holdings, contrary to the previous expectations. A reason might be that although a company has a high number of owners/managers they do not supervise each other, for family reasons or other, unlike the expected. For example, most of the companies with three or more members in the administrative board, i.e. with a number of owners/managers above the median, are family businesses, as seen in the section 4.2.3, enhancing the idea of the inexistence of control over the other members. Therefore, the number of owners/managers may not influence the existence of fictitious cash holdings since a single owner/manager is not controlled by internal forces, and a large number of members may be family related, thus not supervising each other. In other words, the opportunity to commit cash fraud, such as fictitious cash holdings, is present either when the administrative board is composed by a small or a large number of members.

In sum and focusing on the research question of this study, the factors that influence the existence of fictitious cash holdings are FAM, ROC, STATUS and DIM. Concerning the result for STATUS, they corroborate the suggestion made above that at least some of the inactive companies are in a such a status because they may not have conditions to close their accounting books given divergences in between the assets accounting values and the actual ones (for example, fictitious cash holdings). As expected, the existence of a statutory auditor (ROC) works as a constraint to the existence of such a fictitious asset, and the underlying fraud. Finally, for the company size (DIM), the results sustain that smaller companies are more prone to fraudulent acts such as fictitious cash holdings, as referred above.²

² An alternative analysis on the results of the second model is displayed in Appendix 2.

5.4 Other empirical results: robustness tests

To ensure that the results discussed in the previous subsection are robust, a set of other tests have been performed.

As mentioned before, the model was also regressed using the complete subsample 2. The model was also regressed using the extreme quintiles of this sample, defined by amount of the fictitious cash holdings. In both cases, the results were qualitatively similar to those displayed in the above subsection.

The model whose results are displayed in subsection 5.3 was regressed using subsample 2 after having removed the observations where fictitious cash holdings were higher than one ($FCH > 1$), in order to test whether extreme values would affect the results. Hence, to evaluate these effects, the observations with $FCH > 1$ were included, and the sample was once again ordered and divided into three parts, being the middle one removed.

Table 8 presents the result from the addition of these observations.

Table 8 - Results of the addition of the observation with $DCS > 1$

Variables	Coefficients (β)	p-value
Constant	0.356	0.202
FAM	0.152	0.237
ROC	-0.970	0.028
STATUS	0.574	0.007
DIM	-1.241	0.000
NbMan	0.035	0.814
ACTIV	0.173	0.532
Nb of observations	1234	
McFadden R-squared	0.082	
Global significance	0.000	

Model: $DCS^i = \beta_0 + \beta_1.FAM^i + \beta_2.ROC^i + \beta_3.STATUS^i + \beta_4.DIM^i + \beta_5.NbMan^i + \beta_6.ACTIV^i + \varepsilon$

Notes: The definition of the variables is the same as table 7.

The overall results are qualitatively similar to the displayed in section 5.3. Although the model

is globally significant, its power of explanation is slightly lower than the model without the observation with $FCH > 1$. Besides that, the variable FAM loses some of its significance.

To further the analysis, a subsample with only observations $FCH > 1$ was used, but the model was not regressed because of a quasi-complete separation since the variable $ROC > 1$ perfectly predicted binary response success. This result remained even when replacing the ROC for SOC.

Due to the high correlation between the variables ROC and SOC, only one could be inserted in the model. The variable ROC was chosen since this was the major expected factor to constraint the company from having fictitious cash holdings. A robustness test was also performed, with the variable SOC replacing the variable ROC. The results were consistent with the ones of the basic model, as expected, although with a slightly lower quality of adjustment (McFadden r -squared). This is due to the joint stock limited companies' obligation to have a statutory auditor, unlike the partnership limited ones. Nevertheless, some of the latter legal form are audited, leading to the difference in the power of explanation between the two models.

To analyse possible combinations between the factors, multiplicative variables were included in the model. The results when adding the variable $NbMan * FAM$ were similar to the adopted model, since this variable was not significant at a level of 5%; the same happens with the variables $ROC * FAM$ and $STATUS * FAM$. When adding the variable $ROC * STATUS$, the model shows a quasi-complete separation for this variable, not being able to obtain results. This was the result of only one observation presenting the value of 1 for this variable, meaning that was an audited company however it was not active.

Since the variable NbMan was not found to be significant, an alternative definition of this variable was adopted. Instead of dividing the two categories according to be higher or lower than the median, the new variable was defined taking value 1 if the company has one owner/manager and 0 otherwise. Nevertheless, the results were similar to the original model.

In sum, the overall set of extra tests performed offered similar empirical evidence to the basic model. This is taken as a sign of how robust the discussed results are.

6. Conclusion

The objective of this dissertation was to study the determinants of the fictitious cash holdings of the Portuguese micro companies. Underlying these cash holdings there is a tax fraud once it is the result of the management retrieving cash from the company without a business justification, leading to a difference between the accounted cash value and the existent one.

Since companies hold cash for many reasons, a model to compute the expected (normal) cash holding of the companies was performed to identify which companies presented an observed cash balance different than the expected one, i.e., companies with abnormal cash holdings. This model was based on the Trade-off Theory for its similarities with the Portuguese context (e.g. Farinha & Borges, 2017). The coefficients regressed were according to the expectations, except for NWC/A. This exception may be due to the fact that for small companies, with no bargain power, it is difficult to transform rapidly working capital assets into cash, influencing the cash holdings kept.

For the companies which present positive abnormal cash holdings – labelled companies with fictitious cash holdings – the factors that could lead to this phenomenon were analysed taking as a framework Cressey (1953) proposal on fraud, and especially the “opportunity” element since it is the one that companies may control to prevent fraudulent acts (Suh et al., 2019).

The results show the existence of fictitious cash holdings is positively influenced by a family ownership (FAM) and the status of being inactive (STATUS), and negatively influenced by the existence of a statutory auditor (ROC) and the company size (DIM). These results are consistent with the expectations and literature, and robust to several tests that change the sample size and or variables definition. Thus, small, non-audited, inactive, family businesses are prone to present fictitious cash holdings.

The variable number of owners/managers (NbMan) was not found to be a significant determinant, even when changing the definition of the variable or associating it with other factors. This might be due to companies with large number of owners/managers usually are family businesses and thus they do not control each member, vanishing the influence the number of managers could have to prevent fraud.

The literature does not offer empirical evidence that enhances the understanding of the fictitious cash holdings fraud. Therefore, taking advantage of the specific Portuguese context of micro companies, this study, although exploratory, searches in a structured way for the

factors that lead to this anti-social behaviour. More precisely, the present study contributes to the literature by showing that the fraudulent fictitious cash holdings exist and are relatively widespread among micro companies; and by highlighting the basic determinants that increase the opportunity for such a behaviour. Thus, this study adds to the literatures on cash holdings determinants and tax fraud, that till now did not approach the fictitious cash holdings phenomenon.

Nevertheless, this study is not exempt of limitations. It was performed in a specific service sector, and for a specific group of (micro) companies, conditioning the generalization of the results to other sectors. The size of the samples, and the short number of companies with a statutory auditor, may also have conditioned the analysis and results. Moreover, all variables used in the model that explain the determinants of fictitious cash holdings factors are binary, even though some of them could take more categories.

Therefore, future research may focus on the presence of fictitious cash holdings in other sectors and type of companies, answering questions like: the fictitious cash holdings phenomenon is more accentuated in the services industry relatively to others? In what sectors this phenomenon is more likely? Are large companies prone to fictitious cash holdings, even though having a statutory auditor? Besides, a different modelling may be performed.

Micro companies due to their characteristics are susceptible to fraudulent acts, namely those leading to fictitious cash holdings. The society is penalised when such acts occur, being the responsibility of the AT, and companies' managers, to fight back this phenomenon. This study, from its inception, was intended to be a contribution to such a fight.

7. Appendix

7.1 Appendix 1: Variables of the main models referred on the literature review on cash holdings

Table 9 – Variables of the main models referred on the literature review on cash holdings

Author	Variables
Opler et al. (1999)	Cash/assets; Truncated cash/assets; Real size; Market-to-book ratio; R&D/sales; Cash Flow/assets; Net working capital/assets; Capital expenditures/assets; Acquisitions/assets; Payout to shareholders; Industry sigma; Total leverage
Pinkowitz & Williamson (2001)	Cash/assets; Real size; Market-to-book ratio; R&D/sales; Real sales; Excess Cash; Cash Flow/assets; Net working capital/assets; Capital expenditures/assets; Payout to shareholders; Industry sigma; Total leverage
Almeida et al. (2004)	Cash/assets; Cash Flow/assets; Market value/Book value of assets; Size; Expenditures/Assets; Acquisitions/assets; Net working capital/assets; Short debt/assets
Ferreira & Vilela (2004)	Cash/assets; Dividend (dummy); Market value/Book value of assets; Net working capital/assets; Debt/assets; Real size; Industry sigma; Cash Flow/assets; Bank debt
Farinha & Borges (2017)	Cash/assets; Market-to-book ratio; Size; Debt/assets; Long-term debt/total debt; Dividends (dummy); Working capital/total assets; Cash Flow/assets; percentage of voting rights owned by the two largest shareholders; board size; independent non-executive directors/total number of board members; Net income/assets

7.2 Appendix 2: Alternative analysis on the results of the second model

Although the analysis performed in section 5.3 is satisfactory for the aim of this study, an alternative analysis can be considered regarding the coefficients of the second model.

Since the logit model is computed through algorithms, the value of the coefficient is not directly meaningful. Thus, the exponentiation of the coefficients [$\exp(\beta)$] was calculated, as displayed in the fourth column of the table 9. These values represent the likelihood of an event occurring versus not occurring, when an explanatory variable is changed, other things being per unit equal (Liao, 1994).

Table 10 – Additional results of the second model

Variables	Coefficients (β)	p-value	Exp(β)
Constant	0.972	0.001	2.644
FAM	0.224	0.098	1.250
ROC	-0.792	0.041	0.453
STATUS	0.560	0.011	1.750
DIM	-1.563	0.000	0.210
NbMan	0.077	0.621	1.080
ACTIV	-0.343	0.252	0.710

Model: $DCS^i = \beta_0 + \beta_1.FAM^i + \beta_2.ROC^i + \beta_3.STATUS^i + \beta_4.DIM^i + \beta_5.NbMan^i + \beta_6.ACTIV^i + \varepsilon$

Notes: DCS takes the value 1 when FCH is above the median and 0 otherwise; FAM assumes the value 1 if family business and 0 otherwise; ROC takes the value 1 if audited company and 0 otherwise; STATUS assumes the value 1 when company is inactive and 0 otherwise; DIM is the company's size, taking the value 1 when above the median and 0 otherwise; NbMan is the number of owner/managers, assuming the value 1 when above the median and 0 otherwise; ACTIV takes the value 1 if the company belongs to subsector 711 and 0 otherwise. Exp (β) is the exponentiation of the coefficient.

Analysing the exponentiation of the coefficients, the chances of having fictitious cash holdings above the median, other things being per unit equal, is: for family businesses, 125% relatively to non-family businesses; for audited companies, 0.453 as high as companies without an statutory auditor; for inactive companies, 175% relatively to active companies; for larger companies, 0.210 as high as smaller companies.

Therefore, this analysis reaches, in a different way, to the same conclusion as section 5.3.

Moreover, it is possible to calculate predicted probabilities of companies having FCH above the median (DCS=1) based on equation 7.5 (Liao, 1994, pp. 12, 17):

$$Prob(DCS = 1) = \frac{e^{\sum_{k=1}^k \beta_k x_k}}{1 + e^{\sum_{k=1}^k \beta_k x_k}} \quad (7.5)$$

The probabilities of fictitious cash holdings above the median being present in the companies of different combinations of the variables FAM, ROC, STATUS and DIM are present in the table 11.

Table 11 – Results of the equation 7.5

FAM	ROC	STATUS	DIM	Prob(DCS=1)
1	1	1	1	35.5%
1	1	1	0	72.4%
1	1	0	1	23.4%
1	0	1	1	54.8%
0	1	1	1	30.5%
1	1	0	0	60.0%
1	0	1	0	85.3%
0	1	1	0	67.7%
1	0	0	1	40.9%
0	1	0	1	20.1%
0	0	1	1	49.2%
1	0	0	0	76.8%
0	1	0	0	54.5%
0	0	1	0	82.2%
0	0	0	1	35.6%
0	0	0	0	72.6%

Notes: DCS takes the value 1 when FCH is above the median and 0 otherwise; FAM assumes the value 1 if family business and 0 otherwise; ROC takes the value 1 if audited company and 0 otherwise; STATUS assumes the value 1 when company is inactive and 0 otherwise; DIM is the company's size, taking the value 1 when above the median and 0 otherwise

According to table 11, the probability of a small, inactive, family business, without a statutory auditor, of having fictitious cash holdings above the median is 85.27%. While non-family, audited, active and larger companies present the lower likelihood of having fictitious cash holdings above the median (20.1%).

Therefore, a family ownership, the absence of a statutory auditor, a small dimension, and an inactive status influence the existence of fictitious cash holdings, which aligns with the conclusion reached in section 5.3.

References

- Ajzen, I., & Beck, L. (1991). Predicting Dishonest Actions Using the Theory of Planned Behavior, *Journal of Research in Personality* 25(3), 285–301.
- Albrecht, W., Albrecht, C., Albrecht, C., & Zimbelman, M. (2009). *Fraud examination* (3rd ed.). Mason: South-Western.
- Almeida, H., Campello, M., & Weisbach, M. (2004). “The cash flow sensitivity of cash.” *Journal of Finance*, 59, 4.
- Alves, D. (2018). Estrela da Fraude. A Ganância Como Factor Motivador da Fraude. *Working Papers - OBEGEF - Observatório de Economia e Gestão da Fraude*, n. 57
- Baird, J., & Zelin Ii, R. (2009). An Examination of the Impact of Obedience Pressure on Perceptions of Fraudulent Acts and the Likelihood of Committing Occupational Fraud. *Journal of Forensic Studies in Accounting & Business*, 1(1), 1-14.
- Bunn, E., Ethridge, J., & Crow, K. (2019). Fraud in Small Businesses: A Preliminary Study. *Journal of Accounting & Finance* (2158-3625), 19(3), 24-32.
- Chang-Soo, K., Mauer, D., & Sherman, A. (1998). The Determinants of Corporate Liquidity: Theory and Evidence. *Journal of Financial & Quantitative Analysis*, 33(3), 335-359.
- Chapple, L., Ferguson, C., & Kang, D. (2007). Corporate Governance and Misappropriation. *Journal of Forensic and Investigative Accounting*, 1, 1-26
- Choo, F., & Tan, K. (2007). An “American Dream” Theory of Corporate Executive Fraud. *Accounting Forum - Account Forum*, 31, 203-215.
- Cressey, D. (1953). *Other People's Money: A Study in the Social Psychology of Embezzlement*. Glencoe, Illinois: The Free Press.
- Dittmar, A., Mahrt-Smith, J., & Servaes, H. (2003). International Corporate Governance and Corporate Cash Holdings. *Journal of Financial and Quantitative Analysis*, 38(1), 111-133.
- Dorminey, J., Fleming, A., Kranacher, M., & Riley Jr, R. (2010). Beyond the Fraud Triangle. *CPA Journal*, 80(7), 16-23.
- Dorminey, J., Fleming, A., Riley Jr, R., & Kranacher, M. (2012). The evolution of fraud theory. *Issues in Accounting Education*, 27(2), 555-579.
- Farinha, J., & Borges, A. (2017). Corporate Cash Holdings and Financial Crisis: An Empirical Investigation of Portuguese Listed Companies. *Cadernos do Mercado de Valores Mobiliários* (57), 8-34.

- Ferreira, M., & Vilela, A. (2004). Why Do Firms Hold Cash? Evidence from EMU Countries. *European Financial Management*, 10(2), 295-319.
- Free, C., & Murphy, P.(2015). The ties that bind: The decision to co-offend in fraud. *Contemporary Accounting Research*, 32(1), 18- 54.
- Gujarati, D. (2003) *Basic Econometrics* (4th ed.). New York: The McGraw-Hill Companies, Inc
- Jensen, M. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *American Economic Review*, 76(2), 323-329.
- Jensen, M., & Meckling, W.(1976). Theory of The Firm: Managerial Behavior, Agency Costs And Ownership Structure. *Journal of Financial Economics*, 3(4), 305-360.
- Johansson, E., & Carey, P. (2016). Detecting Fraud: The Role of the Anonymous Reporting Channel. *Journal of Business Ethics*, 139(2), 391 - 409.
- Jones, J. (1991). Earnings Management During Import Relief Investigations. *Journal of Accounting Research*, 29(2), 193-228.
- Holtfreter, K. (2005). Is Occupational Fraud "Typical" White-Collar Crime? A Comparison of Individual and Organizational Characteristics. *Journal of Criminal Justice*, 33(4), 353-365.
- Keynes, J. (1936). *The General Theory of Employment, Interest and Money*. New York: Harcourt, Brace and Company.
- Krishnan, G., & Peytcheva, M. (2019). The Risk of Fraud in Family Firms: Assessments of External Auditors. *Journal of Business Ethics*, 157(1), 261-278.
- Kumar, K., Bhattacharya, S., & Hicks, R. (2018). Employee perceptions of organization culture with respect to fraud – where to look and what to look for. *Pacific Accounting Review*, 30(2), 187-198.
- Liao, T. (1994). *Quantitative Applications in the Social Sciences: Interpreting probability models*. Thousand Oaks, California: SAGE Publications, Inc.
- Lozano, M., & Yaman, S. (2020). The determinants of cash flow sensitivity of cash: The family ownership effect. *Research in International Business and Finance*, 53(C), 101204
- Máté, D., Sadaf, R., Oláh, J., Popp, J., & Szűcs, E. (2019). The Effects of Accountability, Governance Capital, and Legal Origin on Reported Frauds. *Technological & Economic Development of Economy*, 25(6), 1213-1231.
- Mortal, S., Nanda, V., & Reisel, N. (2020). Why do private firms hold less cash than public firms? International evidence on cash holdings and borrowing costs. *Journal of Banking and Finance*, 113, 105722.

- Myers, S. (1984). The Capital Structure Puzzle. *Journal of Finance*, 39(3), 575-592.
- Myers, S., & Majluf, N. (1984). Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have. *Journal of Financial Economics*, 13(2), 187- 221.
- Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The Determinants and Implications of Corporate Cash Holdings. *Journal of Financial Economics*, 52(1), 3 - 46.
- Ozkan, A., & Ozkan, N. (2004). Corporate Cash Holdings: An Empirical Investigation of UK Companies. *Journal of Banking and Finance*, 28(9), 2103-2134.
- Pinkowitz, L., & Williamson, R., (2001). Bank Power and Cash Holdings: Evidence from Japan. *Review of Financial Studies*, 14(4), pp. 1059– 1082.
- Rae, K. & Subramaniam, N. (2008). Quality of internal control procedures. *Managerial Auditing Journal*, 23(2), 104 – 124.
- Ross, S., Westerfield, R., & Jaffe, J. (2010). *Corporate Finance* (9th ed.). New York: The McGraw-Hill Companies, Inc
- Rustiarini, N., Sutrisno, T., Nurkholis, N., & Andayani, W. (2019). Why People Commit Public Procurement Fraud? The Fraud Diamond View. *Journal of Public Procurement*, 19(4), 345-362.
- Suh, J., Nicolaides, R., & Trafford, R. (2019). The effects of reducing opportunity and fraud risk factors on the occurrence of occupational fraud in financial institutions. *International Journal of Law, Crime and Justice*, 56, 79-79 - 88.
- Utami, I., Wijono, S., Noviyanti, S., & Mohamed, N. (2019). Fraud Diamond, Machiavellianism And Fraud Intention. *International Journal of Ethics and Systems*, 35(4), 531-544.
- Wells, J. (2017). *Corporate Fraud Handbook: Prevention and Detection* (5th ed.). Hoboken, New Jersey: John Wiley & Sons, Inc.

Webography

- ACFE (2018). *Report to the Nations*. Retrieved from <https://www.acfe.com/report-to-the-nations/2018/default.aspx>, accessed on 15.10.2019
- Bartlett, J. (2014). “The Stats Geek”. Retrieved from <https://thestatsgeek.com>, accessed in 14.08.2020

Colaço, J. (2019). *Saldos de Caixa Elevados*. Retrieved from <https://www.iatoc.org>, accessed on 27.09.2019.

European Commission (2017). *Ficha Temática Do Semestre Europeu: Acesso Ao Financiamento Das Pequenas E Médias Empresas*. Retrieved from https://ec.europa.eu/info/sites/info/files/file_import/european-semester-thematic-factsheet-small-medium-enterprises-access-finance_pt.pdf, accessed on 09.01.2020

Pordata (2020). “*Pequenas e Médias Empresas*”. PORDATA, Base de Dados de Portugal Contemporâneo. Retrieved from <https://www.pordata.pt>, accessed on 03.07.2020

Legislation on the topic consulted

Decree-Law No. 98/2015 of June 2nd. *Diário da República, No 106/2015 - I série*. Lisbon: Ministry of Finance. Available in <https://dre.pt/home/-/dre/67356342/details/maximized>, accessed on 31.08.2020

General Taxation Law (LGT - *Lei Geral Tributária*) – articles: 63rd-C, E. Available in https://dre.pt/web/guest/legislacao-consolidada/-/lc/34438775/view?p_p_state=maximized, accessed on 31.08.2020

General Regime for Tax Offenses (RGIT – *Regime Geral das Infrações Tributárias*) – article: 129th. Available in https://info.portaldasfinancas.gov.pt/pt/informacao_fiscal/codigos_tributarios/rgit/Pages/regime-geral-das-infracoes-tributarias-indice.aspx, accessed on 31.08.2020

Commercial Societies Code (CSC – *Código das Sociedades Comerciais*) – articles: 149th; 262nd- 2; 278th- 1, 3; 413rd – 1. Available in <https://dre.pt/legislacao-consolidada/-/lc/34443975/view>, accessed on 31.08.2020