Cash holdings in SMEs: speed of adjustment, growth and financing

Cristina Martínez-Sola[a], Pedro J. García-Teruel[b,*], Pedro Martínez-Solano[c]

[a] University of Alicante, Faculty of Economics and Business Sciences, Dpt. Financial Economics and Accounting, San Vicente del Rapeig, 03690 Alicante (SPAIN), tel.: +34 965903400 (Ext. 3151), fax: +34 965903621, email: mcristina.martinez@ua.es

[b] University of Murcia, Faculty of Economics and Business, Dpt. Management and Finance, Campus Universitario de Espinardo, 30100-Murcia (SPAIN), tel: +34 868 887828, fax:+34 868 887537, email: pjteruel@um.es

[c] University of Murcia, Faculty of Economics and Business, Dpt. Management and Finance, Campus Universitario de Espinardo, 30100-Murcia (SPAIN), tel: +34 868 883747, fax:+34 868 887537, email: pmsolano@um.es

[*]Corresponding author

ABSTRACT

This paper studies the effect of growth opportunities, financial constraints and financial distress on the speed of adjustment of Small and Medium-sized Enterprises (SMEs) to their target cash holdings. We use a sample of Spanish SMEs from the period of 1998 to 2012. The results support the existence of a target cash holding level to which small firms attempt to converge. Additionally, consistent with the precautionary motive for cash holdings, the results show that SMEs with greater growth opportunities adjust more quickly to their target cash holding level to preserve their financial flexibility and to be able to take advantage of profitable investment opportunities when they arise. Moreover, for SMEs in financial difficulties, the adjustment speed of cash is higher to avoid financial distress costs. Finally, we observe a faster speed of adjustment for cash holding in the crisis period for all firms, as a possible response to the credit restrictions faced by SMEs.

Keywords: Cash holdings, Speed of adjustment, SMEs.

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ABSTRACT

This paper studies the effect of growth opportunities, financial constraints and financial distress on the speed of adjustment of Small and Medium-sized Enterprises (SMEs) to their target cash holdings. We use a sample of Spanish SMEs from the period of 1998 to 2012. The results support the existence of a target cash holding level to which small firms attempt to converge. Additionally, consistent with the precautionary motive for cash holdings, the results show that SMEs with greater growth opportunities adjust more quickly to their target cash holding level to preserve their financial flexibility and to be able to take advantage of profitable investment opportunities when they arise. Moreover, for SMEs in financial difficulties, the adjustment speed of cash is higher to avoid financial distress costs. Finally, we observe a faster speed of adjustment for cash holding in the crisis period for all firms, as a possible response to the credit restrictions faced by SMEs.

1. INTRODUCTION

Ang (1991) highlights the importance of liquidity management of businesses, particularly in small firms. Traditionally, the financial literature has argued that there are two major reasons for holding cash: transactional and precautionary. Under the first, firms benefit from holding cash since they can reduce transaction costs by using cash to make payments without having to raise external capital or to liquidate assets (Han and Qiu, 2007; Opler, Pinkowitz, Stulz and Williamson, 1999). Myers and Majluf (1984) suggest that the existence of information asymmetries may increase the cost of external financing. Thus, cash reserves could save firms from forgoing suitable investments opportunities. As a precautionary motive, firms stockpile cash to meet unexpected contingencies and to hedge against the risk of future cash shortfalls (Han and Qiu, 2007), thereby avoiding liquidity constraints costs. Thus, cash holdings protect constrained firms against the inability to obtain funds when valuable opportunities arise or when a debt payment is due (Almeida, Campello and Weisbach, 2004; Faulkender and Wang, 2006). In the particular case of smaller firms, it is the precautionary motive for cash holdings which is more relevant. Effectively, SMEs, which are mainly unlisted, encounter higher financing frictions given their greater difficulty in accessing capital markets (Almeida et al., 2004; Berger and Udell, 1998), and so, they need a precautionary reserve of cash holdings (Gao, Harford and Li, 2013).

However, cash holdings are not without costs. On the one hand, the opportunity costs forgone because of the low rate of return of liquid assets (Opler et al., 1999); on the other, large cash reserves can also increase the agency conflicts between managers and shareholders due to managerial discretion (Jensen, 1986), but these agency conflicts are not especially relevant in SME, since they are characterized by a higher coincidence between ownership and control[1]. Hence, and consistent with the trade-off of cash holdings (Kim, Mauer and Sherman, 1998), firms balance the benefits and costs of holding liquid assets to determine optimal cash levels and tend to achieve their target levels (Opler et al., 1999; Riddick and Whited, 2009).

Most of the corporate cash holdings literature has focused on the study of large listed firms. However, the literature on small business economics in this topic is not extensive, even though SMEs differ importantly from large listed companies due to differences in

[1]The agency problems associated with debt are most significant in SMEs (Berger and Udell, 2003).

informational uncertainty (Mantecon, 2008), which make them a suitable group for analysing the implications of the precautionary motive for cash holdings. To our knowledge, there are few empirical studies of small firms' cash holdings. The early studies analysed the determinants of cash holdings (Faulkender, 2002, for American Small firms), as well as the existence of a target level of cash holdings to which they attempt to converge (García-Teruel and Martínez-Solano, 2008, for Spanish SME; Bigelli and Sanchez-Vidal, 2012, for Italian private firms). More recent studies have focused on the role played by the ownership structure and other governance mechanisms in determining cash holdings. Steijvers and Niskanen (2013) study American small family firms; Belghitar and Khan (2013) and Al-Najjar (2015) focus on UK listed SMEs, while Orens and Reheul (2013) examine the effect of CEO demographics on cash holdings in Belgian privately held SMEs. Nevertheless, none of these papers focuses on the determinants of the speed of adjustment of cash in unlisted SMEs. With this, and to the best of our knowledge, there is a gap in the small business economics literature in the study of corporate cash holdings, especially in understanding the dynamics of cash. While the literature has demonstrated that SMEs have a target cash level which they attempt to achieve (García-Teruel and Martínez-Solano, 2008; Bigelli and Sánchez-Vidal, 2012; Al-Najjar, 2015), it would be interesting to study what determines the SMEs' speed of adjustment of cash holdings towards their target. Thus, in this paper we examine whether SMEs' growth opportunities, financial constraints or financial distress affect the speed with which these firms adjust their cash levels to the target. In addition, we also study the effect of the financial crisis of 2008 on the SMEs' speed of adjustment of cash.

From our perspective, this paper contributes to the small business economics literature in several ways. First, we analyse different factors that, due to the particularities of SMEs (more debt agency problems, more information asymmetry and more financial constraints), can affect the speed of adjustment of cash. We believe the speed of adjustment of cash holdings towards the target level is not constant across firms but will depend on the cost of being far from their target cash level. In particular, in contrast to the previous literature on the speed of adjustment of cash holdings, which focuses on large US firms, we analyse if growth opportunities, financial constraints and financial distress influence the speed of adjustment at which SMEs achieve their target cash level. Second, we contribute to SME literature by studying the speed of adjustment of cash holdings during the financial crisis of 2008, which led to an important reduction in bank lending for SMEs as consequence of the credit supply shock. Third, this study contributes towards improving our

knowledge of a civil law country, such as Spain. The selection of this country is especially relevant for our study, given the importance of the SME sector in Spain (Ayyagari, Beck and Demirguc-Kunt, 2007). Spain is among the countries of the world with the highest SME contribution to both employment and GDP. For instance, and according to Ayyagari et al. (2007), the formal work force employed in SMEs is 80%, which comprises the majority of the private sector. Moreover, in terms of the contribution to GDP, SMEs constitute 64.70% of the economy. To this, we must add that Spain has a bank-based financial system, where bank financing is the main source of credit for most SMEs in Spain (Aybar-Arias, Casino-Martínez and López-Gracia, 2012). This high dependence of bank debt makes the study of the SMEs' speed of adjustment of cash especially relevant.

The results obtained employing a large sample of Spanish SMEs, taken from 1998 to 2012, show that Spanish SMEs attempt to adjust their cash holdings towards the target level and that there are differences in the rate of adjustment across these firms. Specifically, the results show that firms' growth opportunities have a positive effect on the adjustment speed of cash holdings; therefore, firms can take advantage of potential profitable investments. Similarly, financial constraints and financial distress positively affect the speed of adjustment of cash, since these firms may have limitations in obtaining financing to fund their investment projects or normal operations. These effects on adjustment speed were boosted during the financial crisis, in which SMEs encountered a significant reduction in the availability of external financing and an increase in the cost of it because of the credit supply shock and the subsequent recession. The findings are consistent with the precautionary motive for cash holdings and the importance of maintaining financial flexibility, since a financially flexible firm is able to finance investment and/or liquidity shocks without damaging existing operating, investment, and financing policies (Lockhart, 2014).

The remainder of this paper is structured as follows: Section 2 reviews the literature and examines the potential effect of growth and financing on the speed of adjustment of cash holdings in SMEs, as well as developing the hypotheses. Section 3 describes the sample, methodology and variables employed, while Section 4 reports the results. Section 5 presents the study's conclusions.

2. LITERATURE REVIEW AND HYPOTHESES

Financial literature has developed different theories to explain firm cash holdings. Specifically, the free cash flow theory, the pecking order theory and the trade-off theory of cash.

According to Jensen (1986), free cash flow theory postulates that cash holdings in excess of the required to fund all positive net present values projects generates conflicts of interest between shareholders and managers over pay-out policies, since free cash flow provides managers more discretion, and they can invest the excess of cash in low-return projects or waste it. However, in SMEs due to non-separation of ownership and management in most cases, this agency conflict is not very relevant, although it accentuates debt agency problems (Berger and Udell, 2003), which can be translated into less favourable lending conditions or restricted credit availability of bank debt (Niskanen, Niskanen, and Laukkanen, 2010), so increasing the importance of SMEs' cash holding adjustment.

Regarding the pecking order theory, a firm prefers internal to external financing, and debt to equity, if it issues securities (Myers, 1984). In a related paper, Myers and Majluf (1984) argue that firms accumulate cash to finance future investment opportunities with internal funds because of the existence of information asymmetry, which is more severe in the case of SMEs, causes financing constraints, while there are no costs of holding cash. Therefore, as Opler et al. (1999) assert, under this framework, there is no optimal cash level. However, these researchers observe that the distinction between the financing hierarchy model and the static trade-off model, which we explain below, is not very clear, because some of its empirical predictions are similar.

Finally, extending the trade-off theory of debt, the static trade-off of cash considers that a firm sets a target cash holding and gradually moving towards it. Under this hypothesis, firms balance the value of the benefits against various costs of cash. Thus, the literature shows that firms have a target cash level determined by a trade-off of the costs and benefits of holding liquid assets (Opler et al., 1999; Riddick and Whited, 2009). In the absence of costs of adjustment the firm's observed cash ratio would be its optimal ratio. However, there could be costs and therefore lags in adjusting to the optimum (Myers, 1984). Capital market imperfections, such as information asymmetry, transaction costs, agency conflicts or

financial distress, could lead to lags in adjustment to optimal cash holding levels (Venkiteshwaran, 2011). The magnitude of adjustment costs and the cost of being off target will determine the speed of adjustment towards the target. In this way, there is a growing research devoted to understanding the dynamics of cash holdings as well as some of the factors that influence on the speed of adjustment of cash towards the target level, but the empirical evidence on the speed of adjustment of cash is scarce and restricted to large American companies (Dittmar and Duchin, 2010; Gao et al., 2013; Jiang and Lie, 2016; Venkiteshwaran, 2011).

In a related research which analyses SMEs leverage, Aybar-Arias et al. (2012) argue that the particular characteristics of SMEs compared to large firms makes transaction costs more significant in adjusting to their target leverage. Among the main differences, these authors highlight the restrictions in financial markets because of their higher information asymmetry and debt agency costs, the higher dependence on bank financing and, therefore, investment constraints, the higher propensity to bankruptcy and the lower level of disclosure requirements which makes them more informationally opaque. Following that argument, these particularities of SMEs could also influence the speed of adjustment of cash holdings. So, in this paper, we first study the adjustment speed of cash holdings in SMEs, second, the effect of growth opportunities, financial constraints and financial distress on that speed of adjustment, and finally the impact of financial crisis.

2.1 Growth opportunities

According to Byoun (2011), financial flexibility is a firm's capacity to mobilize its financial resources to take preventive and exploitive actions, i.e., to take timely advantage of investment opportunities, in response to uncertain future contingencies and thus maximize firm value. Kim et al. (1998) find that firms may achieve financial flexibility by accumulating cash reserves. The role of cash holdings in achieving financial flexibility has been analysed in many studies (Acharya, Almeida and Campello, 2007; Almeida et al., 2004; Dittmar and Mahrt-Smith, 2007; Faulkender and Wang, 2006; Gamba and Triantis, 2008; Harford, Mansi and Maxwel, 2008; Opler et al., 1999; and Riddick and Whited, 2009), which find that firms with large cash balances can cope better with cash flow shortfalls and higher growth opportunities.

Similarly, the literature on cash holdings determinants has found that firms' growth opportunities positively affect cash levels (Ferreira and Vilela, 2004; Kim et al., 1998; Opler et al., 1999; and Ozkan and Ozkan, 2004). Dittmar, Marth-Smith, and Servaes (2003) propose that firms with better investment opportunities will hold more cash because the opportunity cost of lost investment is larger for these companies. In addition, it has been shown that high cash holdings are accompanied by greater investment (Mikkelson and Partch, 2003). Faulkender and Wang (2006) find higher value of corporate liquidity for firms with greater growth opportunities. From our perspective, the higher value of cash for firms with larger growth opportunities could be related to a higher cost of being off the target level of cash. Furthermore, firms will avoid holding larger cash reserves than the target level because of the opportunity cost of low return (Dittmar et al., 2003; Opler et al., 1999), since a growing firm will lose value by investing in cash and cash equivalents instead of in more productive investments. Consequently, we expect firms with greater growth opportunities to adjust faster towards their target level of cash. Hence, our first hypothesis is

H_1: SMEs with greater growth opportunities adjust more quickly to their target cash holdings level.

2.2 Financial constraints

Stiglitz and Weiss (1981) argue that asymmetric information may cause lenders to ration credit. The precautionary motive for holding cash is based on the impact of asymmetric information on the ability of firms to raise funds (Dittmar et al., 2003) and means that firms anticipating future financial constraints accumulate cash to fund future investments (Almeida et al., 2004). The importance of liquidity management is that cash holdings reduce the impact of financing frictions on investment (Almeida et al., 2004). In other words, when external funds are rationed, investment spending will vary with the availability of internal funds (Fazzari, Hubbard, Petersen, Blinder and Poterba, 1988), given that constrained firms exhibit greater investment sensitivity than unconstrained firms (Arslan, Florackis and Ozkan, 2006). Thus, companies with financial constraints can protect themselves from having to access the capital markets to obtain financing for investments or liquidity needs (Acharya et al., 2007).

To study the effect of financial constraints on the speed of adjustment to target cash holdings, we have measured firm's financial constraints with firm size and cash flow. First, large firms are less subject to information asymmetry than small firms and, therefore, less financially constrained (Berger, Klapper and Udell, 2001; Fazzari and Petersen, 1993; Jordan, Lowe and Taylor, 1998; and Whited, 1992). This finding means that large firms have better access to financial markets and therefore can raise external funds to finance projects; thus, they would be less dependent on their internal funds. In contrast, smaller firms present more difficulties in accessing external finance because of their lower level of financial information (Berger and Udell, 1998). Therefore, small firms are more likely to be adversely affected by financing constraints (Beck, Demirgüç-Kunt and Maksimovic, 2008; Stiglitz and Weiss, 1981; Vermoesen, Deloof and Laveren, 2013) and thus have a greater need for financial flexibility and resort to larger cash holdings to cope with future contingencies (Byoun, 2011). Second, firms with a greater capacity to generate internal funds (cash flows) have more resources available, and can therefore substitute cash holdings (Kim et al., 1998). Accordingly, Byoun (2011) finds that small firms with low operating cash flows hold more cash to achieve financial flexibility. This finding could be because when firms experience a shortage of cash flow, their cash reserves can prevent them undertaking profitable investment opportunities (Almeida et al., 2004). Accordingly, Bridges and Guariglia (2008) argue that for financially constrained firms there is a positive association between the level of investment and their internal funds.

Therefore, financially constrained firms have higher incentives to hold larger cash reserves (Hovakimian and Titman, 2006; Kim et al., 1998). Similarly, the value of liquidity would be higher for these firms, since higher cash holdings are associated positively with the level of investment (Denis and Sibilkov, 2010; Faulkender and Wang, 2006). Consequently, we expect firms with limited access to financing to have the incentive to be at their target cash level. In addition, if there are deviations from this target, these firms would adjust their level of cash holdings faster because of the difficulties they have in obtaining financing. Therefore, our second hypothesis is

H_2: Financially constrained SMEs adjust faster to their target cash holdings level.

2.2.1 Financial distress

We also consider that the speed of adjustment of cash could be influenced by the probability of financial distress, since firms in this situation may encounter more severe financial constraints. One of the benefits of holding cash is the reduction of the likelihood of financial distress (Belghitar and Khan, 2013). Thus, Ferreira and Vilela (2004), Guney, Ozkan and Ozkan (2003), and Ozkan and Ozkan (2004) argue that firms in financial distress could raise their cash levels to reduce their default risk. Consequently, we suppose that firms more likely to be financially distressed (low interest coverage ratio and low z-score) may adopt a hedging strategy by adjusting faster to their target cash holdings to avoid financial distress costs. Thus, we expect a positive effect of financial distress on the speed of adjustment, because having a cash holding ratio close to the target level could reduce financial distress and bankruptcy risk. Thus, we test the next hypothesis:

H_3: SMEs with higher probability of financial distress adjust faster to their target cash holdings level.

2.3 Speed of adjustment of cash holdings during the financial crisis

The recent global financial crisis may also have affected the firm's cash levels and the actions taken by firms to manage the speed of adjustment of their cash holdings. Essentially, the financial crisis of 2008 and the subsequent recession resulted in an important reduction of bank lending, and firms suffered higher levels of rationing. Thus, the financial crisis had a negative impact on the credit supply, and firms suffered important reductions in the availability of external financing and an increase in its cost (Santos, 2011). In this situation, firms with growth opportunities have reduced their investment (Vermoesen et al., 2013). Actually, Campello, Graham and Harvey (2010) found that constrained firms planned to reduce investment with respect to unconstrained firms during the crisis, and Duchin, Ozbas and Sensoy (2010) also found a high decline in corporate investment for firms with low cash reserves and for financially constrained companies.

Focusing on SMEs, these are more sensitive to credit rationing and higher costs of external financing due to the credit supply shock in the crisis period, given that asymmetric

information and risk are higher in these kinds of firms (Akbar, Rehman and Omrod 2013). Moreover, in the Spanish market, most of the SMEs rely heavily on bank credit, and they faced an important reduction in the credit received from banks during the crisis (Bentolilla, Jansen, Jiménez and Ruano, 2014). All of the above findings reveal that having adequate levels of cash holding for avoiding reductions in firm investments and rationing is more important than ever in periods of crisis (Kahle and Stulz, 2013). Therefore, we expect the speed of adjustment of cash holdings to be faster in the crisis period. Consequently, our last hypothesis to test is

H_4: SMEs adjust faster to their target cash holdings level during a financial crisis period.

3. RESEARCH DESIGN

3.1 Sample

The information used in this study was obtained from the SABI database (System of Iberian Financial Statement Analysis), made by Bureau Van Dijk. We selected SMEs according to the requirements established by the European Commission's recommendation 2003/361/CE of 6th May 2003: fewer than 250 employees, an annual turnover of less than €50 million or less than €43 million in total assets. We then selected firms with audited financial statements, due to the higher quality of their accounting information[2]. Additionally, we have applied a series of filters, such as errors in the accounting information, non-missing values in the variables of the model and, to reduce the impact of outliers, we eliminated 1% of the extreme values in each tail of the variables employed in the analysis. Therefore, our sample consists of an unbalanced panel of 38,187 SMEs with 261,290 firm-year observations over the 1998-2012 period.

[2]According to the Additional Provision One of the Spanish Audit Law, 22/2015, of July 20, companies that exceed two of the following thresholds are not authorized to present abridged financial statements and, therefore, are obliged to audit their accounts: annual revenue of € 5,700,000; total assets of € 2,850,000 and an average of 50 employees over the year, for two consecutive years.

3.2 Methodology

This section presents the methodology to analyse the speed of adjustment of cash holdings and the effect of growth opportunities, financial constraints and financial distress on cash holdings' adjustment. We use the following partial adjustment model (Dittmar and Duchin, 2010; García-Teruel and Martínez-Solano, 2008; Guney et al., 2003; Opler et al., 1999; Ozkan and Ozkan, 2004; Venkiteshwaran, 2011; among others):

$$\Delta Cash_{it} = \gamma (Cash^{*}_{it} - Cash_{it-1}) + \varepsilon_{it} \quad (1)$$

where $\Delta Cash_{it} = Cash_{it} - Cash_{it-1}$ is the change in corporate cash holding ratio for firm i from year t to year t-1 and $Cash^{*}_{it}$ is the target cash holdings. $Cash_{it}$ is observable; it is the ratio of cash and cash equivalents to total assets. The coefficient γ measures the rate of adjustment to the target cash holdings and is expected to be between 0 and 1. If γ is 1, the firms will adjust their cash levels to the target level immediately; if it is 0, this indicates that the costs of adjustment are very high so firms cannot modify their investment in liquid assets. Therefore, a higher value of γ indicates faster adjustment from the actual to the target level of cash.

However, target cash holding ($Cash^{*}_{it}$) is unobservable. Following the literature, we use a widely accepted cash model (Bates, Kahle and Stulz, 2009; and Opler et al., 1999), wherein the target cash holdings is determined by firm characteristics such as growth opportunities, firm size, cash flow to assets, net working capital to assets, leverage, industry cash flow risk, increase in fixed assets to total assets, and deviation from the cash holding industry mean. Specifically, the variables have been defined as explained below.

We proxy firm's growth opportunities by its sales annual growth [$GROWTH=(Sales_{t} - Sales_{t-1})/Sales_{t-1}$] because there is no information about SMEs market value and, therefore, we are not able to calculate their market-to-book ratio. Thus, Scherr and Hulburt (2001) argue that firms that had faster past growth have greater growth potential. In addition, Niskanen and Niskanen (2006) assert that fast growing firms have better investment opportunities. Firm size is calculated as the natural logarithm of firm's total assets (SIZE). We measure cash flow as net income plus depreciation divided by total assets (CFLOW). Net working capital is working capital minus cash to total assets (NWC). Leverage is the ratio of total debt to total assets (LEV). We measure cash flow risk as the standard deviation

of industry cash flow (INDUSTRYRISK). Specifically, for each firm, we compute cash flow standard deviation for the previous five years and take the average across the two-digit NACE (Rev. 2)[3] code of the firm cash flow standard deviations. We also include the increase in fixed assets to total assets (INCASSET). Finally, to control for the existence of a possible industry cash holding target, we also include, by year, the absolute value of the difference between the firm cash holding and the industry mean (INDUSTRYDEVIATION).

Therefore, the model is

$$Cash^{*}_{it} = \alpha + \Sigma \beta_k x_{kit} + v_{it} \quad (2)$$

where α is a constant term, x_{kit} is the vector of firm characteristics for a particular firm i at time t, and v_{it} is the error term.

Thus, substituting (2) in (1), the equation that explains the cash level retained by firms is

$$Cash_{it} = \alpha + \delta_0 Cash_{it-1} + \Sigma \delta_k x_{kit} + \eta_i + \lambda_t + \varepsilon_{it} \quad (3)$$

where $\alpha = \rho\gamma$; $\delta_0 = (1 - \gamma)$; $\delta_k = \gamma\beta_k$; η_i is the unobservable heterogeneity; λ_t are time dummy variables and $\varepsilon_{it} = \gamma u_{u.}$ A higher value of the coefficient δ_0 indicates a lower adjustment speed.

x_{kit} is the vector of firm characteristics for a particular firm i at time t. Specifically, these variables are $GROWTH_{it}$, $CFLOW_{it}$, $SIZE_{it}$, NWC_{it}, $INCASSET_{it}$, LEV_{it}, $INDUSTRYRISK_{it}$, and $INDUSTRYDEVIATION_{it}$. If we substitute it in the previous model, we have:

$$Cash_{it} = \alpha + \delta_0 Cash_{it-1} + \delta_1 GROWTH_{it} + \delta_2 CFLOW_{it} + \delta_3 SIZE_{it} + \delta_4 NWC_{it} + \delta_5 INCASSET_{it} + \delta_6 LEV_{it} + \delta_7 INDUSTRYRISK_{it} + \delta_8 INDUSTRYDEVIATION_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (3.1)$$

To capture the possible differences in the rate of adjustment between firms, we interact lagged cash holdings with dummy variables to classify firms depending on their growth opportunities, financial constraints, financial distress, and financial crisis effects. Specifically, we classify firms according to growth opportunities with annual sales growth

[3] NACE is the European classification of economic activities. NACE is a classification derived from the ISIC (International Standard Industrial Classification) to enable international comparability.

(GROWTH) and growth in fixed assets investments (INCASSET). Regarding financial constraints, we classify firms according to the firm size (SIZE), and the cash flow variable (CFLOW). In addition, the variables designed to explain the differences in the adjustment speed of cash as a function of financial distress are interest coverage ratio (Asquith, Gertner and Scharfstein, 1994) and Z-score for private firms (Altman, 2000). Note that low values of both measures indicate greater financial distress. Interest coverage ratio (COV) is calculated as earnings before interest and taxes-to-interest expenses. The likelihood of financial distress is calculated according to Altman's Z-score (2000) for private firms, given by ZSCORE = 0.717 $*X1$ + 0.847 $*X2$ + 3.107 $*X3$ + 0.420 $*X4$ + 0.998 $*X5$,

where $X1$ = Working capital/Total assets; $X2$ = Retained earnings/Total Assets; $X3$ = Net operating profits/Total assets; $X4$ = Book value of equity/Book value of debt; $X5$ = Sales/Total assets. Finally, concerning the impact of the financial crisis on the speed of adjustment of cash holdings, we have created a dummy variable, which takes value one for the years 2008 to 2012, and zero otherwise.

Following Dittmar and Mahrt-Smith (2007), we also include dummy variables on their own because if an endogenous relation exists, it is more likely to show up in the dummy variable than in the interaction term. Finally, we employ instrumental variables estimation to control for any endogeneity problems that may arise, considering all variables as endogenous and employing the lagged independent variables (one period) as instruments.

Therefore, the model to estimate is

$$Cash_{it} = \alpha + \delta_0 Cash_{it-1} + \delta_1 Cash_{it-1} \times DUMMY_{it} + DUMMY_{it} + \Sigma \delta_k x_{kit} + \eta_i + \lambda_t + \varepsilon_{it} \qquad (4)$$

3.3 Descriptive statistics

Table 1 below presents a brief descriptive analysis of the variables. The cash holdings ratio of the average firm in our sample is approximately 10.19% and the median value is 6.38%. Regarding the determinants of corporate cash holdings, the mean annual sales growth is 10.54%, while for the median firm in the sample the growth is 5.97%, and the average annual increase of fixed assets is 2.35%; the mean firm size is 8.6345 (natural

logarithm of total assets); the ratio of cash flow to total assets has a mean value of 7.50%; working capital minus cash represents 5.03% of total assets; the percentage of debt regarding total assets is on average 63.39%; finally, the mean cash flow variability is 10.22%.

Insert Table 1 Here

In Table 2, we report the correlation coefficients of the variables. As we can see, the correlation between the explanatory variables is not high.

Insert Table 2 Here

Bates et al. (2009) show that the ratio of cash holdings over total assets for U.S. firms is more than double that from the period of 1980 to 2006. Gao et al. (2013) also find a growing trend. To analyse the behaviour of cash holdings during the study period, in Table 3, we present descriptive statistics for CASH variable (ratio of cash and cash equivalents over total assets) across the sample period of 1998 to 2012. If we observe the temporal evolution of the whole period, we can highlight a growing trend, from an average cash ratio of 9.9% in 1998 to 12.3% in 2012. This represents a growth of 24.24% [($CASH_{2012}$-$CASH_{1998}$)/$CASH_{1998}$]. The same occurs if we examine the median cash holding values. If we analyse in more detail the evolution of cash ratios over time, we note that, from 1998 until 2006 the level of cash is more or less constant, in 2007 there is a decline, and from 2008 to 2012 there is a growing trend. During the financial crisis, firms stockpile liquid assets to finance their operations and to meet unexpected contingencies. This finding is consistent with the precautionary motive of cash holdings because it shows that firms encountering financial and liquidity constraints accumulate more cash.

Insert Table 3 Here

4. RESULTS

Table 4 presents the results of the estimation of model 3, which explains the determinants of firms' cash holdings. The results show a positive and significant coefficient

of $CASH_{it-1}$ variable, indicating that firms' decisions on investment in liquid assets aim to achieve their target cash level.

Regarding the results of the remaining explanatory variables, we find that the coefficient of the variable CFLOW is positive and statistically significant; therefore, larger cash flows generated by the firm are associated with higher cash holdings. This is consistent with previous empirical research (Ferreira and Vilela, 2004; Opler et al., 1999; and Ozkan and Ozkan, 2004) and with the financial hierarchy theory (Myers and Majluf, 1984). According to this theory, in the presence of information asymmetry firms will establish a hierarchy in their use of funding sources. First, firms prefer to fund themselves with resources generated internally. This financial hierarchy is particularly relevant for SMEs (Jordan et al., 1998; and Watson and Wilson, 2002), since information asymmetry and agency conflicts associated with debt are greater for smaller firms.

The results of model 3 show a negative relationship between firm size and the level of cash, although it is only statistically significant for the one-tail test[4]. This finding could be observed because the existence of economies of scale associated with the cash levels required to confront the normal transactions of the firm might affect negatively to corporate cash holdings (Baumol, 1952; Miller and Orr, 1966; and Mulligan, 1997). However, as stated above, smaller firms suffer more severe information asymmetries, more financial constraints and are more likely to suffer financial distress; therefore, from this perspective, higher levels of cash can be expected.

Concerning the variable NWC (working capital minus cash to total assets), previous literature argues that the presence of liquid assets, in addition to cash and marketable securities, influences the firm's cash level negatively, since non-cash liquid assets can be a substitute for cash (Opler et al., 1999). Our evidence does not support this argument, as firms with higher net working capital hold more cash. A possible explanation for this is that companies jointly determine their investment policy in inventories, receivables and cash. Thus, firms with a more conservative working capital policy would be associated with high investment in inventories, receivables and cash holdings, and the opposite would hold for an aggressive policy (Baños-Caballero, García-Teruel and Martínez-Solano, 2012; Hill, Kelly and Highfield, 2010).

[4] Significant at 1% level in further analyses.

Regarding growth opportunities, a positive relationship with cash holdings was expected. We find empirical support for a positive effect of an increase in fixed assets (INCASSET) on the level of cash, but the same does not occur for annual sales growth (GROWTH), since the coefficient of this variable is not statistically significant. Conversely, Gao et al. (2013) argue that greater leverage would increase demand for cash holdings to reduce net debt and to provide a buffer to meet interest obligations. Ozkan and Ozkan (2004) also consider that more highly leveraged firms may retain more cash to lower their default risk. For our sample of SMEs, we find that firms with more leverage retain higher cash levels, possibly to avoid potential financial distress.

Insert Table 4 Here

4.1 Growth opportunities

In this section, we analyse how a firm's growth opportunities influence the speed of adjustment of cash. In column (1) of Table 5, we estimate Model 4, including the dummy variable $DHIGHGROWTH_{it}$, which takes, for each year, the value one if the firm sales annual growth ($GROWTH_{it}$) is greater than the median industry value, and zero otherwise, and an interaction term between lagged cash holdings ($CASH_{it-1}$) and $DHIGHGROWTH_{it}$. Thus, we assign to the high growth opportunities group those firms whose sales growth is higher than the median industry value in the sample. In contrast, firms are assigned to low growth opportunities group if sales growth is lower than the median industry value in the sample. The difference in the speed of adjustment across high growth and low growth firms is captured by the interaction variable ($CASH_{it-1}$ * $DHIGHGROWTH_{it}$)[5]. In the second column of table 5, the model is estimated including the dummy variable $DHIGHINCASSET_{it}$, which takes the value one when the firm's increase in fixed assets (investment) to total assets is greater than the median industry value (calculated yearly), and includes an interaction term with lagged cash holdings ($CASH_{it-1}$).

[5] The coefficient δ_0 for high sales growth firms will be the sum between the coefficient of lagged cash ($CASH_{it-1}$) and the interaction with the dummy variable ($CASH_{it-1}$ * $DHIGHGROWTH_{it}$). However, the coefficient δ_0 for the group of firms with lower sales growth will be determined by $CASH_{it-1}$.Note that the adjustment speed (γ) is determined by 1 minus δ_0.

Results show a positive and significant coefficient of $CASH_{it-1}$ variable, indicating that firms' cash holdings follow a partial adjustment model and that firms attempt to adjust towards their target cash level. If we examine the interaction variables, we can observe a negative and significant coefficient in both cases, which implies a higher coefficient of adjustment speed for the subgroup of the fastest growing companies. We can observe an adjustment speed difference for high growth and low growth firms of 0.1696 or 0.3501, respectively, according to the variable used to proxy growth opportunities, sales annual growth (GROWTH) or increases in fixed assets (INCASSET). The results show a higher speed of adjustment for firms with more growth opportunities than for low growth firms.

Insert Table 5 Here

According to the literature review section, the findings support that the costs of cash shortfalls are higher for firms with greater growth opportunities; therefore, these firms adjust more quickly to their target cash holdings to avoid restricting profitable investment opportunities. In contrast, firms with lower growth opportunities can adjust slowly to their target level without incurring high costs. Our results are in accordance with the findings of Almeida et al. (2004) and Acharya et al. (2007), who state that cash reserves increase the capacity and ability of firms to invest. The results are also consistent with the transaction cost motive for holding cash. Liquid assets may be used as a buffer against the possibility of having inadequate funds to implement valuable projects, since raising funds from external markets can be very costly, particularly for firms that need prompt liquidity (Opler et al., 1999).

4.2 Financial constraints

In the literature review section, it was considered that financially constrained firms have higher incentives to maintain large cash holdings and that they will attempt to adjust faster to their target levels. To test this hypothesis, in Table 5 we estimate model 4 by including two dummy variables that separate constrained and unconstrained firms (columns 3 and 4).

First, we rank firms on the basis of the variable $SIZE_{it}$ and, for each year we assign to the financially constrained group those firms whose size lies below the median industry size, namely, the dummy variable $DSMALL_{it}$ takes value one. In contrast, firms are assigned to the unconstrained group if firm size is above the median industry size value; in this case, the dummy variable takes the value zero. In column (3) of Table 5 we estimate Model 4, including the dummy variable $DSMALL_{it}$ and an interaction term between lagged cash holdings ($CASH_{it-1}$) and $DSMALL_{it}$. If we examine the interaction variable ($CASH_{it-1}$ * $DSMALL_{it}$), we observe an adjustment speed difference for large and small firms of 0.2372, which is quicker for smaller firms. The findings are consistent with the view that constrained firms obtain greater benefit from being closer to cash holding targets. The reason is the relatively higher cost for small firms of being off target, since small firms suffer greater information asymmetries as well as agency conflicts between shareholders and creditors. Therefore, small firms are more likely to be subject to financial restrictions (Almeida et al., 2004), which make it more difficult and expensive for them to obtain external financing. In addition, the results support the importance of liquidity management for the investment of financially constrained firms (Fazzari et al., 1988), since if smaller firms are at their target level it enables them to finance operational growth with the stock of liquidity.

In addition to firm size, the adjustment speed of cash holdings could also be affected by the cash flow of the firm. Therefore, in column (4) of Table 5, we estimate model 4, including the dummy variable $DLOWCFLOW_{it}$, which takes value one for firms with operating cash flows to assets lower than the median industry value calculated annually, and zero otherwise, and an interaction term with lagged cash holdings ($CASH_{it-1}$). The difference in the speed of adjustment across firms with low cash flow generation and high cash flow firms is 0.2984. Firms with lower cash flow adjust faster to their target, while the adjustment speed for firms with greater cash flow generation is slower. Our results are consistent with Byoun (2011), who argues that low cash flow firms have greater need for financial flexibility, which makes these companies adjust faster to their target level.

4.2.1 Financial distress

Finally, we also analyse the effect of financial distress on the speed of adjustment of cash holdings, since financially distressed firms can adjust faster to their target to avoid

financial distress cost. To do this, we classify firms according to two variables of financial distress (COV_{it} and $ZSCORE_{it}$). We define a firm as being financially distressed if its interest coverage ratio (COV_{it}) is lower than the median industry value ($DCOV_{it}$). This variable is calculated yearly and takes value one in this case, and zero otherwise. Similarly, we sort firms according to the $ZSCORE_{it}$ and assign to the financial distress group ($DZSCORE_{it}$) those firms whose $ZSCORE_{it}$ variable is smaller than the median industry value. Therefore, the dummy variables will take value one when a firm has more probability of financial distress.

In Table 5, column (5) we estimate Model 4 including the dummy variable $DCOV_{it}$ and an interaction term between lagged cash holdings ($CASH_{it-1}$) and $DCOV_{it}$. Column (6) presents the results including the dummy variable $DZSCORE_{it}$ and an interaction term between lagged cash holdings ($CASH_{it-1}$) and $DZSCORE_{it}$. Starting with the COV_{it} variable (interest coverage ratio), we find a faster adjustment speed of cash holdings for financially distressed firms. Specifically, the adjustment speed conditional on being financial distressed is 0.3193 faster than the estimated adjustment speed of firms without financial difficulties. When the proxy of financial distress is $ZSCORE_{it}$ we obtain similar results, the estimated speed for firms more likely to be financial distressed is 0.4095 faster than for firms without financial difficulties. The empirical findings support our expectations regarding the positive relation between financial distress and the speed of adjustment towards target cash level. We find that firms with higher probability of financial distress tend towards their optimum cash level faster to reduce their default risk and to avoid financial distress costs. This would be consistent with Gamba and Triantis (2008), who find that financially flexible firms are able to avoid financial distress when confronting negative shocks.

4.3 Impact of financial crisis on the speed of adjustment of cash holdings

After studying the effects of growth and financing on the speed of adjustment of cash holdings we found that both firms' financial constraints and growth opportunities positively affect the adjustment of cash. Next, in this section, we explore the impact of recent financial crisis on the adjustment speed of cash holdings towards their target levels.

On the base of the financial literature, we have established previously that the speed of adjustment of cash holdings is faster in the financial crisis period because of its impact on the credit supply and the negative effects on bank lending for SMEs firms. In Table 6 we present the estimation of Model 4 including the dummy variable $DCRISIS_{it}$ and its interaction with $CASH_{it-1}$ to test the financial crisis effect. $DCRISIS_{it}$, takes the value one for the crisis period of 2008 to 2012 and zero otherwise. The difference in the speed of adjustment between the pre-crisis period (1998-2007) and the crisis period (2008-2012) is 0.0552. This finding means that firms adjusted faster to their optimal cash levels during the financial crisis to avoid being affected by rationing and by their investment reductions.

Insert Table 6 Here

We have also tested the impact of the financial crisis on the speed of adjustment of cash holdings depending on the firm's growth and financing features. Specifically, we have divided the sample into groups on the basis of their growth opportunities, financial constraints, and financial distress. Next, we estimate Model 4, incorporating the dummy variable $DCRISIS_{it}$, which distinguishes pre-crisis and crisis period. Panel A in Table 7 presents the results for firms with high growth opportunities (high sales or fixed assets growth), financially constrained firms (lower size or lower cash flows) and financially distressed firms (lower coverage ratio or lower Z-score). Subsequently, Panel B in Table 7 shows the results for firms with low growth opportunities, which are financially unconstrained, and financially strong.

Insert Table 7 Here

Consistent with the results in Table 6, Table 7 shows that during the financial crisis the speed of adjustment increased in all the groups of firms. The coefficient for the interaction between $DCRISIS_{it}$ and $CASH_{it-1}$ is effectively negative and significant for all columns in Table 7, indicating a reduction in the coefficient of the $CASH_{it-1}$ variable in the crisis period and thus a higher adjustment speed. Moreover, similar to the results described in the previous section, the speed of adjustment remains faster for firms with higher growth, higher constraints and higher financial distress. For example, focusing on the sales growth as a proxy for growth opportunities, column 1 in Panel A shows that the estimated coefficient for high growth opportunities firms in the crisis period is 0.6368 (0.6853-0.0485), while it is 0.6791 (0.7533-0.0742) for low growth opportunities firms (see column 1 of Panel B). Given

that the adjustment speed (γ) is determined by 1 minus the estimated coefficient (δ_0), high growth opportunity firms adjust their cash holdings faster. Similar results can be found for the rest of the variables, except for size. These results are consistent with the fact that growing firms will be more sensitive to the bank lending supply shock, and they will be willing to adjust faster to their optimal cash holdings, otherwise they could be forced to reduce their capital expenditures. Similarly, constrained firms could avoid rationing and increases in costs of external financing during the credit supply shock by increasing the speed of adjustment of cash holdings.

Finally, the results for firms' characteristics in all models presented here are consistent and show that cash flows, size, working capital, increase of fixed assets and leverage are important factors in determining cash holding levels.

5. CONCLUSIONS

Firms seek a target cash level to preserve financial flexibility, but they may temporarily deviate from their target cash holdings and gradually come back to the optimum thereafter. The observed and target cash may differ due to the presence of adjustment costs, and these, and therefore the speed of adjustment, are affected by firms' characteristics. Thus, the objective of this paper was to study the speed of adjustment of cash and the impact of growth opportunities, financial constraints, and financial distress on the SMEs' speed of adjustment to the target cash holdings. We used a sample of non-financial Spanish companies over the period 1998-2012, and we are the first to study the determinants of the speed of adjustment of cash in SMEs, which suffer more financial constraints and information asymmetry problems.

Our findings show that the speed at which Spanish SMEs attempt to adjust their cash holdings to the target is affected by their growth opportunities, financial constraints and financial distress. Specifically, the results indicate that firms with more growth options adjust more quickly to their target cash holding level. The empirical evidence also shows that financially constrained firms adjust their cash holdings to their target faster. Particularly, smaller firms and firms with less internal finance (lower cash flows) tend to rebalance their cash holdings level faster than larger firms and firms with better access to internal financing.

In addition, firms with higher probability of financial distress adjust faster to their target cash level to avoid distress costs. All these effects were boosted after the financial crisis of 2008, since the firms increased their adjustment speed to respond to the credit rationing caused by the credit supply shock and the subsequent recession.

We conclude that both firms' financial constraints and their growth opportunities positively affect the adjustment of cash and that they are closely related. This finding is consistent with the view that financially constrained SMEs have limited access to external finance and limited internal funds and may forgo profitable investment opportunities (Arslan et al., 2006). Consequently, SMEs manage their cash ratios more actively towards the target. Furthermore, our results support Faulkender and Wang (2006), who find that the value of liquidity is higher for firms with greater investment opportunities and higher external financing constraints. This finding is consistent with the idea that, for these firms to remain at their target cash level, they need to have more financial flexibility to seize investment opportunities if they do not have sufficient external resources. In our opinion, these results can be useful for SMEs because they highlight the importance of cash holdings management.

Furthermore, these results are important for finance practitioners, since they provide a better understanding of how to manage their cash holdings depending on their growth opportunities and finance access, and their reactions to the economic and financial shocks suffered because of the global financial crisis. The actions taken by firms, either because they are growing or have financial constraints or because credit is tight, indicate the important role played by precautionary cash levels. These findings provide valuable insights for managers because having adequate target cash levels and adjusting to them faster help firms not only maintain their day to day operations but also afford suitable investment opportunities thus reducing the risk of eliminating them, particularly in a credit crunch situation. These results may also be helpful for SMEs established in bank-based financial systems, similar to Spain, where SMEs cope with limited access to other sources of financing than bank debt.

Finally, since the financial literature has established the important role played by the institutional setting where firms are working on access to finance, the results of this research may be limited to civil law countries. Thus, it would be interesting to conduct further research

focused on a cross-country study to analyse the impact of the different legal and economic systems on the speed firms adjust cash using data from a large sample of countries.

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Table 1

Descriptive statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Median*	*Perc. 10*	*Perc. 90*
CASH	261,290	0.1019	0.1020	0.0638	0.0102	0.2575
GROWTH	261,290	0.1054	0.3598	0.0597	-0.1995	0.4063
SIZE	261,290	8.6345	0.8511	8.6332	7.5535	9.7728
CFLOW	261,290	0.0750	0.0643	0.0639	0.0122	0.1602
NWC	261,290	0.0503	0.1988	0.0383	-0.1914	0.3128
LEV	261,290	0.6339	0.2061	0.6645	0.3321	0.8834
INDUSTRYRISK	261,290	0.1022	0.1039	0.0532	0.0315	0.3309
INCASSET	261,290	0.0235	0.0819	0.0033	-0.0474	0.1270
INDUSTRYDEVIATION	261,290	0.0819	0.0597	0.0737	0.0200	0.1478

This table provides a descriptive analysis of the variables. The data is from 1998 to 2012. The variables are ratio of cash and cash equivalents to total assets (CASH), sales annual growth (GROWTH), natural logarithm of total assets (SIZE), net income plus depreciation divided by total assets (CFLOW), working capital minus cash to total assets (NWC), total debt to total assets (LEV), average standard deviation of industry cash flow of five years (INDUSTRYRISK), increase in fixed assets to total assets (INCASSET), and the absolute value of the difference between the firm cash holdings and the industry mean (INDUSTRYDEVIATION).

Table 2

Correlation matrix

	CASH	**$CASH_{t-1}$**	**GROWTH**	**SIZE**	**CFLOW**	**NWC**	**LEV**	**INDUSTRY RISK**	**INCASSET**	**INDUSTRY DEVIATION**
CASH	1									
	0.0000									
$CASH_{t-1}$	0.6276	1								
	0.0000	0.0000								
GROWTH	-0.0143	0.0041	1							
	0.0000	0.0685	0.0000							
SIZE	-0.0669	-0.0705	-0.0313	1						
	0.0000	0.0000	0.0000	0.0000						
CFLOW	0.1715	0.1054	0.1394	-0.0815	1					
	0.0000	0.0000	0.0000	0.0000	0.0000					
NWC	-0.1131	-0.0206	-0.0637	0.0611	-0.0134	1				
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				
LEV	-0.2827	-0.2491	0.1518	-0.0826	-0.3002	-0.4239	1			
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
INDUSTRYRISK	0.0119	0.0191	0.1361	-0.4255	0.097	-0.0776	0.0967	1		
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
INCASSET	-0.0578	0.0448	0.115	0.0216	0.033	-0.1653	0.0766	0.0955	1	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
INDUSTRYDEVIATION	0.6049	0.3347	-0.0287	0.0069	0.0647	-0.0788	-0.1798	-0.0097	-0.0635	1
	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

This table reports the correlation coefficients of the variables (model 3): ratio of cash and cash equivalents to total assets (CASH), lagged cash holdings ($CASH_{it-1}$), sales annual growth (GROWTH), natural logarithm of total assets (SIZE), net income plus depreciation divided by total assets (CFLOW), working capital minus cash to total assets (NWC), total debt to total assets (LEV), average standard deviation of industry cash flow of five years (INDUSTRYRISK), increase in fixed assets to total assets (INCASSET), and the absolute value of the difference between the firm cash holdings and the industry mean (INDUSTRYDEVIATION). P-values are reported below coefficients.

Table 3

Cash holdings by year

Year	*Obs*	*Mean*	*Std. Dev.*	*Median*	*Perc. 10*	*Perc. 90*
1998	15,475	0.099	0.096	0.064	0.011	0.243
1999	17,128	0.100	0.098	0.065	0.011	0.249
2000	18,304	0.098	0.097	0.062	0.011	0.246
2001	19,145	0.097	0.097	0.061	0.010	0.245
2002	19,832	0.096	0.096	0.060	0.010	0.241
2003	20,222	0.098	0.098	0.062	0.010	0.246
2004	20,581	0.097	0.098	0.061	0.010	0.244
2005	20,688	0.098	0.098	0.061	0.010	0.246
2006	20,468	0.099	0.099	0.062	0.010	0.247
2007	18,529	0.093	0.099	0.054	0.008	0.243
2008	16,926	0.102	0.105	0.062	0.009	0.263
2009	16,116	0.114	0.111	0.073	0.011	0.290
2010	15,750	0.118	0.114	0.077	0.011	0.296
2011	14,158	0.116	0.114	0.074	0.011	0.295
2012	7,964	0.123	0.118	0.078	0.012	0.309
1998-2012	261,290	0.102	0.102	0.064	0.010	0.258

This table provides descriptive statistics for the variable CASH, calculated as the ratio of cash and cash equivalents to total assets, during the period 1998 to 2012.

Table 4
Determinants of cash holding level

$CASH_{it-1}$	0.3968***
	(45.36)
$GROWTH_{it}$	-0.0027
	(-0.87)
$CFLOW_{it}$	0.0939***
	(7.45)
$SIZE_{it}$	-0.0024
	(-1.5)
NWC_{it}	0.1101***
	(12.69)
$INCASSET_{it}$	0.1217***
	(4.25)
LEV_{it}	0.0130***
	(2.7)
$INDUSTRYRISK_{it}$	0.0008
	(0.13)
$INDUSTRYDEVIATION_{it}$	0.6950***
	(182)
Constant	0.0428
	(1.29)
Observations	199,306

This table presents the estimation of model 3, which explains the cash level kept by the firm. The estimation method is instrumental variables. The dependent variable is $CASH_{it}$. Independent variables are lagged cash holdings ($CASH_{it-1}$), $GROWTH_{it}$, $CFLOW_{it}$, $SIZE_{it}$, NWC_{it}, $INCASSET_{it}$, LEV_{it}, $INDUSTRYRISK_{it}$, and $INDUSTRYDEVIATION_{it}$. Time dummies are included, although coefficients are not presented. Z statistics are reported below coefficients. Significant at ***1 percent. **5 percent. *10 percent.

Table 5
Growth and financing and cash holdings speed of adjustment

	Growth opportunities		Financial constraints		Financial distress	
	Sales growth	Fixed assets	Size	Cash flow	Coverage ratio	Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
$CASH_{it-1}$	0.7947***	0.8969***	0.7941***	0.8549***		
	(29.76)	(20.52)	(31.33)	(27.78)		
$CASH_{it-1}$*$DHIGHGROWTH_{it}$	-0.1696***					
	(-16.14)					
$DHIGHGROWTH_{it}$	0.0216***					
	(7.48)					
$CASH_{it-1}$*$DHIGHINCASSET_{it}$		-0.3501***				
		(-24.29)				
$DHIGHINCASSET_{it}$		0.0377				
		(1.54)				
$CASH_{it-1}$*$DSMALL_{it}$			-0.2372***			
			(-17.84)			
$DSMALL_{it}$			0.0093***			
			(3.62)			
$CASH_{it-1}$*$DLOWCFLOW_{it}$				-0.2984***		
				(-17.05)		
$DLOWCFLOW_{it}$				0.0249***		
				(7.22)		
$CASH_{it-1}$*$DCOV_{it}$					-0.3193***	
					(-16.38)	
$DCOV_{it}$					0.0230***	
					(9.05)	
$CASH_{it-1}$*$DZSCORE_{it}$						-0.4095***
						(-17.12)
$DZSCORE_{it}$						0.0435***
						(10.17)
$GROWTH_{it}$	-0.0147**	-0.0114*	-0.0116**	-0.0118**	-0.0108**	-0.0152***
	(-2.24)	(-1.94)	(-2.43)	(-2.3)	(-2.09)	(-2.7)
$CFLOW_{it}$	0.1358***	0.1311***	0.1400***	0.0878**	0.0843***	0.1627***
	(7.24)	(5.56)	(7.45)	(2.22)	(2.8)	(6.08)
$SIZE_{it}$	-0.0144***	-0.0139*	-0.0210***	-0.0152***	-0.0156***	-0.0175***
	(-5.67)	(-1.92)	(-5.55)	(-5.69)	(-5.68)	(-5.06)
NWC_{it}	0.2450***	0.2493***	0.2194***	0.2349***	0.2491***	0.2696***
	(14.65)	(6.41)	(14.96)	(14.42)	(14.4)	(12.79)
$INCASSET_{it}$	-0.1104**	-0.1466	-0.0778*	-0.0834*	-0.1006**	-0.1260**
	(-2.25)	(-0.62)	(-1.76)	(-1.75)	(-2.06)	(-2.34)
LEV_{it}	0.0558***	0.0661***	0.0443***	0.0547***	0.0615***	0.0692***
	(6.54)	(4.28)	(5.67)	(6.25)	(6.54)	(7.19)
$INDUSTRYRISK_{it}$	0.0241**	0.0237**	-0.0176	0.0239**	0.0228**	0.0317***
	(2.24)	(2.28)	(-1.31)	(2.19)	(2.01)	(2.69)
$INDUSTRYDEVIATION_{it}$	-0.7144***	-0.5498***	-0.5998***	-0.8158***	-0.9063***	-0.9962***
	(-13.57)	(-11.87)	(-13.43)	(-13.72)	(-13.52)	(-13.39)
Constant	0.2339***	0.1763***	0.3176***	0.2383***	0.2485***	0.2517***
	(4.46)	(2.88)	(5.63)	(4.39)	(4.39)	(4.18)
Observations	199,306	199,306	199,306	199,306	199,306	199,306

All estimations have been carried out using instrumental variables. In column (1) we estimate model 4 including $DHIGHGROWTH_{it}$, which takes value one when the firm's sales growth is greater than the median sales growth in the sample and zero otherwise and an interaction term between lagged cash holdings and $DHIGHGROWTH_{it}$. In column (2) we estimate model 4 including $DHIGHINCASSET_{it}$, which takes value one when the firm's increase in fixed assets is greater than the median increase in fixed assets in the sample and zero otherwise and an interaction term between lagged cash holdings and $DHIGHINCASSET_{it}$. In column (3) we estimate model 4 including $DSMALL_{it}$, which takes value one when the firm size is smaller than the median size in the sample and zero otherwise and an interaction term between lagged cash holdings and $DSMALL_{it}$. In column (4) we estimate model 4 including $DLOWCFLOW_{it}$, which takes value one when the firm operating cash flow is smaller than the median operating cash flow in the sample and zero otherwise and an interaction term between lagged cash holdings and $DLOWCFLOW_{it}$. In column (5) we estimate model 4 including $DCOV_{it}$ (defined previously) and an interaction term between lagged cash holdings and $DCOV_{it}$. In column (6) we estimate model 4 including $DZSCORE_{it}$ (defined previously) and an interaction term between lagged cash holdings and $DZSCORE_{it}$.The dependent variable is $CASH_{it}$. Independent variables are lagged cash holdings ($CASH_{it-1}$), $GROWTH_{it}$, $CFLOW_{it}$, $SIZE_{it}$, NWC_{it}, $INCASSET_{it}$, LEV_{it}, $INDUSTRYRISK_{it}$, and $INDUSTRYDEVIATION_{it}$. Time dummies are included in all regressions, although coefficients are not presented. Z statistics are reported below coefficients. Significant at ***1 percent. **5 percent. *10 percent.

Table 6
Determinants of cash holding level and financial crisis

$CASH_{it-1}$	0.7227***
	(27.42)
$CASH_{it-1}$*$DCRISIS_{it}$	-0.0552***
	(-4.77)
$DCRISIS_{it}$	0.0262***
	(13.3)
$GROWTH_{it}$	-0.0075
	(-1.48)
$CFLOW_{it}$	0.1180***
	(5.81)
$SIZE_{it}$	-0.0134***
	(-5.73)
NWC_{it}	0.2327***
	(14.9)
$INCASSET_{it}$	-0.0819*
	(-1.86)
LEV_{it}	0.0467***
	(5.56)
$INDUSTRYRISK_{it}$	0.0018
	(0.22)
$INDUSTRYDEVIATION_{it}$	-0.6938***
	(-12.24)
Constant	0.1465***
	(8.00)
Observations	199,306

This table presents the estimation of model 4 including $DCRISIS_{it}$, which takes the value one for the crisis period. The estimation method is instrumental variables. The dependent variable is $CASH_{it}$. Independent variables are lagged cash holdings ($CASH_{it-1}$), $GROWTH_{it}$, $CFLOW_{it}$, $SIZE_{it}$, NWC_{it}, $INCASSET_{it}$, LEV_{it}, $INDUSTRYRISK_{it}$, and $INDUSTRYDEVIATION_{it}$. Z statistics are reported below coefficients. Significant at ***1 percent. **5 percent. *10 percent.

Table 7
The impact of financial crisis on the speed of adjustment of cash holdings

Panel A

	High growth opportunities		Financially constrained		Financially distressed	
	Sales growth	Fixed assets	Size	Cash flow	Coverage ratio	Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
$CASH_{it-1}$	0.6853***	0.6438***	0.8756***	0.6317***	0.5314***	0.6047***
	(16.64)	(14.2)	(9.44)	(11.49)	(19.36)	(21.17)
$CASH_{it-1}$*$DCRISIS_{it}$	-0.0485***	-0.0699***	-0.0863***	-0.1076***	-0.0422***	-0.1024***
	(-2.74)	(-4.07)	(-2.95)	(-5.34)	(-2.78)	(-6.28)
$DCRISIS_{it}$	0.0219***	0.0244***	0.0361***	0.0293***	0.0187***	0.0225***
	(7.43)	(7.62)	(6.59)	(9)	(9.58)	(10.36)
$GROWTH_{it}$	-0.0315***	-0.0068	-0.0124	0.0077	-0.0054	0.0006
	(-3.26)	(-0.8)	(-0.72)	(1.19)	(-1.25)	(0.11)
$CFLOW_{it}$	0.1339***	0.2013***	0.1899***	-0.0345	0.1852***	0.0581
	(4.04)	(4)	(4.07)	(-0.23)	(4.88)	(1.5)
$SIZE_{it}$	-0.0192***	-0.0256***	-0.0409***	-0.0067	-0.0159***	-0.0123***
	(-4.79)	(-3.58)	(-3.35)	(-0.85)	(-4.24)	(-3.42)
NWC_{it}	0.2397***	0.2632***	0.4260***	0.1438***	0.1351***	0.1327***
	(8.84)	(7.08)	(6)	(2.93)	(6.83)	(6.96)
$INCASSET_{it}$	-0.0859	-0.2969	-0.2722*	0.0511	-0.1010**	-0.0379
	(-1.08)	(-1.6)	(-1.8)	(0.33)	(-2.01)	(-0.66)
LEV_{it}	0.0611***	0.0590***	0.1404***	0.0347*	0.0106	0.0234***
	(4.37)	(4.22)	(3.69)	(1.87)	(1.63)	(2.78)
$INDUSTRYRISK_{it}$	-0.0085	-0.0210*	-0.0697**	-0.0104	-0.0110	-0.0095
	(-0.67)	(-1.75)	(-2.47)	(-0.67)	(-1.18)	(-1.03)
$INDUSTRYDEVIATION_{it}$	-0.6288***	-0.4800***	-1.3485***	-0.6532***	-0.3673***	-0.3864***
	(-7.36)	(-5.65)	(-6.46)	(-7.13)	(-6.67)	(-7.46)
Constant	0.1950***	0.2480***	0.3319***	0.1021*	0.1846***	0.1410***
	(6.1)	(3.83)	(3.97)	(1.83)	(5.23)	(4.88)
Observations	98,709	99,215	98,888	98,879	101,310	100,854

Panel B

	Low growth opportunities		Financially unconstrained		Financially strong	
	Sales growth	Fixed assets	Size	Cash flow	Coverage ratio	Z-score
	(1)	(2)	(3)	(4)	(5)	(6)
$CASH_{it-1}$	0.7533***	0.9437***	0.6378***	0.8374***	0.8720***	0.9912***
	(13.66)	(8.49)	(18.84)	(11.19)	(6.69)	(7.16)
$CASH_{it-1}$*$DCRISIS_{it}$	-0.0742***	-0.0862***	-0.0445***	-0.0388*	-0.0620**	-0.0778**
	(-3.42)	(-3.28)	(-2.88)	(-1.67)	(-2.05)	(-2.2)
$DCRISIS_{it}$	0.0024	0.0303***	0.0246***	0.0280***	0.0457***	0.0474***
	(0.09)	(4.96)	(10.24)	(6.01)	(6.87)	(5.73)
$GROWTH_{it}$	-0.1925	-0.0050	-0.0073	-0.0234**	0.0225	-0.0084
	(-0.9)	(-0.28)	(-1.57)	(-1.97)	(1.25)	(-0.63)
$CFLOW_{it}$	0.0273	0.0894**	0.0787***	0.0744	0.1101*	0.0644
	(0.44)	(1.96)	(2.64)	(1.12)	(1.9)	(0.75)
$SIZE_{it}$	-0.0111	-0.0064	-0.0180***	-0.0194***	0.0045	-0.0149*
	(-1.39)	(-0.77)	(-3.08)	(-3.57)	(0.51)	(-1.73)
NWC_{it}	0.2015***	0.2912***	0.1714***	0.3752***	0.3661***	0.5078***
	(8.15)	(2.94)	(8.05)	(8.53)	(3.37)	(5.19)
$INCASSET_{it}$	0.0067	-0.0433	-0.0093	-0.1128	0.3668**	0.0262
	(0.09)	(-0.06)	(-0.15)	(-1.27)	(1.99)	(0.15)
LEV_{it}	0.0327	0.0718	0.0160	0.0779***	0.0798	0.1427***
	(1.5)	(1.19)	(1.62)	(3.58)	(1.43)	(2.88)
$INDUSTRYRISK_{it}$	0.0383	0.0270	-0.0254	0.0334*	0.0246	0.0226
	(1.47)	(1.42)	(-1.59)	(1.86)	(1.12)	(0.89)
$INDUSTRYDEVIATION_{it}$	-0.6842***	-0.8615***	-0.4522***	-1.1183***	1.4517***	-1.8327***
	(-5.49)	(-5.89)	(-6.48)	(-6.28)	(-5.04)	(-4.89)
Constant	0.1228**	0.0598**	0.2106***	0.2044***	-0.0077	0.1493**
	(2.43)	(2.46)	(4.09)	(4.6)	(-0.15)	(2.5)
Observations	100,597	100,091	100,418	100,427	97,996	98,452

This table presents the estimation of model 4 including $DCRISIS_{it}$, which takes the value one for the crisis period. The estimation method is instrumental variables. The dependent variable is $CASH_{it}$. Independent variables are lagged cash holdings ($CASH_{it-1}$), $GROWTH_{it}$, $CFLOW_{it}$, $SIZE_{it}$, NWC_{it}, $INCASSET_{it}$, LEV_{it}, $INDUSTRYRISK_{it}$, and $INDUSTRYDEVIATION_{it}$. Z statistics are reported below coefficients. Significant at ***1 percent. **5 percent. *10 percent.