Cash Holdings in Portuguese Private Firms

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ABSTRACT

This paper investigates the corporate cash holdings of private firms in Portugal over the period of 2011 to 2021. Based on a sample of 3,861 firms, the study reveals that private firms tend to hold less cash when they are larger, have higher leverage ratios, higher financial deficits, and superior net working capital. This finding confirms the conventional belief that cash can be seen as negative debt, and that net working capital can be considered a viable substitute for cash. Conversely, the private firms that have higher cash flow volatility, pay dividends, and have a longer cash conversion cycle are found to have a positive relationship with cash reserves. Surprisingly, the study finds no significant relationship between cash holdings and growth opportunities, which contradicts previous research. Furthermore, the study suggests that even private firms with high cash levels tend to delay increasing investments due to limited access to capital markets.

Keywords: Corporate cash holdings, cash determinants, private firms, Portugal

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RESUMO

Este artigo investiga a gestão de tesouraria das empresas privadas portuguesas no período de 2011 a 2021. Com base numa amostra de 3.861 empresas, o estudo revela que empresas com maior dimensão, rácios de divida, défices financeiros e capital circulante líquido tendem a deter menos caixa. Este resultado confirma as expectativas de que o caixa pode ser visto como uma forma de dívida negativa e que o capital circulante líquido pode ser considerado um substituto viável ao caixa. Pelo contrário, empresas de maior risco, que pagam dividendos e com ciclos de conversão de caixa mais longos apresentam uma relação positiva com o dinheiro em caixa. Surpreendentemente, o estudo não encontra qualquer relação significativa entre o saldo de tesouraria e as oportunidades de crescimento, o que contradiz pesquisas anteriores. Além disso, este sugere que mesmo as empresas privadas com elevada liquidez tendem a adiar os seus investimentos, devido ao acesso limitado aos mercados de dívida.

Palavras-chave: Salso de tesouraria, determinantes de tesouraria, empresas privadas, Portugal

Título: Saldo de Tesouraria nas Empresas Privadas Portuguesas

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[1] Banco de Portugal Microdata Research Laboratory

Contents

1. Introduction

When managing a company, managers need to establish an adequate cash policy, as this is a vital decision to support the day-to-day operations and determine the future success of the company. Therefore, it is crucial to question why firms hold large amounts of cash. The literature suggests that firms may hold cash to minimise transaction costs during financially constrained periods, as they are less likely to raise external financing or liquidate existing assets to meet their obligations. Another reason to hold cash is the precautionary motive, which suggests that firms will hold more cash to reduce the probability of financial distress and continue investing in positive net present value (NPV) projects when they arise. However, holding cash also has associated costs, such as the low return earned on liquid assets and the possible agency problems that can arise between managers and shareholders since managers may retain cash holdings to pursue their interests at the expense of shareholders' interests (Jensen, 1986).

The determinants of cash holdings have become a popular research topic in recent years and are an important part of the current literature on cash reserves. Several studies have focused on the determinants of cash holdings in US-listed companies, such as Kim et al. (1998), Opler et al. (1999), Harford et al. (2008), and Bates et al. (2009). Meanwhile, Ozkan & Ozkan (2004) and Al-Najjar & Belghitar (2011) have identified different firm-specific characteristics that impact corporate cash holdings using UK-listed firms, and Ferreira & Vilela (2004) have used data from European Union-listed firms. Some studies have also focused on cross-country comparisons (Dittmar et al., 2003 and Kusnadi & Wei, 2011), while Gao et al. (2013) and Mortal et al. (2019) have investigated the determinants of cash holdings in listed firms by comparing public and private firms in each selected country. Finally, Bigelli & Sánchez-Vidal (2012) focus their research on Italian private firms. However, little is known about cash holdings in private firms.

The purpose of this paper is to present new empirical evidence on the cash holdings of private firms by using 3,861 Portuguese private firms between 2011 and 2021. Our research contributes to the corporate finance literature by examining a type of firm that has been less commonly studied. However, the private sector is particularly important as these firms are usually more financially constrained, face greater risk, and have limited access to external financing, depending more heavily on their cash reserves.

According to our research, Portuguese private firms have consistently increased their cash holdings from 2011 to 2021. On average, these firms hold 11.8% of their total assets in

cash, which is comparable to Italian private firms that hold 10% of their total assets in cash (Bigelli & Sánchez-Vidal, 2012), as well as US unlisted firms that hold a mean cash ratio of 9.39% (Gao H et al., 2013). Furthermore, when comparing small and large firms, we found that smaller firms tend to hold more cash due to their higher perceived risk, greater growth potential, longer cash conversion cycle, and fewer cash substitutes, which aligns with theoretical expectations. We also conducted different models based on our panel data to analyse the sign and significance of the relationships between corporate cash holdings and the selected explanatory variables. From this analysis, we concluded that Portuguese private firms that tend to be larger, have higher leverage ratios, higher financial deficits, and higher net working capital hold less cash. Our results confirm the theoretical expectations that cash can be seen as negative debt, and that net working capital can be considered a good cash substitute. This is consistent with findings from previous research on Italian private firms (Bigelli & Sánchez-Vidal, 2012), EMU countries (Ferreira & Vilela, 2004), and UK-listed firms (Ozkan & Ozkan, 2004).

On the other hand, private firms with higher cash flow volatility, a tendency to pay dividends, and a longer cash conversion cycle tend to have higher cash balances. However, we did not find any significant relationship between cash holdings and growth opportunities, which contradicts previous research. Our study proposes that the most effective model for explaining the variability of cash holdings is the one that considers both macroeconomic events and industry effects. Finally, our findings suggest that cash-rich Portuguese private firms tend to accumulate cash reserves and delay increasing their investments due to limited access to capital markets, a characteristic of private companies.

The remainder of this paper is structured as follows. Section 2 presents the previous literature that focuses on cash holdings. In Section 3, we report the data and methodology used in this research. We present the explanatory variables and empirical hypothesis in Section 4. Section 5 examines the empirical results, and section 6 presents the robustness tests. In Section 7, we investigate whether cash is held to finance future investment opportunities. Lastly, Section 8 summarises the main conclusions and suggests topics for future research.

2. Literature Review

The following section will explore the reasons behind companies' cash reserves while considering the two main capital structure theories: the Trade-off theory and the Pecking order theory. Additionally, we will provide a brief overview of the different drivers that influence a company's cash holdings.

The Trade-off theory, developed by Kraus & Litzenberger (1973), emphasises that a firm must trade off the benefits and costs of using debt and equity financing to find an optimal capital structure. This takes into consideration factors such as tax advantages, bankruptcy risks, and agency costs. Miller and Orr (1966) and later Kim et al. (1998) developed a similar Trade-off theory for cash reserves, stating that the optimal level of cash is determined by comparing the marginal cost of holding non-interest-bearing cash with the benefits of holding cash. Keynes (1934) usually mentions two main reasons for holding cash: the transaction cost and the precautionary motive. Firms with higher cash levels can reduce their transaction costs during financially constrained periods since they are less likely to raise external funds or liquidate existing assets to make payments. The precautionary motive suggests that firms will hold more cash to mitigate the probability of financial distress and continue investing in positive NPV projects when access to external financing is complex and costly. Accessing external funds can be expensive due to information asymmetry and agency costs. However, this paper will not address agency costs as they are typically irrelevant in private firms where control and ownership are not separated.

According to the Pecking order theory proposed by Myers & Majluf, 1984, companies prefer to finance their investment opportunities using internal funds, then with debt, and as a last resort, with equity. The theory assumes that equity is the least preferred source of financing since investors demand a premium due to market information asymmetry. Regarding the cash balances, the authors also argue that, due to financial constraints induced by information asymmetry, companies should maintain a stock of liquid assets to finance future investment opportunities with internal funds. It is essential to note that private firms, which are subject to lower levels of disclosure and external auditing, should follow this financing hierarchy even more strictly.

Besides these main theories, several other empirical studies contribute to explaining the level of cash holdings. Dittmar et al. (2003), Guney et al. (2007), and Kusnadi & Wei (2011) proved that companies with weak shareholder protection have higher levels of cash, as agency problems are more significant in such firms. Managers of such companies tend to prioritise their interests over the interests of shareholders, as they prefer to control more cash instead of using it to finance investment opportunities with a positive NPV, leading to less efficient management of cash balances. Gao H et al. (2013) showed that public firms hold, on average, about twice as much cash as private firms despite facing lower external financing costs. This vast difference is justified by the higher agency cost that the public firms need to bear, as the ownership is dispersed and the ownership and control separate.

Other research studies have suggested that the type of corporate governance could also affect the amount of cash a company holds. Chen Y et al. (2020) found that firms with overconfident CEOs tend to hold more cash, as they are more willing to take risks and pursue innovation. Conversely, Deshmukh et al. (2021) concluded that companies with optimist CEOs hold less cash than a rational CEO. This behaviour can be explained by the expectation that the cost of external financing will decline over time, leading to lower levels of cash and delayed external financing. Finally, Harford et al. (2008) proved that companies with poor corporate governance tend to have lower cash reserves, as they often spend their cash on capital expenditures, acquisitions and repurchases. Such companies may opt for repurchases instead of paying dividends, as this allows them to avoid committing to future payouts.

On the other hand, some researchers have focused their papers on the value of cash balances rather than their drivers. Therefore, Dittmar & Mahrt-Smith (2007) found that poorly governed firms have lower cash values, with $ 1.00 in such firms being worth only $0.42 to $0.88. Denis Sibilkov (2010) reported that cash reserves are more valuable for firms facing financial constraints, as they can use them to invest in positive NPV projects and as a hedge to mitigate the risk of financing constraints.

Finally, several empirical studies have attempted to identify a correlation between a company´s cash holdings and its specific characteristics. These characteristics include age, size, growth opportunities, profitability, R&D investment, dividend payments, cash conversion cycle, leverage, cash flow volatility, and taxes paid, among others. Some of the studies that explore these relationships include those by Opler et al. (1999), Ozkan & Ozkan (2004), Ferreira &Vilela (2004), Acharya et al. (2007), Harford et al. (2008), Bates et al. (2009), Bigelli & Sánchez-Vidal (2012), Megginson et al. (2014). This paper references Bigelli & Sánchez-Vidal (2012) multiple times, as their research also examines the cash holdings using private firms.

Our research on a firm's cash holdings is based on several factors, including its size, cash flow volatility, leverage ratio, growth opportunities, financing deficit, dividend payments, cash conversion cycle, and net working capital. To better understand how each driver is related to the corporate cash levels, section 4 provides a brief overview of the expected relationships based on existing theoretical concepts and prior research.

3. Sample & Methodology

This section outlines the method used for the data selection, the specific criteria for filtering the sample, and the methodology adopted for analysing the relationship between the selected factors and cash holdings.

The Banco de Portugal Microdata Research Laboratory (BPLIM) has granted access to the Central Balance Sheet Database (CB) to obtain all the necessary information about Portuguese private firms from 2010 to 2021. The data range starts from 2010 because prior to that year, the information was reported using The Chart of Accounts (POC) system. From 2010 onwards, the data has been reported according to a new accounting system, the Accounting Standards System (SNC).

To create the dataset for this study, we first eliminated all firms with a turnover of less than 2 million euros in their latest observation, as they are considered micro firms by the European Union definition. After this, financial and utility firms were excluded because their financial statements were subject to specific rules and regulations. We also eliminated the firm-year observations reporting a yearly change in total assets greater than 100%[2], negative equity, negative sales or a ratio of total cash on total assets greater than one or lower than zero. Finally, we removed any missing firm-year observations for any variable, resulting in a sample of 3,861 firms and 13,630 firm-year observations.

In this study, the level of cash holdings, which is the dependent variable, is measured as the ratio of cash and cash equivalents to total assets (net of pure cash and cash equivalents), following the methodology used by Opler et al. (1999). The eight explanatory drivers of cash holdings were selected based on Bigelli & Sánchez-Vidal (2012) (more details in Section 4). To minimise the possible influence of outliers, all the variables have been winsorised at the 1% level on both distribution tails, as Dittmar & Mahrt-Smith (2007) suggested.

Lastly, this paper will analyse the relationship between cash holdings and the explanatory variables using a panel data regression analysis. We will use various models to study this relationship, including the Fama-MacBeth model (Model 1), a fixed effects regression (Model 2), a time-series cross-sectional regression with unreported year dummies (Model 3), and a time-series cross-sectional regression with mean-industry-adjusted variables[3]

[2] The goal is to exclude firm-year observations that show significant fluctuations in their business metrics, which often indicate a major corporate event.

[3] Industries in our sample aggregate companies with the same NACE code at the 2-digit level. NACE is the European Union industry standard classification system, which consists of a 6-digit code statistical classification of economic activities.

and year dummies (Model 4). This approach is based on Baum et al. (2006) research, which found that macroeconomic and industry uncertainties can impact a company's cash reserves. Finally, we will use the means of all variables for each firm across time to run a cross-sectional regression (Model 5).

4. Explanatory Variables and Hypothesis

Size

Larger firms are generally assumed to have greater diversification, a reduced likelihood of facing financial distress, less severe information asymmetry problems (Ozkan & Ozkan, 2004), and better credit ratings (Opler et al., 1999), which make accessing external funds more effortless and cheaper. Furthermore, larger firms can use economies of scale in cash management to keep cash holdings lower, as expected under the Trade-off model. In a study focused on Italian private companies, Bigelli & Sánchez-Vidal (2012) discovered that large firms tend to hold significantly less cash than smaller firms, as they are less financially constrained, older, and less risky.

On the other hand, the Pecking order theory predicts a positive and significant relationship between firm size and corporate cash holdings. This theory defends the idea that large firms retain extra cash to finance their investments since they are usually more profitable and successful (Opler et al., 1999).

Although the literature is unclear, we expect that larger Portuguese private firms follow a similar pattern as larger Italian private firms, holding less cash by utilising economies of scale in cash management and the most accessible access to external financing.

In this study, firm size will be measured by the natural logarithm of the firm's total sales, as used by Bigelli & Sánchez-Vidal (2012) and Acharya et al. (2007). The sales are adjusted at the 2021 price level using the Consumer Price Index (CPI).

H1. There is a significant and negative relationship between firm size and cash holdings.

Risk or volatility of cash flows

According to the Trade-off theory, there is empirical evidence suggesting that firms with higher cash flow volatility tend to hold higher cash reserves to hedge against potential future cash flow shortages and to mitigate the risk of financial distress. Various studies,

including those conducted by Opler et al. (1999), Han & Qiu (2007), Bates et al. (2009), Duchin (2010), Bigelli & Sánchez-Vidal (2012), and Megginson et al. (2014), support this claim.

Han & Qiu (2007) have emphasised that the firm's cash flow volatility, cash holdings, and financial constraints are interconnected. Consequently, they have illustrated that the positive relationship between risk and cash holdings is significant only for financially constrained firms, as they maintain cash reserves for precautionary motives. However, this relationship is insignificant for financially unconstrained firms since they have no reason to hold cash reserves for precautionary purposes.

Additionally, Bigelli & Sanchez-Vidal (2012) have demonstrated that uncertainty within private firms positively influences their cash holdings. However, the industry risk appears to be more relevant than the firm's specific risk for these companies.

Cash flow volatility is quantified by taking the standard deviation of current and the past four operating cash flows to assets, as used by Ozkan & Ozkan (2004) and Mortal et al. (2019).

H2. There is a significant and positive relationship between risk and cash holdings.

Cash as negative debt

The firm's leverage can also determine the amount of cash it holds. The Pecking order theory predicts a negative relationship between financial leverage and cash holdings because it defends the idea that firms should initially fund their investment opportunities with retained earnings and only use leverage as a secondary option when their cash reserves prove insufficient. Several studies support this negative association, including Opler et al. (1999), Ferreira & Vilela (2004), Ozkan & Ozkan (2004), Bates et al. (2009) and Bigelli & Sánchez-Vidal (2012).

Regarding the Trade-off theory, the model´s predictions remain ambiguous. On the one hand, high leverage ratios can also indicate strong relationships with creditors, reducing the cost of additional financing. On the other hand, leveraged firms may hold higher cash reserves as a precautionary measure to mitigate the risk of financial distress (Acharya et al., 2007).

The financial leverage is measured as the total debt divided by the total assets, as used by Bigelli & Sánchez-Vidal (2012).

H3. There is a significant negative relationship between the leverage ratio and cash holdings.

Growth opportunities

Both the Trade-off theory and the Pecking order theory argue that companies with higher growth rates tend to preserve higher cash reserves because they face increased bankruptcy, agency costs, and severe information asymmetry problems, making external financing more expensive. Therefore, firms with more significant investment opportunities are expected to carry larger cash holdings to avoid constraining their valuable investment opportunities and to minimise financial distress costs associated with such firms (Ozkan & Ozkan, 2004). Similar results have been confirmed by Opler et al. (1999), Bates et al. (2009), Megginson et al. (2014), and Ferreira & Vilela (2004).

Furthermore, Duchin (2010) has demonstrated that multi-division companies maintain lower cash amounts than stand-alone firms due to their diversified investment opportunities.

In this paper, the growth opportunities of Portuguese private firms are calculated based on their yearly sales growth rate (as used by Bigelli & Sánchez-Vidal, 2012), as the proxy of market-to-book value is not feasible in this context.

H4. There is a significant and positive relationship between growth opportunities and cash holdings.

Financing deficit

A financing deficit occurs when a company does not have enough financial resources to support its operations, meet its financial obligations, or cover its investment needs. According to the Pecking order theory, companies tend to increase their debt levels when internal funds are insufficient. Therefore, a company facing a financial gap is expected to use its available cash reserves and raise additional funds through debt to meet its financial needs. As a result, there is a negative relationship between the financing deficit and cash holdings.

The financing deficit can be assessed through the total external financing a company receives in one year (either equity or debt), which is approximated by capital expenditures plus dividend payments minus the operating cash flows generated in that year, divided by total assets[4] (as used by Bigelli & Sánchez-Vidal, 2012).

H5. There is a significant negative relationship between financing deficit and cash holdings.

[4] The increase in net working capital was excluded to avoid multicollinearity problems with the net working capital variable.

Dividend payments

Empirical evidence shows that dividend payments are also a key determinant of cash holdings, although the direction of this relationship is unclear.

Considering the Trade-off theory, firms that distribute dividends usually maintain lower cash balances because they can generate funds when needed by cutting their dividend payments (Opler et al., 1999; Ozkan & Ozkan, 2004) and have greater access to external financing, as they are generally considered less risky (Bates et al., 2009).

Contrarily, several studies have shown that firms that pay dividends maintain higher levels of cash holdings to guarantee that they do not reduce, eliminate, or raise external funds to support the dividend payments, as documented by Megginson et al. (2014). Furthermore, Bigelli & Sánchez-Vidal (2012) proved that public firms tend to have higher dividend payments to reduce agency costs. However, generally, private firms do not have this ownership-control separation, which means that dividend payments are only correlated with an extra generation of cash flows and are not affected by agency costs of free cash flows.

In addition, Al-Najjar & Belghitar (2011) concluded that the cash flows are affected by the dividend policy; however, when controlling for simultaneity, dividends do not have a significant impact on cash holdings or vice versa.

This study uses a dummy variable for the dividend payments that equals one if a company pays dividends and equals zero otherwise (as used by Bigelli & Sánchez-Vidal, 2012).

H6. There is a significant and positive relationship between dividend payments and cash holdings.

Cash conversion cycle

A company's cash conversion cycle (CCC) measures its ability to generate cash from day-to-day operations. Therefore, a firm with a shorter cash conversion cycle has a better timing of cash inflows and outflows, a quick replenishment of the cash balance, higher liquidity and an effective management of inventory and credit sales, which decreases the need to hold high cash levels, as supported by the Pecking order theory. Similar results were also observed and corroborated in the context of Italian private firms (Bigelli & Sánchez-Vidal, 2012) and in publicly traded U.S. firms (Opler et al., 1999).

The cash conversion cycle (in days) is measured by adding the inventory conversion period and the receivables conversion period and then subtracting the payment period for accounts payable (as used by Bigelli & Sánchez-Vidal, 2012 and Opler et al., 1999).

H7. There is a significant and positive relationship between the cash conversion cycle and the cash holdings.

Net working capital

Arguing in line with the Trade-off theory, firms with a higher net working capital preserve lower levels of cash holdings, as the net working capital can be considered a substitute for cash, both in public and private firms (Opler et al., 1999). The liquidity assets that serve as substitutes for cash can be easily converted into cash as they are associated with lower transaction costs (Ozkan & Ozkan, 2004). As a result, a negative relationship between net working capital and cash holdings is expected. This expectation is supported by Opler et al. (1999), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), and Bates et al. (2009).

The net working capital is calculated as the difference between current assets (net of cash holdings) and current liabilities divided by total assets (as used by Bigelli & Sánchez-Vidal, 2012).

H8. There is a significant and negative relationship between the net working capital and the cash holdings.

5. Results

- ***Evolution of cash holdings***

Over the past decade, private firms in Portugal have consistently increased their cash holdings, as demonstrated in Figure 1. In 2011, the average cash holdings represented about 9.3% of total assets, the lowest value recorded. On the other hand, the highest value was recorded in 2021, with cash holdings representing 14.7% of total assets. It is important to note that the exceptional increase in cash holdings in 2020 (14.1% of total assets) and 2021 reflects the impact of the COVID-19 pandemic.

Figure 1
Evolution of Cash Holdings

The figure illustrates the evolution of total cash along the sample years (2011-2021) for the 3,861 firms and 13,630 firm-year observations. The values indicate the average total cash as a percentage of total assets each year. Total cash is the sum of pure cash and cash equivalents divided by total assets (net pure cash and cash equivalents).

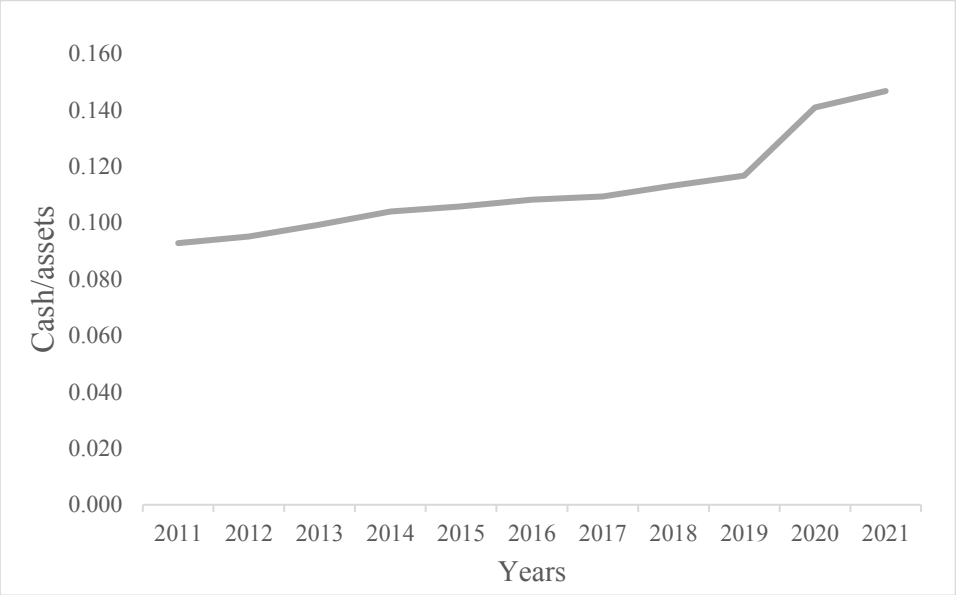

Table 1 provides a comprehensive overview of the main variables used in the study for the total sample of firms and the entire sample period. This includes the mean, median, 25th percentile, 75th percentile, and standard deviation. On average, the firms in our sample hold 11.8% cash of total assets, with a median cash holding of 6.4% of total assets. These values are similar to those reported for Italian private firms, where the mean and median cash ratios are 10.0% and 3.3%, respectively (Bigelli & Sánchez-Vidal, 2012), as well as US unlisted firms, which reveal a mean cash ratio of 9.39% and a median value of 3.79% (Gao H et al., 2013).

It is worth noting that the dependent variable shows a significant difference between the 25th percentile and the 75th percentile, with values of 1.9% and 17.1%, respectively, and the net working capital variable has the most considerable disparity between percentiles, with values of 1.8% and 30.5%, respectively. Finally, the cash conversion cycle variable exhibits the highest standard deviation.

Table 1
Univariate Statistics

The table reports univariate statistics of the main variables for the 13,630 firm-year observations in the 2011-2021 period. Total cash is the sum of pure cash and cash equivalents divided by total assets (net of pure cash and cash equivalents); Size is measured by the natural logarithm of the firm´s total sales (CPI adjusted at the 2021 price level); Company's risk is quantified by the standard deviation of current and the past four operating cash flows to assets; Financial leverage is measured as total debt over total assets; Growth opportunities are proxied by the sales' yearly growth rate; Financing deficit is the total external financing a company receives in one year (either equity or debt) computed as capital expenditures plus dividend payments minus operating cash flows generated in that year divided by total assets; Dividend dummy equals one if a company pays dividends and zero otherwise; The cash conversion cycle (in days) is measured by the inventory conversion period plus the receivables'

conversion period minus the payment period for the accounts' payable; Net working capital is calculated as the difference between current assets (net of cash holdings) and current liabilities divided by total assets.

	Mean	Median	25th Perc.	75th Perc.	Std. Dev.
Total cash	0.118	0.064	0.019	0.171	0.137
Size	15.533	15.729	14.846	16.627	2.012
Risk	0.090	0.069	0.041	0.112	0.081
Financial leverage	0.223	0.198	0.067	0.349	0.819
Growth opportunities	0.129	0.033	-0.069	0.153	0.696
Financing deficit	-0.002	-0.010	-0.068	0.054	0.129
Dividend dummy	0.648	1.000	0.000	1.000	0.478
Cash conversion cycle	129.831	91.192	33.059	169.627	161.530
Net working capital	0.155	0.160	0.018	0.305	0.224

Table 2 presents the correlation matrix for all the selected explanatory variables. Although most of the correlations are statistically significant, none of them are exceptionally high to present serious multicollinearity challenges among the factors. The highest correlation coefficient is between net working capital and cash conversion cycle, which is 0.356.

Regarding the relationship between cash holdings and independent variables, the table below confirms all the expected directions. Among these variables, financial leverage has the highest statistically significant correlation coefficient of -0.351. However, the correlation between cash reserves and the growth opportunities variable is not statistically significant.

Table 2
Correlation Matrix

Correlation coefficients between the dependent variable, Total cash, and its key explanatory variables and correlation coefficients between independent variables are shown for our sample of Portuguese private firms between 2011 and 2021. Variables definitions are provided in Table 1. *p*-values are reported in brackets.

	Total cash	Size	Risk	Fin. leverage	Growth opp.	Fin. deficit	Dividend D.	CCC	NWC
Total cash	1.000								
Size	-0.131 [0.000]	1.000							
Risk	0.110 [0.000]	-0.083 [0.000]	1.000						
Financial leverage	-0.351 [0.000]	-0.029 [0.001]	0.022 [0.011]	1.000					
Growth opportunities	0.002 [0.845]	-0.123 [0.000]	0.040 [0.000]	0.009 [0.309]	1.000				
Financing deficit	-0.188 [0.000]	-0.020 [0.022]	0.013 [0.130]	0.132 [0.000]	-0.016 [0.063]	1.000			
Dividend dummy	0.077 [0.000]	0.193 [0.000]	-0.046 [0.000]	-0.118 [0.000]	-0.055 [0.000]	0.036 [0.000]	1.000		
Cash conversion cycle	0.120 [0.000]	-0.095 [0.000]	-0.074 [0.000]	0.101 [0.000]	-0.015 [0.086]	0.032 [0.000]	0.012 [0.156]	1.000	
Net working capital	-0.190 [0.000]	0.057 [0.000]	-0.023 [0.008]	-0.154 [0.000]	-0.039 [0.000]	0.016 [0.075]	-0.023 [0.009]	0.356 [0.000]	1.000

For a more detailed analysis of cash holdings, we divided the final sample of 3,861 firms based on the statistical classification of their economic activities. Among all industries, the median values are consistently lower than the mean values. The Manufacturing and Wholesale and retail trade industries have the most significant number of firms, comprising 39.16% and 41.78% of the total sample, respectively. In addition, the two industries with the most cash are the Accommodation and food service activities, with mean and median values of 20.7% and 13.1%, respectively, and the Professional, scientific and technical activities, with mean and median values of 15.8% and 8.2% respectively.

Table 3
Cash Holdings by Industry

This table shows the mean and the median of the Total Cash (which includes cash and cash equivalents divided by total assets) for various industries from 2011 to 2021. The industries are categorised based on their "NACE" code at the 1-digit level. NACE is the European Union industry standard classification system, which consists of a 6-digit code statistical classification of economic activities.

Industry	Number of obs.	% of obs. in each industry	Mean	Median
Agriculture, forestry and fishing	80	2.07%	0.069	0.031
Mining and quarrying	14	0.36%	0.045	0.028
Manufacturing	1512	39.16%	0.112	0.060
Construction	242	6.27%	0.117	0.071
Wholesale and retail trade	1613	41.78%	0.118	0.066
Transportation and storage	44	1.14%	0.149	0.089
Accommodation and food service activities	86	2.23%	0.207	0.131
Information and communication activities	84	2.18%	0.156	0.103
Real estate activities	17	0.44%	0.085	0.007
Professional, scientific and technical activities	41	1.06%	0.158	0.082
Administrative and support service activities	56	1.45%	0.120	0.052
Others: Defense, education, other services act., etc.	72	1.86%	0.151	0.085
Whole sample	3861	100%	0.118	0.066

- ***Small private firms versus large private firms***

Private firms often have more difficult access to the capital markets due to their smaller size, perceived risk and lack of transparency. Therefore, specific characteristics of a company, such as its risk profile, financial leverage, growth opportunities, financing deficit, dividend payments, cash conversion cycle, and net working capital, are crucial in determining the access to external financing and the level of cash reserves. In this section, we compare the cash reserves and characteristics of small and large firms in our sample of companies ranked by size deciles. The first decile represents the smallest firms in the sample, while the last decile represents the largest firms. The findings of the company characteristics and the total cash reserves are presented in Table 4.

Table 4
Characteristics of Small versus Large Firms

Table 4 presents a comparison between small and large firms. Small firms are defined as those in the first decile for the variable size, while large firms are in the tenth decile. For small and large firms, the table shows the mean and median values of the variables related to the hypotheses and the total cash. The last two columns display the mean differences and their respective t-values. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Small Firms (1st decile)		Large Firms (10th decile)			
	Mean	Median	Mean	Median	Mean diff.	T-value
Total cash	0.156	0.096	0.069	0.030	0.087	16.741***
Risk	0.107	0.085	0.085	0.064	0.023	6.750***
Financial leverage	0.235	0.206	0.216	0.187	0.019	2.683***
Growth opportunities	0.445	-0.030	0.070	0.037	0.375	8.280***
Financing deficit	0.012	-0.006	0.008	-0.005	0.004	0.738
Dividend dummy	0.609	1.000	0.905	1.000	-0.295	-19.155***
Cash conversion cycle	135.160	65.376	77.391	51.380	57.769	8.532***
Net working capital	0.059	0.067	0.083	0.095	-0.024	-2.606***

Based on the table presented above, it can be inferred that smaller private companies in Portugal are generally riskier than their larger counterparts, with a risk percentage of 10.7% versus 8.5%, respectively. Additionally, smaller firms tend to have a higher leverage ratio when compared to larger private firms (23.5% versus 21.6%). When looking at differences in growth opportunities, it is evident that there is a significant difference between the two groups. Small firms demonstrate an annual growth rate of 44.5%, while large firms only show a growth of 7.0%. This means that smaller firms are growing faster than their larger counterparts.

The study also revealed that smaller Portuguese private firms are more likely to experience financing deficits, have longer cash conversion cycles, and have lower net working capital. These firms experience a higher cash conversion cycle, lasting 135.16 days compared to 77.39 days for larger firms. This can be attributed to their weaker bargaining power regarding payables and receivables payment terms, which are comparatively lower than that of bigger firms.

Regarding the dividend payment, this is the only firm variable with a negative mean difference. Generally, larger firms pay more dividends as they are older, more stable and have lower growth opportunities, opting to distribute a higher percentage of their profits to shareholders rather than reinvest them.

After all, based on the previously defined hypothesis, we can highlight some relationships between the cash levels and the different firms' characteristics. The table above confirms that larger firms tend to have lower cash balances, as expected under the Trade-off theory and hypothesis 1. The analysis also supports a positive relationship between the risk and the cash holdings (hypothesis 2), as smaller firms present a higher risk profile and, thus, a higher cash level than the larger firms. Besides this, smaller firms with more growth opportunities tend to hold more cash to avoid restricting their valuable investment opportunities, which supports hypothesis 4. The study also found that companies with a lower cash conversion cycle, such as

large firms, have a reduced need to hold high cash levels, as expected under hypothesis 7. Finally, smaller firms present a lower value of net working capital, which supports the cash-substitute argument and hypothesis 8. However, these are only univariate statistics, and the hypothesis will be revisited using multivariate regression estimation in the following subsection.

- ***Determinants of cash holdings***

Table 5 displays different panel regression models to study the determinants of cash holdings. We use Total cash as our independent variable in all regressions, measured as the sum of cash and cash equivalents divided by total assets.

In the first regression, we applied the Fama and MacBeth (1973) methodology (Model 1). This is a two-step process where, in the first step, a cross-sectional regression is conducted for each period and, in the second step, the parameters are obtained by averaging the estimated coefficients of each cross-sectional regression. This is a common approach in panel datasets to address the problem of correlated residuals over time since they can lead to biased standard errors of the coefficient estimates, reducing the reliability of the regression model.

The second regression model (Model 2) is a fixed-effects panel regression that controls for specific and time-invariant firm characteristics. In this regression, we exclude firms with only one observation. The third model (Model 3) is a time-series cross-sectional regression that includes unreported year dummies to account for macroeconomic events. Additionally, we use a time-series cross-sectional regression with year dummies where the variables are adjusted for industry (Model 4), using dummy variables defined by the 2-digit NACE code. These industry dummies were included to represent industry specificities that can affect cash holdings. Finally, the cross-sectional regression (Model 5) uses the means of all variables for each firm across time, excluding firms with just one observation.

Table 5
Regressions of Cash Holdings on Major Expected Determinants

The dependent variable in all regressions is the Total cash, which is calculated as sum of pure cash and cash equivalents divided by total assets (net of pure cash and cash equivalents); Size is measured by the natural logarithm of the firm´s total sales (CPI adjusted at the 2021 price level); Company's risk is quantified by the standard deviation of current and the past four operating cash flows to assets; Financial leverage is measured as total debt over total assets; Growth opportunities is proxied by the sales' yearly growth rate; Financing deficit is the total external financing a company receives in one year (either equity or debt) computed as capital expenditures plus dividend payments minus operating cash flows generated in that year divided by total assets; Dividend dummy equals one if a company pays dividends and zero otherwise; The cash conversion cycle (in days) is measured by the inventory conversion period

plus the receivables' conversion period minus the payment period for the accounts' payable; Net working capital is calculated as the difference between current assets (net of cash holdings) and current liabilities divided by total assets. The Fama-MacBeth model gives the average of the time series of coefficients from annual cross-sectional regressions. The year dummy regressions are run with a dummy variable for each year. Industry dummy variables are constructed for each industry, defined by the 2-digit NACE code. The cross-sectional regression uses the means of all variables for each firm. The fixed effects and the cross-sectional regressions exclude firms with only one observation. Standard errors are reported in brackets. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Fama-MacBeth model	Fixed-effects regression	Dummy variables		Cross-sectional regression
			Year	Year and industry	
Variables / Models	1	2	3	4	5
Size	-0.010*** [0.0005]	0.005*** [0.0015]	-0.005*** [0.0008]	-0.006*** [0.0010]	-0.011*** [0.0012]
Risk	0.191*** [0.0243]	0.041*** [0.0134]	0.090*** [0.0115]	0.082*** [0.0115]	0.264*** [0.0315]
Financial leverage	-0.283*** [0.0055]	-0.066*** [0.0085]	-0.153*** [0.0068]	-0.151*** [0.0068]	-0.317*** [0.0134]
Growth opportunities	-0.005*** [0.0010]	0.000 [0.0011]	-0.001 [0.0010]	0.000 [0.0010]	-0.020*** [0.0049]
Financing deficit	-0.145*** [0.0114]	-0.154*** [0.0058]	-0.144*** [0.0054]	-0.144*** [0.0054]	-0.190*** [0.0266]
Dividend dummy	0.020*** [0.0029]	0.017*** [0.0035]	0.019*** [0.0027]	0.020*** [0.0027]	0.018*** [0.0049]
Cash conversion cycle	0.000** [0.0000]	0.000* [0.0000]	0.000** [0.0000]	0.000 [0.0000]	0.000 [0.0000]
Net working capital	-0.141*** [0.0054]	-0.214*** [0.0063]	-0.185*** [0.0052]	-0.190*** [0.0052]	-0.132*** [0.0113]
N	11	12365	13630	13630	2594
Adjusted- R^2	0.238	0.093	0.206	0.244	0.224

In terms of *firm size*, all models, except for the fixed-effects regression, display a significant and negative coefficient, which supports our first hypothesis. These results are consistent with the findings of Bigelli & Sánchez-Vidal (2012), who found that larger Italian private firms tend to be older, less financially constrained, and less risky, which explains the inverse relationship between firm size and cash holdings.

Regarding *firm risk*, also known as *cash flow volatility*, it can be determined that Portuguese private firms with higher cash flow volatility tend to hold more cash reserves. This finding supports our hypothesis 2 and previous studies that have suggested that higher cash reserves are held to hedge against potential future cash flow shortages and to reduce the risk of

financial distress (Opler et al., 1999; Han & Qiu, 2007; Bates et al., 2009; Duchin, 2010; Bigelli & Sánchez-Vidal, 2012; and Megginson et al., 2014)

With respect to *financial leverage* and based on the five different models, it can be concluded that there is a significant and negative relationship between the leverage ratio and the cash holdings of private firms in Portugal at the 1% significance level. This supports hypothesis 3, indicating that a firm's leverage can also be important to explain how much cash it holds and, more specifically, that cash can be considered as negative debt. This negative association has been supported by several studies, including Opler et al. (1999), Ferreira & Vilela (2004), Ozkan & Ozkan (2004), Bates et al. (2009), and Bigelli & Sánchez-Vidal (2012), as mentioned in Section 3.

Regarding *growth opportunities*, the fixed-effects regression (Model 2), the time-series cross-sectional regression with year dummies (Model 3) and the time-series cross-sectional regression with year dummies that adjust variables for industry (Model 4) do not provide any statistical value. In contrast, other models, such as the Fama-MacBeth model (Model 1) and the cross-sectional regression (Model 5), exhibit negative and significant results at the 1% level. This contradicts the Trade-off Theory and the Pecking Order Theory, which suggest that companies with significant investment opportunities tend to hold larger cash reserves to avoid limiting their investment opportunities. However, due to the statistical insignificance and inconsistency between the models, it is difficult to draw any conclusion about the relation between growth opportunities in Portuguese private firms and their cash holdings. This conclusion is consistent with Table 2 (Correlation Matrix), which shows that the correlation between cash reserves and the growth opportunities variable is not statistically significant.

After analysing the *financing deficit* of private firms in Portugal, it has been concluded that there is a negative and significant correlation between cash holdings and financing deficit, with a significance level of 1%. The findings go in line with hypothesis 5 and Bigelli & Sanchez-Vidal (2012), who predict that firms in a financing deficit situation would use their cash reserves and increase their external financing to meet their financial needs.

Based on the findings on *dividend payment,* it can be inferred that companies who pay dividends generally maintain higher cash reserves, which aligns with hypothesis 6. The reason for this is that companies want to guarantee that they do not reduce, eliminate, or raise external funds to support dividend payments (Megginson et al., 2014). Besides this, it is worth noting again that, as emphasised by Bigelli & Sanchez-Vidal (2012), in the case of private firms, these payments are only correlated with an extra generation of cash and are not affected by agency costs, as such firms do not have an ownership-control separation.

With respect to the company's *cash conversion cycle*, our analysis revealed that companies with shorter cash conversion cycles hold significantly less cash, as theoretically expected. All our models presented a positive coefficient, although the last two did not have statistically significant results. Similar results were observed and corroborated in the context of Italian private firms by Bigelli & Sánchez-Vidal (2012). Moreover, it is worth noting that the coefficient for this variable has very low values due to the high values of this explanatory variable.

Our hypothesis 8 and the idea that net working capital can be considered a cash substitute are supported by the negative and significant sign of the net working capital coefficients. This finding is consistent with the results of previous studies conducted by Opler et al. (1999), Ozkan & Ozkan (2004), Ferreira & Vilela (2004), Bates et al. (2009), and Bigelli & Sánchez-Vidal (2012), who found that companies with higher working capital tend to keep lower cash balances.

All in all, based on the five different models, we can conclude that cash holdings in Portuguese private firms have a negative and significant relationship with the size, leverage ratio, financing deficit, and net working capital. In contrast, they have a positive and significant relationship with the risk, dividend dummy and cash conversion cycle variables. Besides this, the time-series cross-sectional regression with year dummies where the variables are adjusted for industry (Model 4) was the best model to explain the variability of the dependent variable, with an adjusted-R^2 of 0.244. It is important to note that as we control for fixed effects, introduce year dummies, and finally control for the industry, the explanatory power of individual firm's characteristics increases.

- ***Additional tests***

We conducted additional tests to verify the previously defined hypothesis using two different samples. The first sample included firms that were active throughout the entire period analysed, which we referred to as survival firms. This sample consisted of 1,463 firm-year observations, and we have presented the results of the five different models in Table 6. The second sample was restricted to profitable Portuguese private firms, i.e., firms that always had positive Earnings Before Interest and Taxes (EBIT). The latter sample had 11,202 observations, and the regression results are presented in Table 7.

The results obtained from our original sample (Table 5) have been confirmed again. It is observed that Portuguese private firms that tend to be larger, have higher leverage ratios,

higher financial deficits, and higher net working capital hold less cash. On the other hand, the private firms that have higher cash flow volatility, pay dividends, and have a longer cash conversion cycle have higher cash balances. Finally, the two samples corroborate that growth opportunities do not affect the level of cash holdings of Portuguese private firms.

Table 6
Regressions of Cash Holdings on Major Expected Determinants
Survival Firms

The dependent variable in all regressions is the Total cash, which is calculated as sum of pure cash and cash equivalents divided by total assets (net of pure cash and cash equivalents); Size is measured by the natural logarithm of the firm´s total sales (CPI adjusted at the 2021 price level); Company's risk is quantified by the standard deviation of current and the past four operating cash flows to assets; Financial leverage is measured as total debt over total assets; Growth opportunities is proxied by the sales' yearly growth rate; Financing deficit is the total external financing a company receives in one year (either equity or debt) computed as capital expenditures plus dividend payments minus operating cash flows generated in that year divided by total assets; Dividend dummy equals one if a company pays dividends and zero otherwise; The cash conversion cycle (in days) is measured by the inventory conversion period plus the receivables' conversion period minus the payment period for the accounts' payable; Net working capital is calculated as the difference between current assets (net of cash holdings) and current liabilities divided by total assets. The Fama-MacBeth model gives the average of the time series of coefficients from annual cross-sectional regressions. The year dummy regressions are run with a dummy variable for each year. Industry dummy variables are constructed for each industry, defined by the 2-digit NACE code. The cross-sectional regression uses the means of all variables for each firm. The fixed effects and the cross-sectional regressions exclude firms with only one observation. Standard errors are reported in brackets. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Fama-MacBeth model	Fixed-effects regression	Dummy variables		Cross-sectional regression
			Year	Year and industry	
Variables / Models	1	2	3	4	5
Size	-0.016*** [0.0007]	0.013** [0.0051]	-0.010*** [0.0033]	-0.006 [0.0039]	-0.016*** [0.0048]
Risk	0.363*** [0.0453]	0.054 [0.0419]	0.117*** [0.0391]	0.128*** [0.0395]	0.527*** [0.1461]
Financial leverage	-0.356*** [0.0099]	-0.078*** [0.0275]	-0.139*** [0.0236]	-0.123*** [0.0241]	-0.416*** [0.0505]
Growth opportunities	-0.003 [0.0087]	-0.005 [0.0050]	-0.003 [0.0048]	-0.004 [0.0049]	0.011 [0.0686]
Financing deficit	-0.171*** [0.0365]	-0.191*** [0.0189]	-0.167*** [0.0181]	-0.164*** [0.0183]	-0.320*** [0.1274]
Dividend dummy	0.015*** [0.0042]	0.031*** [0.0086]	0.019** [0.0076]	0.016** [0.0077]	0.013 [0.0195]
Cash conversion cycle	0.000** [0.0000]	0.000*** [0.0000]	0.000*** [0.0000]	0.000*** [0.0000]	0.000 [0.0000]
Net working capital	-0.166*** [0.0145]	-0.185*** [0.0181]	-0.184*** [0.0165]	-0.176*** [0.0168]	-0.160*** [0.0449]
N	11	1463	1463	1463	133
Adjusted- R^2	0.343	0.072	0.276	0.370	0.317

Table 7
Regressions of Cash Holdings on Major Expected Determinants
Profitable Firms

The dependent variable in all regressions is the Total cash, which is calculated as sum of pure cash and cash equivalents divided by total assets (net of pure cash and cash equivalents); Size is measured by the natural logarithm of the firm´s total sales (CPI adjusted at the 2021 price level); Company's risk is quantified by the standard deviation of current and the past four operating cash flows to assets; Financial leverage is measured as total debt over total assets; Growth opportunities is proxied by the sales' yearly growth rate; Financing deficit is the total external financing a company receives in one year (either equity or debt) computed as capital expenditures plus dividend payments minus operating cash flows generated in that year divided by total assets; Dividend dummy equals one if a company pays dividends and zero otherwise; The cash conversion cycle (in days) is measured by the inventory conversion period plus the receivables' conversion period minus the payment period for the accounts' payable; Net working capital is calculated as the difference between current assets (net of cash holdings) and current liabilities divided by total assets. The Fama-MacBeth model gives the average of the time series of coefficients from annual cross-sectional regressions. The year dummy regressions are run with a dummy variable for each year. Industry dummy variables are constructed for each industry, defined by the 2-digit NACE code. The cross-sectional regression uses the means of all variables for each firm. The fixed effects and the cross-sectional regressions exclude firms with only one observation. Standard errors are reported in brackets. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Fama-MacBeth model	Fixed-effects regression	Dummy variables		Cross-sectional regression
			Year	Year and industry	
Variables / Models	1	2	3	4	5
Size	-0.010*** [0.0006]	0.008*** [0.0017]	-0.005*** [0.0009]	-0.006*** [0.0010]	-0.011*** [0.0013]
Risk	0.172*** [0.0251]	0.043*** [0.0149]	0.087*** [0.0126]	0.080*** [0.0127]	0.250*** [0.0345]
Financial leverage	-0.300*** [0.0080]	-0.071*** [0.0098]	-0.158*** [0.0077]	-0.155*** [0.0077]	-0.336*** [0.0152]
Growth opportunities	-0.006*** [0.0013]	-0.002 [0.0023]	-0.001 [0.0011]	-0.001 [0.0012]	-0.021*** [0.0054]
Financing deficit	-0.146*** [0.0106]	-0.156*** [0.0065]	-0.145*** [0.0060]	-0.146*** [0.0060]	-0.191*** [0.0290]
Dividend dummy	0.019*** [0.0029]	0.016*** [0.0041]	0.017*** [0.0031]	0.017*** [0.0031]	0.017*** [0.0056]
Cash conversion cycle	0.000** [0.0000]	0.000* [0.000]	0.000** [0.0000]	0.000 [0.0000]	0.000 [0.0000]
Net working capital	-0.162*** [0.0060]	-0.243*** [0.0071]	-0.211*** [0.0058]	-0.214*** [0.0059]	-0.153*** [0.0126]
N	11	10072	11202	11202	2161
Adjusted- R^2	0.257	0.099	0.222	0.258	0.241

6. Robustness

To ensure the accuracy of our findings, we conducted two different tests. In the first one, we re-estimated all models using alternative proxies for the size and financial leverage variables. We calculated the size as the natural logarithm of total assets deflated using the CPI into 2021 euros. This alternative proxy was defined based on different sources, including Opler et al. (1999), Ozkan & Ozkan (2004), Bates et al. (2009), and Mortal et al. (2019). As an alternative proxy for financial leverage, we used long-term debt scaled by total assets following Gao et al. (2013). The results are presented in Table 8.

Finally, we have conducted reduced-form regressions to ensure the consistency of our findings. We acknowledge that the cash holdings, leverage ratio, and investment policy may be determined simultaneously, which could create inconsistencies in our previous results (Table 5). In Table 9, we present the findings of the reduced-form regressions in which we have excluded financial leverage and dividend dummy as independent variables in our models. Our results show that the simultaneous determination of cash holdings, leverage, and investment

policy does not affect our previous findings since the coefficients' signs and significance levels do not present significant changes.

Table 8
Modified Regressions of Cash Holdings on Major Expected Determinants

The dependent variable in all regressions is the Total cash, which is calculated as sum of pure cash and cash equivalents divided by total assets (net of pure cash and cash equivalents); Size is measured by the natural logarithm of the firm´s total assets (CPI adjusted at the 2021 price level); Company's risk is quantified by the standard deviation of current and the past four operating cash flows to assets; Financial leverage is measured as long-term debt over total assets; Growth opportunities is proxied by the sales' yearly growth rate; Financing deficit is the total external financing a company receives in one year (either equity or debt) computed as capital expenditures plus dividend payments minus operating cash flows generated in that year divided by total assets; Dividend dummy equals one if a company pays dividends and zero otherwise; The cash conversion cycle (in days) is measured by the inventory conversion period plus the receivables' conversion period minus the payment period for the accounts' payable; Net working capital is calculated as the difference between current assets (net of cash holdings) and current liabilities divided by total assets. The Fama-MacBeth model gives the average of the time series of coefficients from annual cross-sectional regressions. The year dummy regressions are run with a dummy variable for each year. Industry dummy variables are constructed for each industry, defined by the 2-digit NACE code. The cross-sectional regression uses the means of all variables for each firm. The fixed effects and the cross-sectional regressions exclude firms with only one observation. Standard errors are reported in brackets. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Fama-MacBeth model	Fixed-effects regression	Dummy variables		Cross-sectional regression
			Year	Year and industry	
Variables / Models	1	2	3	4	5
Size	-0.023*** [0.0010]	0.034*** [0.0028]	-0.016*** [0.0014]	-0.013*** [0.0015]	-0.025*** [0.0019]
Risk	0.135*** [0.0213]	0.039*** [0.0133]	0.071*** [0.0117]	0.065*** [0.0117]	0.170*** [0.0335]
Financial leverage	-0.194*** [0.0094]	0.115*** [0.0092]	0.013* [0.0078]	0.016** [0.0078]	-0.275*** [0.0191]
Growth opportunities	-0.002*** [0.0006]	-0.001 [0.0010]	-0.002* [0.0010]	-0.002* [0.0010]	-0.001 [0.0048]
Financing deficit	-0.168*** [0.0122]	-0.174*** [0.0056]	-0.164*** [0.0054]	-0.165*** [0.0054]	-0.215*** [0.0277]
Dividend dummy	0.042*** [0.0028]	0.019*** [0.0035]	0.028*** [0.0028]	0.027*** [0.0028]	0.043*** [0.0053]
Cash conversion cycle	0.000* [0.0000]	0.000*** [0.0000]	0.000*** [0.0000]	0.000*** [0.0000]	0.000 [0.0000]
Net working capital	-0.125*** [0.0051]	-0.228*** [0.0065]	-0.179*** [0.0053]	-0.182*** [0.0054]	-0.127*** [0.0116]
N	11	12365	13630	13630	2594
Adjusted- R^2	0.170	0.004	0.126	0.158	0.163

The findings obtained from the models constructed using the alternative size proxy are consistent with the original regressions (Table 5). The signs and significant levels remain unchanged, confirming the findings' robustness. On the other hand, we expected to see some differences when we used a different measure for financial leverage, as our original measure calculated the leverage ratio by dividing the total debt by total assets and in this alternative measure, we used just the long-term debt over total assets. For this new proxy, the coefficients are significant. However, if we do not consider short-term debt, the coefficients become less negative or even positive, as seen in Model 2, Model 3, and Model 4. This suggests that private Portuguese firms depend more on short-term debt to maintain lower cash levels.

Table 9
Reduced-form Regressions of Cash Holdings

The dependent variable in all regressions is the Total cash, which is calculated as sum of pure cash and cash equivalents divided by total assets (net of pure cash and cash equivalents); Size is measured by the natural logarithm of the firm´s total sales (CPI adjusted at the 2021 price level); Company's risk is quantified by the standard deviation of current and the past four operating cash flows to assets; Growth opportunities is proxied by the sales' yearly growth rate; Financing deficit is the total external financing a company receives in one year (either equity or debt) computed as capital expenditures plus dividend payments minus operating cash flows generated in that year divided by total assets; The cash conversion cycle (in days) is measured by the inventory conversion period plus the receivables' conversion period minus the payment period for the accounts' payable; Net working capital is calculated as the difference between current assets (net of cash holdings) and current liabilities divided by total assets. The Fama-MacBeth model gives the average of the time series of coefficients from annual cross-sectional regressions. The year dummy regressions are run with a dummy variable for each year. Industry dummy variables are constructed for each industry, defined by the 2-digit NACE code. The cross-sectional regression uses the means of all variables for each firm. The fixed effects and the cross-sectional regressions exclude firms with only one observation. Standard errors are reported in brackets. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Fama-MacBeth model	Fixed-effects regression	Dummy variables		Cross-sectional regression
			Year	Year and industry	
Variables / Models	1	2	3	4	5
Size	-0.009*** [0.0005]	0.006*** [0.0015]	-0.004*** [0.0008]	-0.004*** [0.0010]	-0.010*** [0.0013]
Risk	0.170*** [0.0269]	0.037*** [0.0135]	0.080*** [0.0116]	0.072*** [0.0116]	0.241*** [0.0350]
Growth opportunities	-0.006*** [0.0014]	0.000 [0.0010]	-0.001 [0.0010]	-0.001 [0.0010]	-0.019*** [0.0054]
Financing deficit	-0.193*** [0.0165]	-0.162*** [0.0057]	-0.164*** [0.0053]	-0.164*** [0.0053]	-0.261*** [0.0292]
Cash conversion cycle	0.000*** [0.0000]	0.000** [0.0000]	0.000*** [0.0000]	0.000*** [0.0000]	0.000*** [0.0000]
Net working capital	-0.094*** [0.0047]	-0.208*** [0.0062]	-0.173*** [0.0052]	-0.177*** [0.0053]	-0.071*** [0.0122]
N	11	12365	13630	13630	2594
Adjusted- R^2	0.100	0.051	0.096	0.140	0.081

7. Is Cash Held to Finance New Investments?

In this section, we delve deeper into why companies hold more cash. It is believed that firms do so to ensure they have enough resources to take advantage of future investment opportunities, also known as the precautionary motive. To understand this better, we have divided our analysis into two panels - Panel A and Panel B. In Panel A, we have segregated the sample into high-cash firms (4^{th} quartile) and the rest of the sample. In Panel B, we focus on comparing high-cash firms (4^{th} quartile) with low-cash firms (1^{st} quartile). Table 5 shows the new investments in fixed, intangible and financial assets scaled by total assets, one year, two years and as an average of the four years following the cash holdings measurement. All variables are industry-adjusted.[5]

It can be inferred that companies with high cash levels tend to invest less in the year after stockpiling cash but significantly increase their investments with a two-year lag. Bigelli & Sánchez-Vidal (2012) found similar results for Italian private firms, explaining that such companies tend to accumulate cash reserves and delay increasing their investments due to limited access to capital markets.

[5] The industry-adjusted variables are obtained using the NACE code at the 2-digit level.

Moreover, it can be concluded that the low-cash firms and the "remaining sample" showed a slight increase in their investments after one year. However, they experienced a reversal afterwards, with both groups reporting higher decreases. All groups had negative investment averages over the following four years.

Table 10
Cash richness and new investments

This table compares investment activity between firms with high-cash holdings (4th quartile) and the rest of the sample in Panel A. In Panel B, the table compares the investment activity between firms with high-cash holdings (4th quartile) and those with low-cash holdings (1st quartile). The investments are scaled based on total assets and measured for one year, two years, and an average of four years following the cash holdings measurement. All variables are industry-adjusted, and the last two columns show the mean differences and their respective t-values. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A				
	High-cash firms	Rest of the sample	Difference	T-value
T+1 year investments	-0.011	0.001	-0.012	-1.658*
T+2 year investments	0.007	-0.048	0.055	7.623***
Following 4 years average investments	-0.045	-0.058	0.013	1.801*
Panel B				
	High-cash firms	Low-cash firms	Difference	T-value
T+1 year investments	-0.011	0.002	-0.013	-1.292
T+2 year investments	0.007	-0.022	0.029	2.892***
Following 4 years average investments	-0.045	-0.002	-0.043	-4.288***

8. Conclusions

This paper investigates the determinants of cash holdings in Portuguese private firms from 2011 to 2021. We also analyse how company´s cash balances change over time, differences in cash holdings across various industries, and whether small and large firms hold varying cash levels. Additionally, we explore if firms hold more cash as a precautionary measure to ensure they have enough resources to take advantage of future investment opportunities. Our research is based on a panel data set of 13,630 firm-year observations, corresponding to 3,861 Portuguese private firms. This country is a particularly interesting choice, as private firms have received little attention in previous literature on cash holdings,

which mainly focus on the cash reserves of public firms. Additionally, Portugal is an important selection for studying private companies' cash holdings since it is a developed country with few listed firms and many private companies.

Results show that private firms in Portugal have consistently increased their cash holdings, with an average of 11.8% of total assets being held in cash. Furthermore, when comparing small and large firms, it was found that smaller firms tend to hold more cash due to their perceived higher risk, greater growth potential, longer cash conversion cycle, and fewer cash substitutes, which aligns with theoretical expectations. We also noticed significant relationships between different firm-specific variables and the cash holdings of private firms in Portugal, which supports several hypotheses derived from theory. Empirical evidence suggests that larger firms hold less cash, while riskier companies opt for higher cash holdings out of precaution and due to transaction needs. These results align with the Trade-off theory of cash holdings, which posits that firms face a trade-off between the costs and benefits of holding cash. Furthermore, the variable of net working capital aligns with this theory as the results demonstrate that firms with higher net working capital tend to hold less cash, as it is a good substitute for cash.

Other results also support the Financing Hierarchy theory, which suggests that firms with lower financing deficits, longer cash conversion cycles, and lower leverage ratios tend to hold more cash. Additionally, our findings show that Portuguese private firms that pay dividends have higher cash holdings. This is because the payment of dividends in private firms is linked with the generation of excess cash and is less affected by agency costs. Finally, we did not find any significant relationship between cash holdings and growth opportunities, which contradicts previous research.

In the final part of our study on cash holdings, we explored whether firms hold more cash to ensure they have enough resources to take advantage of future investment opportunities. Our findings suggest that cash-rich Portuguese private firms tend to accumulate cash reserves and delay increasing their investments due to limited access to capital markets, which is characteristic of private companies.

Although this research provides new empirical evidence on the determinants of cash holdings in private firms in general and Portuguese private firms in particular, the paper has some limitations that we hope will prompt future research. One limitation of this work is the exclusion of specific macroeconomic conditions and corporate governance factors that could be related to the cash policies of private firms. Several studies have shown that the type of governance (Harford et al., 2008), CEO overconfidence (Chen Y et al., 2020), CEO optimism

(Deshmukh et al., 2021), and shareholder protection (Guney et al., 2007; Kusnadi & Wei, 2011; and Dittmar et al., 2003) play a significant role in determining the amount of cash held. However, this is a gap in research as these studies have only focused on public firms. Additionally, future research should examine the impact of cash holdings on private firms' valuation and performance, given their limited access to external finance, greater risk, and financial constraints. Lastly, we hope this research presents new and valuable insights about the cash holdings of Portuguese private firms to investors, shareholders, and managers.

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