



# What drives corporate liquidity? An international survey of cash holdings and lines of credit <sup>☆</sup>

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## ABSTRACT

We survey chief financial officers from 29 countries to examine whether and why firms use lines of credit versus non-operational (excess) cash for their corporate liquidity. We find that these two liquidity sources are employed to hedge against different risks. Non-operational cash guards against future cash flow shocks in bad times, while credit lines give firms the option to exploit future business opportunities available in good times. Lines of credit are the dominant source of liquidity for companies around the world, comprising about 15% of assets, while less than half of the cash held by companies is held for non-operational purposes, comprising about 2% of assets. Across countries, firms make greater use of lines of credit when external credit markets are poorly developed.

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## 1. Introduction

This paper examines whether and why firms from around the world use lines of credit versus cash for their

corporate liquidity. Theoretical research argues that both lines of credit and cash are used as a precautionary hedge against the possibility that capital market frictions will prevent firms from obtaining external finance to fund valuable projects. However, cash provides unconditional liquidity available at any time, whereas lines of credit provide conditional liquidity because they are available only as long as the would-be borrower continues to meet covenants. Thus, it may be the case that these two liquidity sources do not fulfill the same precautionary role but are instead employed to hedge against different risks. Our paper explores precisely this question.

We build on recent research by Sufi (2009) and Yun (2009). These papers find that lines of credit are very large sources of liquidity for U.S. firms. Sufi finds that firms with higher current or expected cash flows make greater use of credit lines relative to cash and that banks restrict access to credit lines when firms violate covenants. Yun investigates a different motivation for holding cash versus

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lines of credit—agency costs—and concludes that firms with lower-quality corporate governance prefer to hold unmonitored cash rather than bank-monitored credit lines. Taken together, the Sufi and Yun evidence implies that firms with low cash flows or high agency costs do not view credit lines and cash as substitute liquidity instruments.

While Sufi (2009) and Yun (2009) convey results on the type of firm that tends to use lines of credit relative to cash, neither paper directly explores whether firms actually use these liquidity instruments in a similar or different manner, which is the focus of our paper. Given the substantial presence of credit lines in the U.S. and the implication that some types of firms cannot expect to use credit lines and cash interchangeably, it is possible that important differences exist in the way firms use these liquidity instruments. In particular, holding lines of credit may ensure funding for future investment options available in good times, while holding cash may ensure that current operations and investment plans can be funded in bad times. It is also useful to know more about whether firms outside of the U.S. make extensive use of credit lines and, if so, why.

We examine the size of credit lines and reasons for their use relative to cash by employing data from a comprehensive global survey of chief financial officers (CFOs) encompassing a broad range of both public and private companies from 29 countries. Using a survey to assess corporate liquidity in an international setting has many benefits. First, while levels of total cash are available internationally, line of credit data are not disclosed consistently in financial statements. International Financial Reporting Standards (under which most large international companies choose to or are required to report) do not explicitly refer to the disclosure of data on lines of credit. Thus, the only way to examine whether the use of lines of credit is as prevalent internationally as it is in the U.S. is to ask companies. Our survey approach also allows us to analyze both listed and privately held firms.

Second, existing research has had to infer which firms (if any) view credit lines and cash as substitute liquidity instruments. Our survey asks financial executives directly whether they consider these liquidity types as substitutes, and what factors they consider important when making credit line and cash holding choices. We also gather data on, and test, whether executives' perceptions of their firms' risk, equity and debt misvaluation, and need for external funding affect their use of each type of liquidity, which allows us to directly assess whether firms use them to hedge against different risks.

Finally, the theory behind holding liquidity in the form of cash is, fundamentally, based on non-operational (i.e., excess) cash holdings, not operational cash holdings. This distinction is not reported in financial statements. Our survey asks about the fraction of cash required for day-to-day operational purposes. As such, we can assess lines of credit in relation to their appropriate cash benchmark, non-operational cash. We can also investigate whether total cash holdings, which are commonly used in the

liquidity literature, are a good proxy for non-operational cash holdings.

Our analysis provides new evidence on the way firms from around the world use credit lines and cash for their corporate liquidity. Using regressions, we find that credit lines are higher when firms' managers state that they have high future external funding needs or believe their equity is undervalued. Also, managers state in the survey that certainty of funding for acquisition opportunities is an important factor for their line of credit decisions. Thus, credit lines tend to hedge against the possibility that frictions in obtaining external finance may prevent a firm from funding valuable future investment opportunities in potential good times ahead. In contrast, non-operational (excess) cash holdings are not positively related to either a firm's need for future external funds or a belief that its equity is undervalued, and the most prominent reason cited by CFOs when deciding on excess cash holdings is that it acts as a buffer against future cash flow shortfalls. Thus, non-operational cash tends to hedge against the possibility that capital market frictions will prevent a firm from funding its current operations in potential bad times ahead. Broadly speaking, lines of credit appear to be held to fund future growth options while non-operational cash appears to be held as general purpose insurance.

Our survey data also provide interesting results on the way firms from around the world obtain their corporate liquidity. Consistent with U.S. results, firms from our sample have high levels of credit lines—the median credit line is about 15% of assets, a level similar to the 16% of assets reported by Sufi (2009). We also find that less than half of the total cash held by companies is held for non-operational purposes, amounting to only about 2% of assets. This indicates that high levels of total cash sometimes discussed in academic research (e.g., Bates, Kahle, and Stulz, 2009) or the financial press (e.g., McDonald, 2006) do not represent high levels of excess liquidity for many firms.

Several additional findings emerge from our data and tests. Fewer than half of the CFOs surveyed believe that credit lines and non-operational cash are substitute liquidity instruments. Regressions show that executives are more likely to judge lines of credit as a substitute for non-operational cash if their firm is more profitable, consistent with Sufi (2009), and has fewer potential agency problems, consistent with Yun (2009). At the country level, we investigate private credit market development and find that when credit markets are less developed, lines of credit are larger and CFOs are less likely to view credit lines and cash as substitutes. Thus, executives find it particularly valuable to have credit lines available in a setting where it is hard to obtain bank funds on the spot.

Finally, our survey data allow us to assess whether regression models of the determinants of total cash holdings yield different insights when estimated using non-operational cash holdings instead. While we find that much of firms' total cash holdings are employed for operational purposes, we also find that the correlation between total cash and non-operational cash is relatively high ( $\rho=0.75$ ,  $p$ -value=0.00). In addition, the coefficient estimates from our regression models are generally

similar whether we employ total cash or non-operational cash as the dependent variable. (The one exception is that profitability is positively related to total cash holdings, but not to non-operational cash holdings.) Employing total cash as a proxy for non-operational cash in a regression framework, as is common in the literature, is generally reasonable.

The remainder of this paper is organized as follows. In the next section, we review the literature on corporate liquidity. In Section 3, we describe the survey design and respondent firm characteristics. In Section 4, we discuss the liquidity survey results. Section 5 presents regression models that assess the magnitude of non-operational cash and lines of credit as well as the factors that lead firms to consider them as substitutes. Section 6 discusses limitations of the survey and the inferences that can be drawn from the analysis. Section 7 provides concluding remarks. The Appendix detailing the construction of the interval regressions used in our analyses follows the conclusion.

## 2. Determinants of corporate liquidity and the choice between cash and lines of credit

In this section, we summarize the theoretical work on the determinants of corporate liquidity and the choice between cash holdings and lines of credit. We begin with the null hypothesis that these liquidity choices are perfect substitutes. Such an outcome obtains under perfect capital market assumptions because liquidity, whether held in cash or as a line of credit, has no impact on the firm's value (except for the value of the cash itself) and firms can raise cash at zero deadweight costs. When imperfections are introduced, however, the amount and choice of liquidity can indeed matter.

### 2.1. Factors affecting cash holdings and lines of credit similarly

Much of the research on benefits of liquidity is framed around the benefits of holding cash, but the intuition generally carries over to credit lines as well. One prominently cited benefit is that information asymmetry between managers and the capital markets makes liquidity valuable because firms will not have to access capital markets to raise funds for capital expenditures when the cost of external capital is high, for example when their equity is undervalued (see Myers and Majluf, 1984; Almeida, Campello, and Weisbach, 2004; and Acharya, Almeida, and Campello, 2007). This is referred to in the literature as the precautionary motive for liquidity. Another long-cited benefit is that liquid firms do not incur transaction costs to frequently raise funds (Miller and Orr, 1966; Meltzer, 1963). Recent theoretical work further explores the value of corporate liquidity. Gamba and Triantis (2008) argue that liquidity provides a firm with valuable financial flexibility, while the Riddick and Whited (2009) model shows that income uncertainty affects the need for liquidity more than the cost of external finance. None of the papers cited above explicitly model lines of credit.

Corporate liquidity can confer strategic benefits as well. A credit line lowers expansion costs, which allows a firm to increase the severity of its threats against its industry rivals, thus improving its competitive position (Maksimovic, 1990). The same logic applies to holding excess cash. Thus, in competitive industries the liquidity of rival firms may affect a firm's liquidity choices.

### 2.2. Factors affecting cash holdings and lines of credit differently

If credit lines could be accessed in all circumstances, they would offer precautionary benefits comparable to cash. In reality, the key difference between cash and credit lines is the conditional nature of credit lines (Sufi, 2009). Cash is unconditional liquidity available in both good and bad times. Lines of credit provide conditional liquidity, where the option to obtain cash can be exercised only when a firm is doing well enough to satisfy covenant restrictions (Sufi, 2009) and when the lender is still able to honor its promise to provide cash.<sup>1</sup> Sufi therefore argues that firms with low profitability should not consider lines of credit and cash holdings as substitute liquidity instruments.

It is this conditional nature of credit lines that drives our primary research question: do firms use credit lines and cash holdings to hedge different risks? We propose that credit lines are likely to be important to ensure funding for future investment opportunities that may arise. For such investments, a guarantee of funds is not required and the option to obtain funds in good times for the firm is sufficient, because the firm would make the investments only during such times. In contrast, excess cash, which is always available, should be relatively more useful as a general liquidity hedge, similar to a corporate insurance policy.

There is another difference between cash and credit lines: management and/or controlling shareholders may hoard cash so that they can use it for their own private benefit.<sup>2</sup> As both Yun (2009) and Sufi (2009) argue, this agency problem is mitigated by using credit lines because a bank imposes covenants and monitors the firm, which lessens managerial discretion.<sup>3</sup> Yun shows that firms increase cash holdings relative to credit lines when state

<sup>1</sup> Recent papers show how financial managers in the credit crisis preemptively drew down lines of credit of still-solvent banks (Ivashina and Scharfstein, 2009) and how weaker borrowers draw down their lines of credit while they still can (Jimenez, Lopez, and Saurina, 2009).

<sup>2</sup> See, for example, Easterbrook (1984), Jensen (1986), Blanchard, Lopez-de-Silanes, and Shleifer (1994), Harford (1999), Opler, Pinkowitz, Stulz, and Williamson (1999), Dittmar, Mahrt-Smith, and Servaes (2003), Mikkelsen and Parth (2003), Pinkowitz, Stulz, and Williamson (2006), Dittmar and Mahrt-Smith (2007), Kalcheva and Lins (2007), and Harford, Mansi, and Maxwell (2008).

<sup>3</sup> Earlier banking research also considers agency problems, but this work treats credit lines as committed rather than conditional, and compares them to the alternative of obtaining bank financing on the spot market, rather than to direct cash holdings. In Boot, Thakor, and Udell (1987), credit lines protect firms from the effect of possible future increases in interest rates on investment, while in Holmstrom and Tirole (1998) firms cannot obtain sufficient future external financing because of agency problems, which leads them to employ a bank line of credit instead.

antitakeover laws reduce control threats, concluding that firms with agency problems do not view cash and credit lines as equivalent liquidity instruments.

Firms that pay dividends may be less likely to view credit lines and cash as substitutes. While much of the literature considers dividend payers to be less financially constrained, debt contracts (including lines of credit) often contain covenants limiting dividend payments unless certain conditions are met (see [Smith and Warner, 1979](#); [Nini, Smith, and Sufi, 2009](#)). Thus, if firms wish to maintain a consistent dividend policy across economic cycles, they are more likely to prefer non-operational cash holdings.

We do not expect leverage to affect lines of credit or whether firms view cash holdings and lines of credit as substitutes (holding profitability constant), but leverage may affect the level of cash holdings. As argued by [Bates, Kahle, and Stulz \(2009\)](#), payments to debtholders reduce the ability of firms to accumulate excess cash over time ([Jensen, 1986](#)), which implies a negative relation between non-operational cash holdings and leverage. However, the hedging argument put forth in [Acharya, Almeida, and Campello \(2007\)](#) and [Gamba and Triantis \(2008\)](#) predicts a positive relation between leverage and cash holdings.

Finally, there are specific costs that may affect how much firms use each type of liquidity. For holding cash, there is a tax expense on the interest income ([Gamba and Triantis, 2008](#); [Riddick and Whited, 2009](#)). For lines of credit, banks typically charge firms commitment fees upfront and/or on an annual basis ([Shockley and Thakor, 1997](#)).

### 2.3. Country-level differences

Under the precautionary motive, the demand for liquidity should be larger when credit is more difficult to obtain. [Dittmar, Mahrt-Smith, and Servaes \(2003\)](#) and [Kalcheva and Lins \(2007\)](#) explore this premise using cash holdings and find that, contrary to expectations, poorly developed external credit markets are not associated with higher cash levels. Instead, both papers report that firms hold more cash when access to private credit is better. This finding is not consistent with a precautionary demand argument.

While the relation between the size of credit lines and credit market development has not been explored in the literature, the precautionary motive predicts a negative relation.

## 3. Survey design and respondent characteristics

### 3.1. Survey design and delivery

Our data come from a 2005 survey of chief financial officers covering publicly traded and privately owned firms from all over the world. This survey was conducted in collaboration with Deutsche Bank Securities, Inc. Prior to launching the survey, we tested it with an initial group of global CFOs to verify that the interpretations we gave to the questions and responses corresponded to their

interpretations. We then altered the survey to reflect feedback from this beta testing period.

The survey instrument was administered over the Internet and made use of conditional branching (i.e., certain responses led to detailed additional questions, while others did not). The survey was completely anonymous. While CFOs received a request from the academic researchers, the Deutsche Bank relationship officers covering the companies were requested to encourage firms to complete the survey, but the bankers did not have access to individual firm responses.

In total, the survey was sent to approximately 4,000 firms in 48 countries. These were all firms worldwide that had a coverage officer assigned to them by the investment banking division of Deutsche Bank. This sample comprises the largest companies in their respective countries and industries. It does not include smaller firms in the bank's home market, because those are covered by local branches. A large fraction of the targeted firms were not Deutsche Bank clients at the time.

The survey instrument covered many facets of financial policy in nine sections (Company Information, CFO Views, Capital Structure, Liability Management, Liquidity Management, General Risk Management, Interest Rate Risk Management, Foreign Exchange Risk Management, and Commodity Risk Management). We did not request that companies complete every section of the survey. Executives from 354 firms answered some part of the survey, and 215 answered the questions regarding corporate liquidity. Of these, 204 executives answered enough questions regarding topics unrelated to liquidity to allow for our regression analyses. In terms of the response rate and number of respondents, our survey is similar to the U.S. and Canadian firm CFO survey conducted by [Graham and Harvey \(2001\)](#), who had a final sample of 392 respondents and a response rate of about 9%. It is also similar to the 8% response rate obtained by [Brav, Graham, Harvey, and Michaely \(2005\)](#) and [Graham, Harvey, and Rajgopal \(2005\)](#) for the portion of their survey of U.S. and Canadian firm CFOs that was conducted via email rather than in person at a conference gathering.

### 3.2. Respondent characteristics

In [Table 1](#), we report the 29 countries of domicile of the 204 firms included in our analyses. The countries with the largest representation are Germany, the U.S., and Japan.<sup>4</sup> For robustness, we repeat all of our tests omitting each of the countries in our sample, one at a time, and find that our results are not sensitive to the exclusion of any one country.

[Table 2](#) reports summary statistics for our sample firms. Mean total revenues are \$7.2 billion and median revenues are \$1.6 billion. Thus, our firms are somewhat larger than the firms from the *Worldscope* and *Global Vantage* databases analyzed by [Dittmar, Mahrt-Smith, and](#)

<sup>4</sup> Only 18 firms in our sample are from the U.S. because the response rate in the U.S. was particularly low.

**Table 1**

Distribution of sample firms by country of origin.

This table contains the country of origin of the 204 firms that responded to the liquidity management part of the survey and provided sufficient responses to other survey questions such that we are able to estimate regression models detailed in subsequent tables. Our data come from a 2005 survey of chief financial officers covering publicly traded and privately owned firms from all over the world.

Country	Number of firms
Argentina	1
Australia	1
Austria	3
Belgium	11
Chile	6
Denmark	2
Finland	1
Germany	46
Hong Kong, China	1
India	6
Indonesia	3
Italy	9
Japan	16
Korea (South)	6
Malaysia	3
Netherlands	4
New Zealand	4
Norway	1
Philippines	6
Portugal	2
Singapore	2
South Africa	3
Spain	11
Sri Lanka	2
Sweden	3
Switzerland	14
Taiwan	6
United Kingdom	13
United States	18
Total	204

**Table 2**

Summary statistics for sample firms.

This table reports mean and median values for fundamental firm characteristics for our sample of 204 firms that responded to the liquidity management part of the survey and provided sufficient responses to other survey questions such that we are able to estimate regression models detailed in subsequent tables. Our data come from a 2005 survey of chief financial officers covering publicly traded and privately owned firms from all over the world. Revenue is converted to U.S. dollars using prevailing exchange rates at the end of October 2005. Return on equity refers to the ratio of net income to book equity. Leverage is measured as total liabilities divided by total assets. Indicator variables are as described in the table and are set equal to one if the attribute is true, and zero otherwise.

Variable	Mean	Median
Log of revenues in billions of U.S. dollars	7.2	1.6
Return on equity	0.12	0.11
Leverage	0.57	0.58
Private (i.e., non-listed) firm indicator	0.34	0
Listed on exchange less than 5 years indicator	0.10	0
CEO is also chairman of board indicator	0.48	0
Firm has paid a regular dividend in past 5 years indicator	0.73	1

Servaes (2003), Pinkowitz, Stulz, and Williamson (2006), and Kalcheva and Lins (2007). Mean and median profitability levels, measured as net income divided by shareholder's equity, are 12% and 11%, respectively. This compares to a mean of 9% and a median of 8% for all firms from our sample of countries listed on Global Vantage as of year-end 2004. Leverage, measured as total liabilities divided by total assets is 57%, on average, with a median of 58%. These values are very similar to the year-end 2004 values for firms on Global Vantage from countries in our sample (mean=55% and median=56%). Thirty-four percent of our sample firms are private and that 10% of sample firms have been listed on a stock exchange for less than five years. The chief executive officer (CEO) is also the chairman of the board in 48% of our firms. Finally, 73% of our firms paid regular dividends in the five years prior to 2005, a level similar to the *Worldscope* firms used in La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000). Overall, our sample firms broadly resemble the firms typically studied in academic international corporate finance research.

#### 4. Survey responses

##### 4.1. The level of cash holdings

We first show how much cash companies hold in Panel A of Table 3. Respondents were asked to report their cash and marketable securities to total assets levels based on the following ranges: 0–2%, 2.1–4%, and so on through 20% or greater. The second column presents the fraction of firms that falls into each category. The largest subset of respondents (20% of the companies) has cash to assets above 20% and the second largest subset (18% of all respondents) holds little cash, between 0% and 2% of assets. The median falls in the 8–10% category, a level similar to the median cash-to-asset levels reported by Dittmar, Mahrt-Smith, and Servaes (2003), Pinkowitz, Stulz, and Williamson (2006), and Kalcheva and Lins (2007).

Next, we show the fraction of total cash holdings that are excess cash holdings, defined as cash and marketable securities above that used in the normal course of business, held as compensating balances, or cash trapped in a foreign jurisdiction.<sup>5</sup> We provided companies with ranges of excess (non-operational) cash holdings as a percentage of total cash holdings: 0%, 1–10%, 11–20%, and so on. For each range of total cash holdings, column (iii) lists the median percentage of total cash which is considered non-operational. For the sample as a whole, median non-operational cash holdings as a fraction of total cash fall in the 21–30% category (not reported in the table).

<sup>5</sup> Foley, Hartzell, Titman, and Twite (2007) provide evidence that cash trapped in a foreign jurisdiction is an important determinant of overall cash balances for U.S. firms. We note that trapped cash is primarily a U.S. phenomenon due to specific features of the U.S. corporate tax code.

**Table 3**

Distribution of cash holdings and lines of credit as a percentage of assets in 2005.

Panel A lists the various categories of total cash to assets provided to survey respondents (column (i)) and the percentage of firms that fall into each category (column (ii)). Column (iii) contains the median percentage non-operational cash to total cash for each category of total cash to assets. Panel B lists the various categories of total credit lines to assets provided to survey respondents (column (i)) and the percentage of firms that fall into each category (column (ii)). Column (iii) contains the median percentage non-operational cash to total cash for each category. This percentage is computed by assuming that a firm's level of cash to assets and non-operational cash to total cash is at the midpoint of its indicated range.

<i>Panel A: Distribution of cash holdings</i>		
Total cash/ Assets (%)	Percentage of firms in each category	Median percentage non-operational cash/ Total cash
(i)	(ii)	(iii)
0–2	18	1–10
2.1–4	9	1–10
4.1–6	9	1–10
6.1–8	9	21–30
8.1–10	9	41–50
10.1–12	6	21–30
12.1–14	7	51–60
14.1–16	4	61–70
16.1–18	4	61–70
18.1–20	5	21–30
Over 20	20	31–40
<i>Panel B: Distribution of lines of credit</i>		
Lines of credit/ Assets (%)	Percentage of firms in each category	Median percentage non-operational cash/ Assets
(i)	(ii)	(iii)
No line of credit	6	14.00
0–2	6	0.60
2.1–4	6	0.75
4.1–6	6	5.80
6.1–8	4	5.50
8.1–10	10	3.15
10.1–12	9	2.10
12.1–14	2	0.50
14.1–16	4	0.70
16.1–18	3	2.40
18.1–20	5	0.60
Over 20	39	1.00

We next compute a firm's non-operational cash-to-assets ratio by multiplying the median of a firm's total cash range by the median percentage that is non-operational cash. For example, if a firm indicates that cash holdings are between 6.1% and 8% of assets and that non-operational cash holdings are between 21% and 30% of cash holdings, we compute non-operational cash to assets as 1.75% (7% multiplied by 25%). This computation yields a median value of the ratio of non-operational cash to assets of only 2%, which shows that much of the cash held by firms is not excess, but instead supports daily business operations. That said, many firms with high cash ratios (i.e., above 20%) have high non-operational cash to assets because half of these high-cash firms have non-operational cash to total cash at or above the 31–40% median reported in column (iii).

#### 4.2. The size of credit lines

We ask companies to report the size of their credit lines as a percentage of assets. As mentioned in the introduction, International Financial Reporting Standards (under which most large international companies report) do not explicitly discuss the disclosure of credit line data. While some companies report under local accounting standards, we have not found any consistent public disclosure requirements of credit lines for the countries in our sample. Thus, the only way to examine whether the use of lines of credit is as prevalent internationally as it is in the U.S. is to ask companies.

Again, firms select from two-percentage-point ranges, with a lower limit of 0–2% and an upper limit of 20% or greater. In addition, firms can indicate that they have no credit line at all. Panel B of Table 3 reports the line of credit results. By far the largest subset of respondents (39% of the companies) has credit lines greater than 20% of their assets. Such credit lines are several times larger than the annual investment budgets and free cash flow levels of most corporations.<sup>6</sup> This suggests that credit lines are used to hedge against risks beyond the maintenance of current investment levels, such as taking advantage of growth and/or acquisition opportunities that may arise or to guard against economic distress. (Sufi (2009), however, argues that credit lines would not provide committed liquidity insurance because firms in economic distress would likely be in violation of covenants.) The median firm's line of credit is in the 14.1–16% category. Column (iii) lists the median non-operational cash-to-assets level corresponding to each credit line range and shows that firms with no credit line have quite high non-operational cash levels, but no pattern emerges across the other ranges.

Overall, when we consider both credit lines and the level of cash holdings, it is clear that lines of credit provide a substantial amount of corporate liquidity worldwide, greatly exceeding the funds available from non-operational cash. In the next two subsections, we begin our analyses of whether non-operational cash and credit lines are used for different purposes.

#### 4.3. Deciding on the level of non-operational cash

We first assess the criteria firms employ when they decide to hold more cash than is needed on a day-to-day basis. In particular, we ask the question: "In deciding how much excess cash to hold, how important are the following factors?" As response choices, we specify 22 factors based on theoretical considerations discussed in Section 2 and other economic drivers mentioned by CFOs during the development of the survey instrument. Firms were asked to rank these on a six-point scale from zero to five, where a zero indicates that the factor is not important, and a five indicates that the factor is very

<sup>6</sup> Kalcheva and Lins (2007) report average annual capital expenditures to assets of 6% and average free cash flow to assets of 7% for a sample of over 5,000 companies from 31 countries.

**Table 4**

Survey responses to questions about non-operational cash and lines of credit.

In Panel A, we summarize responses to the question: “In deciding how much excess cash to hold, how important are the following factors?” Firms were presented with 22 factors and asked to rank each factor on a six-point scale from zero to five, where a zero indicates that the factor is not important, and a five indicates that the factor is very important. In Panel B, we summarize responses to the question “How important are the following factors in deciding on the size of your Line of Credit?” Firms were presented with 7 factors and asked to rank each factor on a six-point scale from zero to five, where a zero indicates that the factor is not important, and a five indicates that the factor is very important. In both panels, the second column lists the fraction of firms ranking each factor as a four or a five, indicating that the factor is relatively important. The third column lists the mean respondent score for each question. The fourth column lists the number of firms responding to that specific item.

<i>Panel A: Answers to the question: “In deciding how much Excess Cash to hold, how important are the following factors?”</i>			
Scale is Not important (0) to Very important (5)	% 4 or 5 Score	Mean score	Number of respondents
Cash as a buffer against future cash flow shortfalls	47	3.04	188
Minimal cash ensures efficient running of the company	35	2.57	182
Difference between interest rate on cash and interest rate on debt	35	2.50	184
Time it takes to raise money when funds are needed	31	2.43	187
Level of uncertainty about future investment opportunities	31	2.36	186
Ability to issue debt at a “fair” price when funds are needed	30	2.29	187
Difference between interest rate on cash and cost of capital	26	2.19	182
Size of the undrawn credit facility	23	2.06	182
Transaction costs of raising funds	22	1.96	184
Difference between interest rate on cash and return on other projects	19	1.93	181
Ability to issue equity at a “fair” price when funds are needed	19	1.77	181
Using cash to retire debt moves company below target debt level	18	1.64	181
Tax that shareholders would pay if company paid out cash	13	1.48	183
Preference of controlling shareholders	13	1.40	182
Rating agency requirements	12	1.45	179
Signals associated with drawing down the undrawn credit facility	10	1.49	174
Other lender requirements	10	1.23	180
Regulatory requirements	9	1.13	178
Contingent liabilities (e.g., possible future litigation exposures)	8	1.37	179
Ability to take on projects even if they do not add value to the firm	8	1.08	182
Cannot apply cash to retire debt without incurring accounting charges	7	1.39	176
Cash holdings of other companies in my industry	4	1.21	182
<i>Panel B: Answers to the question: “How important are the following factors in deciding on the size of your Line of Credit?”</i>			
Scale is Not Important (0) to Very Important (5)	% 4 or 5 Score	Mean score	Number of respondents
Credit facility is flexible: can be drawn and repaid at will	69	3.70	215
Certainty of funding during event risk or acquisition opportunities	60	3.48	208
The fee charged on the credit line	39	2.89	210
The time it takes to raise funds through other means	34	2.79	206
The cost of the credit facility is certain	32	2.75	207
Transaction costs of raising funds through other means versus the commitment fee	30	2.34	203
Company’s commercial paper program requires a backstop facility	26	1.75	204

important. Panel A of Table 4 lists the fraction of firms ranking each factor as a four or a five, indicating that the factor is relatively important, as well as the mean respondent score for each question, and the number of firms responding to that specific item. For ease of interpretation, we present the responses in descending order based on the fraction of respondents that answered a four or five on a question, but in the actual survey instrument all text-based response choices were listed in random order, rather than alphabetically or ranked based on our expectations.

By far the most important stated factor is “cash acts as a buffer against future cash flow shortfalls.” Almost half (47%) of the respondents rank this factor as a four or five in level of importance. This high ranking, which is significantly different from the rankings of all other responses, implies that non-operational cash has a broad use: to insure against bad future cash flow outcomes. The importance of this factor is also interesting because the

factor is general in nature—that is, it does not refer to any particular outcome stemming from poor future cash flows that might worry a firm. Among the factors provided as response choices is the precautionary factor cited often in the literature: “The level of uncertainty about future investment opportunities.” This factor is ranked only fifth in importance among reasons firms hold excess cash. Thus, firms appear to frame non-operational cash holdings as a general risk management tool used when cash flows are insufficient rather than as related to future investment opportunities. We examine this proposition more formally later in our analysis of the determinants of non-operational cash holdings.

Next follow four factors whose mean scores, ranging from 2.57 to 2.29, are not significantly different from each other. The first two are “minimal cash ensures efficient running of the company” and “the difference between the interest rate on cash and debt,” with 35% of respondents ranking each of these as a four or five in importance.

These two responses indicate either that managers view that firms holding too much cash may not make the best use of it or that reducing cash holdings reduces the total dollar amount of the spread between the interest paid on debt versus that received on cash, which is efficient. “The time it takes to raise money when funds are needed,” which speaks to financial flexibility, is tied in its importance ranking (31%) with the level of uncertainty about future investment opportunities (discussed previously).

The remaining factors all have importance rankings at or below 30%. These factors include regulatory, rating agency, lender requirements, shareholder taxes, preferences of controlling shareholders, and cash policies of industry peers. We provide a response choice that directly assesses agency costs—“the ability to take on projects even if they do not add value to the firm”—and 8% of the respondents acknowledge this consideration in determining their firms’ cash level.

In sum, this evidence indicates that CFOs view excess cash mainly as insurance against cash flow shortfalls, but they are also concerned about the costs associated with holding and raising cash.

#### 4.4. Determining the size of lines of credit

We begin our analysis of the reasons firms use credit lines by asking: “How important are the following factors in deciding on the size of your Line of Credit?” As before, firms were asked to rank factors on a scale from zero (not important) to five (very important). Panel B of Table 4 shows that two factors (which are significantly different from the other responses) stand out. The first, with 69% of firms ranking it as a four or five in importance, is that a credit line is flexible and can be drawn and repaid at will. The second, with 60% of firms ranking it as a four or five in importance, is that a credit line provides certainty of funding during event risk or acquisition opportunities. Given Sufi’s (2009) finding that credit lines may not be available during event risk for the firm (a result not shown empirically when the survey was constructed), we interpret this second factor result as indicating that firms consider credit lines to be important for funding future acquisition opportunities. Other motivations for using credit lines are far less important for our global sample of firms.

### 5. Regression analyses

In this section, we use survey data on firms’ financial choices and conditions in logit and interval regressions to further analyze the way firms use credit lines and non-operational cash.

#### 5.1. Logit model specification and results

Our survey asks whether firms view credit lines and cash holdings as substitutes in which large lines of credit imply low cash balances and vice versa and we find that 41% of sample firms view them this way. We further test whether firms that *state* that they view these liquidity

sources as substitutes *exhibit* a negative correlation between non-operational cash to assets and lines of credit to assets. We find that this is the case. The correlation is  $-0.35$  ( $p$ -value=0.00) among firms that view them as substitutes and is insignificant for firms that do not ( $\rho = -0.03$ ;  $p$ -value=0.76). These findings clearly reject the null hypothesis that both forms of liquidity are perfect substitutes for all firms.

We next conduct a logit analysis in which the dependent variable is an indicator variable set equal to one if firms view both forms of liquidity as substitutes, and zero otherwise. Based on the previous work discussed in Section 2, we expect that firms with higher profitability and lower agency costs and firms that do not pay dividends are more likely to consider these liquidity sources as substitutes. At the country level, we expect that in countries with poorly developed credit markets these forms of liquidity are less likely to be substitutes because the option to obtain future cash provided by a credit line should be more valuable when it is difficult to obtain bank funds on the spot.

The ratio of net income to book equity (return on equity) is a proxy for profitability. We employ two proxies for firm-level agency problems. The first measure is a variable indicating whether the CEO is also the chairman.<sup>7</sup> The second measure, which is more direct but has a lower response rate, is the importance ranking of whether “the ability to take on projects, even if they do not add value to the firm” matters in deciding on how much excess cash to hold. This variable ranges from zero to five and firms for which this is an important consideration (scores closer to five) are likely to suffer from more severe agency problems. We assess the importance of dividends using a dummy if a firm paid a regular dividend in the last five years. We include firm size (log of revenues) because smaller firms may have less access to credit lines, and thus may not see cash and credit lines as substitutes. We also include indicator variables for the 18 industries from which the survey participants could choose their primary line of business. All results hold if we estimate our models without industry effects. Finally, to gauge credit market development, we use private credit to gross domestic product (GDP), as proposed by Levine, Loayza, and Beck (2000). This measure captures the debt finance provided to private firms by all financial institutions except central banks, with lower scores indicating greater difficulty obtaining external credit.

Table 5 contains our findings. We report two specifications, one for each measure of agency costs. Consistent with our predictions, both models show that more profitable firms, firms with lower agency costs, and

<sup>7</sup> Whether the separation of the CEO and chairman roles matters for corporate governance is controversial. Brickley, Coles, and Jarrell (1997) question the efficacy of such a separation. However, government-commissioned reports in both the U.S. and the U.K. have recommended the separation of these roles and Dahya, McConnell, and Travlos (2002) find that after the adoption of such a recommendation in the U.K., CEO turnover became more sensitive to corporate performance. In addition, Efendi, Srivastava, and Swanson (2007) find that U.S. firms whose CEO is also the chairman are more likely to have made financial misstatements.



**Table 5**

Logistic regression models—Are credit lines and cash holdings substitutes?

The dependent variable is an indicator variable which is set equal to one if firms state that they view credit lines and cash holdings as substitutes. Independent variables obtained from various portions of the survey are also included. These variables are: the ratio of net income to book equity (return on equity); a variable indicating whether the CEO is also the chairman; the response to whether “the ability to take on projects, even if they do not add value to the firm” is an important factor in deciding on how much excess cash to hold, a measure which ranges from zero to five; and a variable indicating whether a firm paid a regular dividend over the last five years. Industry indicator variables categorize a firm’s primary operations into one of 18 industry category choices presented in the survey. Private credit to GDP, a measure which ranges from 0.08 to 2.17, is obtained from [Levine, Loayza, and Beck \(2000\)](#). The *p*-value of a two-tailed test of equality of each coefficient to zero is reported in parentheses.

	(i)	(ii)
Log of revenue in millions of U.S. dollars	0.169 (0.06)	0.082 (0.42)
Return on equity	1.282 (0.10)	1.818 (0.08)
CEO is also chairman of board indicator	−0.536 (0.09)	
Importance of “the ability to take on projects, even if they do not add value to the firm” when deciding on excess cash		−0.319 (0.02)
Firm has paid a regular dividend in past 5 years indicator	−0.561 (0.12)	−0.768 (0.06)
Private credit to GDP	0.511 (0.10)	0.632 (0.08)
Industry indicator variables included?	Yes	Yes
Number of observations	202	168
Pseudo <i>R</i> -squared	0.110	0.109

firms that operate in countries with better developed credit markets are more likely to view non-operational cash and lines of credit as substitutes. Also, the more direct measure of agency problems has a higher level of significance. Large firms consider both types of liquidity as substitutes in model (i), while non-dividend paying firms view them this way in model (ii).

From an economic perspective, model (ii) shows that (after setting all other explanatory variables equal to their average) if we increase return on equity from its 25th percentile (5.33%) to its 75th percentile (17.39%), the probability that CFOs view lines of credit and non-operational cash as substitutes increases from 41% to 47%, a 15% increase in the probability. Increasing the “the ability to take on projects that do not add value to the firm” from its 25th percentile (0) to its 75th percentile (2) decreases the probability that CFOs view both forms of liquidity as substitutes from 53% to 38%.

## 5.2. Non-operational cash and credit line model specifications

We next examine the determinants of firms’ non-operational cash holdings and lines of credit. Because our dependent variables are measured in intervals, we

estimate our models using interval regressions in which the exact interval endpoints are specified. For example, if cash/assets is in the 8.1–10% range and non-operational cash to total cash is in the 51–60% range, we set the lower limit to 4.13% ( $8.1\% \times 51\%$ ) and the upper limit to 6% ( $10\% \times 60\%$ ). Coefficient estimates from these models are interpreted in the same way as those from standard linear regression models. We describe the details of interval regressions and how we apply them in a brief Appendix.

Because our survey data items are limited, the variables in our models do not completely span the variables employed in prior research (see, for example, [Kim, Mauer and Sherman, 1998](#); [Opler, Pinkowitz, Stulz, and Williamson, 1999](#); [Faulkender and Wang, 2006](#); [Bates, Kahle, and Stulz, 2009](#)). In particular, we do not have data on net working capital, capital expenditures, research and development (R&D), and acquisition activity, which are all variables included in the models estimated by [Bates, Kahle, and Stulz \(2009\)](#). However, we believe that many of these variables are industry-specific, so much of their effect is likely to be captured by the industry dummies included in all of our models. Statistics for the variables we employ were presented in Section 3.

We now discuss the expected relationship between our variables and non-operational cash holdings and credit lines. Smaller firms are likely to have larger proportional transaction costs, higher levels of information asymmetry, and less access to capital markets. As a result, they may want to obtain higher levels of both non-operational cash and lines of credit. The effect of profitability could be positive or negative because consistently profitable firms have a lower general need for liquidity. However, if cash holdings result from recent historical profits, non-operational cash may be mechanically and positively related to profitability. In terms of credit lines, while consistently profitable firms may need less liquidity, [Sufi \(2009\)](#) points out that it is exactly these firms that more often obtain credit lines. Information asymmetry makes external finance more costly and liquidity more desirable. If private firms and firms listed on a stock exchange for less than five years have greater information asymmetry, then they may want higher credit lines and more non-operational cash. Also, newly listed firms may have high non-operational cash levels because they recently raised funds.

If firms hold cash partly because of agency reasons, we would expect to observe a positive relationship between non-operational cash holdings and our two agency measures discussed previously. If firms with agency problems shy away from the monitoring associated with credit lines, we would expect a negative relationship between lines of credit and our agency measures. A decision to pay dividends may also influence liquidity levels. Firms that pay regular dividends may be cash rich because they have been profitable. Alternatively, firms may view a dividend cut as a potential source of funds, lowering the need to have excess cash or lines of credit. The impact of leverage on liquidity could be negative if leverage forces firms to pay out non-operational cash or positive if highly levered firms prefer to save cash or obtain credit lines in order to meet investment needs in the future.

We also use responses from five perceptual questions in our regression models:

- (1) Has the ability to raise external funds limited your ability to take on substantial investment projects? [variable ranges from zero (not limiting) to five (very limiting)—mean response is 1.4 and median is 1.0].
- (2) Compared to the other companies in your industry, would you describe your *need to raise capital* in the *next* five years as being: [variable ranges from one (Small Relative to Internal Resources) to five (Large Relative to Internal Resources)—mean response is 2.7 and median is 3.0].
- (3) Compared to the other companies in your industry, would you describe your *riskiness* in the *last* five years as being: [variable ranges from one (Substantially Less Risky) to five (Substantially More Risky)—mean response is 2.8 and median is 3.0].
- (4) An indicator variable set equal to one if the company feels that its equity is “occasionally” or “frequently” undervalued, as compared to “rarely” or “never” or “not applicable” [mean=0.38].
- (5) An indicator variable set equal to one if a company feels that either the average credit spread currently paid on its debt is “too wide,” as compared to “fair” or “too narrow,” or, if rated, that its current long-term debt rating is “too low,” as compared to “fair” or “too high” [mean=0.24].

Based on the precautionary motive for liquidity, we expect responses to each of these perceptual questions to be positively related to the need for corporate liquidity. If a lack of external funds has limited a firm’s ability to take on substantial projects in the past (question 1), it might do so again in the future; the firm may therefore try to secure additional liquidity, if possible, to ensure that such funds are available in the future. Similarly, firms needing external funds in the future (question 2) should try to obtain more funding today in case future adverse market conditions make it too costly to raise funds. Riskier firms (question 3) are more likely to have cash shortfalls, and thus, may wish to have greater corporate liquidity to offset these shortfalls. Finally, if a firm thinks that issuing equity or debt may be too costly because the market undervalues these securities (questions 4 and 5), additional liquidity guards against having to pay too high a cost for future external capital.

The substitutability of liquidity is also likely to play a role. If firms view non-operational cash and lines of credits as substitutes, then the level of one form of liquidity will be negatively related to the level of the other. We therefore include an interaction between the indicator variable that credit lines and cash holdings are viewed as substitutes and the level of the substitute type of liquidity (to construct this variable, we set the substitute type of liquidity level equal to the midpoint of its range).

At the country level, we include the ratio of private credit to GDP (Levine, Loayza, and Beck, 2000) because the precautionary motive for liquidity suggests that poor credit market development will increase the need for corporate

liquidity. Finally, liquidity needs may vary across industries, so we include industry controls in all models.

### 5.3. Non-operational cash regression results

Table 6 reports interval regressions in which the dependent variable is non-operational cash as a fraction of total book assets. Panel A contains models that are comparable to the models that use financial statement data employed in prior research on corporate liquidity. In Panel B, the models also include perceptual question responses. The models in Panel B have fewer observations because response rates were lower for the perceptual questions. As before, we present two specifications in each panel, one for each measure of agency costs.

In Panel A of Table 6, several of the variables are significant in at least one of the two models. The coefficient in model (ii) for private firms indicates that these firms hold 1.9 percentage points more non-operational cash than other companies. To the extent that private firms have greater information asymmetry associated with them, or might have fewer sources of borrowing in general, this finding is consistent with the previous discussion that an increase in liquidity of any type is beneficial for such firms. Median non-operational cash holdings are 2% of total assets, so this effect is large relative to the median. The second model also shows that dividend paying firms hold about 1.8 percentage points more non-operational cash, which is again large relative to the median. This result is consistent with our earlier discussion that firms wishing to maintain a consistent dividend policy will prefer to hold more non-operational cash. The first model shows that more levered firms have less non-operational cash but we are hesitant to draw any conclusions because leverage is not significant in any of the Panel B models. At the country level, consistent with Dittmar, Mahrt-Smith, and Servaes (2003) and Kalcheva and Lins (2007), non-operational cash holdings are positively, not negatively, related to private credit-to-GDP in the Panel A (and Panel B) models, indicating that at the country level agency cost motives matter more than precautionary motives for this variable.

We now turn to Panel B of Table 6, which includes the responses to the perceptual survey questions. Only one of the responses to these questions is significant: the stated need for external capital in the next five years, relative to internal resources. If a firm wishes to build its strategic cash reserves before it needs external capital in the future, this coefficient is expected to be positive. However, the coefficient on future external capital needs is negative. There are two possible interpretations of this finding: (1) firms do not accumulate non-operational cash to hedge against the possibility that capital needed for future growth will be expensive, or (2) the causality is reversed and firms need to raise funds in the future because they cannot accumulate excess cash today. However, for financially unconstrained firms, interpretation (2) should not apply because unconstrained firms could, if they wished, hoard cash today to hedge the risk that future capital needed for growth will be expensive. If regressions

**Table 6**

Non-operational cash regression models.

The dependent variable is non-operational cash (referred to in the global CFO survey as excess cash) as a proportion of total assets. All models are estimated using interval regressions with robust standard errors. Independent variables obtained from various portions of the survey instrument are also included. These variables are: the ratio of net income to book equity (return on equity); a variable indicating whether the firm is privately held (i.e., non-listed); a variable indicating whether the firm has been listed on a stock exchange for less than five years; a variable indicating whether the CEO is also the chairman; the response to whether “the ability to take on projects, even if they do not add value to the firm” is an important factor in deciding on how much excess cash to hold, a measure which ranges from zero to five; leverage, as measured by the ratio of total liabilities to total assets; and a variable indicating whether a firm paid a regular dividend over the last five years. Industry indicator variables categorize a firm's primary operations into one of 18 industry category choices presented in the survey. Private credit to GDP, a measure which ranges from 0.08 to 2.17, is obtained from [Levine, Loayza, and Beck \(2000\)](#). Panel A includes basic firm variables and Panel B additionally includes firm responses to perceptual questions. The *p*-value of a two-tailed test of equality of each coefficient to zero is reported in parentheses.

<i>Panel A: Models with firm attribute variables</i>		
	(i)	(ii)
Log of revenue in millions of U.S. dollars	–0.219 (0.33)	–0.295 (0.25)
Return on equity	1.073 (0.38)	2.408 (0.28)
Private (i.e., non-listed) firm indicator	0.713 (0.45)	1.897 (0.09)
Listed on exchange less than 5 years indicator	1.889 (0.14)	1.082 (0.43)
CEO is also chairman of board indicator	0.617 (0.40)	
Importance of “the ability to take on projects, even if they do not add value to the firm” when deciding on excess cash		0.207 (0.48)
Leverage	–2.709 (0.10)	–1.979 (0.29)
Firm has paid a regular dividend in past 5 years indicator	1.443 (0.12)	1.779 (0.08)
Private credit to GDP	1.782 (0.02)	2.036 (0.02)
Industry indicator variables included?	Yes	Yes
Number of observations	202	164
Wald Chi <sup>2</sup>	57.58	51.62
<i>Panel B: Models with firm attribute and survey response variables</i>		
Log of revenue in millions of U.S. dollars	–0.198 (0.39)	–0.474 (0.07)
Return on equity	1.996 (0.30)	3.028 (0.16)
Private (i.e., non-listed) firm indicator	1.117 (0.29)	1.958 (0.09)
Listed on exchange less than 5 years indicator	3.115 (0.02)	1.873 (0.17)
CEO is also chairman of board indicator	0.486 (0.51)	
Importance of “the ability to take on projects, even if they do not add value to the firm” when deciding on excess cash		0.225 (0.44)
Leverage	–1.364 (0.42)	0.041 (0.98)
Firm has paid a regular dividend in past 5 years indicator	1.545 (0.10)	2.283 (0.02)
Stated lack of external funds has limited taking on substantial projects	0.239 (0.38)	0.040 (0.89)
Stated need for external capital next 5 years relative to industry peers	–0.645 (0.05)	–0.734 (0.03)
Stated level of riskiness in past 5 years relative to industry peers	0.120 (0.79)	0.302 (0.54)
Stated that equity is occasionally or frequently undervalued	0.240 (0.78)	0.948 (0.29)
Stated that debt spread is too wide or debt rating is too low	0.507 (0.57)	–0.116 (0.90)
Indicator that credit lines and cash are substitutes multiplied by non-operational cash/assets	–0.063 (0.00)	–0.087 (0.00)
Private credit to GDP	1.795 (0.02)	1.920 (0.02)
Industry indicator variables included?	Yes	Yes
Number of observations	180	150
Wald Chi <sup>2</sup>	73.55	51.62

estimated on unconstrained firms still show a negative relation between a need to raise future external capital and non-operational cash, then interpretation (1) is supported. Based on the extant literature, we identify unconstrained firms in two ways: (a) the firm has a bond rating (82 firms in our sample); and (b) the firm pays a dividend (150 firms in our sample). For both samples of unconstrained firms (as well as the intersection between the two samples), we continue to find the same negative relationship between non-operational cash holdings and the stated need for future external capital (results not tabulated). Thus, we believe that the results from Panel B do indeed show that non-operational cash is not used to hedge the risk that capital needed to fund future growth will be expensive.<sup>8,9</sup> In the next subsection, we investigate whether the need for future funds is met through lines of credit instead.

Finally, we note that firms with credit lines that also view these credit lines as a substitute for holding cash tend to have less non-operational cash, as would be expected.

Among the variables that were also included in the Panel A models, private and dividend-paying firms again hold significantly more non-operational cash in one of the two models. In addition, firm size is now significantly negative in one of the models, consistent with the idea that smaller firms have both greater transaction costs and information asymmetry, both of which make corporate liquidity more valuable. We also find that the coefficient on “listed its stock in the past five years” is now positive and significant in one model. This result is consistent with two explanations: (a) these firms have greater asymmetric information and want to hold more non-operational cash as a result, and/or (b) these firms obtained an influx of cash when they listed their shares.

#### 5.4. Line of credit regression results

Table 7 reports interval regressions in which the firm’s line of credit to total assets is the dependent variable. Panel A shows that smaller firms have proportionally larger credit lines, consistent with a general benefit from increased liquidity for firms likely to face higher transaction costs and information problems. The other firm-level variables are insignificant.

New findings emerge from the country-level measure of credit market development in Table 7. All models show that lines of credit are larger when private credit markets

are less developed, which supports the precautionary motive for holding liquidity at the country level. Thus, if a firm expects it to be difficult to obtain cash via a spot loan from a bank at any given point in time, a contract that allows it to instantly tap such bank credit is valuable. In terms of economic significance, decreasing Private credit to GDP from its 75th percentile (1.59) to its 25th percentile (0.72) increases credit lines to assets about three to five percentage points, depending upon the model. The median line of credit to assets is 15%, so this represents about a 30% increase from the median.

In Panel B of Table 7, we again include the responses to the perceptual questions. Firms that state a strong need for external capital in the future have larger lines of credit, contrary to our findings for non-operational cash (Table 6). This implies that firms that expect to need external capital in the future make provisions to improve their liquidity now, but they do so by using lines of credit rather than cash. This is consistent with firms using an option-like liquidity instrument to fund future investment opportunities. From an economic standpoint, an increase in external capital needs from the 25th percentile (2) to the 75th percentile (4) corresponds to a 2.70 percentage point increase in lines of credit to assets (based on model (i)). For a firm with the median line of credit to assets ratio of 15%, this represents an increase of almost 20%.

Panel B also shows that firms that believe their equity is undervalued have higher lines of credit. No such result was found for non-operational cash holdings. Firms with undervalued equity have lines of credit to assets that are 3.8 percentage points higher than other firms (based on model (i)). However, the relationship between undervaluation and credit lines appears to be just an equity phenomenon because there is no relationship between credit lines and a perception that credit spreads are too wide or debt ratings are too low. One potential explanation for this lack of a positive relation is that if a firm believes it pays too much for debt it may not want a larger credit line because, being a debt contract, it too could seem very costly. Finally, we find that, as expected, firms that hold more non-operational cash and view cash and credit lines as substitutes have lower lines of credit.

Summarizing our regression results, Table 7 shows that firms that need future external capital and firms whose equity is occasionally or frequently undervalued make relatively greater use of lines of credit. Firms with these characteristics are likely to have substantially better growth opportunities than perceived by the market. To ensure that they can fund these opportunities at the right price, these firms hold options to obtain future cash via lines of credit. Recall that Table 6 shows that neither of these characteristics is related to non-operational cash. This suggests that excess cash is less likely held to take advantage of growth opportunities. Instead, as indicated in the survey responses tabulated in Table 4, non-operational cash is employed as a corporate insurance policy.

Taken together, the results presented in our tables indicate that CFOs use different liquidity instruments to ensure that their liquidity adequately spans potential future economic conditions. The guaranteed funding

<sup>8</sup> We also verified this interpretation of our findings during several practitioner seminars organized by Deutsche Bank to present the survey findings.

<sup>9</sup> Sufi (2009) finds that lack of access to a line of credit is a more statistically powerful measure of financial constraints than other measures traditionally used in the literature. It would be less suitable to use this as a measure of financial constraints in these tests because, in our next set of tests, we directly assess whether the factors employed in Table 6 Panel B also relate to the magnitude of credit lines. That said, we do find that unconstrained firms, as measured by the presence of a significant credit line, choose not to build up cash reserves when they have high perceived external capital needs, but such a finding is not surprising.

**Table 7**

Line of credit regression models.

The dependent variable is a firm's line of credit as a proportion of total assets. All models are estimated using interval regressions with robust standard errors. Independent variables obtained from various portions of the survey are also included. These variables are: the ratio of net income to book equity (return on equity); a variable indicating whether the firm is privately held (i.e., non-listed); a variable indicating whether the firm has been listed on a stock exchange for less than five years; a variable indicating whether the CEO is also the chairman; the response to whether "the ability to take on projects, even if they do not add value to the firm" is an important factor in deciding on how much excess cash to hold, a measure which ranges from zero to five; leverage, as measured by the ratio of total liabilities to total assets; and a variable indicating whether a firm paid a regular dividend over the last five years. Industry indicator variables categorize a firm's primary operations into one of 18 industry category choices presented in the survey. Private credit to GDP, a measure which ranges from 0.08 to 2.17, is obtained from [Levine, Loayza, and Beck \(2000\)](#). Panel A includes basic firm variables and Panel B additionally includes firm responses to perceptual questions. The *p*-value of a two-tailed test of equality of each coefficient to zero is reported in parentheses.

<i>Panel A: Models with firm attribute variables</i>	(i)	(ii)
Log of revenue in millions of U.S. dollars	– 1.076 (0.03)	– 0.954 (0.07)
Return on equity	2.849 (0.50)	2.656 (0.55)
Private (i.e., non-listed) firm indicator	– 2.014 (0.35)	– 1.802 (0.45)
Listed on exchange less than 5 years indicator	0.589 (0.83)	1.610 (0.57)
CEO is also chairman of board indicator	– 0.842 (0.60)	
Importance of "the ability to take on projects, even if they do not add value to the firm" when deciding on excess cash		0.971 (0.18)
Leverage	5.029 (0.16)	1.901 (0.62)
Firm has paid a regular dividend in past 5 years indicator	0.237 (0.91)	1.101 (0.61)
Private credit to GDP	– 5.480 (0.00)	– 3.959 (0.03)
Industry indicator variables included?	Yes	Yes
Number of observations	204	165
Wald Chi <sup>2</sup>	46.66	45.17
<i>Panel B: Models with firm attribute and survey response variables</i>		
Log of revenue in millions of U.S. dollars	– 0.894 (0.09)	– 0.896 (0.13)
Return on equity	2.553 (0.54)	1.639 (0.71)
Private (i.e., non-listed) firm indicator	0.552 (0.81)	1.457 (0.59)
Listed on exchange less than 5 years indicator	3.284 (0.27)	3.999 (0.20)
CEO is also chairman of board indicator	– 0.827 (0.60)	
Importance of "the ability to take on projects, even if they do not add value to the firm" when deciding on excess cash		0.349 (0.60)
Leverage	2.142 (0.58)	– 0.687 (0.88)
Firm has paid a regular dividend in past 5 years indicator	1.503 (0.48)	2.372 (0.31)
Stated lack of external funds has limited taking on substantial projects	0.686 (0.25)	0.439 (0.52)
Stated need for external capital next 5 years relative to industry peers	1.351 (0.05)	1.501 (0.05)
Stated level of riskiness in past 5 years relative to industry peers	1.196 (0.23)	1.541 (0.16)
Stated that equity is occasionally or frequently undervalued	3.843 (0.04)	5.210 (0.01)
Stated that debt spread is too wide or debt rating is too low	– 0.219 (0.91)	– 0.742 (0.72)
Indicator that credit lines and cash are substitutes multiplied by non-operational cash/assets	– 0.217 (0.01)	– 0.221 (0.01)
Private credit to GDP	– 3.736 (0.03)	– 3.097 (0.09)
Industry indicator variables included?	Yes	Yes
Number of observations	179	150
Wald Chi <sup>2</sup>	64.88	56.06

provided by cash is used primarily when a guarantee is particularly important—to provide insurance against cash flow shortfalls when the firm is faring poorly. A credit line represents an option that can generally be exercised only when the firm and its banks are faring well, so it is used to fund future growth opportunities likely to arise in good economic times. Note that lines of credit are not a permanent solution to the lack of investment funding, however, because they are generally not longer than five years in duration.<sup>10</sup>

Further, lines of credit are a decreasing function of credit market development, consistent with the precautionary motive for corporate liquidity at the country level, while non-operational cash is positively related to credit market development, consistent with the agency cost explanation.

Finally, we note that for all of our regressions it is possible that country-level factors other than those captured by credit market development might ultimately be driving levels of corporate liquidity. To account for this possibility, we incorporate country random effects into our interval regression models. These models acknowledge possible dependence of errors within countries and also allow for both within- and between-country variation in the explanatory variables. All of our results hold both in magnitude and significance when a country random effects specification is used.

### 5.5. Are total cash holdings a good proxy for non-operational cash holdings?

We analyze whether total cash holdings, which, due to data constraints, have traditionally been employed in research on the determinants of corporate liquidity, are an adequate proxy for non-operational cash holdings. We have commented earlier that non-operational cash holdings are much smaller than total cash holdings. However, we do not know whether inferences drawn from models based on non-operational cash holdings are similar to those based on models of total cash. If we find the inferences to be similar, this validates the use of total cash as a proxy for non-operational cash.

To investigate this issue, we first compute the correlation between total cash holdings and non-operational cash holdings and find it to be 0.75 ( $p$ -value=0.00). This high level of correlation indicates a strong mapping between the two measures of cash. Second, we re-estimate the models from Table 6, but replace non-operational cash holdings by total cash holdings. Table 8 contains the results. The inferences using total cash are similar, and, with one exception, all of the explanatory variables that have a significant coefficient in at least one

of the four models of Table 6 also have a significant and similarly signed coefficient in at least one of the Table 8 models. The exception is the impact of profitability: while more profitable firms have higher total cash holdings, this is not reflected in their levels of non-operational cash. Thus, it appears that more profitable firms have higher cash levels for operational reasons. Therefore, unless the purpose of the study is to investigate the relationship between profitability and cash holdings, we believe that total cash is a reasonable proxy for non-operational cash when assessing the determinants of a firm's cash policy.

## 6. Limitations of survey analysis

With any survey there are potential limitations to the inferences that can be drawn. Several concerns can arise. The first is the risk that the survey questions are misunderstood. While it is not possible to verify that each respondent fully understood each question, we went to some lengths to test, and confirm, that the survey questions were generally well understood. Before launching the survey, a beta version was discussed with a number of CFOs to make sure there were no misunderstandings. Also, the survey findings were presented at several practitioner seminars, where participants confirmed their understanding of the survey questions. Moreover, if respondents inconsistently interpreted questions, this would weaken our ability to uncover cross-sectional results. The fact that we uncover economically meaningful relationships between the survey responses and firm characteristics is evidence that, in aggregate, respondents understood the intent of our questions.

A second concern is the possibility that our respondents are not representative of the population of firms which were sent the survey instrument. Additionally, even among the firms that responded to the survey, some chose to complete the section on corporate liquidity, while others did not. The survey was sent to the largest companies in each particular country and industry. We conduct three sets of tests to assess whether respondent firms are representative of this overall sample of firms worldwide. First, as discussed in the text, we find that the characteristics of the firms in our sample are similar to those studied in prior international research, except that our sample firms are larger. This suggests that the firms that chose to respond to our survey are generally representative of a wider cross-section of firms. Second, we have also compared the industry composition of respondent and non-respondent firms and find it to be similar. Third, we test for differences between the firms responding to the liquidity management part of the survey and those who did not. We find no differences in the variables we employ in our regressions between the two groups, with one exception: firms that respond to the liquidity questions are more likely to pay dividends. Taken together, these tests indicate that response bias is unlikely to be a major concern for our survey data.

Another potential concern is that respondents may choose not to answer questions truthfully. Because our survey is completely anonymous, we do not believe there

<sup>10</sup> We base this statement on private conversations with several U.S. bankers who indicate that for large U.S. firms the typical credit line maturity ranges from three to five years. We also read the annual reports (20-Fs) of a sample of nine non-U.S. corporations with NYSE-listed American Depository Receipts to obtain data on credit line maturity. One firm has a six-year line of credit, five firms have a five-year credit line, two firms have a three-year credit line, and one firm reports that its credit line has an "indefinite" maturity.

**Table 8**

Total cash regression models.

The dependent variable is total cash as a proportion of total assets. All models are estimated using interval regressions with robust standard errors. Independent variables obtained from various portions of the survey instrument are also included. These variables are: the ratio of net income to book equity (return on equity); a variable indicating whether the firm is privately held (i.e., non-listed); a variable indicating whether the firm has been listed on a stock exchange for less than five years; a variable indicating whether the CEO is also the chairman; the response to whether “the ability to take on projects, even if they do not add value to the firm” is an important factor in deciding on how much excess cash to hold, a measure which ranges from zero to five; leverage, as measured by the ratio of total liabilities to total assets; and a variable indicating whether a firm paid a regular dividend over the last five years. Industry indicator variables categorize a firm’s primary operations into one of 18 industry category choices presented in the survey. Private credit to GDP, a measure which ranges from 0.08 to 2.17, is obtained from [Levine, Loayza, and Beck \(2000\)](#). Panel A includes basic firm variables and Panel B additionally includes firm responses to perceptual questions. The *p*-value of a two-tailed test of equality of each coefficient to zero is reported in parentheses.

<i>Panel A: Models with firm attribute variables</i>		
	(i)	(ii)
Log of revenue in millions of U.S. dollars	–0.375 (0.27)	–0.530 (0.16)
Return on equity	8.597 (0.02)	9.401 (0.01)
Private (i.e., non-listed) firm indicator	–0.333 (0.82)	0.602 (0.72)
Listed on exchange less than 5 years indicator	1.773 (0.16)	–0.047 (0.48)
CEO is also chairman of board indicator	0.991 (0.37)	
Importance of “the ability to take on projects, even if they do not add value to the firm” when deciding on excess cash		–0.272 (0.53)
Leverage	–5.130 (0.04)	–4.716 (0.12)
Firm has paid a regular dividend in past 5 years indicator	1.321 (0.34)	2.506 (0.10)
Private credit to GDP	3.268 (0.00)	2.926 (0.02)
Industry indicator variables included?	Yes	Yes
Number of observations	202	164
Wald Chi <sup>2</sup>	58.69	52.72
<i>Panel B: Models with firm attribute and survey response variables</i>		
Log of revenue in millions of U.S. dollars	–0.365 (0.31)	–0.759 (0.05)
Return on equity	9.690 (0.01)	10.196 (0.01)
Private (i.e., non-listed) firm indicator	–0.834 (0.61)	–0.044 (0.98)
Listed on exchange less than 5 years indicator	1.864 (0.10)	–0.274 (0.89)
CEO is also chairman of board indicator	0.818 (0.47)	
Importance of “the ability to take on projects, even if they do not add value to the firm” when deciding on excess cash		–0.401 (0.37)
Leverage	–3.171 (0.14)	–4.172 (0.13)
Firm has paid a regular dividend in past 5 years indicator	1.712 (0.24)	2.951 (0.06)
Stated lack of external funds has limited taking on substantial projects	–0.048 (0.91)	–0.197 (0.67)
Stated need for external capital next 5 years relative to industry peers	–0.553 (0.14)	–0.594 (0.11)
Stated level of riskiness in past 5 years relative to industry peers	0.462 (0.50)	1.158 (0.12)
Stated that equity is occasionally or frequently undervalued	–0.059 (0.96)	0.944 (0.48)
Stated that debt spread is too wide or debt rating is too low	–1.073 (0.44)	–1.709 (0.14)
Indicator that credit lines and cash are substitutes multiplied by non-operational cash/assets	–0.077 (0.00)	–0.106 (0.00)
Private credit to GDP	3.096 (0.01)	2.892 (0.03)
Industry indicator variables included?	Yes	Yes
Number of observations	180	150
Wald Chi <sup>2</sup>	74.23	53.37

would be any systematic reason for respondents to answer questions in anything other than a truthful manner. Additionally, as pointed out by Graham and Harvey (2001) for their large-scale survey instrument, it is unlikely that corporate executives would take the time to respond to a lengthy survey if their intent was to be untruthful.

Summing up, our survey respondents appear to be broadly representative of the international firms typically used in other corporate finance research and they appear to have understood the questions asked. We also believe that respondents answered our questions truthfully. Nonetheless, the inferences drawn from our study must be interpreted with the understanding that our data come from a survey rather than from archival data obtained from a comprehensive global data provider.

## 7. Conclusion

This paper uses survey evidence for firms from 29 countries to assess how and why firms use credit lines and excess cash around the world. Our primary research question is whether firms use credit lines and cash holdings to hedge different risks. Our survey approach allows us to investigate this question using detailed information on corporate liquidity that cannot be obtained from publicly available financial statement data. In particular, the survey provides data on the magnitude of credit lines and of cash held for non-operational purposes, on whether CFOs consider these to be substitute liquidity sources, on specific factors considered by CFOs when making decisions on liquidity, and on future capital needs and perceived misvaluation in securities markets.

Overall, our study provides new insights into the way firms manage their corporate liquidity. Our tests indicate that non-operational cash is employed as a general insurance policy against poor cash flow realizations; firms with either higher needs for external funding in the future or a belief that their equity is undervalued do not hold extra cash today. Lines of credit, on the other hand, are employed when future external financing needs are high and managers believe that their equity is undervalued. We conclude that non-operational cash is held to guard against future cash flow shocks in bad times, while credit lines are held to give firms the option to exploit future business opportunities available in good times. Put another way, we conclude from our tests that excess cash is held as general purpose insurance and lines of credit are held to fund future growth options.

Several other new findings emerge as well. First, lines of credit are the dominant source of liquidity for most companies around the world, amounting to about 15% of assets. Second, less than half of the cash held by companies is held for non-operational purposes, amounting to about 2% of assets. Third, we find that when a country's credit markets are less developed, lines of credit are larger and CFOs are less likely to view credit lines and cash as substitutes. Thus, firms find it particularly valuable to have credit lines available in a setting where it is hard to obtain bank funds on the spot.

Our survey was conducted in 2005, before the recent credit crisis, but it foreshadowed some of what transpired. More specifically, when CFOs were asked in the survey to rank each of 19 different finance functions based on how much value it creates for their firm, three of the four most highly ranked functions were activities related to corporate liquidity management, indicating that well before the crisis executives were very concerned with managing their firms' liquidity. Results from the tests we conduct show that while executives made their liquidity decisions primarily based on the precautionary motive, they used different liquidity instruments to hedge different risks. Recent work by Campello, Giambona, Graham, and Harvey (2009) surveys financial executives in the wake of the crisis, and their findings corroborate ours: lines of credit are an important source of liquidity, credit lines are indeed conditional, and the relationship between cash and lines of credit is neither simple nor mechanical. Taken together, research that uses survey data to assess corporate liquidity shows that it is important to consider all facets of corporate liquidity, not just cash, to obtain a more comprehensive picture of the determinants of liquidity policy.

## Appendix. Interval regressions

Interval regressions are used in our analysis of the magnitude of non-operational cash holdings and lines of credit because we observe the data for our dependent variables only in categories rather than in its original form as continuous variables. Below, we discuss the procedure employed to estimate interval regressions.

Assume the following linear regression model:  $y = X\beta + \varepsilon$ , where  $y$  is a vector of the continuous outcomes, either observed or unobserved,  $X$  is a matrix of explanatory variables, and  $\beta$  is a vector of regression coefficients.  $\varepsilon$  is distributed normally with a mean of zero and a standard deviation of  $\sigma^2 I$ , where  $I$  is the identity matrix.

The observations fall into various sets. The first set consists of cases where the actual outcome can be observed. In our non-operational cash models, these are firms with zero non-operational cash, and in our line of credit models, these are firms without credit lines. The second set consists of observations that are left-censored, where we know that the unobserved  $y_j$  is less than  $y_{LOW}$ , a censoring variable that is known. There are no such observations in our sample because we know that the minimum level of non-operating cash and the minimum level of credit lines are zero. The following  $k$  sets (numbered from 3 to  $k+2$ ) consist of firms whose unobserved  $y_j$  is in an interval ( $LOW SET_i$ ,  $HIGH SET_i$ ), where  $i$  refers to the set number. For lines of credit, we have ten such sets; firms with a credit line had 11 size categories to choose from, but the top category has no upper bound. For non-operational cash holdings, we have 137 sets because the minimum and maximum levels of non-operational cash are computed by multiplying the minimum and maximum levels of total cash with the minimum and maximum ratio of non-operational cash to total cash, leading to many different intervals. Finally,



there is a set (numbered  $k+3$ ) that consists of observations that are right-censored where we know that the unobserved  $y_j$  is higher than  $y_{HIGH}$ , a censoring variable that is known. There are no such observations in our sample for non-operational cash because we know that the maximum is 100%. There are 91 observations in our sample for lines of credit; these are firms whose line of credit exceeds 20% of assets (and could therefore potentially exceed 100% of assets).

We then construct the following log likelihood function and estimate the model with maximum likelihood:

$$\begin{aligned} \ln L = & -\frac{1}{2} \sum_{j \in \text{Set}_1} \left[ \left( \frac{y_i - X\beta}{\sigma} \right)^2 + \log 2\pi\sigma^2 \right] \\ & + \sum_{j \in \text{Set}_2} \left[ \log \phi \left( \frac{y_{LOW} - X\beta}{\sigma} \right) \right] \\ & + \sum_{i=3}^{k+2} \sum_{j \in \text{Set}_i} \log \left[ \phi \left( \frac{y_{HIGH \text{ SET}_i} - X\beta}{\sigma} \right) - \phi \left( \frac{y_{LOW \text{ SET}_i} - X\beta}{\sigma} \right) \right] \\ & + \sum_{j \in \text{Set}_{k+3}} \log \left[ 1 - \phi \left( \frac{y_{HIGH} - X\beta}{\sigma} \right) \right], \end{aligned}$$

where  $\phi(\cdot)$  is the standard cumulative normal and  $k$  is the number of sets with both a lower and upper limit specified. For completeness, the above equation includes Set 2, which consists of left-censored observations, but as we pointed out above, there are no such observations in our sample. Note that this approach is just a generalization of Tobit and censored regression models. Tobit models would include the first, second, and fourth elements of the above equation, while censored models would include the third element of the above equation. For a further description of interval regression techniques, see Amemiya (1973).

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