ON THE DETERMINANTS OF SMES CASH HOLDING: EVIDENCE FROM SPAIN

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Abstract: This work analyses the explanatory factors of the cash holdings of a sample of 860 small and medium-sized firms from Spain during the period 1997-2001. We find that the firms pursue a target cash level to which they attempt to converge, and that this level is higher for firms with larger cash flows, for those that are more highly leveraged and for those that have more short-term debt. In contrast, the cash level falls with the use of bank debt and in the presence of substitutes for cash.

Keywords: Cash, Liquidity, SMEs

JEL Classification: G31, G32

1. INTRODUCTION

Firms have important cash holdings on their balance sheets, as has been demonstrated in recent studies. Thus, in late 2000 for example the amount of cash and marketable securities held by firms in the European Monetary Union amounted to 14.8% of their total assets (Ferreira and Vilela, 2004). In spite of the opportunity cost of these liquid assets, they have been traditionally justified for transaction motives, to meet the needs that come from normal activities of the firms, as well as for precautionary motives, to help to meet unforeseen requirements for cash (Baumol, 1952; Miller and Orr, 1966; Meltzer, 1993; Mulligan, 1997).

In recent years other explanations have been advanced in an attempt to complete the transaction approach. This reasoning considers that cash decisions may be affected by the existence of market imperfections such as information asymmetry, agency conflicts or financial distress. On the one hand, information asymmetry and agency conflicts between shareholders and creditors make it difficult and expensive for firms to obtain funds. In these circumstances, firms may build up their liquid monetary assets in order to reduce the costs associated with dependence on external financing. On the other hand, the existence of large free cash flow may induce discretional behaviours in the management that are detrimental to the shareholders (Jensen, 1986). Finally, accumulating cash may reduce the firms' likelihood of entering financial distress.

Thus, numerous recent empirical studies have aimed to test the determinant factors of firms' cash levels. Kim, Mauer and Sherman (1998) demonstrate that US firms with higher cash levels show more growth opportunities, more volatility in their cash flows and less profitability in their productive assets. Opler, Pinkowitz, Stulz and Williamson (1999) obtain similar results for the same market, finding that smaller firms

with more investment opportunities and risky activities possess a larger proportion of liquid financial assets.

More recently, Ozkan and Ozkan (2004) study a sample of British firms and provide evidence in the same line. In addition, unlike the previous work they test the importance of the ownership structure in determining the British firms' cash levels. Similarly, various international studies (Dittmar, Marth-Smith and Servaes, 2003; Guney, Ozkan and Ozkan, 2003; Pinkowitz, Stulz and Williamson, 2003; Ferreira and Vilela, 2004) demonstrate that a firm's cash holding is conditioned by the legal structure of the country concerned, with lower levels found in countries where investors are more protected.

All these previous studies focus their analysis on the determinants of cash holdings in large firms listed on the financial markets. But the imperfections mentioned above are more serious in the case of small and medium-sized enterprises (SMEs). Indeed, as Berger and Udell (1998) point out, the main characteristic of SMEs, which distinguishes them to a large extent from larger firms, is their greater informational opacity, which worsens information asymmetry problems. Along with this, the coincidence of ownership and control and the greater flexibility in the operations in this type of firm makes the agency problems associated with debt more serious (Petit and Singer, 1985). In turn, this type of firm is more likely to suffer financial difficulties (Titman and Wessels, 1988), as well as financial constraints (Whited, 1992; Fazzari and Petersen, 1993). Finally, their transaction costs will be relatively higher, given the economies of scale associated with these costs (Mulligan, 1997).

In this context, and given that to our knowledge there has been only one previous working paper on American SMEs (Faulkender, 2004), the objective of this current research is to provide empirical evidence on the determinants of cash holdings

in small and medium-sized firms. The study also contributes to the literature for a number of other reasons. First, we present empirical evidence for a sample of Spanish SMEs in the context of the continental model (civil law), which is characterised by less-developed capital markets (La Porta, López-de-Silanes, Shleifer and Vishny, 1997). Second, and unlike in Faulkender's (2004) work, we use a dynamic panel. This offers various advantages. On the one hand, it allows us to control for the existence of unobservable heterogeneity, as there is more than one cross section. On the other, and similarly to the work of Guney, et al. (2003) and Ozkan and Ozkan (2004), we can examine a partial adjustment model that allows us to confirm whether the SMEs possess an optimal cash holding level. Finally, the estimation carried out using GMM allows us to control for possible endogeneity problems that may arise, since as Guney, et al. (2003) point out, the random disturbances that affect decisions about the cash level may also affect firm characteristics such as leverage, growth opportunities, etc.

The rest of this work is structured as follows: in Section 2, we review the literature examining the main determinants of investment in liquid financial assets. In the third section, we describe the sample and variables used, while in the fourth we outline the methodology employed. In Section 5, we report the results of the research. Finally, we end with our main conclusions.

2. THEORETICAL FOUNDATIONS AND HYPOTHESES

If market imperfections did not exist, firms' financial decisions would not affect their value (Stiglitz, 1974). In this situation, keeping liquid financial assets would be irrelevant. Indeed, the volume of cash kept to deal with productive investments or temporary cash shortfalls could be obtained without problem and at a reasonable price. On the other hand, the inexistence of a premium for liquidity or taxes would mean that

keeping cash would not have an opportunity cost or fiscal disadvantages, respectively. Thus, in these circumstances decisions about investment in liquid assets would not affect shareholder wealth (Opler, Pinkowitz, Stulz and Williamson, 2001).

However, the presence of market imperfections implies that there is an optimal cash level that balances costs and benefits and maximises the value of the firm. In addition, we should also bear in mind the firm's capacity to generate cash and its possibilities of obtaining funds, since these elements will also affect cash level decisions.

With regards the benefits of keeping cash, in the first place the existence of information asymmetry makes it more expensive for firms to obtain external funding due to problems associated with adverse selection. From this perspective, Myers and Majluf (1984) argue that in the presence of information asymmetry firms establish a hierarchy in their use of financing sources. They will prefer to finance themselves with resources generated internally before resorting to the market. Agency conflicts between shareholders and creditors also make it more difficult and more expensive to obtain funds. All this can lead to distortions in the firms' investments that generate underinvestment problems (Myers, 1977). In this situation, keeping liquid assets can reduce the costs of being dependent on external financing. Moreover, possessing certain cash levels reduces the likelihood of financial distress, especially for those firms with more volatile cash flows.

However, investing in cash holdings also has costs. On the one hand, it has an opportunity cost for the firm, since it will generally provide a lower return than productive investments.

On the other hand, keeping a higher level of liquid financial resources in the firm can also generate agency conflicts between managers and shareholders. Thus, the

existence of large free cash flow can generate discretional behaviours in the managers that are detrimental to shareholder interests (Jensen, 1986). In this context, in firms where ownership and control are firmly separated, such as for example the firms listed on organised markets, managers can use the funds on projects that do not clearly benefit the shareholders, or alternatively they may pursue personal objectives. The investors do, however, have various internal control mechanisms available to reduce the conflict of interests, such as share blocks, the board of directors, compensation systems, the presence of institutional investors, etc. But in small and medium-sized firms the ownership and management generally coincide, meaning that conflicts between managers and shareholders are rare or non-existent. Instead, the coincidence between ownership and control means that agency problems associated with the debt are more significant (Berger y Udell, 2003).

Thus, on the basis of these benefits and costs, we now describe the main firm characteristics that are relevant when determining cash levels according to the theories discussed above.

Growth opportunities

The existence of growth opportunities in firms is an important factor that positively affects cash levels, as has been shown in various empirical studies (Kim et al., 1998; Opler et al., 1999; Ferreira and Vilela, 2004; Ozkan and Ozkan, 2004). As Myers and Majluf (1984) point out, firms whose value is largely determined by their growth opportunities have larger information asymmetry. Consequently, firms with greater growth opportunities incur higher external financing costs. They also suffer more serious agency conflicts associated with the debt, which can lead to

underinvestment (Myers, 1977), insofar as it discourages shareholders from embarking on profitable projects.

On the other hand, firms with more growth opportunities may also incur greater costs of financial distress (Harris and Raviv, 1990; Shleifer and Vishny, 1992). This is because their value depends on their growth opportunities rather than on tangible assets or specific cash flows. Thus, this type of firm will keep higher cash levels to avoid costs of financial distress. In this respect, John (1993) finds that firms with good growth opportunities but few tangible assets tend to keep higher cash holdings.

Hence we might expect firms with more investment opportunities to keep higher liquidity levels, in order not to limit or cancel their profitable investment projects. Their value depends on carrying out these projects, so that the cost of not having sufficient cash to make the investments is higher.

Size

Size is another significant variable that affects cash holdings. The traditional models to determine the optimal cash levels (Baumol, 1952; Miller and Orr, 1966), or more recent models such as that of Mulligan (1997), demonstrate that there are economies of scale associated with the cash levels required to confront the normal transactions of the firm, so that larger firms can keep lower cash holdings.

Moreover, we should also bear in mind that firm size is related to another set of factors that may influence liquidity levels. More specifically, smaller firms suffer more severe information asymmetries (Berger, Klapper and Udell, 2001), more financial constraints (Whited, 1992; Fazzari and Petersen, 1993) and they are more likely to suffer financial distress (Rajan and Zingales, 1995; Titman and Wessel, 1988). Also, financial distress are associated with high fixed costs and these costs are proportionately

greater for smaller firms (Warner, 1977). Thus, we would expect a negative relation between firm size and cash holdings.

Relationships with financial institutions

Establishing bank relationships between borrower and lender reduces information asymmetry and agency problems, since valuable information about client quality can be disclosed. Thus, according to various theoretical contributions (Leland and Pyle, 1977; Diamond, 1984; Boyd and Prescott, 1986), establishing stable links with financial institutions can improve both the availability and the conditions of financing. Various works have empirically demonstrated that keeping banking relationships can be beneficial to firms, insofar as contact between the firm and financial intermediary can improve the availability of funds and lower their costs (Petersen and Rajan, 1994).

On the basis of these arguments, Ozkan and Ozkan (2004) maintain that building relationships with financial institutions will improve firms' ability to access external financing. This suggests that firms with a higher proportion of bank debt will be able to access external financing more easily. The firms could then keep lower cash levels, as indeed Ozkan and Ozkan (2004) find in the case of British firms. Thus, we would expect a negative relation between bank debt and cash holdings.

Probability of financial distress

Costs of financial distress arise when the firm cannot meet its payment obligations contracted with third parties, either in the short or the long term. This factor could affect firms' cash holding decisions, although there is certain controversy about the direction. Guney et al. (2003), Ferreira and Vilela (2004) and Ozkan and Ozkan

(2004) argue that firms in financial distress could raise their cash levels in order to reduce their default risk. However, Kim et al. (1998) expect firms with a greater likelihood of financial distress to have lower levels of liquidity.

Leverage

The leverage ratio will also affect firms' cash holdings. The empirical evidence (Kim et al., 1998; Opler et al., 1999; Ferreira and Vilela, 2004; Ozkan and Ozkan 2004) demonstrates a reduction in cash levels when firms increase their financial leverage. This may be because the higher the financial leverage, the higher the costs of the funds used to invest in liquid assets (Baskin, 1987). In addition, as John (1993) maintains, firms that can access the debt market can resort to lending as a substitute for liquid assets.

Debt maturity structure

The distribution in the debt maturities between short and long term can also affect decisions concerning liquid financial assets, as Guney et al. (2003) and Ferreira and Vilela (2004) sustain. On the one hand, the use of short-term debt obliges firms to periodically negotiate the renewal of their credits, with the consequent risk of refinancing. Thus, firms with a larger proportion of short-term debt will keep higher cash levels in order to avoid the financial distress that they would incur if their loans failed to be renewed.

Furthermore, on the basis of debt maturity structure models (for example Flannery, 1986, and Kale and Noe, 1990), firms with greater information asymmetry

will keep more short-term debt. This relation is confirmed in various empirical studies[†], so that debt maturity can also be regarded as a proxy for information asymmetry. From this perspective therefore we would expect firms with a higher proportion of short-term debt to keep higher cash holdings.

Cash flows generated by the firm

Myers and Majluf (1984) argue that in the presence of information asymmetry firms will establish a hierarchy in their use of funding sources. According to hierarchy theory, firms prefer to fund themselves with resources generated internally before resorting to the market. In these circumstances, firms with large cash flows will keep higher cash levels, as is confirmed by Opler et al. (1999) and Ozkan and Ozkan (2004), for the US and British markets respectively, or Ferreira and Vilela (2004) for European Monetary Union (EMU) countries. However, Kim et al. (1998) claim that the relation is in fact negative, as they consider that cash flows represent an additional source of liquidity for the firm and can therefore substitute cash.

Liquidity

The presence of liquid assets besides cash and marketable securities can also affect firms' optimal cash holdings, since they can be considered substitutes of cash. We would therefore expect firms with more liquid assets other than cash holdings to reduce their cash levels.

In Chart 1, we summarise the main explanatory factors of firms' levels of cash holdings.

[†] Stohs and Mauer (1996) and Guedes and Opler (1996) among others.

CHART 1

3. DATA AND VARIABLES

3.1 Sample and data

The information required for the sample was taken from the SABE (System of Analysis of Spanish Balance Sheets) database, elaborated by Bureau Van Dijk. This database includes accounting and financial information on Spanish firms, obtained from the annual financial statements deposited at the Registry of Companies.

We selected firms from the manufacturing sector that during the period of analysis (1996-2001) complied with the SME condition, according to the requirements established by the European Commission recommendation 96/280/CE of 3rd April, 1996 on the definition of small and medium-sized firms. Specifically, the sample firms met the following conditions: a) have less than 250 employees; b) turn over less than €40 million; and c) possess less than €27 million worth of total assets.

The information obtained was refined, eliminating cases with errors in the accounting data or lost values for some of the variables from the sample. Specifically, we required that variables such as assets, fixed assets, working capital and short-term and long-term debt be positive, as well as any other variable defined as positive. After applying the corresponding filters, we built a panel comprising 5160 observations corresponding to 860 firms.

In addition, we required interest rate data, which we obtained from publications of the Information Bureau of the Spanish Annotated Public Debt Market.

3.2 Variables

The dependent variable used in this study has been measured in two ways. First, and similarly to Ozkan and Ozkan (2004), we used the variable $CASH_1$, calculated as the ratio of cash and marketable securities to total assets. Second, we used the variable $CASH_2$, which is identical to $CASH_1$ except that in the denominator cash and marketable securities are subtracted from the total assets (Opler et al., 1999). The higher the values of both these measures, the higher the firms' cash level.

With regards the explanatory factors of cash holdings[‡], we used, in the first place, firms' *growth opportunities*. In this case, given that the sample comprises small and medium-sized firms for which no information about their market value is available, we cannot use the book-to-market ratio, as is commonly done. Instead, this variable is measured by means of two alternative proxies used by Scherr and Hulburt (2001). First, the ratio depreciation/assets ($GROWP_1$), which measures investment in tangible assets. Firms with a larger investment in these assets are considered to have less growth opportunities. Second, we used the ratio $sales_0/sales_{-1}$ ($GROWP_2$). In this case, firms that grew most in the past are assumed to have more growth opportunities in the future. Thus, we would expect the dependent variable to be negatively related to the first proxy and positively related to the second.

To measure *size* we also used two proxies. On of the one hand $SIZE_1$, which is calculated as the natural logarithm of assets and on the other $SIZE_2$, the natural logarithm of sales. A negative relation is expected between both variables and the amount of liquid financial assets held, since information asymmetry and the probability of default are greater in smaller firms. In addition, as we said in Section 2, larger firms keep lower cash holdings. Thus, there may be economies of scale associated with the cash holdings kept to meet the costs of any possible normal firm transactions.

The *relationships with financial institutions (BANKD)* has been approximated by considering the debt levels that the firms maintain with their banks. Specifically, *BANKD* is calculated as the ratio of short-term bank debt to total debt. The expected relation between this variable and firms' cash holdings is negative.

The likelihood of financial distress is calculated according to the re-estimation of Altman's (1968) model carried out by Begley, Mings and Watts (1996), given by the following expression:

$$ZSCORE=0.104*X_1 + 1.010*X_2 + 0.106*X_3 + 0.003*X_4 + 0.169*X_5$$

where X_1= Working capital / Total assets; X_2= Reserves / Total Assets; X_3= Net operating profits / Total assets; X_4= Book value of capital / Book value of debt; X_5= Sales / Total assets

Although the ratio X_4 is calculated by market value of capital / book value of debt in the original model, here we have used the alternative proposed by Scherr and Hulburt (2001): the book value (and not the market value) of the assets. This is because the market value is not available in the case of SMEs.

A higher ZSCORE implies a lower default risk. Its effect on cash holdings is not at all clear, as we have said in Section 2.

The *leverage (LEV)* has been measured by the ratio of debt to shareholder equity. The previous empirical evidence has found a negative relation between this variable and cash holdings.

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‡ In Appendix 1, we briefly describe these variables.

The *debt maturity structure* is measured by the variable *LTDEBT*, defined as long-term debt divided by total debt. We would expect a negative relation between this variable and the dependent variable. Indeed, firms that use more long-term debt have less risk of refinancing and less information asymmetry.

The *cash flow* has been approximated by dividing pre-tax profits plus depreciation over total assets *($CFLOW_1$)* or sales *($CFLOW_2$)*. We would expect firms with larger cash flows to hold more cash.

On the other hand, and similarly to Opler et al. (1999), Ferreira and Vilela (2004) and Ozkan and Ozkan (2004), we calculated the ratio of working capital less cash to total assets (LIQ) to measure the existence of other liquid assets that may substitute cash. In this case we would expect a negative relation.

Finally, the opportunity cost of the capital invested in liquid assets (*RSPREAD*) has been measured, following Kim et al. (1998), as the difference between the return on the firm's assets (gross operating profits/assets) and the return on Treasury bills. According to these authors this variable should be negatively related to cash holdings, since it measures how attractive investment in the firm's activities is compared to investing in liquid assets.

In order to characterise the firms of the sample, in Table I we report the descriptive statistics of the variables used. We can see that the sample is made up of small firms, with average assets of €8.6 million and average sales of €10.73 million. Likewise, they are highly leveraged, with debt of 2.63 times their shareholder equity. Bank debt represents almost 30% of these firms' debt. In addition, most of their debt is short-term, with their long-term debt making up only 16.8% of their external financing. The average cash holdings of the Spanish SMEs is 6.57% of total assets ($CASH_1$), and 8% if cash and marketable securities are subtracted from total assets ($CASH_2$).

TABLE I

In Table II we report the correlation coefficients of the variables. In general, we can say that the correlations between firms' cash holdings and the explanatory variables have the expected sign, except for the variable measuring the opportunity cost (RSPREAD), although the proxies for size ($SIZE_1$, $SIZE_2$) and liquidity (LIQ) are not statistically significant. On the other hand, the correlation between the explanatory variables is not high except for the case of $CFLOW_1$ and RSPREAD, with a correlation coefficient of 0.7536.

TABLE II

4. METHODOLOGY

We tested the hypotheses about determining factors of firms' cash holdings using the panel data methodology.

Panel data are useful in that they permit the possibility of relaxing and testing assumptions that are implicit in cross-sectional analyses. In particular, we might mention two relevant aspects. On the one hand, controlling for unobservable heterogeneity, since the methodology provides us with more than one cross section. This allows us to eliminate biases deriving from the existence of individual effects (Hsiao, 1985). On the other hand, the panel data methodology also makes it possible to model dynamic responses with micro data.

In addition, we aim to determine if the changes in the firms' cash ratios follow a partial adjustment model. Thus, we assume that the firms pursue a target level when

making their cash decisions. In this way, the levels achieved at any time will also be explained by the decisions taken in past periods. To test this, and following Ozkan and Ozkan (2004), we consider that the optimal cash level is given by particular characteristics of the firm explained above plus a random disturbance, such that:

$$CASH^{*}_{it} = \rho + \sum_{k} \beta_{k} x_{kit} + \upsilon_{it} \quad (1)$$

Firms will adjust their cash levels to achieve this level, such that any changes occurring will be determined by:

$$CASH_{it} - CASH_{it-1} = \gamma\,(CASH^{*}_{it} - CASH_{it-1}) \quad (2)$$

where $(CASH^{*}_{it} - CASH_{it-1})$ indicates the adjustment required to reach the optimal level. Firms' capacity to achieve the desired level will be given by the coefficient γ, which takes values between 0 and 1. If γ is 1, the firms will adjust their cash levels to the optimal level immediately; if it is 0, this indicates that the costs of adjustment are so high that the firms cannot modify their existing cash structures.

Thus, substituting (1) into (2), the equation that explains the cash levels kept by firms is as follows:

$$CASH_{it} = \alpha + \delta_{0}\ CASH_{it-1} + \sum_{k=1} \delta_{k} x_{kit} + \varepsilon_{it} \quad (3)$$

where $\alpha = \rho\gamma$; $\delta_{0} = (1-\gamma)$; $\delta_{k} = \gamma\beta_{k}$; and $\varepsilon_{it} = \gamma\upsilon_{it}$.

In addition, if we introduce the firms' unobservable individual effects and the time dummy variables into the model, the model to estimate becomes:

$$CASH_{it} = \alpha + \delta_0 CASH_{it-1} + \delta_1 GROWP_{it} + \delta_2 SIZE_{it} + \delta_3 BANKD_{it} + \delta_4 ZSCORE_{it} + \delta_5 LEV_{it} + \delta_6 LTDEBT_{it} + \delta_7 CFLOW_{it} + \delta_8 LIQ_{it} + \delta_9 RSPREAD_{it+} + \eta_i + \lambda_t + \varepsilon_{it} \quad (4)$$

The variable η_i (unobservable heterogeneity) aims to measure the particular characteristics of each firm as well as the characteristics of the sector in which they operate. On the other hand, the parameters λ_t are time dummy variables that change in time but are equal for all firms in each of the time periods considered. In this way, we attempt to capture the economic variables (interest rates, prices, etc.) that firms cannot control and which may affect their cash decisions. We should bear in mind that the parameter δ_0 is 1 minus the adjustment coefficient (the adjustment costs).

Regressions of dynamic panels are characterised by the existence of autocorrelation, as a consequence of considering the lagged dependent variable as explanatory variable. In this way, estimations used in static frameworks lose their consistency[§]. Indeed, the estimation by OLS of Equation (4) is inconsistent even if the ε_{it} are not serially correlated, since $CASH_{it-1}$ is correlated with η_i. Likewise, the intragroup estimator, which estimates Equation (1) with the variables transformed into deviations from the mean, is also inconsistent, as a consequence of the correlation that arises between $(CASH_{it-1} - \overline{CASH}_{it-1})$ and $(\varepsilon_{it} - \overline{\varepsilon_{it}})$. Finally, the OLS estimator in first differences is equally inconsistent, since $\Delta CASH_{it-1}$ and $\Delta\varepsilon_{it}$ are correlated, given that $CASH_{it-1}$ and ε_{it-1} are.

[§] See Baltagi (2001).

Considering the previous limitations, the parameters of Equation (4) will be estimated using instrumental variable estimators and specifically applying the General Method of Moment (GMM) on the equation in first differences. This procedure, developed by Arellano and Bond (1991)[**], presents two levels of application in function of the nature of the ε_{it}. If the residuals are homoskedastic, the 1-stage GMM turns out to be optimal. If in contrast there is heteroskedasticity, the estimator of instrumental variables in one stage continues to be consistent, but conducting the estimation in two stages increases efficiency. This procedure makes use of the residuals of the 1-stage estimation.

The GMM estimators that use lagged variables as instruments under the assumption of "white noise" disturbances are inconsistent if the errors are autocorrelated (Arellano and Bover, 1990). In this way, this methodology assumes that there is no second-order serial correlation in the errors in first differences. For this reason, in order to test the consistency of the estimations, we used the test for the absence of second-order serial correlation proposed by Arellano and Bond (1991). Likewise, we employed the Sargan (1958) test of over-identifying restrictions, which tests for the absence of correlation between the instruments and the error term.

5. RESULTS

5.1 Univariate analysis

We first conducted a univariate analysis in order to determine if there were significant differences for the variables studied between the firms in function of their levels of cash holdings. For this, in Table III we present the mean values of the variables used in this study for each quartile of the variable $CASH_1$. Following Opler et

[**] Arellano and Bond's (1991) GMM estimators use more instruments and are more efficient than the

al. (1999), the quartiles have been constructed annually, which explains why the ranges of the variable $CASH_1$ overlap across quartiles. We then carried out a difference of means tests based on Student's t to determine if the mean values of the fourth quartile are significantly different from those of the first. The t statistic is shown in the final column in Table III.

TABLE III

In general, the characteristics of the firms holding most cash (fourth quartile) are significantly different from those with lower cash holdings (first quartile). Thus, firms with greater growth opportunities, higher opportunity cost, higher cash flows and more liquidity present higher levels of cash. In contrast, the cash holding is lower in smaller firms, in those with more likelihood of insolvency, more leverage, more long-term debt and higher proportion of bank debt. However, we should mention that the relation found for opportunity cost or liquidity is in the opposite direction to that which we expected. Likewise, the significance of the difference of means for size and growth opportunities depends on the measure used. Nevertheless, various variables do not change monotonically with cash levels, as can be seen for example for the variable LIQ. This indicates that comparing the first and fourth quartiles is not sufficient to describe the relation between cash holdings and firm characteristics.

5.2 Multivariate analysis

In tables IV and V we report the results obtained for the estimation of the dynamic model described in Section 4. The explanatory variables have been assumed to

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estimator proposed by Anderson and Hsiao (1982).

be endogenous[††]. This is justified since many of the variables are built from financial figures presented by the firms, so that it is difficult to regard them as exogenous (Kremp, Stohs and Gerdesmeier, 1999). Moreover, as Guney et al. (2003) point out, the random disturbances that affect decisions about cash holdings can also influence firm characteristics such as leverage, growth opportunities, etc.

All the estimations have been carried out using the 2-stage GMM estimator, since the 1-stage estimation can present problems of heteroskedasticity, as is shown by the rejection of the null hypothesis of the Sargan (1958) test in these estimations. Furthermore, we do not detect any second-order serial correlation, which confirms the consistency of the estimations.

In column 1 of Table IV we show the results of the estimation of Equation (4). Given the strong correlation between the variables RSPREAD and CFLOW, in columns 2 and 3 we re-estimated Equation (4), excluding one of these two variables from each column. In general the results are similar, as can be seen by observing columns 1, 2 and 3.

TABLE IV

Specifically, the lagged dependent variable $CASH_{1t-1}$ is significant and positive, which confirms the dynamic behaviour of cash holding decisions. Hence it is clear that firms pursue a target cash holding level that balances the costs and benefits of keeping cash. This is consistent with the results found by Guney et al. (2003) and Ozkan and Ozkan (2004) for large firms. In addition, we find that the Spanish SME try to adjust their cash levels to the optimal level more quickly than the firms studied by Guney et al.

[††] $E(x_{it}\,\varepsilon_{is}) \neq 0$ for $s \leq t$ and $E(x_{it}\,\varepsilon_{is})=0$ for all $s>t$.

(2003). Indeed, their adjustment coefficient (1- δ_0) is roughly 0.8, compared to 0.6 obtained for large British firms or 0.5 for French, German or Japanese firms. This could be motivated by the cost borne by small firms of being far from their target level, which is higher than that of the larger firms.

Along with the search for an optimal cash level, decisions about liquid assets are also affected by the explanatory factors considered in Section 2 of this work. The main exception is the variable $GROWP_1$, which is not found to be significant. This result differs from the findings of Kim et al. (1998), Opler *et al*. (1999) and Ozkan and Ozkan (2004) for the US and British markets, but it is consistent with the finding by Guney et al. (2003) for the French and German markets, which are more similar to the Spanish market[‡‡].

Firm size ($SIZE_1$) is not an explanatory factor of cash levels either. This result coincides with that found in previous work (Kim et al., 1998; Guney et al., 2003; Ozkan and Ozkan, 2004), although in our case it may be justified by the greater homogeneity of the sample, which is made up of small firms that do not differ very much in size.

On the other hand, and as predicted, we observe that the coefficient of the variable BANKD is significant and negative. This appears to indicate that maintaining a banking relationship improves access to this type of external financing by reducing the information asymmetry between borrower and lender. In this way, and as is confirmed empirically by Ferreria and Vilela (2004) and Ozkan and Ozkan (2004), firms that are more highly indebted to credit institutions can reduce their investments in liquid financial assets.

[‡‡] These countries, whose legal systems are based on civil law, have less developed capital markets than the United States and Great Britain (La Porta, Lopez de Silanes, Shleifer and Vishny, 1997).

With regards the effects of leverage (LEV) on cash holdings, the results appear to indicate that the most highly leveraged SMEs have higher cash holdings. This result, which contradicts most of the empirical evidence for large firms, is inconsistent with the idea that more leveraged firms should maintain lower cash holdings because they incur higher interest rates and have easier access to the capital markets (Baskin, 1987; John, 1993; Kim et al., 1998). However, it is consistent with Faulkender's (2004) findings for American SMEs. As this author points out, small and medium-sized firms find it more difficult to gain access to the capital markets, so that it is beneficial for them to maintain high levels of cash rather than use it to reduce their debt. Furthermore, Ozkan and Ozkan (2004) also consider that more highly leveraged firms may keep more cash in order to lower their default risk. But this explanation loses force, since the coefficient of the variable measuring financial distress (ZSCORE) is not significant. Hence, there does not appear to be a relation between likelihood of default and cash holdings.

The coefficient of the variable LTDEBT is significant and negative, which shows that the debt maturity structure also affects firms' cash holdings. Specifically, firms with a higher proportion of short-term debt will keep higher levels of cash. They thereby reduce the risk deriving from the non-renewal of their short-term debt. Furthermore, they also reduce the costs associated with dependence on external financing, given the higher information asymmetry of firms with more short-term debt.

The variable CFLOW is also significant and we find that firms generating larger cash flows possess greater cash holdings, as we expected. This result holds both when we include the variable RSPREAD in the regression (column 1 of Table IV) and when we do not (column 3 of Table IV). This supports the idea that in the presence of information asymmetries firms prefer to finance themselves with internally generated resources.

On the other hand, the relation between cash holdings and asset liquidity (LIQ) is negative, although the significance of this variable does vary in function of the estimation carried out. Nevertheless, in the various tests for consistency carried out this coefficient is mostly negative and significant. This supports the hypothesis that firms with more liquid assets will tend to reduce their cash levels, since these assets can be used as cash substitutes.

Finally, the measure of opportunity cost (RSPREAD) is not significantly different from zero. This result holds both when regressing the full model (column 1 of Table IV) and when subtracting the variable CFLOW (column 2 of Table IV). Thus, we find that the lower return that may be the consequence of holding cash does not affect decisions about cash holdings.

To confirm the robustness of the previous results, in Table IV we repeated the estimations using alternative proxies for some variables. Thus, in column 4 we report the results obtained using $GROWP_2$ ($sales_0/sales_{-1}$) as a measure of growth opportunities; in column 5 we use the variable $SIZE_2$ (logarithm of sales) as a measure of size; and in column 6 we introduce a proxy for the cash flows that is less correlated with the variable RSPREAD ($CFLOW_2$). The results obtained with these new estimations are generally consistent with the earlier results.

Finally, and to lend more consistency to the results, we repeated all the previous estimations with the dependent variable $CASH_2$, in which the total assets exclude cash and marketable securities. The results, presented in Table V, are consistent with those found above for the variable $CASH_1$.

TABLE V

6. CONCLUSIONS

The aim of this work has been to examine the determinants of the cash holdings of a sample of small and medium-sized Spanish firms. With this in mind, we used a panel made up of 5160 observations corresponding to 860 Spanish SMEs from the period 1997-2001.

First, we used a dynamic panel to test for the existence of an optimal cash holding. Our findings demonstrate that decisions about cash holdings follow a partial adjustment model. Thus, we find that firms pursue a target level for their cash holdings and their decisions are taken in the aim of achieving this. In addition, the speed with which Spanish SMEs attempt to adjust their levels to the optimal level is higher than that found in previous work for large firms. This may be indicating that the cost of being far from the optimal level is higher for SMEs.

With regards the effects deriving from the existence of market imperfections, the results appear to indicate that firms with more information asymmetry hold more liquid assets. Indeed, on the one hand bank debt is associated with lower levels of cash, which supports the idea that relationships with credit institutions can reduce agency costs and information asymmetry between borrowers and lenders, thereby cutting the firms' cost of external financing. On the other hand, firms with more short-term debt, which are therefore likely to have greater information asymmetry, also hold more cash. Equally, firms with greater capacity to generate cash flows possess higher cash holdings. However, the existence of growth opportunities does not appear to affect the decision to hold liquid assets, a result that coincides with research for large firms belonging to "continental system" countries such as France and Germany.

In contrast, the existence of substitutes for cash also affects firms' cash holdings, since possessing liquid assets reduces cash levels.

Finally, our results appear to indicate that more highly leveraged SMEs hold higher levels of cash. This finding, consistent with the evidence on American SMEs, contrasts with the results found in the literature on large firms. This appears to indicate that SMEs prefer to keep high cash levels rather than use the cash to reduce their debt, given their greater difficulty in gaining access to the capital market. It may also be the case that more indebted firms hold more cash in order to reduce their default risk. This explanation loses weight, however, since we have not found a clear relation between likelihood of financial distress and cash holdings.

Appendix 1. Description of variables	
Name	**Definition**
Cash holdings *($CASH_1$)*	Cash + Marketable securities / Total assets
Cash holdings *($CASH_2$)*	Cash + Marketable securities / Total assets – (Cash + Marketable securities)
Growth opportunities *($GROWP_1$)*	Depreciation / Total assets
Growth opportunities *($GROWP_2$)*	$Sales_0$ / $Sales_{-1}$
Size *($SIZE_1$)*	ln (Assets)
Size *($SIZE_2$)*	ln (Sales)
Bank debt *(BANKD)*	S-T Bank debt / Total debt
Probability of financial distress *(ZSCORE)*	ZSCORE= $0{,}104*X_1 + 1{,}010*X_2 + 0{,}106*X_3 + 0{,}003*X_4 + 0{,}169*X_5$ where X_1= Working capital / Total assets; X_2= Reserves / Total Assets; X_3= Net operating profits / Total assets; X_4= Book value of capital / Book value of debt; X_5= Sales / Total assets
Leverage (*LEV)*	Total debt / Shareholders equity
Debt maturity structure *(LDEBT)*	L-T debt / Total debt
Cash flow *($CFLOW_1$)*	Pre-tax profits + Depreciation / Total assets
Cash flow *($CFLOW_2$)*	Pre-tax profits + Depreciation / Sales
Other liquid assets *(LIQ)*	Working capital – (Cash + Marketable securities) / Total assets
Opportunity cost *(RSPREAD)*	Gross operating profit / Assets – interest rate 1-yr T-bills

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Chart 1: Determinants of cash holdings in SMEs

Factor	**Relation with cash holdings**	**Explanation**
Growth opportunities	Positive	-External finance more expensive due to information asymmetries and agency problems.
Size	Negative	-Economies of scale, information asymmetry, financial constraints, financial distress.
Relationships with banks	Negative	-Ease of access to external financing.
Probability of financial distress	Positive/Negative	-Raise cash level to reduce financial distress. -Worsening financial distress reduces liquid assets.
Leverage	Positive/Negative	-More severe financial distress. -Raised cost of resources to keep liquid assets.
Debt maturity structure	Negative	-Increased risk of refinancing of short-term debt. -More information asymmetry.
Capacity of cash flow generation	Positive/Negative	-Preference for internal financing. -Source of additional liquidity.
Liquidity	Negative	-Possibility of alternative financing.
Opportunity cost of holding cash	Negative	-Alternative return to keeping cash.

Table I. Descriptive statistics

CASH$_1$ is the ratio of cash plus marketable securities to total assets; *CASH*$_2$ the ratio of cash plus marketable securities to total assets less cash and marketable securities; *GROWP*$_1$ and *GROWP*$_2$ measure growth opportunities; *ASSETS* and *SALES* the size; *BANKD* level of short-term bank debt; *ZSCORE* probability of financial distress; *LEV* the leverage; *LDEBT* debt maturity structure; *CFLOW*$_1$ and *CFLOW*$_2$ capacity to generate cash flow; *LIQ* investment in other liquid assets; *RSPREAD* opportunity cost of keeping cash.

Variable	Obs	Mean	Est. Des.	Median	Perc 10	Perc 90
CASH$_1$	5160	0.0657	0.0787	0.0380	0.0038	0.1665
CASH$_2$	5160	0.0800	0.1167	0.0395	0.0038	0.1997
GROWP$_1$	5160	0.0463	0.0293	0.0405	0.0159	0.0846
GROWP$_1$	4300	1.1023	0.2720	1.0808	0.9135	1.2860
ASSETS	5160	8600183	4956745	7311955	3488190	15954179
SALES	5160	10733830	6260136	8884473	4683231	19475743
BANKD	5160	0.2898	0.1733	0.2855	0.0583	0.5201
ZSCORE	5160	0.4812	0.2035	0.4653	0.2370	0.7477
LEV	5160	2.6320	5.2280	1.8071	0.5756	4.8151
LDEBT	5160	0.1680	0.1441	0.1352	0.0125	0.3768
CFLOW$_1$	5160	0.1064	0.0800	0.0945	0.0300	0.2055
CFLOW$_2$	5160	0.0881	0.0933	0.0728	0.0223	0.1757
LIQ	5160	0.0885	0.1612	0.0776	-0.1033	0.3011
RSPREAD	5160	0.0305	0.0750	0.0221	-0.0359	0.1164

Table II: Correlation Matrix

CASH$_1$ is the ratio of cash plus marketable securities to total assets; *CASH*$_2$ the ratio of cash plus marketable securities to total assets less cash and marketable securities; *GROWP*$_1$ and *GROWP*$_2$ measure growth opportunities; *SIZE*$_1$ and *SIZE*$_2$ the size; *BANKD* level of short-term bank debt; *ZSCORE* probability of financial distress; *LEV* the leverage; *LDEBT* debt maturity structure; *CFLOW*$_1$ and *CFLOW*$_2$ capacity to generate cash flow; *LIQ* investment in other liquid assets; *RSPREAD* opportunity cost of keeping cash.

	CASH$_1$	**CASH$_2$**	**GROWP$_1$**	**GROWP$_2$**	**SIZE$_1$**	**SIZE$_2$**	**BANKD**	**ZSCORE**	**LEV**	**LDEBT**	**CFLOW$_1$**	**CFLOW$_2$**	**LIQ**	**RSPREAD**
CASH$_1$	1													
CASH$_2$	0.9832***	1												
GROWP$_1$	-0.0675***	-0.068***	1											
GROWP$_2$	-0.0104	-0.0143	-0.0316**	1										
SIZE$_1$	-0.0021	0.0086	-0.0432***	0.0610***	1									
SIZE$_2$	-0.0156	-0.0218	-0.043***	0.1449***	0.7525***	1								
BANKD	-0.3399***	-0.3181***	-0.0946***	-0.0493***	0.0041	-0.0217	1							
ZSCORE	0.3515***	0.3315***	0.0371***	-0.0403***	-0.1280***	0.1220***	-0.2320***	1						
LEV	-0.0991***	-0.0946***	-0.0729***	0.0089	-0.0359***	-0.0305**	0.0649***	-0.2749***	1					
LDEBT	-0.0294**	-0.0248*	0.2026***	-0.0349**	0.1156***	-0.0852***	-0.2521***	-0.2447***	0.0986***	1				
CFLOW$_1$	0.2731***	0.2540***	0.3539***	0.1416***	0.0116	0.111***	-0.3029***	0.3275***	-0.2473***	-0.0611***	1			
CFLOW$_2$	0.2367***	0.2355***	0.2440***	0.0204	0.1586***	-0.0591***	-0.2092***	0.1294***	-0.1967***	0.0976***	0.7216***	1		
LIQ	-0.0022	-0.0096	-0.2220***	-0.0245	0.0228	0.0642***	-0.1378***	0.4544***	-0.2019***	-0.0184	0.0955***	0.0203	1	
RSPREAD	0.2449***	0.2254***	-0.0403***	0.2102***	0.0019	0.1538***	-0.1923***	0.2661***	-0.1520***	-0.1188***	0.7536***	0.4473***	0.1312***	1

* Significant at 90%. ** Significant at 95%. *** Significant at 99%.

Table III: Firms characteristics by $CASH_1$ quartiles

Comparison of mean values of characteristics of 860 firms for period 1996-2001. Quartiles for variable $CASH_1$ created annually. Median values in brackets. *$CASH_1$* is the ratio of cash plus marketable securities to total assets; *$CASH_2$* the ratio of cash plus marketable securities to total assets less cash and marketable securities; *$GROWP_1$* and *$GROWP_2$* measure growth opportunities; *$SIZE_1$* and *$SIZE_2$* the size; *BANKD* level of short-term bank debt; *ZSCORE* probability of financial distress; *LEV* the leverage; *LDEBT* debt maturity structure; *$CFLOW_1$* and *$CFLOW_2$* capacity to generate cash flow; *LIQ* investment in other liquid assets; *RSPREAD* opportunity cost of keeping cash. t statistic tests difference of means between first and fourth quartile. P-value in brackets

	First quartile	Second quartile	Third quartile	Forth quartile	t
Range $CASH_1$	0 a 0.0141	0.0117 a 0.0420	0.0337 a 0.0919	0.0839 a 0.4986	
$CASH_1$	0.0056	0.0243	0.0584	0.1745	70.98
	(0.0050)	(0.0230)	(0.0564)	(0.1460)	(0.00)
$CASH_2$	0.0051	0.0204	0.0469	0.1602	34.75
	(0.0042)	(0.0182)	(0.0426)	(0.1145)	(0.00)
$GROWP_1$	0.0489	0.0457	0.0470	0.0438	-4.28
	(0.0427)	(0.0405)	(0.0417)	(0.0374)	(0.00)
$GROWP_2$	1.0995	1.0923	1.1157	1.1018	0.16
	(1.0823)	(1.0805)	(1.0922)	(1.0701)	(0.87)
$SIZE_1$	14.1326	13.9657	13.9451	14.0237	-5.06
	(14.1280)	(13.9515)	(13.9159)	(14.0006)	(0.00)
$SIZE_2$	14.2744	14.2133	14.2262	14.2614	-0.60
	(14.2535)	(14.1632)	(14.1863)	(14.2190)	(0.61)
BANKD	0.3434	0.3278	0.2887	0.1995	-22.03
	(0.3419)	(0.3337)	(0.2837)	(0.1548)	(0.00)
ZSCORE	0.3986	0.4542	0.4860	0.5858	24.46
	(0.3923)	(0.4420)	(0.4681)	(0.5907)	(0.00)
LEV	3.0054	3.0793	2.5969	1.8462	-6.99
	(2.1885)	(2.0411)	(1.9377)	(1.1146)	(0.00)
LDEBT	0.1816	0.1646	0.1666	0.1593	-3.88
	(0.1569)	(0.1299)	(0.1317)	(0.1153)	(0.00)
$CFLOW_1$	0.0850	0.0930	0.1076	0.1402	17.53
	(0.0770)	(0.0824)	(0.0992)	(0.1284)	(0.00)
$CFLOW_2$	0.0762	0.0748	0.0842	0.1172	10.00
	(0.0640)	(0.0615)	(0.0733)	(0.0979)	(0.00)
LIQ	0.0800	0.0953	0.0849	0.0936	2.10
	(0.0648)	(0.0801)	(0.0689)	(0.1000)	(0.03)
RSPREAD	0.0105	0.0202	0.0326	0.0587	15.79
	(0.0079)	(0.0152)	(0.0264)	(0.0479)	(0.00)

Table IV. Determinants of cash holdings in SMEs (I)

Dependent variable $CASH_1$ is ratio of cash plus marketable securities to total assets. $GROWP_1$ and $GROWP_2$ measure growth opportunities; $SIZE_1$ and $SIZE_2$ the size; *BANKD* level of short-term bank debt; *ZSCORE* probability of financial distress; *LEV* the leverage; *LDEBT* debt maturity structure; $CFLOW_1$ and $CFLOW_2$ capacity to generate cash flow; *LIQ* investment in other liquid assets; *RSPREAD* opportunity cost of keeping cash.

	1	**2**	**3**	**4**	**5**	**6**
$CASH_{1t-1}$	0.2054***	0.2111***	0.2295***	0.2400***	0.2467***	0.2221***
	5.32	5.19	5.56	5.79	5.93	5.9
$GROWP_1$	0.0813	0.1586	0.0675		0.0714	0.1251
	0.54	1.02	0.44		0.45	0.85
$GROWP_2$				-0.0139		
				-1.96		
$SIZE_1$	-0.0105	-0.0095	-0.0090	-0.0009		-0.0164
	-0.76	-0.66	-0.66	-0.07		-1.15
$SIZE_1$					-0.0206	
					-1.48	
BANKD	-0.0946***	-0.0972***	-0.0896***	-0.0918***	-0.0743***	-0.0903***
	-3.36	-3.38	-3.23	-3.36	-2.61	-3.26
ZSCORE	-0.0181	-0.0310	-0.0189	-0.0273	0.0179	-0.0051
	-0.64	-1.18	-0.67	-0.94	0.54	-0.17
LEV	0.0007***	0.0006**	0.0006**	0.0004*	0.0007***	0.0006***
	2.88	2.38	2.53	1.96	2.64	2.62
LDEBT	-0.0465*	-0.0651***	-0.0510**	-0.0619**	-0.0481*	-0.0470**
	-1.9	-2.74	-2.03	-2.44	-1.93	-2.05
$CFLOW_1$	0.0756**		0.0564*	0.0462	0.0916***	
	2.06		1.8	1.32	2.65	
$CFLOW_2$						0.0468***
						2.68
LIQ	-0.0764*	-0.0431	-0.0644	-0.0795**	-0.0753*	-0.0815**
	-1.93	-1.16	-1.62	-1.98	-1.86	-2.14
RSPREAD	-0.0392	0.0082				-0.0140
	-1	0.25				-0.45
C	0.0016	0.0015	0.0015	0.0006	0.0019*	0.0018
	1.3	1.18	1.2	0.53	1.82	1.41
m_2	-0.58	-0.50	-0.39	0.06	-0.20	-0.37
Sargan Test	79.80 (90)	78.01 (81)	74.10 (81)	76.92 (77)	73.54 (81)	82.35 (90)
Observation	3440	3440	3440	3440	3440	3440

z statistic in brackets.

* Significant at 90%. ** Significant at 95%. *** Significant at 99%.

m_2 is test for second-order serial autocorrelation in residuals in first differences, distributed asymptotically as N(0,1) under null hypothesis of no serial correlation.

Sargan Test is test of over-identifying restrictions distributed asymptotically under null hypothesis of validity of instruments as Chi-squared. Degrees of freedom in brackets.

Table V. Determinants of cash holdings in SMEs (II)

Dependent variable $CASH_2$ is ratio of cash plus marketable securities to total assets minus cash and marketable securities. $GROWP_1$ and $GROWP_2$ measure growth opportunities; $SIZE_1$ and $SIZE_2$ the size; *BANKD* level of short-term bank debt; *ZSCORE* probability of financial distress; *LEV* the leverage; *LDEBT* debt maturity structure; $CFLOW_1$ and $CFLOW_2$ capacity to generate cash flow; *LIQ* investment in other liquid assets; *RSPREAD* opportunity cost of keeping cash.

	1	2	3	4	5	6
$CASH_{2t-2}$	0.1298***	0.1349***	0.1502***	0.1650***	0.1639***	0.1394***
	3.53	3.47	3.73	4.07	4.09	3.82
$GROWP_1$	-0.0897	0.0672	-0.0725		-0.0956	-0.0064
	-0.43	0.31	-0.34		-0.43	-0.03
$GROWP_2$				-0.0076		
				-0.75		
$SIZE_1$	-0.0034	-0.0019	-0.0002	0.0102		-0.0090
	-0.18	-0.09	-0.01	0.57		-0.46
$SIZE_2$					-0.0247	
					-1.22	
BANKD	-0.1411***	-0.1424***	-0.1356***	-0.1371***	-0.1124***	-0.1366***
	-3.7	-3.64	-3.66	-3.68	-2.94	-3.63
ZSCORE	-0.0445	-0.0592*	-0.0503	-0.0529	-0.0105	-0.0268
	-1.08	-1.65	-1.3	-1.37	-0.23	-0.64
LEV	0.0009**	0.0007**	0.0007**	0.0006*	0.0007**	0.0008**
	2.5	2.13	2.18	1.91	2.07	2.4
LDEBT	-0.0987***	-0.1165***	-0.1022***	-0.1096***	-0.0924***	-0.0962***
	-3.38	-3.94	-3.26	-3.4	-2.91	-3.47
$CFLOW_1$	0.1056**		0.0762*	0.0593	0.1201**	
	1.97		1.72	1.23	2.46	
$CFLOW_2$						0.0650***
						2.59
LIQ	-0.1073*	-0.0713	-0.0961	-0.1149**	-0.1054*	-0.1086**
	-1.85	-1.31	-1.61	-1.99	-1.8	-1.96
RSPREAD	-0.0745	0.0049				-0.0407
	-1.2	0.1				-0.83
C	0.0022	0.0020	0.0019	0.0009	0.0033**	0.0021
	1.2	1.09	1.11	0.53	2.21	1.17
m_2	-1.22	-1.15	-1.10	-0.86	-0.97	-1.11
Sargan Test	75.23 (90)	72.96 (81)	69.24 (81)	69.74 (77)	68.79 (81)	79.56 (90)
Observation	3440	3440	3440	3440	3440	3440

z statistic in brackets.

* Significant at 90%. ** Significant at 95%. *** Significant at 99%.

m_2 is test for second-order serial autocorrelation in residuals in first differences, distributed asymptotically as N(0,1) under null hypothesis of no serial correlation.

Sargan Test is test of over-identifying restrictions distributed asymptotically under null hypothesis of validity of instruments as Chi-squared. Degrees of freedom in brackets.