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TO BANK OR NOT TO BANK: THE DETERMINATION OF CASH HOLDINGS AND LINES OF CREDIT

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Abstract

This paper investigates two liquidity choices of listed Jordanian firms: internal represented by cash holdings and external represented by lines of credit. We document a significant substitution effect of lines of credit on cash holdings and show that this effect strengthens with banking relationships. In addition, we show that lines of credit are not viable liquidity substitute of cash for all firms. Firms with characteristics linked to high costs of external financing are significantly less likely to have access to lines of credit. Also, Ownership of the largest owner-controller exerts a significant negative impact on the probability of obtaining a line of credit. Finally, using a simultaneous equation framework to estimate the joint determination of cash holdings and lines of credit we find a significant impact of ownership of the largest owner-controller on cash holdings. This finding suggests that firms with large owner-controller pursue a liquidity policy of high cash holdings and no lines of credit.

JEL Classification: G30; G32

Keywords: Cash Holdings; Lines of Credit; Financial Constraints; Owner-Controller; Jordan; Emerging Markets

ملخص

تبحث هذه الورقة خيارين للسيولة النقدية للشركات الأردنية المدرجة: السيولة الداخلية ممثلة بالموجودات النقدية والخارجية ممثلة بخطوط الائتمان. نحن توثق تأثير إحلال كبير من خطوط الائتمان على الحيازات النقدية ويتبين أن هذا التأثير يعزز العلاقات المصرفية. وبالإضافة إلى ذلك، نبين أن خطوط الائتمان ليست ببديل جيد للنقد لجميع الشركات. أما الشركات ذات الخصائص المرتبطة بالتكاليف المرتفعة للتمويل الخارجي فهي أقل احتمالا للحصول على خطوط ائتمان. كما أن ملكية أكبر مالك - المراقب المالي لها تأثير سلبي كبير على احتمال الحصول على خط ائتمان. وأخيرا، وباستخدام إطار معادلة متزامن لتقدير التصميم المشترك للموجودات النقدية وخطوط الائتمان، نجد أن هناك تأثيرا كبيرا على ملكية أكبر مالك للمراقبة على الحيازات النقدية. وتشير هذه النتيجة إلى أن الشركات التي تتمتع بمراقب مالي كبير تتبع سياسة السيولة الخاصة بالموجودات النقدية العالية ولا توجد خطوط ائتمان.

1. Introduction

Liquid resources enable firms to respond in a timely fashion to unexpected changes to their cash flows or set of investment opportunities (Demiroglu and James, 2011; Denis, 2011; Almeida et al., 2014). Under perfect capital market conditions, firms can adjust their capital structures to meet unexpected periods of insufficient resources (Denis, 2011). However, in the presence of financial frictions firms face states of the world where external funds will be costly or unavailable (Myers and Majluf, 1984; Myers, 1984). Therefore, value maximizing firms can design financial policies such as stockpiling cash and obtaining lines of credit that preserve the flexibility to respond to unexpected needs (Opler et l., 1999; Sufi, 2009; Denis, 2011). The use of cash holdings by firms as a store of liquidity has been under rigorous theoretical and empirical investigation for the past two decades (see for example Opler et al., 1999; Kim et al., 1998; Almeida et al., 2004; Acharya et al. 2007). More recently, and concurrent with the credit crisis of 2008, the attention has shifted to lines of credit as a source of "insured liquidity" (see for example Sufi, 2009; Acharya et al., 2014; Lins et al., 2011). In this study, we examine the determinants of the two liquidity resources of listed Jordanian firms with an emphasis on the roles of banking relationships, costs of external financing and ownership of the largest shareholder on these choices.

The theoretical motivation of stockpiling cash and obtaining lines of credit are similar. Under perfect capital market conditions, corporate liquidity is irrelevant because firms can raise external financing to meet unexpected changes in its cash flows or investment opportunity set at zero cost (Opler et al., 1999; Demiroglu and James, 2011; Denis, 2011; Almeida et al., 2014). However, due to transaction, information and agency costs associated with external financing cash may provide valuable financial flexibility to the firm (Opler et al., 1999; Almeida et al., 2004; Acharya et al., 2007; Denis, 2011). On the other hand, lines of credit are financial products designed to provide liquidity insurance when a firm faces market frictions that prevent it from investing in valuable projects (Holmstrom and Tirole, 1989; Boot et al., 1987; Sufi, 2009). The resemblance of the primary role of lines of credit and cash holdings leads to the question on whether these two types of liquidity are perfect substitutes and on which firm characteristics are associated with each type of liquidity source.

In this paper, we argue that lines of credit substitute cash holdings but to varying degrees depending on the strength banking relationship. Banks establish relationships with firms where a firm repeats borrowing from the same lender (Boot, 2000; Elyasiani and Goldberg, 2004; Schenone, 2009). These relationships allow banks to produce more information and refine the contract terms offered to the borrower over the course of the relationship (Berger and Udell, 1995; Boot, 2000; Elyasiani and Goldberg, 2004). We use measures of banking relationship utilizing information related to lines of credit, such as the duration of the line of credit, because lines of credit capture relationship-driven rather than transaction-driven bank debt (Berger and Udell, 1995). Berger and Udell (1995) argue that lines of credit in comparison to other types of bank debt are a formalization of relationship lending. We expect firms with lines of credit and firms with longer durations of lines of credit, a proxy of the strength of banking relationship, to accumulate significantly less cash.

In addition to examining the strength of the substitution effect of lines of credit on cash holdings this article investigates the choice between the two liquidity sources. We focus on the impact of two groups of variables: the first group deals with firm characteristics that are likely associated with firms facing high costs of external financing, namely: cash flows, size and book to market. The second group concern ownership of largest shareholders. The first group of variables has been under rigorous theoretical and empirical investigation in the cash holdings literature. Theoretical motivation based on the trade-off theory and financing hierarchy theory summarized in Opler et al. (1999) and the theoretical literature on the impact of financial constraints on cash flow sensitivity of cash (Almeida et al., 2004) predicts that firms subject to

higher costs of financing accumulate large cash reserves. Empirical evidence largely supports this prediction (see section 3). Conversely, firms facing higher costs of external financing can be "forced" out of the line of credit services offered by banks (Sufi, 2009). Hence, firms subject to higher costs of external financing will find lines of credit costlier than cash holdings and hence choose to preserve their financial flexibility using cash holdings.[1] According to this view, lines of credit could be interpreted as a measure of financial constraints (Sufi, 2009). To the extent that the cash flow sensitivity of cash reflects financial constraints (Almeida et al., 2004), we expect firms without lines of credit to exhibit significantly higher cash flow sensitivity of cash compared to firms with lines of credit.

Furthermore, lines of credit are bank instruments committing to provide credit, and hence, ownership structure may influence the choice of obtaining lines of credit in a way similar to its impact on debt in general. Strebulaev and Yang (2013) study zero and almost-zero leverage behaviour among US firms and show that a firm's ownership structure affects the probability of having zero leverage. Therefore, we examine how ownership structure influences a firm's incentives to choose lines of credit. We propose that ownership of the largest owner is negatively related to the probability of having a line of credit. In case of listed Jordanian companies, the large shareholder is a controller. She is represented in the board of directors (BoD) and she forms strong ties with other members of the board (based on family, mutual business ties . . . etc) and she usually assumes the Chairman and the CEO positions. In case of the appointment of a professional manager, the largest shareholder has the power and discretion to fire the manager through the BoD. Hence, largest shareholders in listed Jordanian companies have substantial control over the firm and hence their incentives are likely to be similar to inside owners/controllers rather than blockholders/monitors. Therefore, large shareholders may show low preference to lines of credit to avoid monitoring, discipline and transfer of control rights that are associated with bank lending. In addition, to test if the negative impact of ownership on lines of credit is a demand side not supply-side effect we examine the impact of ownership on the drawn portion of lines of credit. If the negative impact is a demand side effect firms with large owner-controllers will be reluctant to use the line of credit facility even if they have access to the facility. Therefore, we expect a negative relationship between ownership and the drawn proportion of the line of credit facility.

Our findings show that, controlling for the size of debt, lines of credit are significantly and negatively related to cash holdings. We also find that the duration of the line of credit is significantly and negatively related to cash holdings. This result is present in the full sample and in the sample of firms with lines of credit. The evidence indicates that lines of credit provide an alternative source of liquidity hence reducing the need to accumulate cash. It also indicates that the negative effect is stronger for firms that are in banking relationships. In addition, we find that firm characteristics associated with costly external financing positively affect the accumulation of cash holdings and negatively affect the probability of having a line of credit. To investigate if these findings are consistent with the hypothesis that the lack of access to lines of credit is a measure of financial constraints we run regressions of cash flow sensitivity of cash using lines of credit as our *priori*. We find that firms with lines of credit exhibit higher positive significant cash flow sensitivity of cash.

In addition, we examine a firm's choice between lines of credit and cash holdings by examining the probability of having a line of credit (firms without lines of credit are choosing to manage their liquidity using cash reserves). We find that the probability of having a line of credit is decreasing with ownership of the largest shareholder. In order to examine if this result is driven

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[1] This paper does not examine the costs of lines of credit, however, the extant evidence shows that these include revocation of the line of credit when the firm faces a negative cash flow shock (Sufi, 2009; Almeida et al., 2014) and adjusting the contract terms by increasing the spreads and commitment fees (Jimenez et al., 2011).

by a demand not supply side, we show that ownership is also negatively related to the used portion of the credit facility indicating that firms with large shareholders are reluctant to use credit even if they have the facility. These results show that ownership is associated with lower leverage, a result consistent with Strebulaev and Yang (2013) finding that inside ownership is positively related to zero (and almost zero) leverage. These results suggest that firms with controlling large shareholders are more likely to manage their liquidity through cash holdings not lines of credit. Finally, we examine the impact of ownership of the largest shareholder on a firm's liquidity policy and we find, similar to the previous result, that ownership is significantly and negatively related to lines of credit and significantly and positively related to cash holdings. This result suggests that firms with large controlling shareholder pursue a liquidity policy of no lines of credit and excess cash holdings.

This study contributes to the extant literature on cash holdings and line of credit determination. To the best of our knowledge this is the first study to examine the impact of lines of credit on cash holdings from a relationship lending channel. Numerous studies on cash holding determinants suspected that lines of credit can have a negative impact on cash holdings as they represent an alternative liquidity source but could not examine this proposition due to data (un)availability at the time (Olpler et al., 1999). Other studies examine the impact of bank debt on cash holdings by proposing that banks are efficient in solving information asymmetry and hence access to bank debt allows firm greater capacity of external financing (Ozkan and Ozkan, 2004; García-Teruel and Martínez-Solano, 2008). However, these studies do not specify which type or characteristics of debt have a substitution impact on cash holdings. In this study, we show that lines of credit substitute cash and that relationship lending strengthens that substitution effect. In addition, this study supports Sufi's (2009) finding that "lack of access to a line of credit is a . . . measure of financial constraints" (p. 1057) using data from an emerging market. This is a useful finding given that measures of financial constraints that are used in the literature indicate difficulty in accessing capital markets. In case of Jordan, firms rarely issue new external financing through the capital market. Therefore, a measure of difficulty of access to the banking system is more applicable. Finally, to the best of our knowledge, this is the first study to examine the impact of the ownership of the largest owner-controller on access to lines of credit and its overall impact of liquidity choices. There is a large body of research examining the impact of governance on cash holdings using international and country specific contexts (see for example Harford, 1999; Dittmar et al., 2003; Kalcheva and Lins, 2007; Pinkowitz, et al., 2006; Harford et al., 2008 to name a few). However, there is little research on the impact of governance on lines of credit with the exception of Yun (2009). The author examines that impact of US state-level changes in takeover protection in a firm's choices between cash and line of credits and finds that cash holdings increase *relative* to lines of credit when the threat of takeover weakens. Yun (2009) findings indicate that managers have preference of stockpiling cash which they pursue when governance becomes weaker. In this paper, we examine the impact of ownership of the largest owners-controller with the view that large owners dislike debt.

In the case of Jordan, firms rarely issue new external financing through the debt market with currently one traded debt issue with a size of 25 Million JDs. On the other hand, and according to statistics issued by the Central Bank of Jordan, total deposits for 2014 with licensed banks amounted to 30.26 billion JDs (approximately \$42.76 billion). For the same year, the World Bank reports that Jordan's GDP at market prices was \$35.83 billion. That is the ratio of Deposits to GDP is 1.19 times indicating the strength of the banking system in the Jordanian economy. The overall evidence shows the extent at which financial products offered by banks can influence corporate decisions at a firm level. Specifically, the evidence shows that lines of credit substitute cash holdings in maintaining a firm's financial flexibility and this effect grow stronger with relationship lending. Given the important role of lines of credit in facilitating a

firm's financial flexibility as an example, it is essential to understand why some firms still find lines of credit more costly than internal sources of financing. Policy makers may be concerned of how banks may increase their reach to financially constrained firms. The results of this study suggest that relationship lending could be one channel. In addition, this study shows that firms with large owner-controller follow a zero line of credit policy. This finding calls for more attention towards the impact of a firm's governance on its credit policies. Is examining these issues in the context of a small emerging country relevant to other economies? We believe that the findings presented in this paper have implications for economies with banking systems that are relatively more important than their capital markets, such as Jordan. The results of this study highlight the importance of relationship lending on a firm's financial policies in a market plagued with frictions, proposes the use of lack of access of lines of credit as a measure of financial constraints for countries with banking-based systems, and show how ownership structures affect firms' liquidity policies. All of these issues are relevant to other emerging markets.

The rest of this article is organized as follows. In the next section, we discuss model specification. The main determinants of cash holdings and lines of credit are discussed in Section 3. We present data, sample choice and descriptive statistics in Section 4. Then, we present the results and analysis in Section 5 and we conclude in Section 6.

2. Model Specifications

The empirical literature on firm's liquidity choices measures the relative importance of lines of credit to cash holdings using the ratio of the size of the line of credit facility divided by the sum of facility size and cash holdings (Sufi, 2009; Jimenez et al., 2009). Ideally, we would use this construct as our dependent variables and test the impact of banking relationships, firm characteristics, and ownership on this construct. However, the published annual reports of listed Jordanian companies disclose the existence of a facility and the drawn portion of the facility. Other information related to credit facilities is not reported regularly across firm and over time. Therefore, data limitations do not allow us to collect the size of the credit facility or the unused portion of the facility. To test the substitution impact of lines of credit on cash holdings and the impact of banking relationships we model cash holdings using lines of credit and the duration of lines of credit as the two main variables of interest. To examine these effects, we estimate a cash model specified in equation 1:

$$Cash_{it} = \sum \gamma_j Z_{jit} + \lambda_1 Bank\ Access_{it} + \sum \beta_k X_{kit} + e_{it} \qquad (1)$$

where Z_{jit} is a vector of control variables associated with firms that may find internal sources of financing less costly than external sources of financing. These variables include: *Cash Flow*, *MTB*, and *Size*. $Bank\ Access_{it}$ is approximated using *Credit Line*, an indicator variable taking the value of one if the firm has a line of credit and zero otherwise, and *Duration*, which is the logarithm of the number of periods the firm have had its line of credit. Firms may obtain lines of credit for transitory periods while others keep their lines of credit for longer periods. Previous evidence shows that firms with repeated borrowing from the same bank form stronger relationships with their lenders and hence obtain credit at better terms (for surveys of the literature see Boot, 2000; and Elyasiani and Goldberg, 2004). Therefore, we expect firms with stronger banking relationships to depend more on the financial products offered by their relationship bank to manage their liquidity. Berger and Udell (1995) argue that measuring banking relationship using information related to lines of credit is more appropriate for SMEs since lines of credit constitute a formalization of the relationship. Therefore, we expect firms with longer durations of lines of credit, a proxy of the strength of banking relationship, to accumulate significantly less cash. In our specification, we employ an indicator variable that takes the value of one if the firm has a line of credit and zero otherwise. To refine our inferences, we also include a proxy of relationship banking defined as the duration of lines of

credit and computed as the logarithm of the number of years the firm has been using a line of credit. X_{jit} is a vector of control variables that include the following: *Volatility*, *Age*, *Dividends*, and *Capital Expenditures*. The choice of control variables and their definitions is discussed in the next section.

In order to test the impact of firm characteristics and ownership on the firm's liquidity choices we examine the probability of having a line of credit. The 0/1 indicator variable used as our dependent variable has been utilized in Sufi (2009) and is a reduced form of the ratio of the size of the line of credit facility divided by the sum of facility size and cash holdings. We hypothesize that there are two main groups of firms that are less likely to obtain lines of credit: Firms which are financially constrained and still find lines of credit more costly than saving cash and firms with large owner-controllers which try to avoid debt altogether because of their preference. To examine these effects, we estimate a line of credit model specified in equation 2:

$$Credit\ Line_{it} = \sum \gamma_j Z_{jit} + \delta_1 Largest_{it} + \sum \beta_k X_{kit} + e_{it} \qquad (2)$$

where Z_{jit} is a vector of control variables associated with firms that may find internal sources of financing less costly than external sources of financing. These variables include: *Cash Flow*, *MTB*, *Size*, and *Tangibility*. *Largest*, is the ownership of the largest shareholder. X_{jit} is a vector of control variables that include *Volatility* and *Age*. The choice of variables is discussed in the next section.

At the primary stage of analysis, equation 1 is estimated using OLS. However, the error term e_{it} in equation 1 contains both individual firm-specific effects v_i and the usual idiosyncratic error v_{it}. The individual firm-specific effects v_i are assumed to be correlated with other explanatory variables, which renders the OLS coefficient estimates biased and inconsistent. To get unbiased and consistent estimates of the coefficients, equation 1 is modified to take into account the firm's unobservable specific effects that change across firms but are fixed for a given firm through time (Wooldridge, 2002). This study employs two alternative models that deal with firm heterogeneity: fixed (within) effects and random effects. The fixed effects estimator treats v_i as fixed constants while in random effects estimator v_i are assumed to be drawn randomly. In this study, we do not make assumptions about the correlation between the independent variables and the unobservable effects and hence we employ both estimation methods. Equation 2 is estimated using probit. To account for the bias resulting from the simultaneous choice of lines of credit and cash holdings we estimate equations 1 and 2 using a 3SLS and 2SLS (by applying the CMP procedure suggested by Rodman, 2010). Finally, to account for time and industry variations, the two equations include industry and time effects.

3. Determinants of Liquidity Choices

In this section, we review determinates of cash holdings and lines of credit as suggested by the relevant literature. Because both models contain similar variables, and for economically similar reasons, we discuss each variable once and explain if this variable will belong to the cash holding or cash equation or both. Our model for cash holdings is based on Opler et al. (1999) and our line of credit model is based on Sufi (2009). However, we allow minor addition and deletion of variables based on data availability and relevance to the context of Jordan.

3.1 Cash Flow

We use cash flows as a determinant for the two liquidity choices. Cash flows are expected to be positively related to cash holdings (Opler et al., 1999) because firms prefer internal to external sources of financing in the presence of information asymmetry (Myers and Majluf, 1984, Myers, 1984). The empirical evidence documents a positive impact of cash flows on cash (Opler et al., 1999; Ferreira and Vilela, 2004; Ozkan and Ozkan, 2004; and García-Teruel and Martínez-Solano, 2008). Cash flows are also expected to be positively related to the probability

of obtaining a line of credit (Sufi, 2009). Commercial banks use cash flows as a base to various types of covenants when approving lines of credit (Sufi, 2009). For example, firms are usually required to maintain a certain level of cash flows that is at least sufficient to repay the interest expenses. However, Campello et al. (2011) argue that relationship between cash and cash-flow is non-linear. At low level of cash firms will seek to have a line of credit and hence positive cash flows may help the firm obtain a line of credit, but at high level of cash firms may not need to raise funds through lines of credit and hence cash flows become unrelated to cash. Campello et al. (2011) find that cash flow is positively related to the ratio of lines of credit divided by total liquidity for firms with small cash holdings. In this study, we measure cash flows as earnings before interest and taxes and depreciation divided by net total assets (Sufi, 2009). Net total assets are defined as total assets minus cash.

3.2 Growth opportunities

We also use growth opportunities as a determinant for the two liquidity choices. Firms choose internal financing over information-sensitive external financing in the presence of information asymmetries (Myers and Majluf, 1984). Firms avoid issuing information-sensitive securities because the adverse selection costs make these securities very expensive (Myers and Majluf, 1984). Firms with large growth opportunities are subject to greater information asymmetry which can result in a premium for external financing (Myers and Majluf, 1984). Therefore, a firm with a large set of growth opportunities have incentives to save cash flows into cash in order to avoid a case whereby it will have to pass profitable investment opportunities because of the high costs of external financing. The empirical evidence shows that firms with higher growth opportunities accumulate large amounts of cash (Kim et al., 1998; Opler et al., 1999; Ferreira and Vilela, 2004 Ozkan and Ozkan, 2004; Guney et al., 2007; and García-Teruel and Martínez-Solano, 2008). The flip-side of the argument is that firms with large growth opportunities are less likely to obtain lines of credit (Sufi, 2009). Following Sufi (1999) growth opportunities are measured using the net market to book ratio defined as the market value of equity plus book value of net assets minus book value of equity divided by net total assets.

3.3 Firm size

Size is also used as a determinant for the two liquidity choices. Large firms enjoy economies of scale when they issue external financing as they can distribute the fixed cost component of issuing external funds over a large size of funds (Smith and Warner, 1979; Smith, 1993). In addition, small firms are subject to greater information asymmetry compared to large firms and, therefore are more likely to be financially constrained (Fazzari and Petersen, 1993). Therefore, small firms are expected to accumulate cash and are expected to be less likely to obtain lines of credit. The empirical evidence shows that smaller firms accumulate large amounts of cash (Kim et al., 1998; Opler et al., 1999; Ferreira and Vilela, 2004; Bigelli and Sanchez-Vidal, 2012) while other studies document negative but insignificant impact of size on cash holdings (Ozkan and Ozkan, 2004; Guney et al., 2007; and García-Teruel and Martínez-Solano, 2008). Following Sufi (1999), size is measured as the natural logarithm of net total assets, net total assets are defined as total assets minus cash.

3.4 Cash flow volatility

Cash flow volatility enters as a control variable in the two liquidity choices. Firms with more volatile cash flows will be subject to a greater number of states in which the firm will be short of liquid assets (Ozkan and Ozkan, 2004). Therefore, firms may fail to finance all profitable projects and they face larger costs of external financing (Ozkan and Ozkan, 2004). Thus, firms with more volatile cash flows are expected to hold more cash in order to reduce the costs of sudden liquidity shortages. The evidence documented in Opler et al. (1999); Bigelli and Sanchez-Vidal (2012); and Guney et al. (2007) show that cash flow volatility is positively related to cash holdings. In an important paper, Bates et al. (2009) find that the volatility of

new listed firms accounts for most of the increase in cash holdings witnessed by US firms in the recent two decades. In terms of the impact of volatility on the use of lines of credit, higher cash flow volatility accelerates the violation of cash flow-based covenants and hence reduces the likelihood of obtaining a line of credit (Sufi, 2009). Volatility of cash flows is measured following the approach in Sufi (2009). It is computed as the standard deviation of annual changes in the level of cash flows (earnings before interest, taxes and depreciation) over a lagged four-year period, scaled by average non-cash assets in the lagged period.

3.5 Age

We use the firm's age as a determinant of the two liquidity choices. A firm's age is a proxy of information asymmetry as it measures how much the market knows about the firm. Old firms are expected to be more known to the market in comparison to small firms. We include the natural logarithm of the years since the firm's inception. Age is expected to be negatively related to cash holdings (Opler et al., 1999) and positively related to the likelihood of obtaining a line of credit (Sufi, 2009).

3.6 Leverage

We use Leverage as a determinant of cash holdings. Under the financing hierarchy theory, a firm with internal resource surplus uses these resources to repay debt and/or save cash. However, when a firm is in deficit it exhausts its cash savings and/or issue debt. This implies a negative relation between leverage and cash holdings. In addition, Opler et al. (1999) note that firms facing low investment opportunities set have the lowest marginal benefits of holding cash and are also the ones that have high leverage and hence there exist a negative relation between leverage and cash holdings. Several empirical studies document a significant negative relation between leverage and cash holdings including Opler et al. (1999), Guney et al. (2007) and Ozkan and Ozkan (2004), and García-Teruel and Martínez-Solano (2008). This study measures leverage as the amount of total debt, short and long, divided by book value of assets.

3.7 Dividends and capital expenditures

Following Opler et al. (1999) we include dividends and capital expenditures in our cash model. Dividend cuts can provide funds in case of a liquidity shortage (Opler et al., 1999). Dividend cuts are assumed to be associated with low costs and hence dividend-paying firms accumulate lower cash in comparison to non-paying firms. However, Ozkan and Ozkan (2004) argue that dividend-paying firms could accumulate cash to avoid scenarios where they are short of internal cash flows that are insufficient to pay dividends. Dividends are measured by assigning a value of one for firm-years paying dividends and zero otherwise. Capital expenditures could be positively or negatively related to cash holdings. Firms with high growth opportunities invest a lot and hence they hold on average more cash to support their capital expenditures (Opler et al., 1999). However, the financing hierarchy view predicts that firms that spend more on capital expenditures have fewer internal resources and hence these firms would accumulate less cash (Opler et al., 1999).

3.8 Tangibility

We use Tangibility as a determinant of lines of credit (Sufi, 2009). Asset tangibility is expected to be positively related to the likelihood of obtaining a line of credit as these assets are easier to value and could be used as collateral (Graham and Harvey, 2001). Tangibility is measured as net fixed assets scaled by non-cash total assets. Operational definitions of the variables discussed so far are presented in Table 1.

Table 1 summarizes variable operational definitions. Financial data is collected from the Corporate Guides issued by the Amman Stock Exchange (ASE). Ownership data is collected from the Corporate Guides for the period 2002-2007 and from the financial statements of listed companies thereafter.

4. Data Sources and Sample Description

The sample consists of nonfinancial Jordanian companies publicly traded on the Amman Stock Exchange (ASE) over the period 2002-2013. The choice of the sample period is motivated by data availability as the ASE has been reporting financial data regularly through the Company Guides starting from 2002. In addition, the computation of the measure *Volatility* requires observations from the previous four years and therefore the analysis uses the data from the period 2005-2013. The data is collected from three main sources. Data on financial items and information on market values are obtained from the ASE's Company Guides and Trading Files respectively. Company Guides compile financial data items obtained from the financial statements of firms listed in the ASE and is published by the ASE at the end of each year. Trading Files compile market related data including the market value of listed firms. Data on ownership is collected from the Companies Guide for the period 2002-2007. The 2008 Company Guide edition onwards do not compile ownership data. Therefore, ownership data is collected manually from the firm's annual reports for the period 2008-2013. It is mandated that listed firms on the ASE disclose in their annual reports the names of owners with an equity stock holding equal or above 5%, the numbers of declared shares and the corresponding percentage of ownership for each owner. The financial, market and ownership data are then matched using the firm's identifier. Firms with less than two consecutive years of complete data items are excluded. The final sample consists of 131 nonfinancial firms. The next table presents some descriptive statistics of the key variables in the study.

Table 2 shows that half of firm-year (thereafter firms) observations hold 2.3% of their net total assets as liquid cash. Nonetheless, the mean value of *Cash* is 8% indicating that some firms have relatively large cash holdings (relative to the median value). For example, the 75th percentile firms report a *Cash* ratio of 9.3%. It is interesting nonetheless that more than 25% of firm-year observations hold less than 1% of cash. The distribution of cash across the years is fairly homogenous during the 2005-2013 period with the average ranging between 7% low in 2008 and 9.3% high in 2013 (not reported). To examine if there are industry effects, we examine the mean and median values of Cash for the 19 sectors (sectors are defined based on the ASE classification) in Table 3. The mean values indicate that there are some industry effects with regards to cash holdings, however, the median values suggest that the average sector effect may be driven by one or a small number of firms in that sector. For example, the technology and communication sector have the highest average of 41%, however, the high cash ratio in this sector is mainly driven by one company "Jordan Telecom". Nonetheless, we control for both time and industry effects in our regression analysis. Table 3 reports the mean and median values of Cash for the 19 sectors in the ASE. Sectors are defined based on the ASE classification.

Table 4 presents the correlation coefficients between the variables of the study. Focusing on the correlation coefficients between cash and its expected determinants, we note that most variables carry the expected sign. As hypothesized, *Credit Line* and *Duration* are negatively and significantly correlated with *Cash*. In addition, ownership by the largest owner (*Large*), growth opportunities (*MTB*), cash flow (*Cash Flow*) and cash flow volatility (*Volatility*) are all positively and significantly correlated with *Cash*. Similarly, *Leverage* carries the expected negative sign and is significantly correlated with *Cash*. *Dividends* is positively correlated with cash indicating that dividend-paying firms maintain a reserve of cash in order to sustain their dividends payments in case of cash flow shortfall. However, other expected determinants of cash including, *Size*, *Capital Expenditures*, and *Age*, are not significantly correlated with *Cash*. With regard to the determinants of having access to lines of credit we report that in line with our hypothesis *Size* is positively and significantly correlated with *Credit Line* and *MTB* is negatively and significantly correlated with *Credit Line*. However, *Cash Flow* is significantly and negatively correlated with *Credit Line*, while *Tangibility* is negatively correlated with *Credit Line* but at 5% significance level. In the following section we will examine the negative

relation between *Cash Flow* and *Credit Line* further and show that the relation between these two variables is nonlinear as it depends on the level of cash holdings. We also report that in line with our hypothesis *Large* is negatively and significantly correlated with *Credit Line*.

5. Results and Analysis

5.1 Cash holdings and access to lines of credit

We start the analysis by examining the impact of lines of credit and the duration of lines of credit on the level of cash holdings. Lines of credit are important alternative of cash holdings given that they provide liquidity insurance and hence they could substitute cash. However, we are more interested in lines of credit as a proxy of the presence of an existing relationship with an outside source of financing and the impact of the strength of this relationship on cash holdings. We are also interested in examining the impact of having lines of credit on mitigating financial constraints. Provided that saving cash out of cash flows is a good indicator of the financial constraints facing a firm, firms with lines of credit will have fewer incentives to save cash out of cash flows in comparison to firms without lines of credit. In order to examine the impact of lines of credit on cash holdings we estimate the cash model specified in equation 1 using OLS, fixed and random effects and report the results in Table 5. All specifications include time effects to control for macroeconomic conditions and all specifications include industry effects, except for the fixed effects estimator, to control for industry variation on cash holdings. All models are estimated using robust standard errors.

We start our analysis by discussing the impact of the set of control variables. *Cash Flow* is positively and significantly related to *Cash* at the 1% level in all specifications. This result is consistent with the pecking order view of cash holdings, where firms accumulate internal sources of financing to avoid the premium of external sources of financing in the presence of information asymmetry. In addition, we find that find that *MTB* carries the predicted positive sign and is statistically significant at the 1% level (5% using the fixed effects estimator). Firms with large *MTB* maintain larger cash balances in order to avoid a case whereby they will have to pass profitable investment opportunities because of the high costs of external financing. *Size* is negatively related to *Cash*; however, the impact is statistically significant at the 5% and 10% level for the OLS and random effects respectively but is statistically insignificant for the fixed effects model. This result is consistent with the view that large firms enjoy larger economies of scale and are subject to lower information asymmetry and hence have fewer incentives to accumulate cash. *Volatility* is positively related to *Cash* with a significant impact at the 1% and 5% level for the OLS and random effects respectively but is a statistically insignificant for the fixed effects model. Firms with more volatile cash flows will be subject to a greater number of states in which they will be short of liquid assets and therefore they may fail to finance all profitable projects which incentivize them to accumulate more cash. *Leverage* is negatively related to *Cash* but significant only using the OLS estimator. Firms with leverage are also characterized by low growth opportunities and hence they accumulate low cash. *Dividends*, *Capital Expenditures*, and *Age* are all insignificant in all models except for *Age* in OLS estimation.

Table 5 reports estimation results of the cash model with *Credit Line* as the main variable of interest using three estimation methods. The sample consists of nonfinancial Jordanian firms listed in the ASE over the period 2002-2013. Estimation is carried over the period 2005-2013 due to loss of data caused by the computation of *Volatility*.

The variable of interest *Credit Line* is negatively and significantly related to cash holdings at the 1% significance level except for the fixed effects model where it is significant at the 5%. Taking the random model as our base case, we expect firms with lines of credit *citrus paribus* to have on average lower cash holdings by 2.7%. This is a large difference given that the average cash holding is 8%. This result could be attributed to a substitution effect between lines

of credit and cash holdings. Firms that secure a line of credit facility can use the facility as an alternative to cash holdings for liquidity purposes. Next, we measure the duration of the line of credit by counting the number of periods the firm have had a line of credit. The available data does not specify the source of the line of credit and therefore we assume that the line of credit is provided by the same bank. This assumption works against finding a negative relationship between the duration of the line of credit and cash holdings, and hence will weaken the statistical significance. We examine the impact of *Duration* on *Cash* using the full sample and the sub-sample of firms with lines of credit. This is because *Duration* could be a noisy proxy of *Credit Line* and hence measures the substitution effect in the full sample rather than the relationship effect. Table 6 reports the results of the impact of Duration on Cash using the full sample in the first column and the sample of firms with lines of credit in the second column. We find that *Duration* has a negative and significant effect on cash holdings at the 1% and 10% levels respectively. We attribute the reduction in the significance level among firms with lines of credit to the noise caused by the measurement errors of *Duration*.

Table 6 reports estimation results of the cash model using *Duration* for the full sample and the sub-sample of firms with lines of credit using random effects. The sample consists of nonfinancial Jordanian firms listed in the ASE over the period 2002-2013. Estimation is carried over the period 2005-2013 due to loss of data caused by the computation of *Volatility*.

The previous analysis shows that firms with lines of credit and longer durations accumulate lower cash holdings due to a substitution and relationship effects. These results imply that firms with lines of credit, especially the ones with longer durations, are less constrained in the sense that they secure funds externally when needed presumably at a fair cost. Therefore, it is important to identify which firms choose access or lack of it to line of credit facilities and why.

5.2 Lines of credit and external costs of financing

We use a line of credit model following Sufi (2009) focusing on two groups of variables. Similar to Sufi (2009), the first group of interest include firm characteristics that are likely associated with firms facing high costs of external financing, namely: cash flows, tangibility, size and book to market. The second group elates to ownership of largest shareholders which we will discuss next section. We are interested in the first group because firms facing higher costs of external financing are "forced" out of the line of credit services offered by banks (Sufi, 2009). In other words, these firms are likely to be difficult to value, even for banks, and hence they are offered lines of credit at terms that reflect in part information asymmetries and other market imperfections. We expect small, intangible firms with low cash flow and high market to book ratio to rely on internal cash rather than lines of credit. To test or prediction, we estimate equation 2 using Probit and report the results in Table 7. We find that smaller firms and firms with higher MTB are less likely to have access to lines of credit. This evidence is consistent with the view that firms facing higher costs of external financing are "forced" out of line of credit services offered by banks. However, Cash Flow is negatively and significantly related to the probability of having a line of credit which is inconsistent with our prediction. This finding implies that firms with low cash flows are more likely to secure a line of credit.

To examine this finding in more details, we follow Campello et al. (2011) who argue that the relation between cash flow and lines of credit is nonlinear and that it depends on the amount of cash a firm has in hand. At low level of cash firms will seek to have a line of credit and hence positive cash flows may help the firm obtain a line of credit. However, at high level of cash firms may not need to raise funds through lines of credit and hence cash flows become unrelated to cash. To test their prediction Campello et al. (2011) use an interaction variable between cash flow and cash holdings in a model that explains the variation in the size of the credit facility to total assets. However, our measure of lines of credit is an indicator variable that takes a value of one if a firm have a line of credit and zero otherwise. A zero observation, therefore, is a firm

who depends solely on cash and therefore we do not include another cash measure in the right-hand side. In order to test the non-linearity of the impact of cash flows on the probability of having access to lines of credit, we stratify our sample based on their cash holdings into high and low cash holding firms and report the estimates in Columns 2 and 3 respectively in Table 7. Consistent with our conjecture we find that cash flow exerts a positive and significant impact on the probability of obtaining a line of credit among firms with small cash holdings, but has no impact among firms with large cash holdings. Table 7 reports estimation results of access to line of credit model using probit. The sample consists of nonfinancial Jordanian firms listed in the ASE over the period 2002-2013. Estimation is carried over the period 2005-2013 due to loss of data caused by the computation of *Volatility*.

Can we interpret the previous evidence documented in Tables 5-7 from the view that firms without lines of credit are financially constrained? In order to examine this question, we follow Almeida et al. (2004) approach where they examine the cash flow sensitivity of cash of firms sub-grouped based on a priori of financial constraints. The common used priori in the literature are: payout ratio, firm size, bond ratings, commercial paper market ratings, and financial constraints indexes (Fazzari and Hubard, 1988, Almeida et al., 2004, Acharya et al., 2007). Firms identified by the priori as firms facing financial constraints (firms with low payout ratio, small firms, without bond or commercial paper ratings) are expected to save more cash from their cash flows to meet their financing needs. In this paper, we examine the propensity of saving cash from cash flows for firms with and without lines of credit. We run tests similar to Almeida et al. (2004) for firms with and without lines of credit using their model and our extended model. We find that firms without a line of credit indeed have a higher cash flow sensitivity of cash with a significant positive coefficient of 0.133 compared to firms without credit ratings with an insignificant coefficient of 0.034.

Table 8 reports estimation results of the cash flow sensitivity of cash using a reduced and extended model. The dependent variable is the change in cash holdings. The extended model contains the set of variables identified in equation 1. The sample consists of nonfinancial Jordanian firms listed in the ASE over the period 2002-2013. Estimation is carried over the period 2005-2013 due to loss of data caused by the computation of *Volatility*.

5.3 Liquidity choices and ownership

The evidence so far has viewed lines of credit from the precautionary motive perspective. Firms facing lower costs of external financing are more likely to obtain lines of credit, they exhibit less cash flow sensitivity of cash and they accumulate less cash especially when the duration of lines of credit increases. However, lines of credit are debt instruments and hence they can be affected by the preferences of owners-controllers towards leverage. Strebulaev and Yang (2013) study zero-leverage behaviour among US firms and show that a firm's ownership structure affects the probability of having zero leverage. In this study we examine the impact of the ownership of the largest owner on the probability of having a line of credit. The results are reported in Table 8. We find that the ownership of the largest owner is negatively and significantly related the probability of having a line of credit. To examine if this finding is driven by the demand rather than the supply side, we examine the impact of ownership on the size of the used line of credit (as a proportion to total assets) and report the results in Table 9, the second column. We find that ownership is also negatively related to the used proportion of the line of credit, suggesting that even in the case where firms with large owner-controller obtain lines of credit they are reluctant to use it. In addition, we examine if ownership is negatively related to leverage and report the results in the third and fourth columns in Table 9. We find that *Large* is negatively but insignificantly related to *Leverage* in the whole sample and negatively and significantly related to *Leverage* in the sample of firms without lines of credit. These results suggest that firms with large owner-controller are less likely to obtain lines

of credit and obtain little debt in comparison to other firms when they lack access to lines of credit.

Table 9 reports estimation results of the access to line of credit model with *Largest* as the main variable of interest. Table 9 also reports the estimation results of the impact of *Largest* on *Used Credit Line* and *Leverage*. The sample consists of nonfinancial Jordanian firms listed in the ASE over the period 2002-2013. Estimation is carried over the period 2005-2013 due to loss of data caused by the computation of *Volatility*.

To evaluate the economic importance of these effects we compute the marginal effects for the factors influencing the probability of obtaining a line of credit model when the factor increases from its median value to the 75th percentile holding all other variables at their mean levels. We find that *Size*, *MTB*, *Largest*, and *Volatility* have the largest impacts on the probability of having a line of credit. An increase of *Size* from the median to the 75th percentile increases the probability of obtaining a line of credit by 6.9%, an increase of *MTB* decreases the probability of obtaining a line of credit by 4.9%, an increase in *Largest* decreases the probability of obtaining a line of credit by 3.5%, and increase of *Volatility* decreases the probability of obtaining a line of credit by 2%. *Tangibility* and *Age* have minor marginal effects of 0.23% and (negative) 1.3% respectively. As for *Cash Flow,* we report the marginal effect of (negative) 3.1% for completeness purposes but advise that the effect of *Cash Flow* on *Credit Line* is non-linear.

We documented so far that *Largest* has a significant negative impact on the probability of obtaining a line of credit, but we didn't examine if *Largest* has an impact over cash holdings. Firms with large owners choose to avoid lines of credit and may compensate loss of liquidity provided by accumulating more cash. However, we are interested in excess cash holdings and hence we are concerned with examining the impact of ownership of the largest owner on the joint determination of the liquidity choices. To estimate the impact of ownership on cash holdings on the joint determination of cash holdings and lines of credit, we estimate a two stage least squares (2SLS) using the CMP procedure suggested by Rodman (2010). CMP is useful in estimating simultaneous equations with a binary dependent variable in the second stage. We also estimate the system using three-stage-least squares (3SLS) system of equations. The results are reported in Table 10. We find that ownership is significantly and negatively related to lines of credit but significantly and positively related to cash holdings. This result suggests that firms with large controlling shareholder pursue a liquidity policy of low lines of credit and excess cash holdings.

Table 10 reports estimation results of the simultaneous equation system of cash holdings and line of credit models using 2SLS (by applying the CMP procedure suggested by Rodman, 2010) and 3SLS respectively. *Largest* as the main variable of interest. The sample consists of nonfinancial Jordanian firms listed in the ASE over the period 2002-2013. Estimation is carried over the period 2005-2013 due to loss of data caused by the computation of *Volatility*.

6. Conclusion and Summary of the Results

This paper investigates the determinants of two liquidity choices of nonfinancial firms listed on the ASE over the period 2005-2013 by studying the cash holding and line of credit choices. This article focuses mainly on the impact of bank access, measured by having a line of credit, and the strength of this access, measured by the length of time a firm has a line of credit, on a firm's cash holdings. In addition, the study examines the impact of a firm's properties that are associated with high costs of external financing on the probability of having a line of credit. We find that firms with lines of credit and longer durations of lines of credit accumulate significantly lower cash holdings. We also find that firms subject to larger external financing (small and with higher growth opportunities) are less likely to obtain lines of credit. Taken together, these findings imply that firms without lines of credit are financially constrained. To

investigate this finding further we show that firms with line of credit exhibit no sensitivity of cash flow to cash whilst firms without lines of credit exhibit a positive and significant sensitivity of cash flow to cash. To examine if there are any demand side influences on liquidity policies, we examine the impact of the ownership of the largest owner on the probability of obtaining a line of credit and on the joint determination of lines of credit and cash policies. We document a negative significant impact of the ownership of the largest owner on the probability of obtaining a line of credit. We also document a significant positive impact of ownership on the level of cash holdings. These results suggest that firms with large owner-controller follow a policy of no lines of credit and high cash balances.

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Table 1: Summary of Variable Definitions

Variable	Proxy
Cash Holding Ratio (*Cash*)	Cash and cash equivalents divided by net total assets. Net total assets equal total assets minus cash.
Line of Credit (*Credit Line*)	Indicator variable taking the value of one if the firm has a line of credit and zero otherwise.
Duration (*Duration*)	The natural logarithm of the length of time a firm had a line of credit in a specific year.
Cash Flow Rights of the Largest Shareholder (*Largest*)	The percentage of shares held by the largest owner who hold 5% or more of outstanding shares.
Cash flows (*Cash Flow*)	Earnings before interest, tax and depreciation divided by net total assets.
Growth opportunities (*MTB*)	Net Market to book value ratio (MTB) defined as the market value of equity plus book value of net assets minus book value of equity divided by net total assets.
Firm size (*Size*)	Natural logarithm of net total assets.
Cash Flow Volatility (*Volatility*)	The standard deviation of annual changes in the level of cash flows (earnings before interest, taxes and depreciation) over a lagged four-year period, scaled by average non-cash assets in the lagged period.
Firm Age (*Age*)	The natural logarithm of the years since the firm's inception.
Debt Ratio (Leverage)	The total of all long and short-term borrowings divided by total assets valued at book basis.
Dividends (*Dividends*)	An indicator variable equals one if the firm pays dividends and zero otherwise.
Capital Expenditures (*Capital Expenditures*)	The change in net fixed assets between two consecutive years divided by total assets at the beginning of the year.
Tangibility (*Tangibility*)	Tangibility is measured as net fixed assets scaled by non-cash total assets.

Table 2: Summary Statistics

	Mean	Median	SD	Min	Max	Skewness	Kurtosis
Cash	0.080	0.023	0.153	0	1.241	3.705	19.177
Credit Line	0.619	1	0.486	0	1	-0.491	1.241
Duration	2.330	1	2.588	0	9	0.941	2.784
Largest	32.049	27	19.708	5.523	97.3	1.259	4.605
Cash Flow	0.076	0.071	0.131	-0.534	0.634	0.592	7.206
MTB	1.406	1.129	0.849	0.254	5.633	1.935	7.091
Size	16.810	16.728	1.371	12.649	21.278	0.327	3.555
Volatility	0.085	0.057	0.085	0.002	0.593	2.295	9.534
Age	23.004	18	15.410	1	75	0.968	3.204
Leverage	0.151	0.110	0.154	0	0.680	0.999	3.356
Dividends	0.421	0	0.494	0	1	0.322	1.103
Capital Expenditures	0.118	-0.020	0.862	-0.936	15.796	10.942	156.268
Tangibility	0.409	0.385	0.267	0.000	0.986	0.300	2.113

Table 3: Distribution of Cash across Industry Sectors

Sector	Mean	Median
Chemicals	0.058	0.017
Commercial Services	0.135	0.028
Educational Services	0.057	0.009
Electricals	0.074	0.028
Engineering and Construction	0.028	0.007
Food and Beverages	0.036	0.011
Glass and Ceramic	0.011	0.003
Health Care Services	0.059	0.018
Hotels and Tourism	0.109	0.035
Media	0.121	0.040
Mining and Extraction	0.116	0.042
Paper and Cardboard	0.107	0.009
Pharmaceutical and Medical	0.049	0.023
Printing and Packaging	0.035	0.037
Technology and Communications	0.416	0.336
Textiles, Leathers and Clothing	0.064	0.031
Tobacco and Cigarettes	0.088	0.030
Transportation	0.055	0.022
Utilities and Energy	0.018	0.011

Table 4: Correlation Matrix

	Cash	Credit Line	Dur	Large	Cash Flow	MTB	Size	Vol	Age	Lev	Div	Cap Exp	Tang
Cash	1												
Credit Line	-0.33	1											
	(0.00)												
Dur	-0.31	0.86	1										
	(0.00)	(0.00)											
Large	0.16	-0.15	-0.13	1									
	(0.00)	(0.00)	(0.00)										
Cash Flow	0.48	-0.14	-0.16	0.10	1								
	(0.00)	(0.00)	(0.00)	(0.00)									
MTB	0.47	-0.24	-0.26	0.13	0.48	1							
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)								
Size	0.03	0.11	0.13	0.02	0.32	0.03	1						
	(0.38)	(0.00)	(0.00)	(0.47)	(0.00)	(0.32)							
Vol	0.16	-0.10	-0.10	0.09	0.02	0.18	-0.08	1					
	(0.00)	(0.00)	(0.00)	(0.01)	(0.49)	(0.00)	(0.01)						
Age	0.05	0.02	0.14	-0.02	-0.02	0.07	0.09	0.00	1				
	(0.12)	(0.46)	(0.00)	(0.49)	(0.57)	(0.03)	(0.01)	(0.95)					
Lev	-0.17	0.04	0.05	-0.05	-0.15	-0.11	0.08	0.06	-0.12	1			
	(0.00)	(0.23)	(0.11)	(0.12)	(0.00)	(0.00)	(0.01)	(0.09)	(0.00)				
Div	0.19	-0.07	-0.06	-0.11	0.50	0.23	0.29	-0.09	0.11	-0.25	1		
	(0.00)	(0.03)	(0.09)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)			
Cap Exp	0.00	-0.01	-0.03	0.04	0.01	-0.01	0.06	0.02	-0.02	0.12	-0.02	1	
	(0.91)	(0.78)	(0.38)	(0.19)	(0.74)	(0.84)	(0.09)	(0.64)	(0.65)	(0.00)	(0.65)		
Tang	0.06	-0.07	-0.09	0.16	0.09	0.07	-0.02	-0.09	-0.17	-0.05	-0.04	0.02	1
	(0.08)	(0.03)	(0.00)	(0.00)	(0.00)	(0.02)	(0.58)	(0.01)	(0.00)	(0.14)	(0.22)	(0.62)	

Notes: Variables are defined in Table 1. *p*-values are in parentheses.

Table 5: Estimation Results of the Cash Model with Access to Line of Credit

	OLS	Fixed Effects	Random Effects
Constant	0.135 (1.71)*	-	-
Credit line	-0.049 (-6.85)***	-0.017 (-2.16)**	-0.027 (-3.63) ***
Leverage	-0.144 (-4.71) ***	-0.001 (-0.03)	-0.037 (-1.08)
Cash Flow	0.434 (5.55) ***	0.290 (4.53) ***	0.312 (4.90) ***
MTB	0.041 (4.90) ***	0.025 (2.25)**	0.030 (2.93) ***
Size	-0.011 (-2.13)**	-0.037 (-1.36)	-0.021 (-1.80)*
Volatility	0.191 (2.91) ***	0.098 (1.37)	0.124 (2.09)**
Dividends	-0.014 (-1.47)	0.004 (0.56)	0.002 (0.28)
Capital Expenditures	0.001 (1.12)	0.000 (0.57)	0.000 (0.95)
Age	0.014 (1.87)*	0.006 (0.18)	0.022 (1.62)
Time Effects	Yes	Yes	Yes
Industry Effects	Yes	-	Yes
Observations	932	932	932
Groups	131	131	131
R^2	0.4672	0.1677	0.1636
F Test (*P* Value)	-	10.89 (0.000)	-
Hausman Test (*P* Value)	-	-	35.94 (0.005)

Notes: Variables are defined in Table 1. *t*-statistics (alternatively *z*-statistics) are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% respectively.

Table 6: Estimation Results of the Cash Model with Duration

	Full Sample	Firms with Lines of credit
Duration	-0.022 (-3.85)***	-0.018 (-1.66)*
Leverage	-0.036 (-1.04)	0.032 (0.74)
Cash Flow	0.313 (4.90)***	0.194 (2.31)**
MTB	0.030 (2.95)***	0.021 (1.85)*
Size	-0.021 (-1.81)*	0.003 (0.61)
Volatility	0.129 (2.21)**	0.120 (2.16)**
Dividends	0.002 (0.32)	0.001 (0.10)
Capital Expenditures	0.000 (0.87)	0.000 (-0.03)
Age	0.024 (1.79)*	0.010 (1.32)
Time Effects	Yes	Yes
Industry Effects	Yes	Yes
Observations	932	577
R^2	0.1675	0.1246

Notes: Variables are defined in Table 1. *z*-statistics are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% respectively.

Table 7: Estimation Results of the Access to Lines of Credit

	Credit Line	Small Cash Holding Firms	Large Cash Holding Firms
Cash Flow	-1.473 (-3.29)***	3.381 (2.63)***	-1.130 (-0.81)
MTB	-0.306 (-4.73)***	-0.105 (-0.51)	-0.502 (-3.19)***
Size	0.214 (5.15)***	0.017 (0.12)	0.456 (3.65)***
Tangibility	-0.094 (-0.47)	0.022 (0.04)	0.318 (0.61)
Age	-0.069 (-0.93)	-0.100 (-0.46)	-0.437 (-2.35)**
Volatility	-1.258 (-2.18)**	-4.434 (-3.05)***	-0.535 (-0.45)
Time Effects	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes
Observations	932	209	213
R^2	0.133	0.172	0.320

Notes: Variables are defined in Table 1. *z*-statistics are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% respectively.

Table 8: Estimation Results of the Cash Flow Sensitivity of Cash

	Cash Flow	MTB	Size	R^2
Reduced Model				
Constrained (without CL)	0.133**	-0.010	0.001	0.044
	(2.08)	(-1.22)	(0.19)	
Unconstrained (with CL)	0.034	0.008	-0.002	0.019
	(0.93)	(1.60)	(-0.70)	
Extended Model				
Constrained (without CL)	0.11*	-0.011	0.002	0.063
	(1.78)	(-1.14)	(0.53)	
Unconstrained (with CL)	0.044	0.009**	-0.002	0.023
	(1.19)	(2.00)	(-1.11)	

Notes: Variables are defined in Table 1. z-statistics are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% respectively.

Table 9: Estimation Results of the Access to Line of Credit

	Credit Line	Used Credit Line	Leverage Full Sample	Leverage Credit Line Sample
Largest	-0.626 (-2.37)**	-0.054 (-1.70)*	-0.023 (-0.60)	-0.104 (-2.94)***
Cash Flow	-1.456 (-3.26)***	-0.044 (-1.01)	-0.123 (-2.66)***	-0.179 (-3.07)***
MTB	-0.289 (-4.43)***	-0.002 (-0.37)	-0.002 (-0.37)	0.007 (0.96)
Size	0.220 (5.29)***	0.037 (2.26)**	0.041 (2.23)**	0.108 (4.70)***
Tangibility	0.027 (0.13)	0.006 (0.30)	0.025 (0.60)	0.044 (0.96)
Volatility	-1.041 (-1.76)*	0.011 (0.26)	-0.007 (-0.11)	-0.180 (-2.02)**
Age	-0.066 (-0.89)	-0.003 (-0.13)	0.013 (0.51)	-0.028 (-0.83)
Time Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	-	-	-
Observations	932	932	932	355
R^2	0.138	0.051	0.053	0.238

Notes: Variables are defined in Table 1. *t*-statistics (alternatively *z*-statistics) are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% respectively.

Table 10: Simultaneous Equations

	2SLS	3SLS
Cash Model:		
Largest	0.056 (2.08)**	0.056 (2.64)***
Cash Flow	0.458 (5.70)***	0.456 (10.87)***
MTB	0.050 (6.19)***	0.050 (8.73)***
Size	-0.010 (-2.17)**	-0.010 (-2.95)***
Volatility	0.167 (2.87)***	0.168 (3.39)***
Age	0.008 (1.29)	0.008 (1.28)
Leverage	-0.114 (-4.36)***	-0.118 (-3.20)***
Dividends	-0.021 (-2.20)**	-0.020 (-2.02)**
Capital Expenditures	0.001 (0.97)	0.001 (1.83)*
Credit Line Model:		
Largest	-0.914 (-3.51)***	-0.275 (-3.51)***
Cash Flow	-1.798 (-3.47)***	-0.344 (-2.43)**
MTB	-0.325 (-4.88)***	-0.115 (-5.38)***
Size	0.237 (5.31)***	0.055 (4.62)***
Tangibility	0.123 (0.65)	-0.052 (-0.91)
Volatility	-0.911 (-1.51)	-0.190 (-1.04)
Age	-0.037 (-0.52)	0.021 (0.94)
Time Effects	Yes	Yes
Industry Effects	Yes	Yes
Observations	932	932

Notes: Variables are defined in Table 1. *z*-statistics are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% respectively.