Corporate cash holdings: financial determinants and consequences*

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Comments welcome.

Abstract

This paper investigates the determinants and consequences of the corporate cash holdings. We use firm-level data of 4,515 firms in Canada, France, Germany, Great-Britain and the USA over the period 1989-2002. We show that cash holdings must be analyzed from a dynamic point of view: we find strong empirical support for the hypothesis of implicit cash targets. Financial determinants influence the corporate cash holdings, but it's not clear which model – the transaction cost model or the managerial opportunism thesis – supports best our empirical findings. In order to settle the question, we focus on the consequences of "excessive" cash holdings. To do so, we implement a bivariate probit model to take into account the fact that cash balances levels and the future performance of these firms are probably jointly determined. We conclude that excessive cash holdings lead to poor firm performances. This result is clearly in favor of the managerial opportunism thesis rather than the transaction cost thesis for enlightening cash holdings motivation.

Keywords: Corporate cash holdings, corporate governance, dynamic panel data, bivariate probit model.

JEL Classification: C33, G32.

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"And what about the cash, my existence jewel?"

Ch. Dickens, *Nicholas Nickelby*, ch. 17

Introduction

It's a well-known fact that nearly all firms hold cash reserves, which are often large: in our panel, the median US firm holds more than 13% of its total assets as cash and marketable securities[1] over the 1989-2002 period.

If capital markets were perfect, a firm would not have incentives or needs to hold substantial cash reserves: when firms decide to invest, or face a cash shortage, they can find the needed funds on the market at a cost which is function of the anticipated risk and profitability of their projects[2]. The gap between the reality and the prediction of the model with perfect markets is wide. Since Opler *et al.* (1999), the determinants of corporate cash holdings have been regularly studied, in order to try to fill this gap. Under the imperfection of capital markets hypothesis[3], internal and external funds are no longer perfect substitutes and many theoretical factors, firm-specific (financial) as well as institutional, have been put forward to enlighten the motives for corporate cash holdings.

On the one hand, a firm with cash holdings will not have to forego some positive net present value projects because of market imperfections, asymmetric information or transaction costs. This firm is also less likely to face financial distress. On the other hand, from a corporate governance point of view, large cash holdings can be suspected of weakening market discipline and can increase the entrenched CEO autonomy. The manager can potentially use these cash holdings to finance investments which will not enhance firm value. The question is about the relative part of cash holdings which can be explained by precautionary or optimal financial planning motives and by managerial opportunism. The existing empirical evidence is quite mixed on this question.

In this paper, we study the cash holdings determinants, using Osiris[4] and Datastream data for 4,515 firms of five countries (Canada, France, Germany, Great-Britain and USA). We implement a dynamic panel data estimation, to check whether firms act as if they had an implicit target for their cash holdings or not. With a GMM-derived method, we can focus on the dynamic nature of cash holding decisions, allowing for delays or imperfections in the adjustment of cash holdings. The dynamic nature of cash holdings is strongly confirmed, but it is hard to decide which one of the two alternative theoretical models

[1] 7% in Canada, 16% in Germany, 18% in France and 14% in Great-Britain.

[2] As long as the firm is not in financial distress.

[3] At least understood as a limited capacity of the market to finance firms and projects and to discriminate between them.

[4] Osiris is a Bureau Van Dijk's publication. Osiris provides standardized and as reported financial accounts for the world's publicly quoted companies (more than 24,000), up to 15 years on approximately.

(transaction cost model or managerial opportunism thesis) explains best the corporate cash holdings.

Since the study of the determinants of cash holdings are not sufficient enough to establish the motives for corporate cash holdings, we turn to another leading angle, emphasizing upon the consequences of what we call "excessive" cash holdings. The key idea of this section is to study the relationship between firm performance and corporate cash holdings. If the performance of firms with "too large" cash holdings is above average, corporate cash holdings have to be a clue in favor of transaction cost motives. On the contrary, if a link exists between high corporate cash holdings and bad performance of firms, it is allowed to see this link as a strong element in the favor of the managerial opportunism thesis. In order to study this relationship between cash holdings and firm performance, we estimate a bivariate probit model. The existing literature on excess cash spending, to our knowledge, has never dealt with the fact that past cash balances levels and present performance of firms are probably jointly determined[5]. The bivariate probit model with recursive equations allows us to take this fact into account.

Our paper is organized as follows. In section 1, we review the theoretical reasons for which a firm can decide to hold cash. We present our data in section 2. We study the dynamic determinants of cash holdings in section 3 and then we investigate the consequences of "excessive" cash holdings in section 4.

1 Why do firms hold cash?

1.1 Transaction costs and trade-off theory

In the trade-off theory framework, a value-maximizing firm evaluates the marginal costs and marginal benefits of cash holdings to determine its optimal cash ratio[6]. Tobin (1956) or Miller and Orr (1966) for example emphasize the transaction motive for corporate cash holdings. The underlying hypothesis is the existence of scale economies for raising external funds, encouraging firms to hold cash to avoid frequent and repetitive fund raising. Another point is that cash holdings reduce the likelihood of financial distress, allow investment even when some financial constraints are binding, and suppress the costs of raising external funds or switching from non-liquid assets to cash. The cost of holding cash is the liquidity premium, defined as the opportunity cost for holding liquid assets.

The second generation of papers about the trade-off theory is more focused on empirical issues. John (1993) studies the link between liquidity and financial distress costs. Beltz and Frank (1996) test the trade-off theory and find that empirical results strongly support the theoretical predictions of the trade-off theory. Deloof (1999) finds strong evidence of cash holdings for transaction motives, but none for precaution. D'Mello *et al.* (2004) confirm these results,

[5] Because some (at least) factors which are influencing the firm performance are also crucial to explain corporate cash holdings.

[6] The cash ratio is defined as cash and marketable securities on total assets.

adding new evidence about cash holdings and financial factors: cash holdings are decreasing in the ease of raising cash from internal sources and increasing in growth opportunities and variability of cash flow. Kim *et al.* (1998) study the optimal investment in liquidity of a firm. Following them, cash holdings are increasing in the cost of external funds, the variance of future cash flow, and the profitability on future investment, while it decreases with the opportunity cost of holding liquid assets.

1.2 Asymmetric information and cash holdings

In the transaction cost model, there are incentives for firms to hold cash, without the assumption of asymmetric information or agency problem. Introducing such a possibility intensifies the incentives for corporate cash holdings. The pecking order theory (Myers, 1984; Myers and Majluf, 1984) emphasizes on asymmetric information costs associated to external financing. To minimize these costs, firms should finance investment with internal funds first, then with external funds (debt first and finally equity)[7]. Following them, firms have to stockpile cash when they are able to in order to finance future investment without (or with less) external funds.

In this theoretical framework, Opler *et al.* (1999) investigate the determinants and consequences of cash holdings of US firms. They find that cash holdings are positively correlated with small size, investment opportunities, risk and low access to external funds (high leverage...)[8].

Another informational cost which can affect cash holdings is between banks and firms. Theoretically, one can suggest that the more a firm is linked to a bank, the less cash the firm holds, because a strong relationship between a firm and a bank is supposed to relax the constraint upon raising funds, so the firm is less likely to be constrained, which lowers the cash holdings for precautionary motives. Against the intuition, Pinkowitz and Williamson (2001) find that Japanese firms have higher levels of cash balances than US and German ones. They explain this fact by the higher power of Japanese banks and the lack of checks and balances system, such as large block shareholders. Banks are likely to encourage firms to hold large cash balances to lower their monitoring costs.

1.3 Entrenched managers and cash holdings

Another theoretical body must be evoked to understand reasons for which a firm can hold cash: the agency theory. The very basic idea of the agency theory is that managers may have their own objectives that do not necessarily coincide with those of shareholders. In this framework, to protect themselves, investors ration capital to firms (Stulz, 1990; Hart and Moore, 1998). Jensen (1986) follows the same logic and argues that managers have incentives to increase the

[7] See Smith (1993) for evidence of costly external finance.

[8] Same results are found on US firms by Kim *et al.* (1998) and Schnure (1998), on US small firms by Faulkender (2002) and on UK firms by Ozkan and Ozkan (2004).

free cash flow[9] of their firm, because it's probably the only one asset they can freely control. The manager's incentives to hold cash are mainly to lower the probability of a future financial distress and to allow investment in projects that suit his own interest but may not be in the interest of the shareholders (*cf.* Shleifer and Vishny (1997) for in-deep review of the reasons for which a manager can decide to engage additional investment on projects that they prefer even though such investment is not in the interests of shareholders).

Empirically studying this point, Kusnadi (2003) established that board size is positively related and outside block-holder ownership is negatively related to the ratio of cash to net assets in Singapore. These findings support the agency cost model: shareholders of firms with large boards and low non-management block-holder ownership do not have much power in forcing the managers to give back the cash in excess to the shareholders.

The takeover market is often viewed as a way for dealing with the agency problems of corporate free cash flow (external control of the managers by the market). Recent empirical evidence is mixed on this subject. Harford (1999) and Pinkowitz (2002) both find a negative correlation between the likelihood of becoming a target of a takeover and the cash balances levels. This counterintuitive result can be explained by enhanced ability of a target to defend itself (because of its cash reserves...) against the bidder, by repurchasing its stock, acquiring a competitor of the bidder... On the other side, Faleye (2004) investigates the proxy contests[10] as a control mechanism for addressing the agency problems of excessive corporate liquidity, and finds a positive relationship between proxy fights and high cash balances.

Some recent papers are interested in the influence of legal and institutional factors on the decision to hold cash, because of the correlation between these factors and the level of agency costs. The basic idea of these papers is that the agency costs vary among countries, according to the degree of protection the outside investors receive. The more the outside investor are protected, the more they are ready to finance firms at low cost and the less firms have to hold cash. La Porta *et al.* (1997) and La Porta *et al.* (1998) have provided some proxies for characterizing institutional and legal systems across countries. Using these proxies, Dittmar *et al.* (2003) show that cash or marketable securities holdings are higher in countries with a lower value of the anti-director rights index. This variable is a proxy for legal rights of minority shareholders[11]. They assess that shareholders in countries with poor shareholders protection are not in position to enforce managers to give back excessive cash to themselves. This result supports the agency costs of managerial discretion hypothesis for high cash holdings. These results are supported by additional evidence on EMU countries (Ferreira and Vilela, 2004). Pinkowitz *et al.* (2004) follow the same

[9] The free cash flow is the net income of the firm plus depreciation minus capital expenditures. Free cash flow represents the cash that is really available for a firm to spend after financing everything (investment, changes in working capital, interest, taxes...).

[10] A proxy contest occurs when the bidder attempts to convince shareholders of the target to use their proxy votes to fire the managers and replace them by new ones who are in favor of the takeover.

[11] High value if laws protect minority shareholders better.

path, extending the evidence on the importance of the link between institutional factors viewed as proxies for corporate governance practices and cash holdings (see also Kalcheva and Lins (2003)). A contradictory result is obtained by Harford *et al.* (2004), who find that US firms with weaker shareholder rights have small cash reserves. The explanation they give for this striking result is that US entrenched managers spend their cash reserves more quickly than do non-entrenched managers.

1.4 Theoretical predictions

The relationship between cash flow and cash holdings is ambiguous, because on the one hand, when internal funds are abundant, the firm can finance valuable investment opportunities with no problem and is not likely to face financial distress, so cash holdings are not really needed for such a firm (transaction cost theory). On the other hand, when a firms generates abundant cash flow, the less dependent is the firm from external capital markets, and the less the shareholders are able to control the manager, so the manager can decide to stockpile cash (managerial opportunism theory). The relationship between Tobin's q and cash holding is somewhat ambiguous, too: a high Tobin's q firm is a firm which invest more than the average firm, with more growth opportunities, and is more valuated by the market. According to the transaction cost theory, this firm must have low cash balances, since its resources are used to invest and grow. But the managerial theory suppose that these firms are also, all else being equal, less likely to face financial distress and are managed by more autonomous managers. These managers can try to augment cash holdings.

Following the transaction cost theory, cash holdings are correlated with the variability of cash flow because the more cash flow are volatile, the more probable is the existence of a liquidity constraint in a near future, and the more the firm wants to avoid the expected costs of this liquidity constraint. The indebtedness is expected to be correlated with low cash holdings (debt can be viewed as a more costly substitute for cash holdings). Following the same logic, an inverse relationship is expected to be found between the interest rate and cash holdings (a higher interest rate is the sign of higher transaction costs and/or higher risk premium). Conversely, a highly liquid balance sheet is supposed to lower cash holdings, because many assets can be sold when the firm faces a cash shortage. The dividend variable is likely to be negatively correlated with cash holdings, since a firm can cut its dividend when cash is needed. Last, capital expenditures must be negatively correlated with cash holdings: when a firm decide to invest, it is not likely to keep high cash balances.

To sum up the theoretical predictions about the signs of the variables on cash holdings, one can say that it's very hard to distinguish between the transaction cost and the pecking order theory, because the theoretical predictions are essentially the same. The pecking order theory only gives a strong basis for the existence of transaction costs. But the theoretical predictions about cash holdings are quite divergent between the transaction cost theory and the managerial opportunism theory (also called the free cash flow hypothesis); see table 1. The

aim of our empirical research is to determine which determinants are significant to explain cash holdings, and to test these theoretical predictions.

Table 1: Theoretical predictions

Variable	Transaction cost th.	Manag. opp.
Cash flow	−	+
Anticipated variation of cash flow	+	.
Indebtedness rate	−	−
Portion of long-term debt	+	.
Size of the firm	−	+
Liquidity of its balance sheet	−	.
Dividend	−	.
Investment	−	.
Market valuation of the firm	−	+
Interest rate	−	.

2 Sample and descriptive statistics

2.1 Sample design

To build our panel, we use the Osiris and Datastream databases. We started with an initial sample of 7,994 companies[12] from Osiris[13]. We then merge this database with some additional data types (historical market data) from Datastream database. The usual checking for coherence of both sources of data encourages us to delete 1,881 firms[14]. After matched merging, we obtain data from both databases for 6,113 firms.

Firms under the direct or indirect control from the government, banks, insurance companies and other financial companies (sectors 45 to 48[15]) and firms with non reported industry code are set aside from our sample (1552 firms). To ensure the reliability of the data, we exclude 46 firms which are reporting non-credible values such as negative debt, negative total assets, *etc*. The extreme low and high 1% of each variable are winsorized.

Finally, we obtain a sample of 4,515 listed firms from five countries: USA, Canada, France, Germany and Great-Britain. The sample period is from 1989 to 2002. For each of them we have its annual balance sheet and current ac-

[12] Criteria for selecting these firms: at least 10 employees, publicly listed, data available (at least 4 years in a row of data), country, standardized account presentation and absence of major event in the firm life (bankruptcy, merger...).

[13] Osiris is a Bureau Van Dijk's publication. Osiris provides standardized and as reported financial accounts for the world's publicly quoted companies (more than 24,000), up to 15 years on approximately. We use the Osiris DVD version, October 2003.

[14] Data types included in both databases from Osiris and from Datastream are used to control the merging and must be similar (number of shares and market price of common shares in particular).

[15] About the Fama and French sector classification, see details in appendix C.

count, with some additional variables (number of employees, PER, number of shares...).

2.2 Descriptive statistics

The left-hand side variable, $CASH$[16], is the ratio of total cash and marketable securities to total assets.

We define the financial variables listed on Table 1. $CASH\_FLOW$ is the ratio of pre-tax profit plus depreciation on total assets. VAR_CF is the three-year average variation in % of $CASH\_FLOW$ on total asset. $TOTDEBT$ is the ratio of long term debt bearing interest plus short term debt on total assets. $LTDEBT$ is the ratio of long-term debt on $TOTDEBT$. $SIZE$ is the log of total revenue. $CAPEX$ is the ratio of capital expenditures to total assets. TOB_Q is the Tobin's q, the ratio of the total market value of the firm divided by the replacement costs of assets, estimated as the book value of fixed assets. INT_RATE is a fictive interest rate, calculated as the ratio of interest expenses to $TOTDEBT$ and DIV is a dummy, equal one when the firm had given a dividend to its shareholders.

We winsorize the data, VAR_CF between -20 and 20, TOB_Q between 0 and 15 and INT_RATE between 0 and 1.

Table 2 reports the descriptive statistics for the variables used in the estimations[17]. The usual financial ratios and variables are provided in Table 3.

Table 2: Summary statistics

Variable	Mean	Std. Dev.	Median	Min.	Max.	N
$CASH$	0.21	0.21	0.13	0.01	0.92	48112
$CASH\_FLOW$	0.06	0.19	0.09	-1	0.44	48107
VAR_CF	0.02	0.71	0.00	-20	20	36369
$TOTDEBT$	0.28	0.2	0.24	0.01	0.99	48126
$LTDEBT$	0.41	0.32	0.43	0	0.94	48127
$SIZE$	18.68	2.38	18.66	6.91	26.17	47547
$LIQUIDITY$	0.1	0.13	0.02	0	0.52	48037
DIV	0.49	0.5	0	0	1	39286
$CAPEX$	0.07	0.1	0.02	0	0.55	44004
TOB_Q	3.75	4.29	1.94	0.09	15	39096
INT_RATE	0.16	0.24	0.08	0	1	39051

3 The determinants of cash holdings: a dynamic approach

Many authors (Opler *et al.*, 1999) emphasize on the "persistence of cash holdings" and the existence of implicit target cash levels (*i.e.* cash balances are mean-reverting). It seems that firms have an implicit and unobservable cash holdings

[16] See Appendix A for more details about the calculation of these variables.
[17] Summary statistics by country are presented in appendix B.

Table 3: Financial ratios

Variable	Median	Std. Dev.	N
GROSS MARGIN	0.05	87.06	47549
NET MARGIN	0.03	69.61	47549
EMPLOYEES	1116	29621.75	27240
CURRENT RATIO	1.78	12.53	48051
PAYOUT RATIO	0.13	9.60	38323
SOLVENCY RATIO	0.47	4.57	48111

target, but the adjustment of real cash holdings to targeted cash holdings is only partial. In other terms, a delay can exist in the adjustment process because of positive costs of adjustment. Even if firms have cash holdings targets, the right-hand variables used in the static estimations have to be taken into account. To deal with the potential dynamic nature of cash holdings, we fit a dynamic panel data model. The key idea of this technique is to add a lag of the left-hand side variable as a right-hand variable. Some methodological issues compel us to use the Arellano and Bond (1991) and Arellano and Bover (1995) estimators.

3.1 Dynamic panel data estimation

Consider the following model:

$$CASH_{i,t} = \alpha CASH_{i,t-1} + \beta' \mathbf{X}_{i,t} + \nu_i + \varepsilon_{i,t} \tag{1}$$

where $i = 1, ..., N$, and $t = 1, ..., T$. α and the $(K \times 1)$ vector β are $K+1$ parameters to be estimated. $\mathbf{X}_{i,t}$ is a $(K \times 1)$ vector of strictly exogenous variables. ν_i are the random effects that are independent and identically distributed (i.i.d.) over the firms and the disturbances $\varepsilon_{i,t}$ are i.i.d. over the whole sample.

It is well known that the standard estimators are inefficient and inconsistent in dynamic panel data models since including lags induce a correlation between the error term and the lagged dependent variable[18]. Moreover, if the error terms $\varepsilon_{i,t}$ are serially uncorrelated, the errors in first differences may well exhibit AR(1) autocorrelation.

An usual technique for dealing with this difficulty is to use an instrumental variable approach. Many consistent estimators are available: GMM estimators (Arellano and Bond, 1991), IV estimators (Anderson and Hsiao, 1982), or the corrected FE estimator (Kiviet, 1995). The Arellano and Bond (1991) estimator is widely used in recent dynamic panel data studies, has some advantages compared to other estimators. It has interesting asymptotic properties and its performance in finite sample with N large - which is the case in our panel - is quite good, as Monte-Carlo evidence is able to show (Harris and Matyas,

[18] In a dynamic panel data model, the lagged dependent variable is correlated with the disturbance, then the fixed-effects as well as the random-effects estimators are inconsistent. See Nickell (1981).

2004)[19]. This method is appropriate (the estimators are convergent) when the number of instruments is higher than exogenous variables, as is the case here.

Arellano and Bond (1991) derived a differenced Generalized Method of Moments estimator (or "difference GMM") for α and β. First differencing ("D.") equation 1 removes the ν_i and produces an equation that is estimable by instrumental variables:

$$D.CASH_{i,t} = \alpha D.CASH_{i,t-1} + \beta' D.\mathbf{X}_{i,t} + D.\varepsilon_{i,t} \tag{2}$$

We follow this approach to estimate (2), with all possible lagged vectors of right-hand variables as instruments. This asymptotically efficient estimator takes into account the presence of arbitrary heteroskedasticity. The instruments are optimally weighted by the expected variance-covariance matrix of the orthogonality conditions, as required for an optimal GMM estimator. An AR(1) autocorrelation in the errors in first differences doesn't induce biases in the Arellano and Bond (1991) estimator. But an AR(2) (or more) autocorrelation does.

We also implement the augmented version of the estimator or "system GMM", outlined in Arellano and Bover (1995) and Blundell and Bond (1998). This second estimator was designed to deal with the fact that lagged levels are often poor instruments for first differences[20]. One can add moment conditions to increase efficiency. This technique adds to the system of estimated differenced equations the original equations in levels. In these equations in level, predetermined and endogenous variables in levels are instrumented with suitable lags of their own first differences, in order to control for firm-specific effects. These lagged differences are appropriate instruments as long as the correlation between the explanatory variables and the firm-specific effect is time-invariant.

These two estimators have one- and two-step variants. Theoretically, the two-step estimators are asymptotically more efficient, but their estimates of the standard errors are biased. To take into account this fact, we use the finite-sample correction to the covariance matrix following Windmeijer (forthcoming).

The other main interest of these estimators is that they allow to avoid a potential endogeneity problem (exogenous random shocks can affect both cash holdings and other right-hand variables such as cash flow or total debt).

3.2 Results

We implement different tests in order to evaluate the relevance of our econometric estimation. We first provide the Arellano and Bond tests for first and second order serial autocorrelation of residuals. If $\varepsilon_{i,t}$ is not serially correlated, the difference residuals should be characterized by a negative first-order serial correlation and the absence of a second-order serial correlation. The Sargan-Hansen test for the validity of over-identifying restrictions and the quality of

[19] See also Judson and Owen (1999) who insist on the intrinsic limitations of FE estimators and are in favor of the use of the GMM estimators.

[20] Especially when the series are close to being random walks.

instruments is implemented for each regression. The null hypothesis is that the remaining theoretical orthogonality restrictions are equal to zero (Sargan, 1958; Hansen, 1982). Failure to reject the null hypothesis indicates that the instruments are valid.

The one step estimations (see table 4) show that the validity of over-identification restrictions are not valid: it is not possible to reject the null hypothesis of the Sargan-Hansen test. Following Arellano and Bond (1991), there is evidence that the one-step Sargan-Hansen test over-rejects the validity of the over-identifying restrictions in presence of heteroskedasticity.

According to these results, we need to estimate the relationship with a two-step model, taking into account the presence of heteroskedasticity in the data[21].

The first result of this second set of regressions is both the Arellano-Bond and the Sargan-Hansen tests support the regressions. The model is in consequence validated by the data. The $L.CASH$ coefficient [22] is significantly positive and under 1. The significance of this coefficient confirms the dynamic nature of cash holdings and, by the way, the merits of a dynamic estimation. We can conclude that firms make a trade-off between the positive costs of cash holdings adjustments and the costs of being far from the fixed target. The persistence of cash holdings is quite low, because nearly $2/3$ of the gap between the actual cash level and the desired cash level is filled each year. This result casts doubts on the robustness of all regressions in which cash holdings determinants are estimated from a static model. The failure of these studies to take into account the dynamic nature of cash holdings introduces a serious bias in their results.

Now turning to the analysis of the sign and magnitude of other coefficients, the results of the two estimations (two-step difference GMM and two-step system GMM) are convergent. Due to the dynamic nature of the regression, the entire history of the right-hand side variables is included in the lagged term. In other terms, the measured influence of right-hand side variables in this equation is conditioned on this history, and is only the consequence of the effects of new information (that is, a change in the value of the variable).

Firms with liquid assets $(LIQUIDITY)$ can easily turn these assets into cash, so they don't need high cash balances. Conversely, small firms ($SIZE$) are expected to have high cash balances. Firms with higher capital expenditures (with more profitable investment opportunities) tend to lower their cash balances ($CAPEX$), probably because internal resources are spent to finance these investments. These results are supporting the transaction cost model. The only contradiction between the theoretical predictions and our results deals with the sign of the TOB_Q variable. In our sample, we observe that the highest the TOB_Q is (the more valuated the firm is), the more cash the firm add to its past holdings.

All these results tend to confirm the transaction cost model or the asymmetric information paradigm, since the only consequence of the informational

[21] Windmeijer finite-sample correction applied in order to obtain robust two-step GMM estimators.

[22] The first lag of the variable CASH.

imperfections are that external funds are harder to raise. The interesting point with the asymmetric information theory is that this theory gives a solid reason for explaining the costs associated with external funds, and insisting on informational costs about the cost of raising external funds.

The key problem is that some of our results are not in favor of the transaction cost theory : all else being equal, a firm with volatile cash flow should have more cash holdings than other firms. The coefficient associated with VAR_CF is not significant. And some results can be convoked in favor of the managerial opportunism thesis: firms with low debt ($TOTDEBT$) have more cash. Because of their low indebtedness, these firms are less subject to financial monitoring by the capital markets or banks, and managers can more easily be autonomous in their decisions. But this coefficient can also be read in a transaction cost theory framework: before choosing indebtedness, firms have spend all the internal funds available, including cash holdings.

We also run separate regressions by country (see appendix D). Two striking points can be underlined. First, the velocity of the adjustment of cash balances to the targeted level is not so different among countries, despite large differences in corporate governance standards and practices: in Canada and the US, the velocity is higher (more than 60% of the gap between actual cash holdings and target cash holdings is filled each year) than in France and Germany (only 50% of the gap is filled in one year), but the difference is still small. Second, when we look at all coefficients, they are some country-specific differences. The big picture is that cash holdings determinants are roughly the same in Great-Britain and the US. For instance, the sign and significativity of the cash flow variable or the Tobin's q are in favor of the managerial opportunism thesis, but the sign and significativity of the coefficients for the three remaining countries (Canada, Germany and France) provide no univocal support to this model: the cash flow variable is not significant in Canada and France, and even negative in Germany, *etc*...

These results are clearly not sufficient enough to decide which model explains best the cash holdings determinants, even it's clearly impossible to reject the managerial opportunism thesis. The main problem at this point of the analysis is that one can not include legal or institutional variables as left-hand side variables, because these variables are dropped when the equation is differenced. It's in consequence impossible to include in the analysis some variables in the spirit of La Porta *et al.* (1997) and La Porta *et al.* (1998), which should have been a very convenient way to add evidence of managerial opportunism in cash holdings decisions of firms. Another way must be found in order to find strong and clear support to one model or another. We decide to focuse our analysis on firms which hold much cash, in order to investigate if these "extreme points" in terms of cash holdings exhibit different performance than the other firms.

Table 4: Dynamic panel data estimation - One step

	One-step difference GMM results		One-step system GMM results	
Variable	**Coefficient**	**(Std. Err.)**	**Coefficient**	**(Std. Err.)**
$L.CASH$	0.328***	(0.025)	0.409***	(0.011)
$CASH\_FLOW$	0.102***	(0.022)	0.039***	(0.005)
VAR_CF	0.003	(0.008)	0.004***	(0.001)
$TOTDEBT$	-0.193***	(0.054)	-0.158***	(0.010)
LT_DEBT	-0.077**	(0.037)	0.026***	(0.007)
$SIZE$	-0.013***	(0.004)	-0.005**	(0.002)
$LIQUIDITY$	-0.493***	(0.092)	-0.621***	(0.018)
DIV	-0.036	(0.031)	-0.010*	(0.005)
$CAPEX$	-0.411***	(0.036)	-0.241***	(0.009)
TOB_Q	0.009***	(0.002)	0.011***	(0.001)
INT_RATE	-0.001	(0.031)	-0.052***	(0.006)
$INTERCEPT$	–	–	0.291***	(0.045)
N	20648		20648	
$AR-1$ test	$z=-24.03$	$Pr>z=0.000$	$z=-31.90$	$Pr>z=0.000$
$AR-2$ test	$z=0.37$	$Pr>z=0.713$	$z=1.28$	$Pr>z=0.199$
Sargan-Hansen test	302.10	$Pr>\chi^2=0.000$	516.46	$Pr>\chi^2=0.000$

Notes: Significance levels : $*$: 10% $**$: 5% $***$: 1%.

Arellano and Bond (1991) residual tests are performed on the null hypothesis of zero auto-covariance in residual (of order 1 and 2).

Instruments validity is checked using the Sargan-Hansen test for over-identifying restrictions.

Table 5: Dynamic panel data estimation - Two step

Variable	Two-step difference GMM results Coefficient	(Std. Err.)	Two-step system GMM results Coefficient	(Std. Err.)
$L.CASH$	0.319***	(0.039)	0.377***	(0.019)
$CASH\_FLOW$	0.112***	(0.035)	0.034***	(0.009)
VAR_CF	-0.010	(0.013)	0.003	(0.002)
$TOTDEBT$	-0.230***	(0.087)	-0.145***	(0.016)
LT_DEBT	-0.039	(0.051)	0.029***	(0.010)
$SIZE$	-0.017**	(0.007)	-0.007**	(0.003)
$LIQUIDITY$	-0.468***	(0.125)	-0.548***	(0.031)
DIV	-0.002	(0.031)	-0.003	(0.006)
$CAPEX$	-0.427***	(0.055)	-0.207***	(0.012)
TOB_Q	0.007***	(0.002)	0.010***	(0.001)
INT_RATE	-0.046	(0.041)	-0.056***	(0.008)
$INTERCEPT$	–	–	0.304***	(0.056)
N	20648		20648	
$AR-1$ test	$z=-12.98$	$Pr>z=0.000$	$z=-17.06$	$Pr>z=0.000$
$AR-2$ test	$z=0.44$	$Pr>z=0.660$	$z=1.11$	$Pr>z=0.267$
Sargan-Hansen test	177.88	$Pr>\chi^2=0.384$	32.68	$Pr>\chi^2=0.337$

Notes: Significance levels : $*$: 10% $**$: 5% $***$: 1%.

Windmeijer finite-sample correction applied in order to obtain robust two-step GMM estimators.

Arellano and Bond (1991) residual tests are performed on the null hypothesis of zero auto-covariance in residual (of order 1 and 2).

Instruments validity is checked using the Sargan-Hansen test for over-identifying restrictions.

4 Why do some firms stockpile "too much" cash ?

4.1 Methodological issues

Since some firms hold large amounts of cash, we investigate the consequences of these holdings, in terms of firm performances. Do firms with large cash holdings perform differently from other firms? Testing the correlation between firm performance and cash holdings is a roundabout way to verify which explanation (transaction costs or managerial opportunism) is the more pertinent to understand the motives for cash holdings. According to the free cash flow theory, one can expect that the cash-rich firms performance is below the average performance, since their managers have less incentives to do well. On the contrary (in transaction costs framework), a cash-rich firm faces less transaction costs, can finance investment at a lower cost and is not likely to be forced to forego valuable investments, so cash-rich firms, all else being equal, are likely to perform better than other firms.

Some studies focus on excess cash (firms which hold more cash than the average cash holdings of comparable firms), but the evidence on the subject is mixed. Harford (1999) is focused on firms that have excess cash holdings at a particular point in time. He finds that firms with excess cash holdings are more likely than other firms to attempt acquisitions or overdiversify and by the way to destruct value. Same conclusions of the destroying value comportment for cash-rich firms are reached by Blanchard *et al.* (1994), who study firms that receives cash windfalls from lawsuits. Harford and Haushalter (2003)[23] find that expenditures of cash windfalls are influenced by managerial ownership stakes[24]. On a German sample of firms, Schwetzler and Reimund (2004) do find a significant operating under-performance of German firms that previously held excess cash over a three-year period. These studies support strongly the findings of Jensen (1986) and the fact that large cash holdings lead to poor performance and strategic managerial behavior.

In contrast, Mikkelson and Partch (2003) examine the operating performance of firms that held more than 25% of their assets in cash. They focus on firms which have a "sustained and deliberate policy of retaining large holdings of cash", since they consider cash balances over a five-year period to build the group of firms which own "large cash reserves". Following them, the operational performance of firms is not correlated to the size of cash balances. They confirm the early results of Opler *et al.* (1999), who don't find the proof of non-efficient cash-spending in cash-rich firms.

These divergent results are probably the consequences of many factors: differences in the sample, in the methodology, in the definitions of excess cash and inefficient spending of cash... Another problematic issue is that a correlation between performance and the amount of cash hold by the firms probably exists. More precisely, these two variables are probably jointly influenced by the same observable and unobservable factors. Furthermore, the excessive holdings of

[23] They use the Persian Gulf crisis of 1991 as a natural experiment.
[24] Another paper with the same conclusion is Lang *et al.* (1991)

cash will appear as a right-hand side variable in the performance equation, so the two equations (cash holdings and performance) are correlated.

We address this issue with a framework for estimating such a model of recursive bivariate probit model. The bivariate probit model belongs to the general class of simultaneous equation models with continuous and discrete variables. This model is similar to the simple bivariate probit model, except the left-hand side variable of the second equation appears as an independent variable in the first equation. The bivariate model is useful when two left-hand variables are interdependent or may depend on a common set of explanatory variables. Greene (2003) demonstrates that the endogenous nature of one of the left-hand side variable can be ignored when we maximize the log-likehood function.

A strong hypothesis is needed implementing this model. One can not estimate this model with fixed effects. We are constrained to suppose the orthogonality of firms-specific effects and left-hand side variables. Robust variance estimates have been produced across individual observations.

Before estimating such a model, we do have to define first what is "too much" cash. We can not precisely observe how much cash in excess a particular firm have. We can only observe if a firm, in a particular period of time, has more cash than the predicted amount of cash[25]. We suppose that cash holdings larger than the predicted cash holdings plus one standard deviation are excessive. The dummy $EXCESS\_CASH$ is in this case equal to the unity, and zero otherwise.

Following the same logic, since we can not define precisely what is a good or bad performance for a firm, we suppose that a firm have good performance when it does better than the median firm, for the year and the sector considered. Conversely, a firm presents bad performance ($BAD\_PERF = 1$) when its profitability rate is under the median profitability rate less a standard deviation.

4.2 Results

The presence of cash in excess is positively correlated with the probability of bad performance for firms. Even with all these contemporaneous control variables, the negative influence of the cash in excess on firm's performance is significant at 1%[26]. This result strongly supports the managerial opportunism thesis. All else being equal, firms with high cash balances are likely to underperform. A Wald test confirms at 1% the existence of a dependence between the two equations. The same regressions run without the cluster option provides

[25] The predicted amount of cash, i.e. predicted by the dynamic model estimated in the previous section.

[26] This influence exists for all countries, when separate regressions are run. Alternative specifications of bad results and excess cash holdings were tested, without notable changes in the results : predicted cash holdings plus two standard deviations, predicted cash calculated as the average cash holdings of firms of same sector, size, and year... The excess cash is always correlated with future under average performance of firms. Results available upon request.

the same coefficients, since this clustering option modifies only the standard errors (the standard errors are smaller for the cluster estimates).

Table 6: Firm performance and firm cash holdings

Variable	**Coefficient**	**(Std. Err.)**
Equation 1 : BAD_PERF		
$EXCESS\_CASH$	0.632***	(0.093)
$CASH\_FLOW$	0.042**	(0.020)
LT_DEBT	-0.038	(0.070)
DIV	-0.706***	(0.044)
$SIZE$	-0.169***	(0.010)
$VARIAB\_CF$	-0.053*	(0.015)
TOB_Q	0.016***	(0.005)
TX_INT	0.245**	(0.062)
$TOTDEBT$	0.428***	(0.089)
$LIQUIDITY$	-3.169***	(0.209)
$CAPEX$	-0.946***	(0.154)
$iNTERCEPT$	2.051***	(0.328)
Equation 2 : $EXCESS\_CASH$		
$CASH\_FLOW$	-0.458***	(0.055)
$VARIAB\_CF$	-0.007	(0.013)
$TOTDEBT$	-0.281***	(0.102)
LT_DEBT	-0.230***	(0.075)
$SIZE$	-0.010	(0.010)
$LIQUIDITY$	2.047***	(0.164)
DIV	-0.290**	(0.039)
$CAPEX$	-1.574***	(0.165)
TOB_Q	0.035***	(0.004)
TX_INT	-0.228***	(0.067)
$INTERCEPT$	-0.551	(0.401)
N	24970	
Log L	-14087.229	
Pseudo R^2	0.609	
ρ	-0.328	(0.045)
Wald test of $\rho = 0$	46.42	

Notes: Significance levels : $*$: 10% $**$: 5% $***$: 1%

Standard errors adjusted for clustering on $IDFIRM$.

Clustering allows for correlated errors within firms, but none across firms.

Two concurrent explanations can be given. First, managers who are free to stockpile cash are not really under the control of the shareholders (because of the absence of a major shareholder, of a "good" managerial entrenchment...). These managers have no incentives to manage their firm in the shareholders' interests, and they can allow the firm they manage to underperform without risk for their jobs and compensations. The other explanation is that the cash

in excess is an assurance for the risk-averse managers against potential future bad performances. But this cash in excess reduce the ability of the firm to invest and increase the incentives for the managers to spend this cash, even in absence of profitable projects. Whatever the good explanation may be, there is a correlation between "excessive" cash holdings and bad performance of firms. And this correlation is a significative clue in favor of the free cash flow hypothesis Jensen (1986).

Conclusion

This paper investigate the corporate cash holdings determinants and consequences on the firms' profitability from 1989 to 2002, by using firm-level data from Canada, France, Germany, Great-Britain and the USA.

We find that, *ceteris paribus*, cash holdings are increasing on firm's size, cash flow level, cash flow variability, and Tobin's q, and decreasing on indebtedness, investment rate, liquidity of the balance sheet. The institutional determinants of cash holdings are significant and support the hypothesis of an influence of the legal system on cash holdings decisions: cash balances are lower in the institutional frameworks which are more in favor of the shareholders rights. Both financial and institutional factors which are significant can not rule out the free cash flow hypothesis.

We also run a dynamic estimation of corporate cash holdings, using the appropriate GMM framework. This model is probably a better way to estimate the cash holdings determinants, since the usual tests support the hypothesis of an implicit cash holdings target.

Last, we focus on the link between cash holdings and firms' profitability, by implementing a bivariate probit model. A negative correlation is drawn between these two variables, a firm with more cash is likely to perform worst than other firms. This finding strongly support the managerial opportunism thesis, according to Jensen (1986). This result is in contradiction with the findings of Opler *et al.* (1999) or Mikkelson and Partch (2003). One potential explanation for this striking result is that, in our empirical framework, we consider that cash balances levels and the future performance of these firms are probably jointly determined.

Static determinants of cash holdings as well as the link between cash holdings and firm performance are in favor of the free cash flow hypothesis. As a consequence, a consequent amount of cash in the balance sheet of a firm is probably a clue in favor of the presence of entrenched managers.

References

ANDERSON, T. W. and HSIAO, C. (1982), " Estimation of dynamic models with errors components ", *Journal of the American Statistical Association*, vol. 76: pp. 589–606.

ARELLANO, M. and BOND, S. (1991), " Some tests of specification for panel data: Monte-Carlo evidence and an application to employment equations ", *Review of Economic Studies*, vol. 58 nº 2: pp. 277–297.

ARELLANO, M. and BOVER, O. (1995), " Another look at the instrumental variable estimation of error-components model ", *Journal of Econometrics*, vol. 68: pp. 29–51.

BELTZ, J. and FRANK, M. (1996), " Risk and Corporate Holdings of Highly Liquid Assets ", Working Paper.

BLANCHARD, O., LOPEZ DE SILANES, F. and SHLEIFER, A. (1994), " What do firms do with cash windfalls? ", *Journal of Financial Economics*, vol. 36 nº 3: pp. 337–360.

BLUNDELL, R. and BOND, S. (1998), " Initial Conditions and Moment Restrictions in Dynamic Panel Data Models ", *Journal of Econometrics*, vol. 87: pp. 115–43.

DELOOF, M. (1999), " Intragroup Relations and the Determinants of Corporate Liquid Reserves: Belgian Evidence ", Working paper.

VAN DIJK, B. (2003), *Osiris User Guide*, Bureau van Dijk Publications, Paris, oct. 2003 edition.

DITTMAR, A., MAHRT-SMITH, J. and SERVAES, H. (2003), " International corporate governance and corporate cash holdings ", *Journal of Financial and Quantitative Analysis*, vol. 38 nº 1: pp. 111–133.

D'MELLO, R., KRISHNASWAMI, S. and LARKIN, P. J. (2004), " Determinants of Corporate Cash Holdings:Evidence from Spin-offs ", Working paper.

FALEYE, O. (2004), " Cash and Corporate Control ", *Journal of Finance*, vol. 59 nº 5: pp. 2041 – 2060.

FAULKENDER, M. (2002), " Cash holdings among small business ", Working Paper, Northwestern University.

FERREIRA, M. A. and VILELA, A. S. (2004), " Why Do Firms Hold Cash? Evidence from EMU Countries ", *European Financial Management*, vol. 10 nº 2: pp. 295–319.

GREENE, W. H. (2003), *Econometric Analysis (International edition)*, Prenctice-Hall, New Jersey, 5th edition.

HANSEN, L. P. (1982), " Large Sample Properties of Generalized Method of Moments Estimators ", *Econometrica*, vol. 50 nº 4: pp. 1029–1054.

HARFORD, J. (1999), " Corporate cash reserves and acquisitions ", *Journal of Finance*, vol. 54 nº 6: pp. 1969–1997.

HARFORD, J. and HAUSHALTER, X. (2003), " Cash-flow Shocks, Investment, and Financial Constraint: Evidence from a Natural Experiment ", Working paper.

HARFORD, J., MANSI, S. A. and MAXWELL, W. F. (2004), " Corporate Governance and Firm Cash Holdings ", Working paper.

HARRIS, M. N. and MATYAS, L. (2004), " A Comparative Analysis of Different IV and GMM Estimators of Dynamic Panel Data Models ", *International Statistical Review*, forthcoming.

HART, O. and MOORE, J. (1998), " Default and Renegotiation: A Dynamic Model of Debt ", *Quarterly Journal of Economics*, vol. 113 nº 1: pp. 1–41.

JENSEN, M. (1986), " Agency costs of free cash flow, corporate finance and takeovers ", *American Economic Review*, vol. 76 nº 2: pp. 323–329.

JOHN, T. A. (1993), " Accounting measures of corporate liquidity, leverage, and costs of financial distress ", *Financial Management*, vol. 22: pp. 91–100.

JUDSON, R. A. and OWEN, A. L. (1999), " Estimating dynamic panel data models: a guide for macroeconomists ", *Economic letters*, vol. 65: pp. 9–15.

KALCHEVA, I. and LINS, K. V. (2003), " International Evidence on Cash Holdings and Expected Managerial Agency Problems ", Working paper.

KIM, C.-S., MAUER, D. C. and SHERMAN, A. E. (1998), " The determinants of corporate liquidity: theory and evidence, ", *Journal of Financial and Quantitative Analysis*, vol. 33 nº 3: pp. 335–359.

KIVIET, J. F. (1995), " On bias, inconsistency and efficiency of various estimators in dynamic panel data models ", *Journal of Econometrics*, vol. 68 nº 1: pp. 53–78.

KUSNADI, Y. (2003), " Corporate Cash Holdings, Board Structure, and Ownership Concentration:Evidence from Singapore ", Working paper.

LA PORTA, R., LOPEZ DE SILANES, F., SHLEIFER, A. and VISHNY, R. W. (1997), " Legal determinants of external finance ", *Journal of Finance*, vol. 52 nº 3: pp. 1131–1150.

LA PORTA, R., LOPEZ DE SILANES, F., SHLEIFER, A. and VISHNY, R. W. (1998), " Law and finance ", *Journal of Political Economy*, vol. 106 nº 6: pp. 1113–1155.

LANG, L. H. P., STULZ, R. M. and WALKLING, R. A. (1991), " A test of the free cash flow hypothesis: The case of bidder returns ", *Journal of Financial Economics*, vol. 29 nº 2: pp. 315–335.

MIKKELSON, W. and PARTCH, M. M. (2003), " Do Persistent Large Cash Reserves Hinder Performance? ", *Journal of Financial and Quantitative Analysis*, vol. 38 nº 2: pp. 275–294.

MILLER, M. H. and ORR, D. (1966), " A model of the demand for money by firms ", *Quaterly Journal of Economics*, vol. 80 nº 3: pp. 413–435.

MYERS, S. C. (1984), " The capital structure puzzle ", *Journal of Finance*, vol. 39 nº 3: pp. 575–592.

MYERS, S. C. and MAJLUF, N. S. (1984), " Corporate Financing and Investment Decisions when Firms Have Information That Investors do not Have ", *Journal of Financial Economics*, vol. 13 nº 2: pp. 187–221.

NICKELL, S. (1981), " Biases in dynamic models with fixed effects ", *Econometrica*, vol. 49 nº 6: pp. 1417–1426.

OPLER, T., PINKOWITZ, L., STULZ, R. and WILLIAMSON, R. (1999), " The determinants and implications of corporate cash holdings ", *Journal of Financial Economics*, vol. 52 nº 1: pp. 3–46.

OZKAN, A. and OZKAN, N. (2004), " Corporate cash holdings: an empirical investigation of UK companies ", *Journal of Banking and Finance*, forthcoming.

PINKOWITZ, L. (2002), " The market for corporate control and corporate cash holdings ", Working paper, Georgetown University.

PINKOWITZ, L. and WILLIAMSON, R. (2001), " Bank Power and cash holdings:evidence from Japan ", *Review of Financial Studies*, vol. 14 nº 4: pp. 1059–1082.

PINKOWITZ, L., STULZ, R. M. and WILLIAMSON, R. (2004), " Do firms in countries with poor protection of investor rights hold more cash? ", NBER working paper.

SARGAN, J. D. (1958), " The estimation of economic relationships using instrumental variables ", *Econometrica*, vol. 26: p. 393–415.

SCHNURE, C. (1998), " Who holds cash? And why? ", Federal Reserve Board Working Paper 98-13.

SCHWETZLER, B. and REIMUND, C. (2004), " Valuation Effects of Corporate Cash Holdings: Evidence from Germany ", Working Paper.

SHLEIFER, A. and VISHNY, R. W. (1997), " A Survey of Corporate Governance ", *Journal of Finance*, vol. 52 nº 2: pp. 737–783.

SMITH, C. (1993), " Raising Capital: Theory and Evidence ", in CHEW, D. (editor), *The new corporate finance*, McGrawHill, New York.

STULZ, R. (1990), " Managerial discretion and optimal financing policies ", *Journal of Financial Economics*, vol. 1 nº 26: pp. 3–27.

TOBIN, J. (1956), " The interest elasticity of transactions demand for cash ", *Review of Economics and Statistics*, vol. 38 nº 3: pp. 241–247.

WINDMEIJER, F. (forthcoming), " A finite sample correction for the variance of linear two-step GMM estimators ", *Journal of Econometrics*, vol. XXX nº XXX: p. XXX.

A Description of the variables

The item references indicates the source: Osiris (OS_000) or Datastream (DS_000)[27].

$$\text{Total debt} = \text{Long term interest bearing debt } (OS\_D14016) + \text{Loans (current liabilities) } (OS\_D21010) + \text{Other LT int. bearing debt } (OS\_D21115)$$

$$\text{CASH} = \frac{\text{Total Cash and Short term Investment } (OS\_20070)}{\text{Total assets } (OS\_13077)}$$

$$\text{CASH\_FLOW} = \frac{\text{Earnings after tax } (OS\_13037) + \text{Depreciation } (OS\_13039)}{\text{Total assets } (OS\_13077)}$$

$$\text{VAR\_CF} = \frac{\sum_{i=t-2}^{t} \left| \frac{\text{CASH\_FLOW}_i - \text{CASH\_FLOW}_{i-1}}{\text{CASH\_FLOW}_{i-1}} \right|}{3}$$

$$\text{TOTDEBT} = \frac{\text{Total debt}}{\text{Total debt } + \text{Total Shareholders Equity} (OS\_14041)}$$

$$\text{LT\_DEBT} = \frac{\text{Long term interest bearing debt } (OS\_D14016)}{\text{Total Debt}}$$

$$\text{SIZE} = \ln\left(\text{Total Revenues } (OS\_13004)\right)$$

$$\text{CAPEX} = \frac{\text{Fixed Assets}_t (OS\_D20085) - \text{Fixed Assets}_{t-1} (OS\_D20085)}{\text{Total assets } (OS\_13077)}$$

$$\text{INT\_RATE} = \frac{\text{Interest expenses } (OS\_D13026)}{\text{Total debt}}$$

$$\text{TOB\_Q} = \frac{\text{Market value } (DS\_MV)}{\text{Fixed assets } (OS\_D20085)}$$

$$\text{LIQUIDITY} = \frac{\text{Tot. curr. assets } (OS\_13061) - \text{Tot. curr. liab. } (OS\_14011)}{\text{Total assets } (OS\_13077)} - \frac{\text{CASH}}{\text{Total assets } (OS\_13077)}$$

[27] For more details about accounting principles, see van Dijk (2003).

B Summary statistics by country

Table 7: Summary statistics 5

Variable	Mean	Std. Dev.	Median	Min.	Max.	N
$CASH$	0.22	0.22	0.13	0.01	0.92	30715
$CASH\_FLOW$	0.05	0.21	0.08	-1	0.44	30710
VAR_CF	0.02	0.52	0.00	-20	20	22206
$TOTDEBT$	0.28	0.22	0.25	0.01	0.99	30729
LT_DEBT	0.44	0.33	0.48	0	0.94	30730
$SIZE$	18.52	2.36	18.50	6.91	26.17	30368
$LIQUIDITY$	0.11	0.14	0.04	0	0.52	30640
DIV	0.32	0.47	0	0	1	24110
$CAPEX$	0.07	0.11	0.02	0	0.55	28291
TOB_Q	4.12	4.51	2.21	0.09	15	23963
INT_RATE	0.15	0.23	0.08	0	1	24709

Table 8: Summary statistics by country (continued)

	Canada						Germany					
Variable	**Mean**	**Std. Dev.**	**Median**	**Min.**	**Max.**	**N**	**Mean**	**Std. Dev.**	**Median**	**Min.**	**Max.**	**N**
$CASH$	0.16	0.21	0.07	0.01	0.92	2697	0.22	0.18	0.16	0.01	0.92	3201
$CASH\_FLOW$	0.05	0.19	0.08	-0.99	0.44	2697	0.09	0.16	0.10	-1	0.44	3201
VAR_CF	0.03	2.29	0.00	-20	20	2109	0.01	0.17	0.00	-1.14	4.18	2465
$TOTDEBT$	0.31	0.19	0.30	0.01	0.99	2697	0.2	0.14	0.17	0.01	0.99	3201
LT_DEBT	0.41	0.31	0.45	0	0.94	2697	0.39	0.3	0.40	0	0.94	3201
$SIZE$	18.96	2.86	19.41	6.91	24.24	2565	19.5	2.27	19.34	7.60	25.82	3195
$LIQUIDITY$	0.07	0.1	0.00	0	0.52	2697	0.11	0.13	0.05	0	0.52	3201
DIV	0.46	0.5	0	0	1	2420	0.72	0.45	1	0	1	2406
$CAPEX$	0.09	0.12	0.03	0	0.55	2378	0.06	0.1	0.02	0	0.55	2852
TOB_Q	2.36	3.55	1.00	0.09	15	2422	2.76	3.55	1.44	0.09	15	2405
INT_RATE	0.12	0.18	0.08	0	1	2118	0.17	0.25	0.08	0	1	2529
France							**Great-Britain**					
Variable	**Mean**	**Std. Dev.**	**Median**	**Min.**	**Max.**	**N**	**Mean**	**Std. Dev.**	**Median**	**Min.**	**Max.**	**N**
$CASH$	0.21	0.14	0.18	0.01	0.92	2719	0.21	0.2	0.14	0.01	0.92	8780
$CASH\_FLOW$	0.11	0.1	0.10	-0.83	0.44	2719	0.09	0.17	0.11	-0.99	0.44	8780
VAR_CF	0.01	0.1	0.00	-1.3	2.78	2274	0.01	0.43	0.01	-20	20	7315
$TOTDEBT$	0.33	0.16	0.32	0.01	0.99	2719	0.25	0.16	0.23	0.01	0.99	8780
LT_DEBT	0.41	0.25	0.40	0	0.94	2719	0.33	0.3	0.28	0	0.94	8780
$SIZE$	19.91	2.21	19.89	6.91	25.46	2700	18.45	2.19	18.39	6.91	25.92	8719
$LIQUIDITY$	0.06	0.1	0	0	0.52	2719	0.06	0.11	0	0	0.52	8780
DIV	0.84	0.37	1	0	1	2342	0.83	0.37	1	0	1	8008
$CAPEX$	0.05	0.08	0.02	0	0.55	2458	0.07	0.1	0.02	0	0.55	8025
TOB_Q	2.86	3.58	1.46	0.09	15	2341	3.62	4.04	1.98	0.09	15	7965
INT_RATE	0.11	0.17	0.06	0	1	2563	0.2	0.29	0.08	0	1	7132

C The Fama and French (1997) sector classification

Sector number	Sector	SIC codes
1	Agriculture	100-799, 2048
2	Foods products	2000-46, 2050-63, 2070-9, 2090-5, 2098-9
3	Candy and sodas	2064-8, 2086-7, 2096-7
4	Alcoholic beverages	2080-5
5	Tobacco products	2100-99
6	Recreational products	900-99, 3650-2, 3732, 3940-49
7	Entertainment	7800-41, 7900-99
8	Printing and publishing	2700-49, 2770-99
9	Consumer goods	2047, 2391-2, 2510-2519, 2590-9, 2840-4, 3160-99, 3229-31, 3260, 3262-3, 3269, 3630-9, 3750-1, 3800, 3860-79, 3910-9, 3960-1, 3991, 3995
10	Apparel	2300-90, 3020-1, 3100-11, 3130-59, 3965
11	Healthcare	8000-99
12	Medical equipment	3693, 3840-51
13	Pharmaceutical products	2830-6
14	Chemicals	2800-29, 2850-99
15	Rubber and plastic products	3000, 3021, 3050-99
16	Textiles	2200-95, 2297-9, 2393-5, 2397-9
17	Construction materials	800-99, 2400-39, 2450-9, 2490-9, 2950-2, 3200-19, 3240-59, 3261, 3264, 3270-99, 3420-42, 3446-52, 3490-9, 3996
18	Construction	1500-49, 1600-799
19	Steel work	3300-69, 3390-9
20	Fabricated products	3400, 3443-4, 3460-79
21	Machinery	3510-36, 3540-69, 3580-99
22	Electrical equipment	3600-21, 3623-29, 3640-46, 3648-9, 3660, 3691-2, 3699

23	Miscellaneous	3900, 3990, 3999, 9900, 9999, n.a.
24	Automobiles and trucks	2296, 2396, 3010-1, 3537, 3647, 3694, 3700-16, 3790-2, 3799
25	Aircraft	3720-9
26	Shipbuilding	3730-1, 3740-3
27	Defense	3480-9, 3760-9, 3795
28	Precious metals	1040-9
29	Non-metallic mining	1000-39, 1060-99, 1400-99
30	Coal	1200-99
31	Petroleum and natural gas	1310-89, 2900-11, 2990-9
32	Utilities	4900-99
33	Telecommunications	4800-99
34	Personal services	7020-1, 7030-9, 7200-12, 7215-99, 7395, 7500, 7520-49, 7600-99, 8100-499, 8600-99, 8800-99
35	Business services	2750-9, 3993, 7300-72, 7374-94, 7397, 7399, 7510-9, 8700-48, 8900-99
36	Computers	3570-9, 3680-9, 3695, 7373
37	Electronic equipment	3622, 3661-79, 3810, 3812
38	Measuring and control equipment	3811, 3820-30
39	Business supplies	2520-49, 2600-39, 2670-99, 2760-1, 3950-5
40	Shipping containers	2440-9, 2640-59, 3210-21, 3410-2
41	Transportation	4000-299, 4400-799
42	Wholesale	5000-199
43	Retail	5200-736, 5900-99
44	Restaurants, hotels,motels	5800-13, 5890, 7000-19, 7040-9, 7213
45	Banking	6000-199
46	Insurance	6300-411
47	Real Estate	6500-53
48	Trading	6200-99, 6700-99

D Results of dynamic estimations by country

Table 10: Dynamic panel data estimation - Two step system GMM

	Canada		Germany		France		Great-Britain		USA	
Variable	**Coefficient**	**(Std. Err.)**	**Coefficient**	**(Std. Err.)**	**Coefficient**	**(Std. Err.)**	**Coefficient**	**(Std. Err.)**	**Coefficient**	**(Std. Err.)**
$L.CASH$	0.278***	(0.064)	0.466***	(0.059)	0.523***	(0.067)	0.451***	(0.056)	0.383***	(0.036)
$CASH\_FLOW$	-0.001	(0.030)	-0.100**	(0.046)	0.070	(0.044)	0.053**	(0.023)	0.047***	(0.013)
VAR_CF	0.000	(0.002)	0.082***	(0.021)	0.037***	(0.008)	-0.002	(0.003)	0.005	(0.003)
$TOTDEBT$	-0.148**	(0.067)	-0.168*	(0.092)	-0.066	(0.047)	-0.135***	(0.038)	-0.128***	(0.026)
LT_DEBT	-0.017	(0.050)	0.006	(0.044)	0.092***	(0.030)	0.080**	(0.036)	0.131***	(0.031)
$SIZE$	-0.008	(0.008)	0.019**	(0.007)	-0.015*	(0.008)	0.001	(0.008)	0.004	(0.005)
$LIQUIDITY$	-0.543***	(0.106)	-0.376***	(0.068)	-0.405***	(0.082)	-0.771***	(0.179)	-0.493***	(0.130)
DIV	0.009	(0.041)	0.014	(0.015)	-0.046**	(0.022)	0.006	(0.029)	-0.017	(0.031)
$CAPEX$	-0.199***	(0.035)	-0.342***	(0.053)	-0.164***	(0.057)	-0.214***	(0.045)	-0.168***	(0.045)
TOB_Q	0.024***	(0.006)	0.007*	(0.003)	0.007*	(0.004)	0.008**	(0.004)	0.014***	(0.003)
INT_RATE	-0.181**	(0.082)	-0.072**	(0.035)	-0.003	(0.047)	0.019	(0.049)	0.135**	(0.055)
$INTERCEPT$	0.342**	(0.145)	-0.188	(0.154)	0.422***	(0.152)	0.114	(0.158)	0.001	(0.109)
N	1600		1629		1972		5640		14129	
$AR-1$ test: $z=$	-4.06	$Pr>z=0.00$	-4.59	$Pr>z=0.00$	-4.94	$Pr>z=0.00$	-8.60	$Pr>z=0.00$	-13.66	$Pr>z=0.0$
$AR-2$ test: $z=$	1.59	$Pr>z=0.11$	1.10	$Pr>z=0.27$	1.13	$Pr>z=0.26$	-0.61	$Pr>z=0.54$	0.81	$Pr>z=0.41$
Sargan-Hansen test	128.03	$Pr>\chi^2=0.72$	106.56	$Pr>\chi^2=0.36$	95.05	$Pr>\chi^2=0.65$	69.03	$Pr>\chi^2=0.37$	49.93	$Pr>\chi^2=0.3$

Notes: Significance levels : $*$: 10% $**$: 5% $***$: 1%.
Windmeijer finite-sample correction applied in order to obtain robust two-step GMM estimators.
Arellano and Bond (1991) residual tests are performed on the null hypothesis of zero auto-covariance in residual (of order 1 and 2).
Instruments validity is checked using the Sargan-Hansen test for over-identifying restrictions.