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Determinants of Corporate Liquidity in Swedish Listed Firms

- The Importance of Lines of Credit -

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Abstract

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Authors	Johanna Linnard and Camilla Nordberg
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Keywords	Corporate Liquidity, Cash Holdings, Lines of Credit, Financial Crisis, Capital Structure
Aim and Objective	The objective of this study is to empirically investigate the determinants of liquidity holdings in Swedish listed firms. By including both lines of credit and cash, this study aims to extend the scope of previous work within the field and shed light on the important role of lines of credit in corporate liquidity management. Further, by incorporating a time period covering the recent financial crisis, this study investigates whether determinants of corporate liquidity holdings vary with changes in the financial environment.
Methodology	This study is undertaken using a deductive and quantitative approach. The determinants of corporate liquidity are investigated using the least square method on a panel data set as well as on a cross-sectional data set.
Theoretical perspectives	The theoretical framework consists of traditional capital structure theories, namely the trade-off theory and the financing hierarchy model.
Empirical foundation	This study empirically investigates a sample consisting of 163 survivors and non-survivors listed on the NASDAQ OMX Stockholm during 2007-2011. Data on lines of credit are collected manually for a subsample of the 2007 and 2011 firm observations, totalling 197 observations.
Conclusions	The findings of this study imply that lines of credit constitute the majority of Swedish firms' liquid holdings confirming that this source of liquidity should not be overlooked within corporate liquidity literature. The results further show that the use of lines of credit is even more pronounced post-crisis than pre-crisis. Looking at determinants of corporate liquidity, this study concludes that both the trade-off model and the financing hierarchy model play important roles, although none of the theories fully explain these determinants. Finally, this study finds several determinants behind the proportionality of lines of credit and cash in total liquidity, but also that there are differences pre- and post-crisis.

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1 Introduction

1.1 Background

The current increasing cash levels in corporations has drawn considerable attention to the question regarding the role of cash in firms' capital structure. Sanchez and Yurdagul (2013) find that US firms' cash levels are record-high, and that the development has been positive almost consistently since mid-1990s, with an exception for the slow-down around the financial crisis. They find that the cash to net assets ratio in 2011 exceeds 12%, which is more than double compared to 1995. The increasing corporate cash levels have engaged academics and several studies have investigated what drives the development (e.g. Bates, Kahle, & Stulz, 2009; Lins, Servaes, & Tufano, 2010). A proposed explanation is the benefit of financial flexibility that cash provides, and that firms pile cash for precautionary reasons (Bates et al., 2009; Lins et al., 2010; Sanchez & Yurdagul, 2013).

Pettit debates that the role of cash within corporate capital structure decisions is increasing and that *"the optimal capital structure question is expanding to include the left-hand side of the balance sheet. It is now as much a question of cash balances and pension assets as it is about financial leverage"* (Pettit, 2007, p. 97).

During times of financial constraint cash is especially important, since external financing becomes more expensive and less available. In such times, firms tend to increase cash levels and adopt more conservative financial policies (Song & Lee, 2012). Several studies have investigated the role of cash in the recent credit crisis, concluding that the corporate performance and corporate investment within firms with larger cash reserves was less affected by the crisis compared with firms with less cash reserves (e.g., Adjei 2011; Duchin, Ozbas, & Sensoy, 2010).

In a frictionless world, however, the value of the firm is independent of the choice of financing. Hence, firms would not have to hold cash, as external financing is available at a fair price at all times (Modigliani & Miller, 1958). In reality though, the existence of market imperfections provides rationale for holding cash, in particular when transaction costs are material and when external financing is expensive or not available (Opler, Pinkowitz, Stulz, & Williamson, 1999). Traditionally, two main theories are put forward to explain firms' capital structure decisions – the trade-off theory and the financing hierarchy theory. These two theories also provide a theoretical framework in corporate liquidity literature and are used to understand firms' incentives to hold cash. The trade-off model of liquid holdings postulates that firms consider the marginal costs and marginal benefits of holding cash to determine the optimal level of cash holdings (Kim, Mauer & Sherman, 1998). Benefits associated with holding cash highlighted in the literature are for example the decreased probability of financial distress, the low transaction cost, and the ability it

provides to finance investments when other means of financing are not available (Keynes, 1934; Whalen, 1966). On the other hand, the cost of cash is that it carries a low rate of return (Baumol, 1952). This is referred to as the liquidity premium of cash and reflects the benefit of low transaction cost associated with liquid assets (Keynes, 1934; Miller 1986). Thus, there is an opportunity cost entailed to holding cash and liquid assets. However, the opportunity cost is expected to be lower in low interest rate environments (Opler et al., 1999), again highlighting the topicality of cash as recent years have been characterized with low interest rates.

The financing hierarchy theory suggests that there is no optimal amount of cash but that firms rather choose the mean of financing that is associated with the lowest cost of information asymmetry. Firms prefer to finance its investments with internal funds, and will only raise external capital if such funds are insufficient. Under this view, the amount of cash held in a firm is solely the outcome of its profitability, payout policy, and investment outlays. (Myers & Majluf, 1984).

Opler et al. (1999), one of the most cited studies within the field of cash holdings, find evidence supporting the trade-off model when examining the determinants and implications of firms' cash holdings on a US sample during 1971-1994. They find that firms' cash balances are mean reverting indicating that firms do have target cash levels. They find additional support for the trade-off view when concluding that certain firm characteristics can explain cash levels, all together indicating that firms do consider marginal benefits and marginal costs to identify optimal level of cash holdings. The results indicate that firms with better access to capital market, such as large firms, tend to hold less cash. Cash holdings also decrease with net working capital and with leverage, and if the firm is paying dividends. Small firms, firms with higher cash flow volatility, and firms with strong growth opportunity, tend to hold larger amounts of cash.

Several studies have further contributed to the field, with explanations regarding determinants of cash holdings. Ferreira and Vilela (2004) find on a sample consisting of publicly traded firms in EMU countries that cash holdings increase with investment opportunities and decrease with level of liquid asset substitution. In addition, large and levered firms tend to hold less cash than others. Ozkan and Ozkan (2004) provide evidence that cash flow and growth opportunities have a positive impact on the level of cash holdings in their UK sample. They also find that ownership structure plays an important role. Guney, Ozkan and Ozkan (2007) provide empirical evidence that there exists a non-linear relationship between cash holdings and leverage, more specifically; cash is negatively related to leverage for firms with low leverage and positively related in the more levered firms.

Despite the growing literature on determinants of corporate cash holding, there is no theory that can unanimously explain the empirical results. For example, studies have found a negative relationship between cash holdings and size which supports the

trade-off theory but is in conflict with the financing hierarchy theory, whereas the positive relationship between cash holdings and cash flow generation is in line with financing hierarchy theory but contradicts the predictions of the trade-off theory (e.g., Ferreira & Vilela 2004; Opler et al. 1999; Drobetz & Gruninger 2007). It is thus argued that both the trade-off theory and the financing hierarchy theory are useful in explaining determinants of corporate cash levels. In addition, the results regarding the determinants of firms' cash holdings are not necessary consistent over the studies. Ozkan and Ozkan (2004) find no support that size negatively affects cash holdings and Kim et al., (1998) find that there exists a negative, rather than a positive, relationship between cash flow and cash levels. This indicates that there are issues that need to be addressed further as the field of cash holdings develops and expands its empirical scope.

1.1 Problem Discussion

What previous studies have not managed to include in their analysis of level of cash holdings is the available cash for firms in form of undrawn lines of credit, as such data must be collected manually. In addition, International Financial Reporting Standards (IFRS), which are the accounting standards that all publicly traded companies within the European Union has to follow when reporting consolidated accounts (Regulation (EC) 1606/2002 of the European Parliament and of the Council, 2002), does not require firms to disclose information regarding amounts under lines of credit available to the company (IAS 7 Statement of Cash Flows). Lins et al. (2010) find in their survey-based research covering 29 countries that lines of credit are the dominant source of liquidity for most of the companies, and that both cash and lines of credit are being considered when implementing liquidity policy. Excluding lines of credit could hence lead to conclusions being drawn on firms' use of liquid sources in an incorrect way. While there has been extensive prior research on lines of credit (e.g., Boot, Thakor, & Udell, 1987; Holmström and Tirole 1998; Martin and Santomero 1997), few studies incorporate both lines of credit and cash when analyzing corporate liquidity, despite the similarities in the literature on the two areas of research (Sufi 2009).

Sufi (2009) provide a seminal work were he quantitatively examines the factors affecting firms' choice between lines of credit and cash in their corporate liquidity management. The results indicate that cash flow is a strong predictor of whether firms choose to rely on cash holdings or on lines of credit. Weak cash flows or high cash flow volatility characterizes the firms that rely on cash rather than lines of credit. These firms are less likely to obtain lines of credit, and consequently, they rely on internally generated funds to a greater extent. According to Sufi (2009), lines of credit are hence liquidity substitutes mainly for firms with strong cash flows. Campello, Giambona, Graham, and Harvey (2011) provide insight regarding the role of lines of credit in firms' liquidity management in financially constraint times, examining how firms used their internal and external sources of liquidity during 2008 and 2009. The

result indicates that lines of credit eased the negative impact of the financial crisis on firms, highlighting that lines of credit play a significant role in firms' liquidity management and should not be a neglected component.

The determinants of cash holdings have in recent years been relatively well debated in academic literature. However, there are few studies that cover the Nordic countries and none that, to the authors' knowledge, focus on Sweden. Research has shown that cash holdings vary significantly across countries, much explained by different regulations and financial policies (Dittmar, Mahrt-Smith, & Servaes, 2003). It is thus difficult to generalize results from previous research and infer that the findings also hold on the Swedish market.

An extension of previous research would thus be to investigate whether Swedish firms' cash levels has developed in a similar way as demonstrated in previous research, and whether the determinants of Swedish corporate cash levels are similar to those found in previous research. To further improve the analysis of Swedish firms' liquidity management this study will, following Sufi (2009), include both cash[1] and undrawn lines of credit as a measure of total liquidity available for firms, and examine what might determine the choice between the two. This study is, to our knowledge, the first to quantitatively investigate firms' use of both cash and lines of credit in a European country.

As previously mentioned, both cash and lines of credit have been proven to have played an important role in the recent financial crisis and it is therefore of interest to more thoroughly examine whether the results differ pre- and post-crisis. This study will employ a sample that covers the period of 2007-2011, which enables an analysis of whether determinants of corporate liquidity holdings vary with changes in the financial environment. Although the effects of the financial crisis might not be completely cleared in 2011, this year will be referred to as post-crisis as it is the best estimate available at the time of conducting this study. Finally, we recognize that the majority of the existing literature on corporate liquidity use historical data to measure firms' liquidity management, and do not incorporate any time varying components. However, the level of liquid holdings can also be defined as the present as well as expected future sources and uses of liquidity. This study will as a final step also employ a liquidity ratio similar to that used by Standard & Poor's (S&P), and also by practitioners within the field of liquidity management, as an extension to existing measurements of liquidity.

[1] Cash is always defined as cash and marketable securities. Although interchangeably referred to as cash, cash and marketable securities, and cash and cash equivalents.

1.2 Aim and Objective

The aim of this study is to empirically investigate the determinants of cash holdings among Swedish listed firms during 2007-2011, and whether these have changed over the years, pre- and post-crisis. By adding lines of credit to the cash measurement the study aims to extend the scope of previous work within the field. In addition, the study aims to investigate the relationship between cash and lines of credit in firms' liquidity management and whether certain firm characteristics can explain if firms are more prone to rely on one more than the other.

1.3 Research Question

Our research question is two fold:

(i) What determines corporate liquidity in Swedish listed firms 2007-2011?

(ii) What determines the use of lines of credit as opposed to cash within the corporate liquidity management of Swedish listed firms 2007 and 2011?

1.4 Scope and Limitations

This study will empirically investigate a sample consisting of 163 survivors and non-survivors listed on NASDAQ OMX Stockholm during 2007-2011. As previously mentioned, data on lines of credit is not available in financial databases but has to be collected manually. This limits the time horizon of the sample that can be covered within the scope of this study. The analysis of lines of credit will be concentrated to the years of 2007 and 2011, and data on lines of credit will be collected for a subsample consisting of these two years only, while data for other variables will be collected for the full period.

Although, no formal definition of corporate liquidity exists, it typically refers to corporate cash (core and strategic), lines of credit, and assets that can easily be converted to cash (Servaes and Tufano, 2006). When referring to liquidity and liquidity management in this paper, it will concern corporate cash and lines of credit solely (in line with e.g., Sufi 2009; Lins et al., 2010) to capture the amount of cash as well as pre-negotiated liquidity that is available to firms.

1.5 Thesis Outline

Chapter 2 outlines the theoretical framework relevant for this study. The theory of cash holdings is derived from the traditional capital structure theories such as the trade-off theory and the financing hierarchy theory. The theory of lines of credit build largely upon the theory of cash but includes a profound discussion on the differences between the two liquidity components. The chapter further presents a review of previous empirical findings regarding corporate cash and lines of credit, relevant for this study. Finally, based on previous discussion on the theoretical predictions of

corporate liquidity, multiple hypotheses are derived to guide through the empirical investigation in this study.

Chapter 3 presents the research methodology employed in this study, together with the data sample and several variables that are predicted to have a determining effect on corporate liquidity. The chapter provides detailed information regarding the applied methods and econometric approach in order to enable future studies to replicate the used framework.

Chapter 4 presents the results of the empirical investigation together with an analysis of its theoretical implications. The chapter begins with descriptive statistics over the full sample and the subsample respectively in order to enable a more complete discussion on liquid holdings within the studied firms. Following this, the results of the regression analysis are presented and discussed. The results are analyzed both in context of theoretical predictions and previous empirical findings.

Chapter 5 summarizes the findings and presents the conclusions of corporate liquidity determinants established in this study. Finally, suggestions for future research are outlined.

2 Theoretical Framework

2.1 Cash in a Perfect Market

In 1958, Modigliani and Miller presented their seminal work proposing that, under certain restrictive assumptions[2], firm value is independent of capital structure. In such capital markets, described as a perfect or frictionless, financial decisions do not affect shareholders' wealth (Modigliani & Miller, 1958). If a firm faces cash shortage it can turn to external financing to pursue a positive net present value investment at zero cost. On the other hand, following the irrelevance argument there is no liquidity premium associated with holding cash, and thus investing in liquid asset entails no opportunity cost, meaning that firm value is unaffected also if a firm chooses to hold cash (Opler et al., 1999). However, introducing market imperfections such as transaction costs and information asymmetries cause cash holdings to matter. For instance, if a firm has to forgo a positive net present value project when internal cash generation is insufficient and external financing is unavailable (or too costly), holding cash reserves enable firms to pursue value-creating investments (Opler et al. 1999).

In capital structure literature, two main theories have emerged after Modigliani and Miller's capital structure irrelevance principle, the trade-off theory and the financing hierarchy theory. These two theories also provide a theoretical framework in liquidity literature by explaining corporate cash holdings (see e.g., Dittmar et al. 2003; Ferreira & Vilela, 2004; Opler et al. 1999).

2.2 Theoretical Motives for Holding Cash

2.2.1 The Trade-Off Theory

Kraus and Litzenberger (1973) argued that the existence of the market imperfections, corporate taxation and bankruptcy penalties result in a firm being dependent on its choice of capital structure. They suggest that the optimal capital structure is a trade-off between the cost and benefit of debt, i.e. the bankruptcy penalties and the tax advantage (Kraus & Litzenberger, 1973). Contemporary liquidity literature suggests that the same argument can be used when analyzing firms' optimal cash level, namely

[2] Key assumptions of perfect capital markets (Modigliani & Miller, 1958)

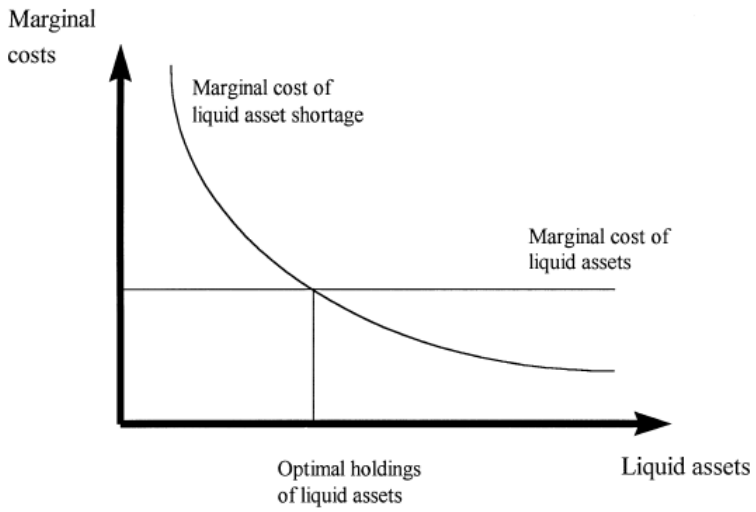
- Two types of securities exit that firms can issue, both with equal cost of capital; equity and risk-free debt
- There are no transaction costs
- There are no bankruptcy costs
- There are no taxation costs
- There is homogeneous information available to all investors at all times
- There are no conflicts of interest between management and shareholders.

that the optimal level of cash is a trade-off between the associated costs and the benefits (see e.g., Dittmar et al., 2003; Ferreria & Vilela, 2004; Opler et al., 1999).

Keynes (1934) described two motives for holding cash; the transaction cost motive and the precautionary motive, which later in liquidity literature have been referred to as the two main benefits of holding cash (see e.g. Drobetz & Gruninger, 2007; Opler et al., 1999; Ozkan & Ozkan, 2004). Kim et al. (1998) developed a model where it is suggested that firms consider the benefit of holding cash against the low rate of return liquid assets yield. The agency cost of managerial discretion, based on the argument of Jensen (1986) that managers have an incentive to hold cash to pursue their own objectives, is another cost of cash highlighted in the literature (see e.g., Bates et al., 2009; Dittmar et al., 2003; Opler et al., 1999). More recent research also emphasizes the tax implication of cash as one of the factors that firms consider in their trade-off (e.g., Bates et al., 2009; Servaes and Tufano, 2006).

Opler et al. (1999) intuitively describe the logic behind firms' trade-off between costs and benefits of cash. If being short of cash hinders firms from pursuing value-creating projects or hampers its operations, there is a cost associated with liquid asset shortage. Holding cash reserves reduce the probability of cash shortage, which is valuable, and accordingly there is a benefit of cash. A value maximizing firm should weight the marginal benefit of holding cash against the associated marginal cost and actively adjust the cash levels towards an optimal level, where marginal cost of liquid asset shortage equals marginal cost of liquid assets as shown in the figure below.

Figure 2.1 - Optimal Level of Liquid Assets (Opler et al., 1999)



The remainder of this section will discuss the costs and benefits of holding cash that firms are assumed to face, and the theoretical implications of these costs and benefits on the level of cash holdings.

2.2.1.1 Costs of Holding Cash

Cost of Carry

One cost considered to determine the optimal size of cash balance is the opportunity cost of holding cash (see e.g., Baumol, 1952; Whalen, 1966). In a perfect capital market, a firm can raise debt and hold as cash on the balance sheet at no cost, since cash will generate the same interest as charged for the debt. In reality however, the cost of debt is likely to be greater than the return on cash (Miller, 1986). If assuming that managers act in shareholders' interest and maximizes firm value, the only cost of cash is the difference between return on cash and the interest paid to finance another investment of the same risk. This opportunity cost, often called cost of carry, affects firm value negatively and is borne by the shareholders. (Servaes and Tufano, 2006)

Agency Costs of Managerial Discretion[3]

If the assumption of aligned interests between managers and shareholders is relaxed, managers may hold cash to pursue its own objective rather than maximize shareholders' wealth (Jensen, 1986). Jensen (1986) argues that managers have an incentive to hoard cash as it allows them to stay independent from capital markets and remain control over the firm's assets. With cash readily available, managers can pursue investments that are value destroying, which capital market does not agree to finance. Investing in cash can hence have negative impact on firm value as it allows management to avoid the discipline of capital markets (Ferreira & Vilela, 2004).

Previous research has used several variables to proxy the extent a firm may suffer from agency cost of managerial discretion. Opler et al. (1999) argue that firms with valuable investment opportunities may have less severe problems with agency cost of managerial discretion, as the objectives of management and shareholders are more likely aligned. At the same time, if a firm has few valuable investment opportunities, it would be more difficult for management to obtain external financing, hence cash reserves become critical if management wants to pursue investments of own interest. The monitoring function of debt is assumed to reduce agency costs as suggested in Jensen's (1984) control hypothesis, hence firms with low leverage can hold more cash because such firms are less subject to capital market monitoring. Finally, it is assumed that larger firms should have larger shareholder dispersion, which in turn can give rise to managerial discretion (Ferreira & Vilela, 2004).

[3] Also commonly referred to as Jensen's Free Cash Flow hypothesis

Tax Implications

Modigliani and Miller presented in 1963 a corrected version of their publication in 1958 where they take corporate taxation into account in the discussion of capital structure. When introducing taxes, there are certain benefits of raising debt that firms forgo when instead using cash reserves to finance investments. Interest payments on debt are tax deductible, hence using debt decreases the tax paid by the firm, which ultimately increases shareholder value. Further, taxes are disadvantageous for shareholders, since the interest income that cash generates is taxed twice, first on corporate level and then on the individual shareholder level, which significantly lowers the interest gain (Masulis & Trueman, 1988).

2.2.1.2 Benefits of Holding Cash

Transaction Cost Motive

The transaction cost motive, first introduced by Keynes (1936), postulates that when introducing transaction costs in capital markets, firms have an incentive to hold cash reserves because it is costly to convert cash substitutes into cash. Classic money demand models (e.g., Baumol, 1952; Miller & Orr, 1966; Tobin, 1956) derive optimal cash demand recognizing such transaction costs. Trading financial and real assets are assumed to involve both a fixed and a variable cost. The fixed cost makes it less attractive to frequently raise funding externally, and encourage firms to instead hold cash as a buffer. This further implies that there are economies of scale in cash management. Opler et al. (1999) emphasize that the variable component results in greater shortages costing more, as the firm has to cut back on larger amounts of investments, liquidate larger amounts of assets, or raise larger amounts of external funding. When the cost or probability of liquid asset shortage increases, the marginal cost curve in figure 2.1 shifts outwards and increases the firm's optimal level of liquid asset holdings.

The transaction cost motive suggests that firms hold cash reserves in order to avoid transaction costs, hence avoid the marginal cost of cash shortage. Liquidity literature put forward several variables to proxy for this cost, which are used within the trade-off framework to understand how firms estimate an optimal cash level. The economies of scale in cash management suggest that it is more costly for smaller firms to raise external funding, hence, theory predicts that smaller firms hold more cash compared to larger firms (Barclay & Smith 1996; Kim et al., 1998). Smaller firms are in general expected to have inferior access to capital markets and face higher transaction costs compared to larger firms (Opler et al., 1999). A related argument is that firms with lower probability of financial distress face lower transaction costs and therefore hold less cash (Kim et al., 1998).

Further, since firms with greater growth opportunities face greater losses when incurring cash shortage, as they have to give up more valuable projects, they are

expected to hold more cash (Opler et al., 1999). To the extent that the amount of capital expenditures captures the future investment demand, it is expected that investment intensive firms also need to hold more cash to avoid losses associated with cancelled investments (Dittmar et al., 2003). It is also expected that firms with more volatile and/or lower cash flows hold more cash reserves because they face a greater probability of cash shortage (Kim et al., 1998; Opler et al., 1999). Moreover, Shleifer and Vishny (1992) argue that one way to raise funds is through the liquidation of assets, hence the level of assets available to (cost-efficiently) liquidate when facing cash shortage affects the amount of cash held as a buffer. Baskin (1987) suggest that the cost of investing in liquid funds increases with leverage and that highly levered firms are for that reason expected to hold less cash. Finally, dividend-paying firms are expected to be able to raise funds relatively easy by simply cutting their dividend payments, and therefore hold less cash (Opler et al., 1999).

All in all, in the presence of transaction costs, it is expected that assets that can cost-efficiently be converted into cash carries a lower rate of return reflecting the benefit of minimizing the transaction costs (Keynes, 1936). Such premium is expected to be highest for cash and decrease with the illiquidity of an asset (see Baumol, 1952; Miller, 1986). The previously discussed cost of carry of cash hence increases with transaction costs (Opler et al., 1999).

Precautionary Motive

Keynes (1936) suggests another motive for holding cash in which firms aim at reducing the risk of future cash shortfalls. Whalen (1966) argues that the optimal level of such precautionary cash depends on the cost of illiquidity. Raising funds externally does not only result in direct costs, such as underwriting fees, but also various indirect costs (Servaes and Tufano, 2006). The precautionary motive, as discussed in more recent liquidity literature on corporate cash determinants (Dittmar et al., 2003; Drobetz & Gruninger, 2007; Opler et al., 1999), puts forth indirect costs such as information asymmetries, agency costs of debt and the opportunity cost of foregone investments of which firms strive to insure themselves against. To avoid dependency on external capital markets, which might be expensive when recognizing the previously mentioned costs, firms instead accumulate liquidity reserves (Servaes & Tufano, 2006).

Looking at information asymmetries first, Myers and Majluf (1984) discuss the implications of outsiders being less informed of the prospect of the firm than insiders, making it more difficult for outsiders to recognize the true value of the securities they purchase. They suggest that outsiders discount to ensure that they do not pay a premium due to overvaluation. However, it is possible that the discounting results in undervaluation to such an extent that the firm finds it more profitable to cancel its investment project rather than selling the securities at the discounted price.

As a proxy for degree of information asymmetry, liquidity literature suggests the level of research and development expenses (R&D) arguing that R&D-intensive firms are in nature more opaque and thus more likely to be incorrectly valued (e.g. Dittmar et al., 2003; Opler et al., 1999; Servaes & Tufano, 2006). Consequently, it is expected that firms with large R&D expenses hold more cash to compensate (Opler et al. 1999). Myers and Majluf (1984) argue that the firms whose value is determined by growth opportunities are subject to more severe information asymmetry problems. It is also argued that such firms have greater incentive to hold cash for precautionary reasons because it is more costly for them to pass up investment opportunities (Drobetz & Gruninger, 2007). In addition, smaller firms are expected to face larger information asymmetries compared to larger firms, and accordingly experience more borrowing constraints and face higher cost of external financing (e.g., Collins, Kothari, & Rayburn, 1987; Brennan and Hughes, 1991). Firms with greater information asymmetries are also expected to hold more short-term debt relative to long-term debt (Flannery 1986), and it can therefore be expected that the debt maturity structure affect the amount of liquid assets firms choose to hold (Garcia-Teruel & Martinez-Solano, 2008).

Secondly, agency costs of debt, arising from conflicts of interest between shareholders and debt holders, can result in costly problems such as underinvestment and asset substitution, as discussed by Myers (1977) and Jensen and Meckling (1976), increasing the cost of external financing. Highly levered firms are expected to experience agency costs of debt to a greater extent compared to less levered firms, and are hence expected to hold more cash for precautionary reasons (Opler et al., 1999). They are also expected to be more constrained regarding access to external funds, again suggesting that they hold more cash for precautionary reasons (Guney et al., 2007). In addition, Myers (1977) argue that growth firms face greater agency costs, as risky debt causing underinvestment problems result in such firms having to forego valuable growth options. Bates et al. (2009) predicts that cash held for the purpose of avoiding capital markets, increase with uncertainty of future cash flow, and that there therefore exists a positive relationship between cash levels and cash flow volatility. Finally, firms in financial distress might choose to increase their cash reserves in order to the decrease the risk of default, which would result in a positive relationship between cash holdings and probability of default (Ferreria and Vilela, 2004; Ozkan and Ozkan, 2004).

2.2.2 The Financing Hierarchy Theory

As previously discussed, introducing information asymmetries makes externally raised funding expensive. Costs arising from asymmetric information can either be viewed as additional costs that firms consider in their trade-off, or as prohibitive (Drobetz & Gruninger, 2007). If seen as prohibitive, firms might choose to avoid external financing resulting in a pecking order behavior, as described by Myers and

Majluf (1984). The financing hierarchy model suggests that firms prefer to finance its investments with internally generated funds, and if such funds are insufficient it will use its liquid asset reserves before raising funds externally. Equity is assumed to be subject to greater adverse selection costs, and firms will therefore choose debt as opposed to equity. The model suggest that firms with strong cash flows will pay down their debt and invest the surplus of internally generated funds in liquid reserves. Hence, the level of liquid assets is a function of the profitability of the firm as well as the investment and financing decisions made by the firm. As such, there is no optimal level of cash as suggested in the trade-off theory. (Myers, 1984; Myers & Majluf, 1984)

The financing hierarchy predictions of cash holdings are not entirely different from the ones suggested by the trade-off model, which makes it somewhat difficult to empirically distinguish between the two models (see Dittmar et al., 2003; Opler et al., 1999). However, the cost of external financing plays a more important role in the financing hierarchy model. The previously discussed variables for information asymmetry used in earlier literature are assumed to serve as an approximation for the financing hierarchy model as well. One clear difference from the trade-off model is that the financing hierarchy model views cash as negative debt. When investments exceed internally generated funds, debt increases, and when internally generated funds exceed investments, debt decreases (Myers, 1984). Another important difference from the trade-off view on cash holdings is that the financing hierarchy predicts cash to be negatively correlated to corporate investments. It is assumed that firms with high investment intensity accumulate less cash compared to firms with lower investment intensity.

Moreover, contradicting the trade-off view, cash holdings are expected to increase with firm size, because larger firms are expected to have been more profitable historically and thus accumulated more cash. Similarly, it is assumed that firms with strong cash flow generation hold more cash because internal cash surplus can be invested in liquid reserves (Opler et al., 1999). Shyam-Sunder and Myers (1999) argue that firms with strong cash flows also often are characterized with high market-to-book ratios because they are expected to be profitable in the future. As such, firms with higher market-to-book ratios might also hold more cash. This prediction is in line with that of the trade-off model, although, the explanation is rather because of strong cash generation and not because of higher cost of cash shortage (as suggested in the trade-off model).

Finally, the financing hierarchy theory predicts, again in line with trade-off theory, a negative relation between cash and dividends. However the explanation is that distributing dividends simply decrease the amount for cash accumulation. Myers (1984) argue that because dividends are sticky, firms first decrease its cash reserves when internally generated cash is less than investment outlays, before cutting back on dividends.

Table 2.1 – Predicted Relationship of Liquidity Determinants by Respective Theory

	Trade-Off Theory			Financing Hierarchy Theory
	Transaction Cost Motive	Precationary Motive	Agency Cost of Managerial Discretion	
Growth Opportunities	+	+	-	+
Firm Size	-	-	+	+
Cash Generation	-			+
Working Capital Intensity	-			
Investment Intensity	+			-
Leverage	-	+	-	-
Debt Maturity	-	-		
R&D Intensity	+	+		-
Probability of Default	+	+		-
Cash Flow Volatility	+	+		
Seasonality	+	+		
Dividend	-			-

Summary of predicted relationship on liquidity by theory

2.3 Theoretical Motives for Using Lines of Credit

Under perfect capital market assumptions cash and lines of credit are to be seen as perfect substitutes and firm value is unaffected of whether a firm chooses to hold one over the other. However, as before, introducing market imperfections results in the amount of cash and lines of credit to matter. Much of the literature on corporate liquidity focus on the role of cash, but the intuition generally applies to lines of credit as well (Lins et al., 2010). As previously discussed, cash is important for firms to be able to finance valuable projects when market frictions make external funding disadvantageous. The same applies for lines of credit, which are argued to provide an option-like cash equivalent (e.g., Boot et al., 1987; Holmstrom & Tirole, 1998; Melnik and Plaut, 1986). The remainder of this section will discuss the main motives of using lines of credit also commenting on the main limitations with using lines of credit as a source of liquidity.

2.3.1 Rate of Return

As highlighted in 2.2.1, a disadvantage of cash is the low rate of return it earns. Acharya, Almeida, and Campello (2012) model the trade-off a firm faces when it comes to holding cash and using lines of credit. They put forward one disadvantage of holding cash, as opposed to lines of credit, which is the absence of the liquidity premium. Instead of holding liquid assets that generates low rate of return, firms might manage their liquidity needs by using credit lines.

2.3.2 Agency Costs of Managerial Discretion

Cash exposes firms to managerial opportunism, as discussed by Jensen (1986). Lines of credit however, limit this problem through monitoring, covenants and various payment requirements (e.g. banking fees) that managers must meet. In other words,

lines of credit grant managers' conditional control right only under certain restrictions (Yun, 2009). Boot et al. (1987) motivate the use of lines of credit arguing that moral hazard problem makes it difficult to observe managers effort but that lines of credit are capable of eliminating potential value destruction due to agency costs of managerial discretion. Yun (2009) suggests that it can be value increasing for firms with weak internal governance to reduce cash levels and replace with lines of credit. The previously discussed variables for agency cost approximation, i.e. growth opportunities, firm size and leverage, can be expected to explain what type of firms choose to rely on lines of credit over cash reserves and vice versa. Entrenched management in firms with relatively low growth opportunities are suggested to rely on cash to a greater extent to pursue opportunistic investments, because they are expected to find it difficult to obtain external funding. Larger firms are in addition expected to have larger shareholder dispersion, which can give rise to managerial discretion. Finally, firms with lower leverage are less subject to monitoring, which also can give rise to managerial discretion. In conclusion, firms with high quality corporate governance policies are expected to be more likely to view cash and lines of credit as liquidity substitutes compared to firms with lower corporate governance quality (Yun, 2009).

2.3.3 Tax Implications

The effect of taxation on cash as opposed to lines of credit may affect firms' choice between the two sources of liquidity. While firms forgo benefits of raising debt when instead using cash reserves to finance investments as discussed in 2.2.1.1, interest payments on lines of credit are tax-deductible. Using lines of credit over cash therefore provides firms with a value-creating tax shield while serving the same purpose of meeting firms' liquidity needs (Demiroglu & James, 2011).

2.3.4 Transaction Cost Motive

As discussed in 2.2.1.2 there are transaction costs associated with raising external funds and firms with liquid asset reserves may avoid such costs. Flannery and Lockhart (2009) put forward that the ex post fixed costs associated with credit lines are minimal. They argue that if transaction costs are material (for equity and regular debt issuance), lines of credit should play an important role in firms' liquidity management and ultimately affect shareholders' wealth positively. Similar predictions regarding variables as discussed in section 2.2.1.2 are expected for lines of credit under the assumption that firms view lines of credit as a cash-equivalent component in their liquidity management.

2.3.5 Precautionary Motive

The liquidity literature suggest that it is valuable to hold liquid resources in capital markets with information asymmetries because it provides firms with the security to pursue investment opportunities even at times when cost of external capital is too high, e.g. when securities are underpriced (see Acharya, Almeida & Campello, 2007; Almeida et al., 2004; Myers & Majluf 1984). Under the assumption that lines of credits can be accessed unconditionally, lines of credit provide the same precautionary benefit as cash (Lins et al., 2010). In fact, Flannery and Lockhart (2009) suggest that lines of credit can weaken firms' incentive to hold precautionary cash, because precautionary liquidity could instead be held in the form of lines of credit, which provide the same benefit but do not entail the same cost of carry and agency cost of managerial discretion as cash does.

2.3.6 Limitations of Lines of Credit

As mentioned, theory suggests that lines of credit protect firms against future liquidity shortfalls and acts as an insurance that enable firms to pursue valuable projects. However, the insurance is likely to be incomplete because, as Sufi (2009) highlights, lines of credits provide *conditional* liquidity in most cases. One contingency is the financial health of the firm, as an option-like credit line can be exercised only if certain financial covenants are being fulfilled. A second contingency is the financial health of the lender, as the possibility that the lender may not be able to provide funds when a firm wishes to draw on its credit line (Demiroglu & James, 2011). Finally, the available line of credit is contingent on the value of the pledged collateral, often accounts receivables or inventories, and the amount available might fluctuate with the value of the asset collateralized (Flannery & Wang, 2011). Sufi (2009) therefore suggests that the lines of credit available for firms in reality are somewhat different from the ones described in the theoretical literature because they are in fact contingent and not always a fully committed source of liquidity.

Cash and lines of credit are hence not perfect substitutes, and the demand for lines of credit should not necessary equal demand for cash. Several firm specific characteristics are put forward to proxy for to what extent firms view lines of credit as cash equivalent, based on the above discussion on contingency. Firms with poor credit quality are more limited in accessing lines of credit and thus there is an expected negative relationship between probability of default and the use of lines of credit (Demiroglu, James & Kizilaslan, 2009). Because of financial covenants of lines of credit, it is expected that firms with weaker cash flows find lines of credit less of a cash substitute, because the credit line may not be available when most needed, and therefore they choose to rely on cash reserves rather than conditional credit (Sufi, 2009). The same argument applies for firms with relatively high cash flow variability, which might find cash more favorable due to the, often cash flow based, restrictive covenants. However, as suggested by Sufi (2009) it might be that firms with higher

variability in cash flows enjoy the flexibility of lines of credit, and to a greater extent rely on this source of financing as opposed to cash to manage their working capital and inventories. It is further suggested that size is predictor in whether firms use cash or lines of credit, because large firms are assumed to have better access to lines of credit compared to smaller firms (Sufi, 2009). Larger firms might also be more transparent and less risky, ultimately resulting in more favorable credit terms, and greater usage of lines of credit (Demiroglu and James, 2010). However, to the extent that larger firms have larger shareholder dispersion (Ferreira and Vilela, 2004), which can give rise to managerial discretion, a plausible interpretation is that lines of credit is negatively related to firm size.

Firms whose value largely consists of growth opportunities tend to be less levered, therefore it can be expected that such firms do not rely primarily on lines of credit but rather on cash (Sufi, 2009). However, entrenched management of firms with low growth opportunities are expected to prefer cash to lines of credit in order to stay independent of capital markets. Although the problem of opportunistic cash hoarding is expected to decrease with growth opportunities. A positive relationship between growth opportunities and use of lines of credit is therefore suggested by the agency cost of managerial discretion theory. Growth firms and R&D intensive firms are further expected to experience more tight covenants since they are less transparent (and associated with greater information symmetries), thus finding lines of credit less equivalent to cash (Demirouglu & James, 2010). Finally, dividend paying firms are less likely to view lines of credit as a cash substitute because covenants typically restrict payouts in breach of covenants, hence in order to avoid cutting dividends in case of impaired economic condition, firms should choose to hold cash (Nini, Smith, & Sufi, 2009; Lins et al., 2010).

Table 2.2 - Predicted Impact on Use of Lines of Credit over Cash with Corresponding Explanation

	Impact on Use of Lines of Credit over Cash	Explanation
Growth Opportunities	+/-	Information Asymmetries / Credit Terms
Firm Size	+/-	Access to Credit / Agency Cost of Managerial Discretion
Cash Generation	+	Credit Terms
Working Capital Intensity	+	Borrowing Base
Investment Intensity		
Leverage	+	Agency Cost of Managerial Discretion
Debt Maturity		
R&D Intensity	-	Information Asymmetries
Probability of Default	-	Credit Terms
Cash Flow Volatility	+/-	Flexibility / Credit Terms
Seasonality	+/-	Flexibility / Credit Terms
Dividend	-	Credit Terms

Summary of predicted impact on use of lines of credit with additional explanation

2.4 Review of Empirical Literature

Kim et al. (1998) develops a trade-off model on the optimal level of liquid assets, suggesting that firms consider the low rate of return on cash against the flexibility cash provides when external financing is expensive. Testing the model on a large panel of US firms over 1975-1994 they find support that corporate liquidity is positively related to cost of external financing. Small firms and firms with larger market-to-book ratios, which are assumed to face larger costs of external financing, therefore hold more cash than other firms. In addition, they find that firms in industries with high average cash flow volatility hold more cash.

Opler et al. (1999) considerably expand previous empirical evidence on what factors affect corporate liquidity. On a sample of publicly traded US firms during 1971-1994, they analyze corporate cash holdings using both the trade-off and the financing hierarchy framework. They find evidence that cash levels are mean reverting, supporting the trade-off theory. However, there is also support for the financing hierarchy theory since changes in cash holdings and fund deficits are related. Further, investigating firm-specific variables' impact on cash levels they find that small firms and firms with high market-to-book ratios hold more cash compared to other firms, in line with the result of Kim et al. (1998). The positive relation between cash and capital expenditure and R&D is also in line with the prediction of the trade-off model. However, the positive coefficients of cash flow generation and negative coefficient of leverage is consistent with the financing hierarchy model. The authors do not find support that agency costs have significant impact on cash holdings and suggest that more work needs to be done regarding this factor.

Dittmar et al. (2003) extend the previous studies by investigating the role of corporate governance as a determinant of firms' cash holdings in greater detail, using an international sample covering 45 countries. They find that cash holdings vary significantly across countries and that the differences are strongly related to the countries' legal structure and shareholder protection rights (other studies highlighting the cross-country difference in cash holding are e.g. Ferreira & Vilela, 2004; Pinkowitz & Williamson, 2001). The result supports the hypothesis that managerial discretion affects cash holdings. Ozkan and Ozkan (2004) also contribute with results indicating a strong relationship between firms' corporate governance policy and the level of cash it chooses to hold, using a UK sample covering the period of 1984-1999. In addition, there is significant evidence that firms on the UK market substitute their non-cash liquid assets for cash and that firms with higher debt ratios hold less cash than others. However, there is no evidence for the more common hypotheses that larger firms hold less cash or that more volatile firms hold more cash. Although not explicitly reported here, several other studies have further investigated the role of corporate governance policies; among these are Couderc (2005), Harford, Mansi, and Maxwell (2008).

Deloof (2001) investigate a sample of Belgian non-financial firms over the period of 1992-1994 concluding that liquidity play an important role in firms' choice of financing, just as predicted by the financing hierarchy model. The results of the firm-specific characteristics are in line with the transaction cost motive for holding cash, but only partially support the precautionary motive. Drobetz and Gruninger (2007) investigate the determinants of cash holdings among Swiss firms between 1995-2004. They find support for both the precautionary motive and the transaction cost motive, e.g. that economies of scale result in small firms holding more cash. However, the negative relationship between leverage and cash reserves and the positive relationship between cash flow generation and cash holdings support the financing hierarchy model. In contrast to previous studies (e.g., Opler et al., 1999; Ozkan & Ozkan, 2004) the authors do not find support that firms with large growth opportunities hold more cash.

Also Ferreira and Vilela (2004), find results partially supporting the trade-off model and partially supporting the financing hierarchy model, studying a sample consisting of EMU countries during 1987-2000. For example, the negative relationship between firm size and cash holdings support the trade-off model, but contradicts the financing hierarchy model. In addition, the positive relationship between cash flow and cash holdings is in line with the financing hierarchy model but contradicts the prediction of the trade-off model. Other studies that should be mentioned among several that investigate firm-specific characteristics as determinants of corporate cash holding are; Alles, Lian, and Yan (2012), Bates et al. (2009), Buinshoofd and Kool (2004), Garcia-Teruel and Martinez-Solano (2008).

Bates et al. (2009) investigate the positive development of corporate cash holdings in US industrial firms over the 1980-2006 period and conclude that the average cash-to-assets ratio has more than doubled over the period (the same applies when looking at median values). The result shows that the average firm can retire all its debt obligations with its cash reserves. The main explanations behind the increase in cash levels are suggested to be the increasing cash flow volatility, the increasing R&D expenditures and the decreasing capital expenditures identified. However, the authors do not find any evidence that agency conflicts can explain the increasing corporate cash levels.

Song and Lee (2012) investigate corporate liquidity management in Asian firms before, during, and after the Asian financial crisis of 1997-1998. They find that changes in cash holdings could not be explained by changes in firm characteristics, as suggested in previous studies, but that firms rather change their total demand for cash after a financial crisis. More specifically, they find that firms increased their cash holdings significantly during and after the crisis and that the median cash ratio almost doubled between 1996 and 2006. Increased sensitivity to cash flow risk is suggested to explain the post-crisis behavior of building up cash levels. The results indicate that a financial crisis has long-term effects on firms' liquidity management and that severe

macroeconomic shocks cause firms to adopt more conservative policies in both investments and cash holdings.

Sufi (2009) is the first to quantitatively examine the determinants of firms' choice between lines of credit and cash in their liquidity management. The study finds that lines of credit are a significant component in firms' liquidity management, on average accounting for 16% of book value of assets. The principal finding is that firms with weaker cash flow or higher cash flow volatility do not make use of lines of credit to the same extent, but rather rely on cash reserves. Sufi points out that cash flow is a strong predictor of firms' use of lines of credit as a component in their liquidity management and that this is even more evident when looking at firms with higher probability of financial distress. Thus, lines of credits are more likely do be viewed as cash substitute among firms with low probability of financial distress, high cash flow generation and low cash flow volatility. Yun (2009) focus on several corporate governance variables when examining what drives firms' choice between cash and lines of credit, concluding that firms under takeover threats prefer lines of credit and that firms with lower quality of corporate governance tend to hold cash rather than lines of credit. Both studies employ samples including US firms only.

Lins et al. (2010) build on these previous studies, in a survey-based research covering 29 countries, and find that firms use lines of credit and cash to hedge for different risks. Cash provides protection against cash flow shocks in bad times, and lines of credit support firms in pursuing investments opportunities in good times. Lins et al. (2010) also find that lines of credit are a significant component in firms' liquidity management, in fact it is the primary source. The median line of credit accounts for 15% of assets, while the median cash holdings amounts to 8-10% of assets. Other studies examining the role of credit lines in corporate liquidity management include Acharya et al. (2012), Flannery and Lockhart (2009), Jimenez, Lopez, and Saurina (2009).

Campello et al. (2011) provide new insights on firms' usage of lines of credit and cash by examining how firms manage their liquidity component during the financial crisis 2008-2009. The results from their survey-based study comprising firms from 31 countries suggest that firms substitute between lines of credit and cash when facing credit shortage, which is inconsistent with the result of Sufi (2009). The value of lines of credit does however decrease with increase in internally generated liquidity. In contrast to the results of Lins et al. (2010), the survey participants state that choices regarding cash and lines of credit are made jointly, which enhances the importance of including lines of credit in the analysis of corporate liquidity.

2.5 Hypotheses Development

2.5.1 Total Liquidity

Under the assumption that lines of credit are an important component of firms' liquidity management and should be added to the measure of cash, the hypotheses of corporate liquid holdings presented below have been developed. The hypotheses are derived from the theoretical predictions of corporate liquidity discussed in sections 2.2 and 2.3, and are thus interchangeably used in this study when examining determinants of cash holdings and total liquidity respectively. Total liquidity is defined as cash and marketable securities plus undrawn available amounts under lines of credit. Although this study investigates differences in liquidity pre- and post-crisis, such differences are difficult to theorize and thus not included in the hypothesis below.

2.5.1.1 Growth Opportunities

Both the transaction cost motive and the precautionary motive suggest that firms with larger growth opportunities hold more cash than firms with lower growth opportunities. Also the financing hierarchy theory predicts that growth firms hold more cash because they are subject to greater information asymmetries, which makes external capital expensive (see e.g. Opler et al., 1999; Ozkan & Ozkan, 2004). However, the theory of agency cost of managerial discretion suggest a negative relationship because entrenched managers in firms with poor growth opportunities hold cash to pursue own objectives. Though this conflict of interest is expected to decrease with increased growth opportunities (see e.g. Drobetz & Gruninger, 2007; Opler et al., 1999).

Hypothesis 1a: Total liquidity is positively related to growth opportunities
Hypothesis 1b: Total liquidity is negatively related to growth opportunities

2.5.1.2 Firm Size

Both the precautionary motive and the transaction cost motive predict smaller firms to hold more cash than larger firms because they face higher costs of external financing and because of economies of scale (see e.g. Opler et al., 1999; Ozkan & Ozkan, 2004). On the other hand, the financing hierarchy model puts forward that larger firms have presumably been able to accumulate cash over time, and should hence hold more liquid asset reserves. In addition, larger firms are expected to have larger shareholder dispersion, which can give rise to managerial discretion in holding more cash to pursue own interests (see e.g. Ferreira & Vilela, 2004; Opler et al., 1999).

Hypothesis 2a: Total liquidity is negatively related to firm size
Hypothesis 2b: Total liquidity is positively related to firm size

2.5.1.3 Cash Generation

A firm with strong internal cash generation should, according to the financing hierarchy model, invest its surplus in liquid asset reserves (see e.g. Ferreira & Vilela, 2004; Opler et al., 1999). A contradicting prediction, according to the transaction cost motive, is that the lower the internal cash generation the higher the probability of cash shortage and the more liquid asset reserves the firm hold. Or put differently, firms with strong cash generation can afford to hold a lower cash buffer (see e.g. Dittmar et al., 2002; Kim et al., 1999).

Hypothesis 3a: Total liquidity is positively related to cash generation
Hypothesis 3b: Total liquidity is negatively related to cash generation

2.5.1.4 Working Capital Intensity / Liquid Asset Substitution

According to the transaction cost motive, the need for liquid asset reserves decreases with the amount of assets that cost-efficiently can be converted into cash (see e.g. Garcia-Teruel & Martinez-Solano, 2008; Opler et al., 1999). Since none of the other theories explicitly address the impact of assets substitution on cash holdings, only one hypothesis is developed.

Hypothesis 4:Total liquidity is negatively related to liquid assets substitution

2.5.1.5 Investment Intensity

The financing hierarchy model suggests that firms with larger investment outlays have less or no surplus from internally generated funds to invest in liquid asset reserves, and hence they hold less liquid assets on their balance sheet (see e.g. Bates et al., 2009; Opler et al., 1999). On the other hand, liquid asset shortage may be more expensive for firms with high investment intensity, which would lead to such firms holding more reserves than others according to the transaction cost motive (see e.g. Dittmar et al., 2003; Opler et al., 1999).

Hypothesis 5a: Total liquidity is negatively related to investment intensity
Hypothesis 5b: Total liquidity is positively related to investment intensity

2.5.1.6 Leverage

The financing hierarchy model suggests a negative relationship between leverage and liquidity holdings, because if internally generated funds are not sufficient firms will use its liquid reserves before issuing debt, but if the firm has internal surplus it will pay down its debt. The theory of agency costs of managerial discretion puts forward that firms with low leverage are less subject to monitoring, and that entrenched

managers in such firms should hold more cash than others. Further, according to the transaction cost motive, highly levered firms face higher costs when investing in liquid assets and should hence hold less relative to others (see e.g. Deloof, 2001; Ferreira & Vilela, 2004; Kim et al., 1998). However, the precautionary view suggests that highly levered firms experience higher agency costs of debt and hence hold more liquid assets than others. Highly levered firms are also more likely to be constrained in raising external funding, again suggesting that they should hold liquid asset reserves for precautionary reasons (see e.g. Guney et al., 2007; Opler et al., 1999).

Hypothesis 6a: Total liquidity is negatively related to leverage
Hypothesis 6b: Total liquidity is positively related to leverage

2.5.1.7 Debt Maturity

Firms with larger portions of short-term debt are assumed to face greater refinancing risk and hence hold more cash for precautionary reasons to compensate for this. It is also expected that firms with higher information asymmetries keep more short-term debt, again suggesting a negative relation between debt maturity and liquid asset holdings, where debt maturity is defined as portion of long-term debt over total debt (see e.g. Garcia-Teruel & Martinez-Solano, 2008).

Hypothesis 7: Total liquidity is negatively related to debt maturity (long-term debt to total debt)

2.5.1.8 R&D Intensity

Given the information asymmetries associated with R&D expenditures, R&D intensive firms are expected to hold more liquid asset reserves for precautionary reasons. In addition, the transaction cost motive suggests that when external financing is expensive firms hold more cash. Given the low asset tangibility of R&D-related assets, it is expected to be costly for firms to finance R&D investments with external capital, hence, R&D intensive firms should hold more cash (see e.g. Bates et al., 2009; Opler et al., 1999). On the other hand, R&D intensive firms are assumed to consume its internal surplus and accumulate less liquid assets, in line with the financing hierarchy model (see e.g. Bates et al., 2009; Opler et al., 1999).

Hypothesis 8a: Total liquidity is positively related to R&D intensity
Hypothesis 8b: Total liquidity is negatively related to R&D intensity

2.5.1.9 Probability of Default

The transaction cost motive predicts a positive relation between liquid asset holdings and the probability of default of a firms, because firms with lower probability of default typically face lower transaction costs. Firms in financial distress might in

addition try to increase their liquid asset reserves as a precautionary reason to reduce the default risk (see e.g. Kim et al., 1998; Ozkan & Ozkan, 2004). On the other hand, a plausible interpretation can be that firms in financial distress are simply less likely to hold liquidity reserves due to their economic condition (see e.g. Kim et al., 1998).

Hypothesis 9a: Total liquidity is positively related to the probability of default
Hypothesis 9b: Total liquidity is negatively related to probability of default

2.5.1.10 Cash Flow Volatility

The precautionary motive expects firms with more volatile cash flows to hold more cash. In addition, as the probability of liquid asset shortage increases with cash flow volatility a positive relationship is predicted by the transaction cost motive as well (see e.g. Bates et al., 2009; Opler et al., 1999).

Hypothesis 10: Total liquidity is positively related to cash flow volatility

2.5.1.11 Seasonality

As with predictions made with regards to cash flow volatility, one could argue in line with the precautionary motive that seasonality, the systematic volatility in cash flows within a year, should be positively related to liquid holdings. To minimize the risk of liquidity shortage during the year, more seasonal firms would thus hold more liquid assets to manage larger deviations in working capital and inventories during the year (see e.g. Sufi, 2009).

Hypothesis 11: Total liquidity is positively related to seasonality

2.5.1.12 Dividends

The transaction cost motive puts forward that cutting dividends is a cost-efficient way of accessing capital and therefore it can be expected that dividend-paying firms hold less liquid asset reserves. The financing hierarchy model also suggests a negative relationship because dividends decrease the available surplus for liquid asset investments (see e.g. Dittmar et al., 2003; Opler et al., 1999).

Hypothesis 12: Total liquidity is negatively related to dividends

2.5.2 The Relationship Between Lines of Credit and Cash

Assuming that the theoretical motives of using lines of credit as opposed to cash (or vice versa) are not perfectly aligned, the following hypotheses have been developed in

order to investigate the determinants of firms' choice between the two sources of corporate liquidity.

2.5.2.1 Growth Opportunities

To the extent that growth firms experience larger information asymmetries, firms with larger growth opportunities are expected to use less lines of credit, following the idea that such firms hold less debt in general (see e.g. Sufi, 2009). On the other hand, it can be argued that firms with more promising growth opportunities are expected to experience more favorable covenants compared to firms with less promising growth opportunities. Such firms are more likely to view lines of credit as a cash equivalent and thus rely less on cash (see e.g. Demiroglu & James, 2010).

Hypothesis A1: Lines of credit are negatively related to growth opportunities
Hypothesis A2: Lines of credit are positively related to growth opportunities

2.5.2.2 Firm Size

Larger firms are expected to both have better access to lines of credit and enjoy more favorable covenants due to the increasing transparency associated with firm size. Such firms are hence expected to benefit more from the advantages with external financing, and also lines of credit, compared to smaller firms (see e.g. Demiroglu & James, 2010; Sufi, 2009). Entrenched management is however expected to prefer cash to lines of credit. To the extent that larger firms have larger shareholder dispersion, which can give rise to managerial discretion, a plausible interpretation is thus that lines of credit is negatively related to firm size (see e.g. Ferreira & Vilela, 2004; Yun, 2009).

Hypothesis B1: Lines of credit are positively related to firm size
Hypothesis B2: Lines of credit are negatively related to firm size

2.5.2.3 Cash Generation

Firms with strong internal cash generation are less limited by the financial covenants associated with lines of credit and more likely benefit from the advantages it provides. Hence, firms with stronger internal cash generation rely on lines to a greater extent compared to firms with weaker internal cash generation (see e.g. Sufi, 2009).

Hypothesis C: Lines of credit are positively related to cash generation

2.5.2.4 Working Capital Intensity / Borrowing Base

The borrowing base ties the available credit to the value of a specific collateral, often accounts receivable or inventory. Hence, firms with a greater amount of working

capital are expected to have access to greater amounts of lines of credit (see e.g. Demiroglu & James, 2011; Flannery & Wang, 2011).

Hypothesis D: Lines of credit are positively related to borrowing base

2.5.2.5 Investment Intensity

Theoretically there is no indication on how the level of capital expenditures affects the relationship between cash and lines of credit. The difficulty lies in predicting the role of cash and lines of credit within firms' liquidity management with regards to operational and ongoing funding versus expansionary funding, thus no hypothesis has been developed.

No hypothesis with regards to lines of credit's relatedness to investment intensity

2.5.2.6 Leverage

To the extent that low leverage, and thus lower capital market monitoring, increases the possibility of opportunistic management, it is expected that low-levered firms prefer less monitoring and will rely on cash as opposed to lines of credit (see previous discussion on agency costs of managerial discretion, and e.g. Yun, 2009).

Hypothesis E: Lines of credit are positively related to leverage

2.5.2.7 Debt Maturity

The impact of debt maturity on the use of lines of credit as opposed to cash has, to the best of knowledge, not been covered in previous theories or literature. This results in no hypothesis having been developed with regards to expected outcome.

No hypothesis with regards to lines of credit's relatedness to debt maturity

2.5.2.8 R&D Intensity

As with debt maturity, there are no clear theoretical indications as to how R&D intensity affects the use of lines of credit as opposed to cash. However, following the discussion above on the effect of R&D intensity on total liquidity, information asymmetries associated with R&D expenditures are expected to make external financing more expensive, and thus would R&D intensive firms hold proportionally more cash than lines of credit.

Hypothesis F: Lines of credit are negatively related to R&D intensity

2.5.2.9 Probability of Default

Firms with poor credit quality are expected to be more limited in their access to lines of credit, and if accessing lines of credit more likely to face tighter covenants. It is therefore expected that lines of credit are negatively related to the probability of default, since firms closer to distress will prefer cash (see e.g. Demiroglu et al., 2009; Demiroglu and James, 2010).

Hypothesis G: Lines of credit are negatively related to the probability of default

2.5.2.10 Cash Flow Volatility

Firms with larger variability in cash flows, thus riskier, should find lines of credit less valuable compared to firms with more stable cash flows. More volatile firms, are hence expected to hold less lines of credit, in order to avoid less favorable covenants that commonly are cash flow based (see e.g. Sufi, 2009). On the other hand, firms with relatively more volatile cash flows are expected to find lines of credit a useful source of financing to secure future investment opportunities in times when internally generated funds are insufficient (see e.g. Sufi (2009).

Hypothesis H1: Lines of credit are negatively related to cash flow volatility
Hypothesis H2: Lines of credit are positively related to cash flow volatility

2.5.2.11 Seasonality

Similar to firms with volatile cash flows can seasonal firms be expected to hold less lines of credit due to potentially less favorable credit terms compared to less seasonal firms. On the other hand, firms with larger intra-year fluctuations in sales or cash flows can be expected to value the flexibility of lines of credit and make greater use of lines of credit to temporarily manage fluctuations in for example working capital and inventories (see e.g. Sufi, 2009).

Hypothesis I1: Lines of credit are negatively related to seasonality
Hypothesis I2: Lines of credit are positively related to seasonality

2.5.2.12 Dividends

Dividend-paying firms are less likely to view lines of credit as a cash substitute because loan agreements typically restrict dividend payments in breach of covenants. Such firms are more likely to choose cash over lines of credit in their liquidity management (see e.g. Lins et al, 2010; Nini et al., 2009; Sufi, 2009).

Hypothesis J: Lines of credit are negatively related to dividends

Table 2.3 – Summary of Hypothesized Impact of Independent Variables on Dependent Variable

	Total Liquidity		Lines of Credit	
	Expected sign	**Hypothesis**	**Expected sign**	**Hypothesis**
Growth Opportunities	+	1a	-	A1
	-	1b	+	A2
Firm Size	-	2a	+	B1
	+	2b	-	B2
Cash Generation	+	3a	+	C
	-	3b		
Working Capital Intensity	-	4	+	D
Investment Intensity	-	5a		
	+	5b		
Leverage	-	6a	+	E
	+	6b		
Debt Maturity	-	7		
R&D Intensity	+	8a	-	F
	-	8b		
Probability of Default	+	9a	-	G
	-	9b		
Cash Flow Volatility	+	10	-	H1
			+	H2
Seasonality	+	11	-	I1
			+	I2
Dividend	-	12	-	J

Summary of hypothesized relationship between dependent independent variables

3 Methodology

3.1 Methodological Approach

To empirically investigate the determinants of corporate liquidity in Swedish firms this study employs a deductive approach using existing theories to form the basis for the research methodology (Saunders, Lewis, & Thornhill, 2009). In order to examine how Swedish listed firms manage their liquidity three sets of regressions are carried out. (1) The first set of regressions aims at investigating cash holdings (cash and marketable securities) during the entire period 2007-2011, in order to enable a comparison with previous studies covering other markets. (2) The second set of regressions will then look at total liquidity, adding total undrawn lines of credit to the measure of cash holdings. Adding lines of credit is critical in order to fully understand the field of corporate liquidity management, as discussed previously. For the second set of regressions, a sub sample of two years out of the total time period is chosen, 2007 and 2011 respectively. The two-year approach is motivated in several ways. Firstly, 2007 and 2011 enables a comparison of total liquidity pre- and post-crisis, i.e. present[4]. Secondly, since information on lines of credit needs to be collected manually, collecting data for the entire period is outside the time scope of this paper. The second set of regressions will then also look into the relationship between cash and lines of credit. (3) As a final step, the third set of regressions applies an alternative definition of liquidity on the 2007 and 2011 sub sample, a measure commonly used by practitioners within the field of liquidity management. The definition is based on that used S&P in their liquidity assessment of firms, and incorporates present and future projected liquidity sources and uses.

3.2 Data

This study will analyze all Swedish primarily listed firms on the Nasdaq OMX Stockholm Small-, Mid- and Large Cap lists during 2007-2011. Any information regarding changes to the lists, such as new listings or de-listings are collected manually from the Nasdaq OMX Stockholm homepage (NASDAQ OMX Group, Inc., u.d.). By also including the firms that have been listed and/or delisted during the period, the effect of survivorship bias in the sample is minimized. Any changes between the Small-, Mid- and Large Cap are not accounted for.

3.2.1 Data Collection

The data is collected from the annual reports using the Bloomberg Database, including any information required for data sampling. As mentioned previously, data

[4] Although one could argue that 2012 would have been favorable to use, complete data of the corporate accounts has not been made available for a majority of the sample at the time of this study.

regarding lines of credit is collected manually. The published annual reports for 2007 and 2009 are primarily downloaded from each company's homepage, and if reports are not readily available the reports are instead downloaded from the Bolagverket (Swedish Companies Registration Office) records.

When collecting information regarding the lines of credit, the following search criteria are used: (1) Line(s) of credit, (2) credit line(s), (3) facility/facilities, (4) overdraft, (5) credit agreement, (6) liquidity, (7) liquidity risk, (8) financing risk (9) (un)utilized, (10) (un)used. These search criteria will thus also capture revolving credit facilities, working capital facilities, bank facilities, standby letters of credit, back up facilities etc. In case of only Swedish reports being available the following criteria are used: (1) checkkredit, (2) checkräkningskredit, (3) facilitet(er), (4) kreditram, (5) kreditlöfte(n), (6) likviditet, (7) likviditetsrisk, (8) finansieringsrisk, (9) (o)utnyttjad, (10) tillgänglig. The lack of standardized information presented in the annual reports with regards to the commitment of the lines of credit, makes it difficult to draw valid conclusions of whether the lines of credit are committed or uncommitted. The search criteria are thus set up to capture total undrawn amounts under all credit lines, i.e. no difference is made with regards to the nature of the credits, in line with Sufi (2009). For a discussion as to how including all lines of credit affects this study, please see in 3.5.

3.2.2 Data Sampling

In order for a firm to be included in the sample, the company has to have been primarily listed for the entire year. The year in which a company is listed or delisted is thus excluded if one or both has occurred during 2007-2011. This criterion is added to avoid including incomplete and distorted data from the annual accounts, which would yield misleading results.

In addition to the requirement of primary listing on the Nasdaq OMX Stockholm Small-, Mid- and Large Cap lists during 2007-2011, only firm observations fulfilling the following criteria are included:

i. Classified as ICB (Industry Classification Benchmark) code 1-7000 or 9000, i.e. financials (ICB Industry Code 8000) are excluded. Banks and financials are excluded since cash and marketable securities are part of such firm's business, but also due to effects of regulatory capital requirements on capital structure (Opler et al., 1999)
ii. Report in SEK
iii. Domicile Sweden
iv. Report in line with the IAS/IFRS accounting standard
v. Complete data available for all variables

It is generally important to minimizing the effect of outliers, especially in studies such as this one where an Ordinary Least Squares (OLS) estimator is used. Since the OLS estimator minimizes the sum of the squared residuals, equally weighting each observation, it can be very vulnerable to extreme values. Large residuals, positive or negative, are thus given a substantial weight (Wooldridge, 2006). However, there are no clear indications of extensive outlier effects within the sample, when studying the distribution statistically or graphically. The data set has thus not been winsorized, in order to conserve as many observations as possible, which is of particular importance in the subsample used in the second and third set of regressions. Please see 4.1.1.1 and 4.1.2.1 for statistics and distribution of the included variables. The use of OLS in this study is further explained in section 3.4.

3.2.3 Descriptive Statistics of Final Sample

Total number of primarily listed firms on the Nasdaq OMX Stockholm during 2007-2011 amounted to 317, of which 26 were listed during the period, 44 were delisted during the period, and 247 were listed throughout the entire period. Out of the initial 317 firms, 16 were removed due to not being listed for an entire fiscal year 2007-2011. The sample was further reduced by 56 financial firms (ICB 8000), 21 firms that did not have Sweden as domicile or reported in another currency than SEK, and 6 firms that did not report in line with IAS/IFRS. Out of the remaining 218 firms were 55 firms removed due to incomplete data for one or more variables. The final sample (included in the first set of regressions) comprised 163 firms and 567 firm year observations throughout the period 2007-2011. Descriptive data of the total sample, including industry classification and dividend frequency, is presented in table 3.1 below.

Table 3.1 - Descriptive Statistics of Total Sample

Total sample	2007	2008	2009	2010	2011	TOTAL
ICB 1000 - Basic Materials	5	7	6	5	5	28
ICB 2000 - Industrials	47	46	52	60	63	268
ICB 3000 - Consumer Goods	13	15	16	12	12	68
ICB 4000 - Health Care	13	12	14	14	14	67
ICB 5000 - Consumer Services	16	14	11	10	9	60
ICB 6000 - Telecommunications	2	1	1	1	1	6
ICB 7000 - Utilities	0	0	0	0	0	0
ICB 9000 - Technology	26	22	22	15	13	98
Number of dividend-paying observations	82	72	69	77	75	375
Number of observations	122	117	122	107	99	567
Total number of cross-sections in sample	122	117	122	107	99	163

Number of firm observations in the total sample 2007-2009 and in total by industry classification and dividend-payment.

For the second and third set of regressions the total sample was sorted into a subsample of the 2007 and 2011 firm observations. The subsample was reduced from

the initial 221 firm observations, to 197, due to data unavailability mainly associated with lines of credit. The final subsample comprised 133 firms and 197 firm observations. Descriptive data of the subsample, including industry classification and dividend frequency, is presented in table 3.2 below. For a list of the specific companies included in the total sample as well as the subsample, please see Appendix A.

Table 3.2 - Descriptive statistics of subsample

Subsample	2007	2011	Total
ICB 1000 - Basic Materials	4	5	9
ICB 2000 - Industrials	40	42	82
ICB 3000 - Consumer Goods	12	9	21
ICB 4000 - Health Care	10	14	24
ICB 5000 - Consumer Services	16	9	25
ICB 6000 - Telecommunications	2	1	3
ICB 7000 - Utilities	0	0	0
ICB 9000 - Technology	21	12	33
Number of dividend-paying observations	71	70	141
Number of observations	105	92	197
Number of cross-sections in subsample	105	92	133

Number of firm observations in the subsample 2007, 2009 and in total by industry classification and dividend-payment.

3.3 Variables

3.3.1 Dependent Variables in the Three Regressions Sets

In order to be able to both conduct a comparison with previous studies, as well as shed more light on the field of liquidity management, liquidity will be defined in three different ways.

The First Set of Regressions (2007-2011 sample)
In order to enable a comparison with previous studies on cash holdings, cash (CASH) is defined as cash and marketable securities, to book value of total assets less cash and marketable securities (hereon after referred to as net assets). The measure is in line with the definition used by e.g. Opler et al. (1999), Drobetz and Gruninger (2007), Ferreira and Vilela (2004). This study chooses to remove cash and marketable securities from total assets in order to isolate the portion of cash to non-cash assets.

$$CASH = \frac{Cash\ \&\ Marketable\ Securities}{Net\ Assets} \quad (1)$$

The Second Set of Regressions (2007 and 2011 subsample)
As a development of previous measurements, the definition of total liquidity (LIQUIDITY) adds total undrawn lines of credit to cash and marketable securities that are traditionally excluded, despite being proven to represents a substantial portion of corporate liquidity, as previously mentioned.

$$LIQUIDITY = \frac{Cash\ \&\ Marketable\ Securities + Lines\ of\ Credit}{Net\ Assets} \quad (2)$$

The second set of regressions will further investigate the relationship between cash (CASH) and lines of credit (LOC), as well as the determinants of firms' use of lines of credit as opposed to cash (and vice versa). This is done by first regressing cash holdings as a dependent variable, in line with the definition in the first set of regressions, also including lines of credit to net assets as one of the independent variables (referred to as regression 2.2). Secondly, to find determinants behind the use of lines of credit in comparison to cash, lines of credit (LOC) to the sum of cash and lines of credit (CASH + LOC) is regressed as the dependent variable together with the independent variables discussed below (referred to as regression 2.3).

The Third Set of Regressions (2007 and 2011 subsample)
This last definition is strongly influenced by the measure used by Standard & Poor's, and is a forward looking cash flow measure of liquidity (LIQUIDITY RATIO). One modification is made with regards to the measurement of lines of credit, where the total undrawn amount rather than undrawn *committed* amount only is included. The reason behind this slight adjustment is the lack of information presented in the annual reports with regards to the commitment of the lines of credit, as discussed in 3.2.1. This third measure is included in order to investigate whether the definition commonly used by practitioners, yields a stronger explanatory power as to the determinants of corporate liquidity. The definition is measured as a ratio of firms' liquidity sources to liquidity uses, incorporating both present and future (short-term) projected liquidity, as shown below:

$$LIQUIDITY\ RATIO = \left(\frac{Cash\ \&\ Marketable\ Securities_t + Op\ CF_{t+1}(if\ positive) + NWC_{t+1}\ (if\ positive) + Undrawn\ LoC_t}{CapEx_{t+1} + Op\ CF_{t+1}(if\ negative) + NWC_{t+1}\ (if\ negative) + S-t\ Debt_t + Div_{t+1}} \right) \quad (3)$$

3.3.2 Independent Variables

Based on the hypotheses development in section 2.5, a set of independent variables are included to investigate determinants of liquidity management of Swedish firms 2007-2011. All variables are calculated using annual data unless otherwise stated. Nominal values are used for all measures of dependent and independent variables. For detailed calculations of the variables including the Bloomberg functions (mnemonics) used, please see Appendix B.

Growth opportunities are include to capture the theoretical aspect that growth firms face greater information asymmetries and greater costs of liquidity shortfalls, which is expected to affect amount of total liquidity. As a proxy for *growth opportunities* (M/B) this study uses the market-to-book ratio, calculated as book value of total assets less book value of equity plus market value of equity less cash, divided by net assets. This definition is equal to the definition used by Sufi (2009), who, as opposed to Bates et al. (1995) and Dittmar et al. (2003), Opler et al. (1999), removes cash from the nominator as well as denominator. As with the definition of the dependent variable, which is scaled by net asset (see 3.3.1), it is important to also clear assets from cash in the independent variables in order to isolate from effects of cash holdings. In addition, expressing the independent variables similarly is preferred in order to enhance comparison of the results.

Firm size (SIZE) is included as a proxy for access to capital markets, cost of external financing, and shareholder dispersion. The variable is calculated as the natural logarithm of the book value of total assets. Although not reported, the natural logarithm of net assets was also calculated. This alternative measure did not affect the results in any material way and was thus excluded. Measuring size as the natural logarithm of the book value of assets is in line with Drobetz and Gruninger (2007) and Garcia-Teruel and Marinez-Solano (2008).

Cash generation (OP CF) is included to proxy for firms' ability to accumulate cash, as well as the probability of cash shortage. The variable is measured differently when comparing across previous studies. For example, Opler et al. (1999) uses earnings after interest, dividends, and taxes but before depreciation to net assets, Dittmar et al. (2003) defines it as EBITDA less interest payments, taxes and dividends to net assets, Ozkan & Ozkan (2004) calculates pre-tax profits plus depreciation divided by total assets, while Drobetz & Gruninger (2007) uses operating cash flow to total assets. When collecting data for this study, two measures were initially calculated. Firstly cash flow was proxied using an earnings-based measure similar to that used by Ozkan & Ozkan (2004), and secondly cash flow was calculated as operating cash flow to net assets. Since the first proxy had significantly worse data availability and since it is an accounting based proxy for true cash flow generation, the second cash flow measure is chosen.

In order to account for differences in *liquid assets substitution* (referred to as *borrowing base* in regression 2.3) (NWC) among firms, net working capital to net assets is included in the regression. Net working capital is calculated as current assets minus current liabilities less cash to net assets. This definition does not vary much looking at previous research, however is often measured as a ratio of total assets rather than net assets (see e.g., Bates et al., 2009; Ferreira & Vilela, 2004; Opler et al., 1999). Again, this study chooses to look at net assets to isolate the measure from effects of cash holdings as previously discussed.

An investment intense firm consumes more cash and would, ceteris paribus, accumulate less cash. However, the cost of cash shortage is greater for investment intensive firms, which implies a greater need for cash reserves. In order to capture and investigate the effect of *investment intensity* (CAPEX) on liquid holdings, capital expenditures as a ratio of net assets is calculated. This definition is in line with Bates et al. (2009) and Opler et al. (1999), although scaled by net assets instead of total assets.

Leverage (LEV) is measured as total debt over total asset, and equals the definition used by Drobetz and Gruninger (2007), Dittmar et al. (2003), Opler et al. (1999) and Ozkan and Ozkan (2004), to mention a few. The variable is included not only to investigate what impact the amount of debt has on firms liquidity reserves, but also to proxy for the level of capital market monitoring the firm is subject to and potential problems with agency cost of debt, all which are expected to affect the amount of liquidity firms hold. As with firm size, an alternative measure of leverage was calculated using net assets as a denominator. The alternative measure of leverage did not affect the conclusions in any substantial way, and is thus not reported.

For R&D intensity, previous studies e.g., Drobetz and Gruninger (2007) and Opler et al. (1999), have used R&D expenses over sales. Bates et al. (2009) use R&D to sales as well as R&D to assets but find no differences between the two variables. In these previous studies R&D is assumed to be zero if no information is given. This is a risky assumption since R&D is not reported unanimously across companies, but could be expensed together with other items in the income statement. This study chooses to capture firms' use of R&D by instead looking at the amount of intangible assets a firm holds on its balance sheet. *R&D intensity* (R&D) is calculated as book value of total assets less tangible assets less goodwill to net assets. This definition improves the measurement by avoiding faulty assumptions regarding the presence of R&D within Swedish firms, at the same time capturing the intensity in which firms invest (organically since goodwill is excluded) in their intangible assets. The R&D intensity variable is related to several of the factors that are expected to affect the liquidity holdings of firms, such as information asymmetries and asset tangibility.

Following Drobetz and Gruninger (2007), Kim et al. (1998) and Sufi (2009), this study aims to employ a measure for probability of default. Previous studies are somewhat inconsistent in the definition of such measurement. Drobetz and Gruninger (2007) and Kim et al. (1998) use the inverse of Altman's (1968) Z-score, but exclude the working capital component to avoid circularity with the dependent variable cash. Sufi (2009) also uses an adjusted version of Altman's Z-score but excludes the leverage component and includes the working capital component, again to avoid circularity with the dependent variable. Other studies, e.g., Bates et al. (2009) and Opler et al. (1999), choose to instead proxy for the cost of financial distress using other variables and suggests that firms with, for example high market-to-book value,

high R&D expenditures and high capital expenditures experience higher costs of financial distress.

This study recognizes that the Z-score may not efficiently explain the potential relationship between the financial health of a firm and its liquidity management, because of the highlighted problems with circularity. However, the natural logarithm of Altman's Z-score is included to proxy for *probability of default* (ZSCORE), in an attempt to capture the desired information regarding firms' financial health. Using the natural logarithm of the Altman's Z-score is needed in order to compress the relatively large standard deviation of the variable. The effect on Altman's Z-score on the results is further discussed in 4.2.1.

$$ZSCORE = \ln\left(1.2 \times \frac{Working\ Capital}{Total\ Assets} + 1.4 \times \frac{Retained\ Earnings}{Total\ Assets} + 3.3 \times \frac{EBIT}{Total\ Assets} + 0.6 \times \frac{MV\ Equity}{Total\ Assets} + 1.0 \times \frac{Sales}{Total\ Assets}\right) \quad (4)$$

Debt maturity (LT DEBT) is measured as the portion of long-term debt to total debt, and is in line with the definition used by Ferreira & Vilela (2004) and García-Teruel & Martínez-Solano (2008). The variable captures the debt structure of a firm, and can proxy for refinancing risk as well as level of information asymmetry, all which may have an impact on the level of liquidity.

Cash flow volatility (CF VOL) is defined as the standard deviation of operating cash flow to net assets for the previous ten years, requiring a minimum of three consecutive observations. The variable aims to capture the probability of cash shortage, which affects the need for liquid assets reserves. The definition is similar to that used by Bates et al. (2009) and Opler et al. (1999), with the modification of using net assets as opposed to total assets. Also Bates et al. (2009) and Opler et al. (1999) average the cash flow standard deviation each year across industries. Since the sample in this study does not yield a substantial number of firms in each industry category (see table 3.1 and 3.2), volatility is not calculated across specific industries but rather across each firm individually.

As an additional input to the field of liquidity management, this study includes a measure of *seasonality* (SEASON). Seasonality is calculated as the yearly standard deviation in operating cash flow to net assets using quarterly data. This measure attempts to account for quarterly fluctuations in cash flow during a given year, that is not truly captured looking at the instantaneous end of year accounts. Firms with larger quarterly fluctuations are expected to hold more security in form of cash (and lines of credit) in order to handle the risk of liquidity shortage during the lower quarters. Although Sufi (2009) tries to capture the effect of seasonality by including the standard deviation in sales for firms within a given industry, this measure does not incorporate seasonality effects apprehended to actual cash flows. A firm may experience seasonality effects in cash inflows, such as sales, but may also be exposed

to seasonal (operating) cash outflows. Using operating cash flow rather than sales captures both of these effects, and removes the risk of accounting based measures that do not correspond to actual cash generation, as with the cash flow volatility measure. Seasonality is not calculated per industry classification for the same reason as presented in previous measure of cash flow volatility.

Lastly, *lines of credit* (LOC) are included in the second set of regressions as an independent variable, calculated as the total undrawn amounts under all reported lines of credit to net asset. Since lines of credit are a form of pre-negotiated liquidity and have been proven to constitute a substantial part of firms' liquidity management and corporate funding (see e.g, Jiménez et al., 2009; Lins et al., 2010; Sufi, 2009), lines of credit are expected to have a negative relationship to the level of cash holdings, although the degree of substitutionality may differ among firms of different characteristics.

3.3.3 Dummy Variables

This study will also look at the effect of industry classification and dividend payment using a set of dummy variables. The *dividend dummy* (DIV) will equal 1 if dividends have been paid out and 0 if no dividends have been paid out during the year. The different industries will be captured using six dummy variables set to cover the ICB Industries (Industry Classification Benchmark) on a one-digit level. Since none of the firms in the sample were classified as ICB 7000, and since ICB 8000 is excluded according to the sampling criteria in 3.2.2, only 7 categories remain. The one-digit ICB code level is chosen to gain sufficient number of firms within each industry classification (for information regarding the industry classification of the firms in the sample, please see table 3.1 and 3.2).

3.4 Regression Techniques

A multiple regression model investigates the relationship between the dependent variable and a set of independent variable and whether the behavior in the dependent variable can be explained by the behavior of the independent variables (Brooks, 2008). Using the Ordinary Least Square (OLS) estimation model, this study aims to empirically investigate the relationship between the variables presented above. Whether the coefficients generated using the OLS estimation model describe the true relationship or not depends on the assumptions made regarding the distribution of the error term and its relation to the variables (Verbeek, 2012). In order to determine whether the OLS coefficient estimates in this study are valid, all regressions are controlled for the six assumptions of the multiple linear regression model. The results of these diagnostic tests are discussed in 4.2.1. The six assumptions are as follows:

i. The regression model is linear in the parameters and correctly specified

ii. The error term and the independent variables are uncorrelated, i.e. the independent variables are non-stochastic
iii. The error term has a zero mean value
iv. The error term has a constant variance, i.e. the error terms are homoscedastic
v. The error terms are uncorrelated with one another, i.e. no autocorrelation exists between the error terms
vi. No exact linear relationships between the independent variables exist, i.e. no exact collinearity exists. (Gujarati & Porter, 2010)

3.4.1 The First Set of Regressions – Multiple Regression on Panel Data

Since the first set of regressions differs in that it incorporates the entire time period, the methodological approach will differ somewhat in this set compared to the other two sets due to the impact of panel data. Panel data arises when the data set includes cross-sectional observations as well as times-series observations (Brooks, 2008). The sample on which the first set of regressions is carried out includes 163 firms over a five-year period 2007-2011, totaling 567 observations of dependent and independent variables. There are several advantages when using panel data, much due to its rich information set over both time and space. Compared to simple time-series or cross sectional data, panel data enables addressing a wider range of problems increasing the ability to estimate more complex and realistic models (Verbeek, 2012). Further panel data yields several advantages by reducing the need for a longer period of data, at the same time as a sufficient number of observations are attained (Brooks, 2008). When looking at the relatively short time period 2007-2011, combining cross-sectional and time series data is therefore favorable, due to an increase in degrees of freedom and therefore power of the tests to be conducted.

The standard linear regression model for panel data can be written as:

$$y_{i,t} = \alpha + \beta x_{i,t} + \varepsilon_{i,t} \qquad (5)$$

where i is the index for the cross-sectional units and t is the index for the time periods (Brooks, 2008).

Panel data can either be balanced or unbalanced. Balanced panel data consist of an equal number of times-series observations for all cross-sectional units, whereas unbalanced data may have different amount of observations for each cross-sectional unit (Brooks, 2008). The sample used in this study is unbalance, as it is not required that all cross-sectional units have observations for the full period, only to have full information for all variables for each observation. Since the econometric software[5] automatically handles the unbalanced nature of our sample, no implications on the result are expected.

[5] The econometric software used in this study is Eviews 7.

Following assumption (ii) and (v), the multiple linear regression model assumes that there is no correlation between the error terms and the independent variables, and no correlation between the error terms from different periods. However, these assumptions may not be realistic in a panel data set, which may result in the routinely computed standard errors for OLS being misleading (Verbeek, 2012). Firstly, given that the same cross-sectional unit is observed repeatedly over time there may exist correlation between its error terms (Verbeek, 2012). Secondly, one might suspect that there in fact is dependence between the independent variables chosen in the sample, i.e. they are not exogenous, as one firm-specific characteristic may depend on another. To address such problems, error component models should be incorporated as they typically lead to more efficient coefficient estimates than the standard OLS (Verbeek, 2012).

Two models of interest are the random effects model and the fixed effects model. Using a Hausman test one can control whether random effects are necessary for the specific panel data set. The random effects model decomposes the error term and adds one component to the individual observation's error term that captures the random deviation of each cross-sectional unit from a common intercept, which is constant in both data dimensions. Similarly, using a fixed effects redundant likelihood ratio test one can control whether fixed effects are necessary for the specific data set. The fixed effects model decompose the error term into one component that captures all the observations that affect the dependent variable cross-sectionally but are constant over time, and one component that captures what is left unexplained about the dependent variable, i.e. cross-sectional fixed effects (Brooks, 2008). If the average value of the dependent variable varies over time, but not over cross-sections the model adds an intercept, which is allowed to vary over time but stays constant over cross-sections. This in order to capture the effects that impact the dependent variable over time (but are constant over cross-sections), i.e. time-series fixed effects (ibid.).

The first set of regressions is constructed as follows:

$$[Reg\,1.1]\ CASH_{i,t} = \alpha + \beta_1 M/B_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 OP\,CF_{i,t} + \beta_4 NWC_{i,t} + \beta_5 CAPEX_{i,t} + \beta_6 LEV_{i,t} + \beta_7 LT\,DEBT_{i,t} + \beta_8 R\&D_{i,t} + \beta_9 CF\,VOL_{i,t} + \beta_{10} SEASON_{i,t} + \beta_{11} DIV_{i,t} + \varepsilon_{i,t} \quad (6)$$

3.4.2 The Second and Third Set of Regressions – Multiple Regression Using Cross-Sectional Data

The second and third set of regression are carried out on a subsample and incorporates data on lines of credit. As mentioned, the subsample consists of 105 cross-sectional units for 2007 and 92 for 2011, totaling 197 observations. Although consisting of observation from two different time periods, the second and the third set of

regressions will apply the standard OLS on a cross-sectional data set. In order to analyze the potential difference between the two years 2007 and 2011, representing pre- and post-crisis, intercept and slope dummy variables are used (although not expressed in the regressions definitions shown below).

The second set of regressions is constructed as follows:

$$[Reg\ 2.1]\ LIQUIDITY_i = \alpha + \beta_1 M/B_i + \beta_2 SIZE_i + \beta_3 OP\ CF_i + \beta_4 NWC_i + \beta_5 CAPEX_i + \beta_6 LEV_i + \beta_7 LT\ DEBT_i + \beta_8 R\&D_i + \beta_9 CF\ VOL_i + \beta_{10} SEASON_i + \beta_{11} DIV_i + \varepsilon_i \quad (7)$$

$$[Reg\ 2.2]\ CASH_i = \alpha + \beta_1 LOC_i + \beta_2 M/B_i + \beta_3 SIZE + \beta_4 OP\ CF_i + \beta_5 NWC_i + \beta_6 CAPEX_i + \beta_7 LEV_i + \beta_8 LT\ DEBT_i + \beta_9 R\&D_i + \beta_{10} CF\ VOL_i + \beta_{11} SEASON_i + \beta_{12} DIV_i + \varepsilon_i \quad (8)$$

$$[Reg\ 2.3]\ \frac{CASH_i}{CASH_i + LOC_i} = \alpha + \beta_1 M/B_i + \beta_2 SIZE_i + \beta_3 OP\ CF_i + \beta_4 NWC_i + \beta_5 CAPEX_i + \beta_6 LEV_i + \beta_7 LT\ DEBT_i + \beta_8 R\&D_i + \beta_9 CF\ VOL_i + \beta_{10} SEASON_i + \beta_{11} DIV_i + \varepsilon_i \quad (9)$$

The third set of regression is constructed as follows:

$$[Reg\ 3.1]\ LIQUIDITY\ RATIO_i = \alpha + \beta_1 M/B_i + \beta_2 SIZE_i + \beta_3 OP\ CF_i + \beta_4 NWC_i + \beta_5 CAPEX_i + \beta_6 LEV_i + \beta_7 LT\ DEBT_i + \beta_8 R\&D_i + \beta_9 CF\ VOL_i + \beta_{10} SEASON_i + \beta_{11} DIV_i + \varepsilon_i \quad (10)$$

3.5 Methodological Criticism and Measurement Issues

Although the methodological approach has been constructed and carried out to minimize incorrectly inferred results, it is important to revise the method by addressing several aspects that may have negative influenced its quality. Since data collection involves both secondary data from the Bloomberg database as well as primary data on lines of credit, there may exist inconsistencies between the two data types, especially with regards to standardization. Bloomberg consistently defines each data component in a standard format, in order to enhance comparability across firms and time periods. When collecting data on lines of credit manually, it is difficult to ensure such consistency and completely eliminate mistakes, although mistakes have been minimized through the use of the previously listed search criteria.

It is not entirely unproblematic to collect data on lines of credit when no formal requirements on disclosure of such information exist. However, IAS 17, which is the accounting standard that regulates the historical changes in cash and cash equivalents

as well as the definition of cash and cash equivalents, encourages firms to disclose additional information that "may be relevant to users in understanding the financial position and liquidity of an entity. Disclosure of this information [...] may include: (a) the amount of undrawn borrowing facilities that may be available for future operating activities and to settle capital commitments, indicating any restrictions on the use of these facilities" (IAS 17, §50-50a). The stated recommendation reduces the addressed problem and increases the availability of information regarding lines of credit, although not eliminating it. It should therefore be highlighted that the subsample, might suffer from selection bias in that only those reporting information on the use of lines of credit are included. Whether such (potential) bias is size dependent, linked to financial health or determined by any other firm characteristic is difficult to further examine. In addition, it would have been interesting to incorporate whether the lines of credit are committed or uncommitted. This would have enabled a further discussion regarding the contingency in the lines of credit as discussed in 2.3.6, as well as to what extent lines of credit constitutes true cash equivalents. However due to the lack of information in the annual reports this is unfortunately not possible, whereby the total undrawn amount under the lines of credit are included in this study.

Further, according to IAS 17 (§8), bank overdrafts that are repayable on demand are in some countries incorporated in firm's cash management and may be included as a component of cash and cash equivalents. This increases the risk of potentially double counting overdrafts that are already included in cash and cash equivalents on the balance sheet, thus inflating the measure of total liquidity. However, since IAS 17 also requires firms to disclose information of the components included in cash and cash equivalents (IAS, §45), potential problems of double counting have been minimized by also checking the definition and the associated note of cash and cash equivalents in each annual report, adjusting the measure accordingly when necessary. An alternative solution would have been to exclude bank overdrafts from the measure of total liquidity. However this would neither have yielded a complete measurement of total liquidity, nor enabled an analysis of the effect of seasonality on liquid holdings, since overdrafts typically have a maturity of less than a year and are used to manage short-term fluctuations in cash flows (Holmes, Sugden & Gee, 2005).

Lastly, it is worth commenting on the assumption made that cash, total liquidity and the liquidity ratio, is a linear function of the included independent variables. Although most previous studies have investigated and found support for a linear relationship (e.g. Bates. et al., 2009; Campello et al., 2011; Deloof, 2001; Opler et al., 1999; Sufi, 2009), it is not possible to rule out non-linearity. For example, Drobetz and Gruninger (2007) find a non-linear relationship between leverage and liquidity, and between managerial ownership and cash holdings. Guney et al. (2006) also find that there exists a significant non-linear relationship between cash and leverage. It would have been interesting to further investigate the non-linearity in the relationship between the measures of liquidity and the independent variables used in this study, however it is unfortunately outside the time scope of this thesis.

4 Empirical Results and Analysis

4.1 Descriptive Statistics

Before presenting and analyzing the results from the three sets of regressions respectively, descriptive statistics of the total sample as well as the subsample are presented and analyzed. It is important to first analyze the descriptive statistics of the respective samples, in order to enable a more complete discussion and conclusion of liquid holdings within Swedish listed firms 2007-2011.

4.1.1 Total Sample – Cash Holdings 2007-2011

4.1.1.1 Description of Variables

Table 4.1 presents the statistics of the variables of the total sample 2007-2011. The median Swedish firm holds 6.8% of its net assets in cash. The result can be compared with those of previous studies, e.g. Opler et al. (1999) find that the median cash to net assets ratio for US firms is 6.5%, and Dittmar et al. (2003) find that the overall median cash to net assets ratio is 6.6% on their sample covering 45 countries. Drobetz and Gruninger (2007) find that Swiss firms hold approximate twice as much, 12,9% of net assets, while Ferreira and Vilela (2004) find that the median EMU country's cash to net asset ratio is 9.1%. Based on these numbers, the results of this study is more similar to the results found on the US market and on international samples, than the results found on the European market. However, it is important to bear in mind that the numbers are derived from samples of different time periods.

Table 4.1 - Description of Variables for the Total Sample

Variable	Mean	1st Quartile (25th Percentile)	Median	3rd Quartile (75th Percentile)	Standard deviation	Number of observations
CASH	0.1133	0.0361	0.0679	0.1316	0.1381	567
M/B	1.6925	1.0199	1.3525	1.8257	1.4742	567
SIZE	7.9754	6.6030	7.4680	9.2494	1.9387	567
OP CF	0.0803	0.0408	0.0875	0.1363	0.1290	567
NWC	0.0666	-0.0392	0.0657	0.1628	0.1580	567
CAPEX	0.0336	0.0123	0.0245	0.0476	0.0292	567
LEV	0.2118	0.0883	0.1907	0.3210	0.1509	567
R&D	0.0999	0.0158	0.0534	0.1179	0.1385	567
ZSCORE	1.8264	0.9500	1.4349	2.2454	1.4799	567
LT DEBT	0.6172	0.3788	0.6932	0.8943	0.3204	567
CF VOL	0.2233	0.0460	0.0668	0.1268	0.7235	567
SEASON	0.0488	0.0171	0.0287	0.0487	0.2513	567

Descriptive statistics on variables for the total sample of Swedish listed firms 2007-2011, used in regression 1.1.

The mean of the cash ratio yields significantly larger values. Such difference between mean and median is consistent with the results of previous studies (see e.g. Ferreira

and Vilela, 2004; Opler et al. 1999). In order to enable comparison between this study and previous studies that either use median or mean values, both measurements will be used in this chapter. As shown in table 4.1 the average cash to net asset ratio is 11.3% across the total sample.

Table 4.2 describes the variables separated into yearly values. Looking at median values of the cash variable, presented in brackets, one can identify that firms hold less cash in 2011 than in 2007, and that the most distinct change is the decrease from 8.9% in 2009 to 5.1% in 2010. The same trend applies to the mean values where the cash ratio decreased from 12.45% in 2009 to 9.88% in 2010, and is also lower 2011 than 2007.

Table 4.2 - Averages (medians within parenthesis) of Variables for the Total Sample

Variable	2007	2008	2009	2010	2011
CASH	0.1261 (0.0675)	0.1112 (0.0699)	0.1245 (0.0893)	0.0988 (0.0512)	0.1038 (0.0602)
M/B	2.0993 (1.5379)	1.2370 (1.0291)	1.6438 (1.3551)	1.8900 (1.5297)	1.5740 (1.3380)
SIZE	7.8158 (7.4333)	7.9822 (7.4822)	7.9121 (7.3459)	8.0145 (7.5610)	8.1995 (7.8474)
OP CF	0.0770 (0.0820)	0.0655 (0.0807)	0.1020 (0.1036)	0.0846 (0.0877)	0.0705 (0.0834)
NWC	0.0695 (0.0434)	0.0629 (0.0698)	0.0610 (0.0585)	0.0664 (0.0653)	0.0745 (0.0829)
CAPEX	0.0398 (0.0322)	0.0362 (0.0267)	0.0291 (0.0232)	0.0306 (0.0210)	0.0316 (0.0223)
LEV	0.2186 (0.1802)	0.2300 (0.2292)	0.2074 (0.2062)	0.2041 (0.1984)	0.1960 (0.1796)
R&D	0.0876 (0.0435)	0.1034 (0.0507)	0.1019 (0.0512)	0.1048 (0.0553)	0.1030 (0.0627)
ZSCORE	1.9002 (1.5856)	1.5108 (1.0839)	1.9271 (1.4108)	1.9006 (1.5186)	1.9033 (1.5628)
LT DEBT	0.6145 (0.6757)	0.6040 (0.6719)	0.6339 (0.7169)	0.6172 (0.6785)	0.6159 (0.7008)
CF VOL	0.3340 (0.0739)	0.2542 (0.0724)	0.2166 (0.0665)	0.1752 (0.0614)	0.1110 (0.0646)
SEASON	0.0416 (0.0292)	0.0936 (0.0320)	0.0360 (0.0273)	0.0346 (0.0265)	0.0359 (0.0265)

Mean values (median within parenthesis) of variables per year for the total sample of Swedish listed firms 2007-2011, used in regression 1.1.

Song and Lee (2012), who study corporate cash holdings in Asian firms before, during, and after the Asian financial crisis of 1997-1998 find that the median cash ratio was at a stable level before the crisis, but that it significantly increased during and after the crisis. The results of Table 4.2 indicate a similar increasing pattern during the financial crisis 2008 to 2009. However, there is a significantly decreasing pattern in 2010, before returning to lower, not higher, levels as before the crisis, suggesting that Swedish firms were not able to retain its pre-crisis cash levels. Whether the effect of the recent financial crisis on corporate cash holdings is long-term, is difficult to say given the close proximity and remains to be seen.

4.1.1.2 Average Cash Holdings by Firm Size Quartile

Based on the results of previous studies, this study takes a closer look at two variables that are suggested to play an important role in corporate liquidity management, firm size and cash flow volatility (see e.g. Bates et al., 2009; Opler et al., 1999; Sufi, 2009). This is done by graphically examining the variables relationship with cash levels. Figure 4.1 illustrate average cash holdings in the total sample, by firm size quartile.

Figure 4.1 - Average Cash Holdings of Total Sample by Firm Size Quartile

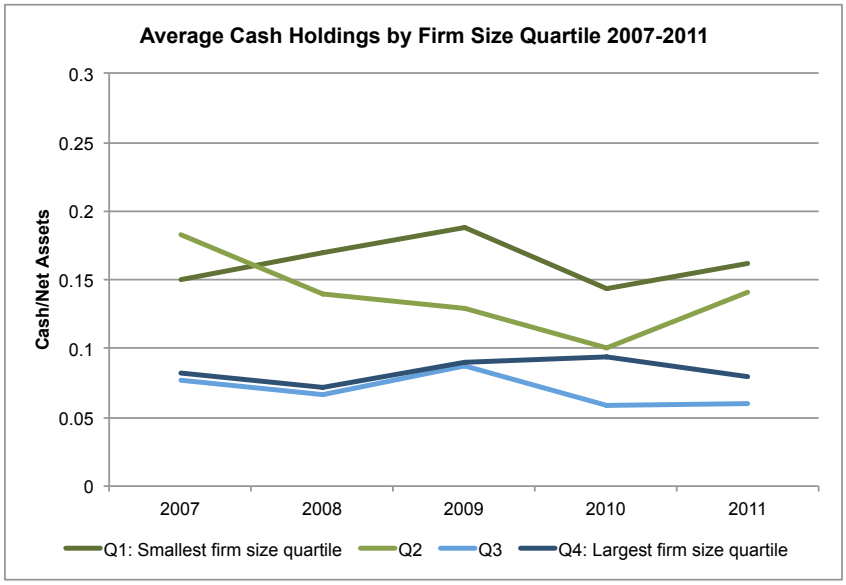
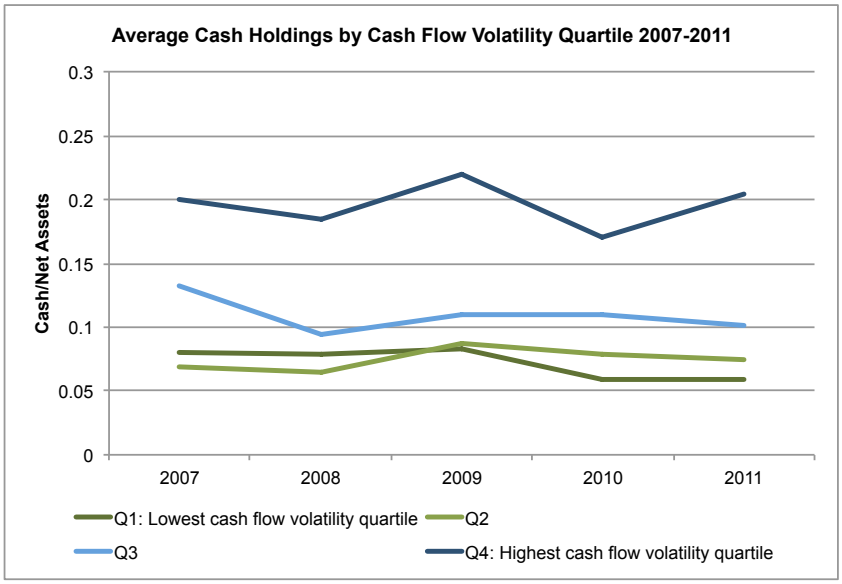


Figure 4.1 suggests that smaller firms hold more cash than larger firms, which is consistent with the transaction cost motive and precautionary motive indicating that smaller firms face higher cost of financing, but inconsistent with the financing hierarchy view that larger firms accumulate more cash and also inconsistent with the theory on agency costs of managerial discretion. Interestingly, it seems like that the largest firms did not suffer from the same decline in cash levels during the studied (crisis) period as the other firms. The largest firms instead increased their cash holding 2008-2010, in line with the evidence of Song and Lee (2012) that firms build up cash holdings during and after a financial crisis.

4.1.1.3 Average Cash Holdings by Cash Flow Volatility Quartile

Figure 4.2 below illustrate average cash holdings for quartiles sorted by cash flow volatility.

Figure 4.2 - Average Cash Holdings of Total Sample by Cash Flow Volatility Quartile



The result indicates a significant difference between the fourth quartile's cash level compared to the other three quartiles. Firms with the highest cash flow volatility hold (roughly 15%) more cash than the two lower quartiles, which is in line with the predictions of both the transaction cost motive and the precautionary motive as the risk of liquid asset shortage increases with cash flow volatility. The fourth quartile also experienced the most distinct changes in cash levels over the period, with more pronounced increases and decreases compared to the other quartiles, indicating that the financial crisis affected cash holdings of these firms to a greater extent.

4.1.2 Subsample – Total Liquidity 2007 and 2011

4.1.2.1 Descriptions of Variables

Table 4.3 shows the statistics of the variables of the subsample. The results are in general in line with the ones of the full sample. The median cash to net assets on the subsample is 6.0%, and the mean value is 10.4%. This indicates that the characteristics of the subsample do not differ significantly from the full sample, which facilitates a comparison of the results from the different sets of regressions. The table also presents statistics on the lines of credits, suggesting that the median firm hold lines of credit equal to 11.2% of its net assets. The result is in line with the prediction that lines of credit accounts for a substantial portion of firms' total liquidity, and in fact represents the majority as in the study of Lins et al. (2010). Lines of credit to cash

and lines of credit indicate that the portion of undrawn lines of credit represents 64.5% of total liquidity for the median firm. In turn, total liquidity of the median firm equals as much as 19.8% of net assets.

Table 4.3 - Description of Variables for the Subsample

Variable	Mean	1st Quartile (25th Percentile)	Median	3rd Quartile (75th Percentile)	Standard deviation	Number of observations
CASH	0.1043	0.0327	0.0600	0.1128	0.1428	197
LOC	0.1375	0.0611	0.1115	0.1848	0.1064	197
LOC/CASH+LOC	0.5963	0.4153	0.6449	0.8021	0.2605	197
LIQUIDITY	0.2434	0.1280	0.1977	0.3094	0.1837	197
M/B	1.8672	1.0949	1.4223	2.1350	1.8488	197
SIZE	8.1129	6.6392	7.6966	9.3707	1.9037	197
OP CF	0.0727	0.0362	0.0783	0.1191	0.1387	197
NWC	0.0698	-0.0344	0.0641	0.1525	0.1496	197
CAPEX	0.0351	0.0142	0.0251	0.0492	0.0274	197
LEV	0.2151	0.0947	0.1843	0.3239	0.1495	197
R&D	0.0853	0.0134	0.0538	0.1123	0.1031	197
ZSCORE	1.8152	1.0271	1.5689	2.2486	1.3031	197
LT DEBT	0.6062	0.3851	0.6790	0.8838	0.3171	197
CF VOL	0.2194	0.0449	0.0681	0.1151	0.8219	197
SEASON	0.0365	0.0173	0.0275	0.0420	0.0347	197

Descriptive statistics on variables for the subsample of Swedish listed firms 2007 & 2011, used in regressions 2.1, 2.2, 2.3 and 3.1.

Further, the results indicate that Swedish firms hold a larger portion of their total liquidity in lines of credit compared to those firms covered in previous studies. For example Sufi (2009) finds that the median firm in his US sample holds 45.5% of total liquidity in unused lines of credit. The mean values of both this study and of Sufi (2009) are somewhat lower than the median values, indicating that there are observations in the lower range of the ratio that affects the average downwards.

Table 4.4 below, presents the differences in the statistical values between the two years of 2007 and 2011. As previously highlighted, the median cash level is somewhat lower in 2011 than it was in 2007. The same applies for the median undrawn portion of lines of credit, which decreased from 11.81% of net assets in 2007 to 10.58% in 2011, indicating that Swedish firms suffered from a decline in total liquidity after the financial crisis. The portion of lines of credit in firms' total liquidity did however increase from 62.77% to 65.31%. In other words, the decline in cash holdings was greater than the decline in lines of credit resulting in Swedish firms relying on lines of credit to a greater extent in 2011 than they did in 2007.

Table 4.4 - Averages (medians within parenthesis) of Variables for the Subsample

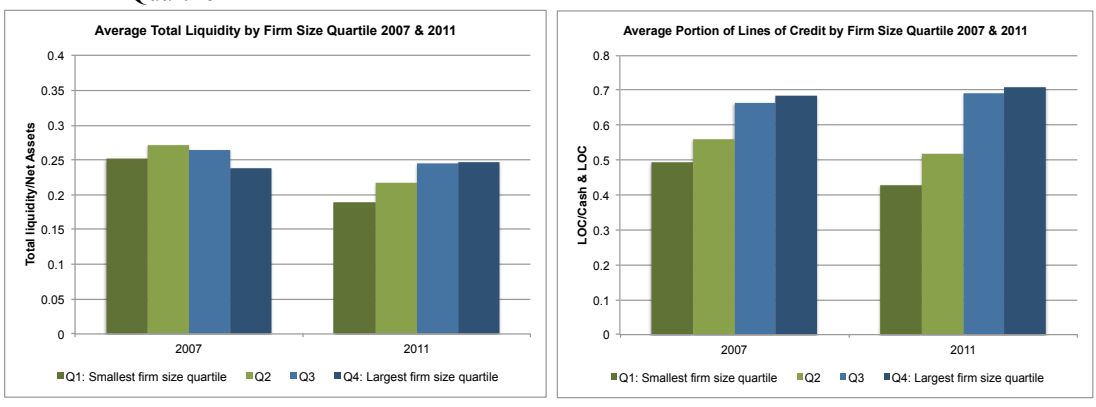
Variable	2007	2011	Total	Variable	2007	2011	Total
CASH	0.1124 (0.0637)	0.0951 (0.0504)	0.1043 (0.0600)	NWC	0.0702 (0.0375)	0.0693 (0.0718)	0.0698 (0.0641)
LOC	0.1443 (0.1181)	0.1298 (0.1058)	0.1375 (0.1115)	CAPEX	0.0376 (0.0319)	0.0323 (0.0223)	0.0351 (0.0251)
LOC/CASH+LOC	0.5955 (0.6277)	0.5971 (0.6531)	0.5963 (0.6449)	LEV	0.2265 (0.1843)	0.2021 (0.1874)	0.2151 (0.1843)
LIQUIDITY	0.2567 (0.2030)	0.2282 (0.1951)	0.2434 (0.1977)	R&D	0.0753 (0.0475)	0.0967 (0.0627)	0.0853 (0.0538)
M/B	2.1043 (1.4811)	1.5966 (1.3394)	1.8672 (1.4223)	LT DEBT	0.6090 (0.6573)	0.6029 (0.6960)	0.6062 (0.6790)
SIZE	7.9773 (7.4813)	8.2677 (7.8567)	8.1129 (7.6966)	CF VOL	0.3156 (0.0727)	0.1095 (0.0599)	0.2194 (0.0681)
OP CF	0.0783 (0.0813)	0.0663 (0.0765)	0.0727 (0.0783)	SEASON	0.0384 (0.0287)	0.0342 (0.0257)	0.0365 (0.0275)

Mean values (median within parenthesis) of variables per year and in total for the subsample of Swedish listed firms 2007 & 2011, used in regressions 2.1, 2.2, 2.3 and 3.1. ZSCORE has been removed from the regressions in line with discussion in 4.2.1.

4.1.2.2 Average Total Liquidity by Firm Size Quartile

As with the total sample, it is interesting to take a closer look at the level of liquidity for firms in the subsample, during 2007 and 2011. Looking at the left diagram below in figure 4.3, it can be seen that smaller firms hold slightly more liquidity 2007 than larger firms, consistent with cash levels in 2007 in figure 4.1. This is again in line with the predictions of the transaction cost motive and the precautionary motive, but inconsistent with the financing hierarchy theory and the theory of agency costs of managerial discretion. Further, looking at the liquid holdings in 2011, larger firms were not as affected by the crisis as the smaller firms. The first and second quartile's liquid holdings decreased significantly compared to 2007, the third quartile's liquid holdings decreased slightly, while the fourth quartile's liquid holdings actually increased (marginally) compared to 2007.

Figure 4.3 - Average Total Liquidity and Portion of Lines of Credit of Subsample by Firm Size Quartile



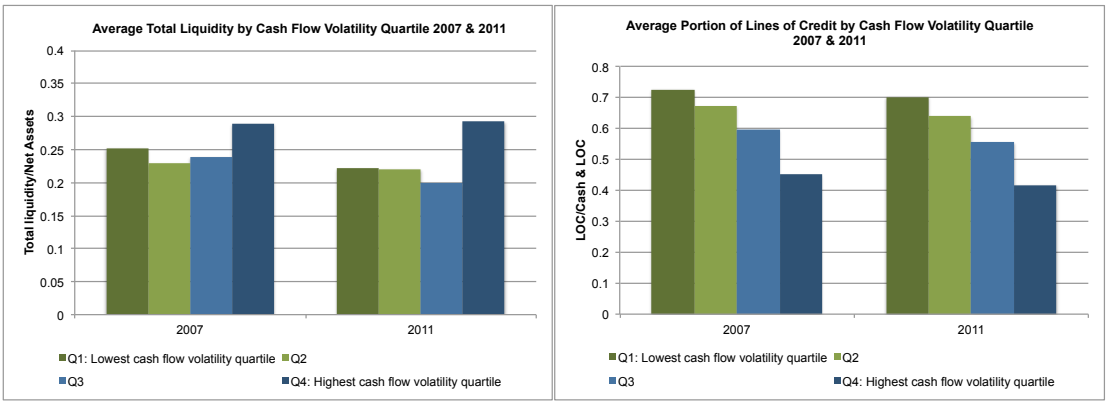
Looking at the right hand diagram in figure 4.3, showing the portion of lines of credit to total liquidity, there is a clear trend during both 2007 and 2011 that larger firms hold significantly more lines of credit compared to smaller firms. This is in line with the theory that larger firms benefit more from the advantages of external financing,

and clearly contradicts the view that larger firms are more prone to cash hoarding, as a result of larger room for managerial discretion due to shareholder dispersion and thus less monitoring. The two upper quartiles have increased the portion of lines of credit compared to cash from 2007 to 2011, and is clearly the major part of liquid holdings both years, around 65-70%. Although the portion of lines of credit is quite a bit smaller for the two lower quartiles, it still constitutes a substantial portion of total liquidity, around 40-55%, again indicating the importance of including lines of credit in the study of corporate liquidity.

4.1.2.3 Average Total Liquidity by Cash Flow Volatility Quartile

The left hand diagram in figure 4.4 below shows that firms in the fourth quartile, with largest cash flow volatility, hold more liquidity in accordance with the precautionary motive and the transaction cost motive. Just as in the figure 4.2 on cash holdings, it can be seen that the firms with the highest cash flow volatility hold significantly more liquidity in relation to the other quartiles. The level of liquid holdings does not differ substantially between the other three quartiles, although all three quartiles decreased liquid holdings from 2007 to 2011. This indicates that the impact of cash flow volatility on total liquidity could be somewhat exponential, where firms with high cash flow volatility hold significantly more liquidity compared to those in the middle and lower range (Q1-Q3), where there is no clear difference.

Figure 4.4 - Average Total Liquidity and Portion of Lines of Credit of Subsample by Cash Flow Volatility Quartile



The diagram on the right hand side in figure 4.4 clearly portrays a negative relationship between cash flow volatility and the use of lines of credit within firms' liquidity management, in line with hypothesized outcome. The portion varies between the first and fourth quartile, amounting to roughly 70% and 40% of total liquidity respectively. It is only in the fourth quartile that cash represents a larger portion than lines of credit, around 55-60%.

4.2 Regression Results

4.2.1 Diagnostic Testing for the Regression Assumptions

All six assumptions of the multiple linear regression model, presented in section 3.4, have been analyzed. The first assumption requires the regression to be linear in the parameters, which is true for all the regressions in this study, and that the regression model is correctly specified, which means that irrelevant variables should be excluded. When testing for redundant variables, the inclusion of the probability of default variable (ZSCORE) had a large impact on the other variables' statistical significance in regression 1.1. Although the variable in it self yielded statistically significant impact on cash, the variable seems to be affected by the previously discussed problems of circularity, which cause statistical noise ultimately affecting the overall validity of the regression. The ZSCORE variable was thus removed form regression 1.1 and also in the following regressions on the subsample (for regression results including ZSCORE, please see Appendix D). All other variables were when testing considered relevant in the regression models.

To control for the assumption of non-stochastic independent variables and non-linear relationship between the independent variables, correlation matrices are constructed for all regressions. Although no single measure of multicollinearity exists, this study applied a rule of thumb that correlations between the independent variables should be below 0.8 to assume that no exact collinearity exists. The results suggest that the independent variables are non-stochastic, and show no presence of exact collinearity. However, the probability of default variable again yields results that deviate from the otherwise similar results. The correlation between this variable and the market-to-book ratio and leverage variable (0.5171 and -0.6730 respectively) is significantly larger than the correlation between the other variables (correlation matrices of the independent variables are presented in Appendix C).

As discussed in section 3.4.1, the Hausman test and the Fixed Effects Redundant Likelihood Ratio test can control whether random or fixed effects are necessary when conducting regressions on a panel data set. The null hypothesis in the Hausman test was rejected indicating that the random effects model is misspecified and should not be used. In the redundancy test, the null hypothesis that fixed effects in both dimensions are redundant, i.e. both cross-sectional and over time, was rejected which indicate that there is unobserved heterogeneity. Fixed effects in both dimensions were therefore employed in the first set of regressions. The test results of the Hausman test and the Fixed Effects Redundant Likelihood test are reported in Appendix E.

The assumption of homoscedasticity was however not fulfilled and the error terms were heteroscedastic in all three sets. White heteroscedasticity-robust standard errors was therefore employed diagonally on the first regression set while the standard errors

in the second and third set were adjusted with the HAC (Newey-West) estimator (due to additional presence of autocorrelation as discussed below).

In the panel data set the Durbin-Watson statistic indicated that there was no problem of autocorrelation, but in the second and third set of regressions the same statistic indicated that there was some correlation between the error terms (although typically associated with time-series). The HAC (Newey-West) estimator treats both the heteroscedasticity and autocorrelation problem in the second and third regression sets.

4.2.2 Results from the First Regression Set – Determinants of Cash Holdings

Table 4.5 presents the results of regression 1.1 conducted on the panel data set covering 2007-2011, reporting coefficients together with White standard errors in parentheses. The level of statistical significance of the coefficients is indicated by *, ** and *** representing the 10%, 5% and 1% level respectively. The p-value of the F-statistic (0.0000) rejects the null hypothesis that all coefficients are zero, which confirms that the independent variables explain the behavior of the dependent variable. The adjusted R^2, which adjusts for additional variables included that do not add to the explanatory power of the regression model, further indicates that there is a high "goodness of fit" in the model (0.8544), and thus the regression line fits the joint data points well.

Table 4.5 - Results of Regression 1.1 on Total Sample

	Regression results **Regression (1.1)**		*Regression results* **Regression (1.1)**
Dependent variable	CASH		
Intercept	-0.3591**	**LEV**	-0.1081**
	(0.1672)		(0.0440)
M/B	0.0299***	**LTDEBT**	0.0542***
	(0.0062)		(0.0192)
SIZE	0.0483**	**R&D**	-0.0401
	(0.0204)		(0.0513)
OP CF	0.2601***	**CF VOL**	0.0410
	(0.0499)		(0.0355)
NWC	-0.1825**	**SEASON**	0.0023
	(0.0819)		(0.0041)
CAPEX	0.2230	**DIV**	0.0067
	(0.2159)		(0.0087)
Prob(F-statistic)	0.0000		
R^2	0.8999		
Adj. R^2	0.8544		
N	567		

The table presents coefficients of the least square panel data regression on cash holdings within Swedish listed firms 2007-2011. The standard errors are robust for heteroscedasticity using Whites (diagonal), and are reported in brackets. ZSCORE and industry dummy variables have been excluded as of seperate discussion. *, ** and *** indicate that the coefficient is significant at the 10%, 5% and 1% level respectively.

Growth Opportunities

The market-to-book coefficient indicates that growth opportunities affect cash holdings positively as predicted by hypothesis 1a. The result supports the transaction cost motive, which suggest that firms with growth opportunities face greater cost of cash shortage and therefore hold more cash as a buffer compared to other firms. The result is also in line with the predictions of the precautionary motive, suggesting that growth firms hold cash for precautionary reasons to avoid external capital markets, since high information asymmetries associated with growth opportunities make external financing expensive. As such, it is also in line with the financing hierarchy theory that postulates that firms with larger information asymmetries follow a pecking order behavior. The positive coefficient of growth opportunities is in line with the results of most previous studies discussed in this paper, e.g, Bates et al. (2009) on the US market, Ferreira and Vilela (2004) on EMU countries, Kim et al. (1998) on the US market, Opler et al. (1999) also on the US market, and Ozkan & Ozkan 2004 on the UK market.

Firm Size

The size coefficient is statistically significant and positive, supporting hypothesis 2b but contradicting hypothesis 2a. The result supports the financing hierarchy view suggesting that larger firms hold more cash because they have been able to accumulate cash over time. Another explanation is put forward by the theory of agency costs of managerial discretion, which suggests that large firms hold more cash because they tend to have larger shareholder dispersion that give discretionary power to managers. Interestingly, out of the studies that are relevant to compare with, none find that size and cash holdings are positively correlated, but that they are negatively correlated which rather supports the trade-off theory (see e.g. Deloof, 2001; Drobetz & Gruninger 2007; Ferreira & Vilela 2004; Opler et al. 1999). Although the coefficient in table 4.5 is statistically significant and positive, it is worth noticing that when analyzing firm size and cash holdings graphically in the descriptive statistics, it is shown that firms in the lowest quartile do hold more cash than the other quartiles, indicating that the relationship might not be completely straightforward.

Cash Generation

The coefficient of operating cash flow is statistically significant at the 1% level and reports a positive relationship between cash generation and cash holdings, which is in line with the predictions of hypothesis 3a but contradicts hypothesis 3b. The result is inconsistent with the findings of e.g. Bates et al. (2009) and Ozkan and Ozkan (2004), but consistent with most other previous studies discussed (e.g. Dittmar et al., 2003; Kim et al., 1998; Opler et al., 1999; Ferreira and Vilela, 2004). The result again supports the financing hierarchy view, suggesting that firms with strong cash generation invest relatively more in liquid assets compared to firms with weaker cash generation.

Working Capital Intensity/ Liquid Asset Substitution

In line with the predicted outcome in hypothesis 4, indicates the NWC coefficient a negative relationship between liquid asset substitution and cash holdings. The relationship is explained by the transaction cost motive, which suggests that the need of cash reserves decreases with the amount of assets available that cost-efficiently can be converted into cash. The result is in line with previous studies that have included liquid asset substitution proxies in their analysis (e.g. Bates et al., 2009; Dittmar et al., 2003; Ferreira and Vilela, 2004; Ozkan and Ozkan 2004).

Investment Intensity

The capital expenditures coefficient is positive but not statistically significant. Hence, no reliable evidence on investment intensity's impact on cash holdings can be found. Opler et al. (1999) also find a positive however significant relationship, whereas Bates et al. (2009) find statistical significant results of a negative relationship between investment intensity and cash holdings. The variable's impact on cash holding thus remains ambiguous and unknown on the Swedish market. Since the variable is not commonly included in previous studies, it is difficult to compare the lack of significance within the model. However, one potential explanation could be the relatively low level of capital expenditures within Swedish firms. Opler et al. (1999) find that the median (average) firm's capital expenditures amounts to 0.064 (0.090) of total assets on the US market, while the corresponding capital expenditures to net assets is 0.025 (0.034) on the Swedish market. The ratio on the Swedish market would have been even lower if measured to total assets in line with Opler et al. (1999), indicating a clear difference between the two markets.

Leverage

The negative leverage coefficient, statistically significant at the 5% level, supports hypothesis 6a but rejects hypothesis 6b. The result is once again in line with the financing hierarchy model, which states that cash and leverage should follow an inverse pattern. However, the result is consistent with the trade-off model as well. The agency cost theory of managerial discretion suggests that firms with low leverage are less subject to monitoring and therefore have greater opportunities to hoard cash to pursue investments of their own objective. Further, the transaction cost motive suggest that cost of investing in liquid assets increases with leverage, and that highly levered firms hold relatively less cash for this reason. The result confirms previous findings of e.g. Deloof (2001), Drobetz and Gruninger (2007), Ferreira and Vilela (2004) and Ozkan and Ozkan (2004), suggesting that leverage is a strong determinant of level of corporate cash.

Debt Maturity Structure

The debt maturity structure coefficient is statistically significant and positive, which contradicts hypothesis 7. The result is at odds with the theoretical prediction that firms with shorter debt maturity structure hold more cash for precautionary reasons in order to avoid the financial distress they would face if their loans were not renewed at

maturity. It is further also contradicting the theoretical aspect that firms with higher information asymmetries have more short-term debt, and therefore hold more cash to reduce dependence on external capital. There is unfortunately no clear theoretical explanation behind the positive relationship.

R&D Intensity

The empirical results of R&D's impact on corporate cash in previous studies are ambiguous, Drobetz and Gruninger (2007) cannot find support for a relationship between R&D intensity and cash holdings, while Bates et al. (2009) and Opler et al. (1999) find support for a positive relationship. No statistically significant result of R&D's impact on cash holding in Swedish firms can be found in this study. There is thus no evidence that R&D intensive firms hold more cash than other firms because they face greater costs of external financing, due to information asymmetries and low asset tangibility. There is neither any evidence that R&D intensive firms consume its internal surplus to a greater extent than other firms, and therefore hold less cash.

Cash Flow Volatility

The cash flow volatility variable is insignificant and no conclusion on whether firms with higher cash flow volatility hold more cash can be drawn. However, when analyzing the cash flow volatility graphically in section 4.1.1.3, a clear difference in the amount of cash held by the fourth quartile with the highest cash flow volatility and the three other quartiles was identified, indicating that the variable indeed affects corporate cash holdings, although the impact cannot be statistically proven. Cash flow volatility has in many other studies proven to be an important determinant of corporate cash levels, e.g. Bates et al. (2009) conclude that the increase in corporate cash holdings among US firms can to large extent be explained by the increase in cash flow volatility.

Seasonality

Similar to the cash flow volatility variable, does the seasonality variable not yield any significant result. Hence, no conclusions on the impact of intra-year cash fluctuations on corporate cash holdings can be drawn. A further discussion on the effect of seasonality within Swedish firms liquidity management is conducted in the analysis of regression 2.1 (see 4.2.3.1).

Dividends

Finally, no evidence on the role of dividend payments on cash levels is found. Empirical results of previous studies are ambiguous where some studies (e.g. Bates et al., 2009) find support for a negative relationship, while others (e.g. Ozkan & Ozkan, 2004) find no support that dividend policies have a significant influence on corporate liquidity. The theoretical predictions that dividend-paying firms should hold relatively less cash because dividends reduces the amount of internally generated funds, as suggested by the financing hierarchy model, or because dividend-paying firms can

simply cut dividends in case of cash shortage, as suggested by the transaction cost motive, does not seem to apply for the firms included in this study.

Industry Classification
In a separate regression industry dummy variables were included to capture potential variations across industries. However several problems arises when adding the dummy variables, including autocorrelation and impaired goodness of fit, ultimately affecting the validity of the model. The relatively small sample does not yield a significant number of observations within each industry classification (as specified previously), which makes it difficult to draw statistical conclusions on industry association's impact on cash holdings. Further, it is difficult to comprehend which factors these dummy variables capture, that are not already incorporated with the relatively extensive set of independent variables included in this study. Industry dummy variables have, hence, been excluded in the above regression. For regression including industry dummy variables, please see Appendix D.

4.2.3 Results for the Second Regression Set – Determinants of Total Liquidity and the Relationship Between Lines of Credit and Cash

As discussed previously, the second set of regressions is carried out on a subsample consisting of observations from 2007 and 2011 solely. When comparing the results of the first and second set of regressions it is therefore important to bear in mind that the regression results are derived from two non-identical samples.

Table 4.6 shows the results of the second set of regressions on the subsample of firms incorporating the use of (undrawn) lines of credit within firms' liquidity management. The two years of 2007 and 2011 are separated using both intercept and slope dummy variables. In all three regressions the null hypothesis of the F-test that all coefficients are equal to zero is rejected, which suggest that the independent variables do explain the level of total liquidity of the firms included in the subsample. Although not as strong as in regression 1.1, the adjusted R^2 in regression 2.1 (0.4971) indicate that the model has an acceptable degree of linear approximation of the observations. Comparing across previous studies, the adjusted R^2 in this regression is in the upper range (see e.g. Kim et al., 1998; Opler et al., 1999; Sufi, 2009). The adjusted R^2 in regression 2.2 and 2.3 is 0.5743 and 0.2526 respectively. Although the adjusted R^2 in regression 2.3 is lower, it is still higher than many comparable studies on the use of lines of credit (see e.g. Sufi, 2009; Campello et al., 2011), and thus still considered in the upper range.

The left hand side of table 4.6 reports the regression coefficients (and standard errors within parenthesis) using 2007 as a reference year. On the right hand side the same regression is reported with 2011 as a reference year. The dummy variables in the lower half of the table test the significant difference between the two years. The slope

dummy variables test the difference in effect of the control variables on the dependent variable 2007 and 2011, while the intercept dummy variable tests shifts in the mean of the dependent variable between the two years, holding the independent variables constant. Since the intercept dummy does not yield significant results in any of the regressions, no significant difference in the mean of the dependent variables 2007 and 2011 can be concluded. The respective slope dummy variables are commented on further in the analysis of each of the independent variables below.

4.2.3.1 Determinants of Total Liquidity – Regression 2.1

Growth Opportunities

The results suggest that the level of growth opportunities affect the amount of total liquidity held by Swedish firms positively, confirming hypothesis 1a. When comparing the two years no significant difference on the variable's impact on total liquidity can be identified (the dummy variables are insignificant), indicating that the financial crisis did not have any significant affect on growth firms' level of liquidity. The positive relationship is in line with the predictions of the transaction cost motive, i.e. that growth firms hold more cash because they face greater cost of cash shortage as they have to give up valuable growth opportunities. It is further in line with the precautionary motive, i.e. that growth firms face greater information asymmetries, which makes external funding expensive and liquidity reserves valuable. As such, the result is not inconsistent with the financing hierarchy model either, which suggests that information asymmetries cause firms to follow a pecking order behavior in their financing where cash constitutes the most favorable source. A firm facing relatively large information asymmetries would hence find liquid holdings more valuable. In addition, as mentioned in section 2.2.2 are firms with strong cash flows commonly also characterized with high market-to-book ratios. This would further explain why growth firms hold more total liquidity when following the arguments of the financing hierarchy model, i.e. that such firm can invest relatively more in liquid asset holdings. The result is similar to the result of regression 1.1 and supports hypothesis 1a, indicating the impact of growth opportunities does not change whether corporate liquidity is defined as cash or cash plus pre-negotiated liquidity (lines of credit).

Firm Size

The positive size coefficient is statistically insignificant in 2007 but significant in 2011. There is however a statistically significant difference between the two years indicating that the positive relationship was stronger in 2011 than in 2007. The positive relationship supports hypothesis 2b and is in line with the findings of regression 1.1. The increased impact of firm size on total liquidity is also visible in the descriptive statistics 4.1.2.2 where there is a more clear increase in total liquidity moving from the lowest to the highest quartile in 2011 compared to 2007. The positive relationship is in line with the predictions that large firms have been profitable historically and have been able to accumulate more cash over time.

Table 4.6 - Results of Regressions 2.1, 2.2 and 2.3 on Subsample

	Regression results - reference category 2007				*Regression results - reference category 2011*		
	Regression (2.1)	**Regression (2.2)**	**Regression (2.3)**		**Regression (2.1)**	**Regression (2.2)**	**Regression (2.3)**
Dependent variable	LIQUIDITY	CASH	LOC/LOC+CASH	**Dependent variable**	LIQUIDITY	CASH	LOC/LOC+CASH
Intercept	-0.0104	-0.0538	0.4306***	**Intercept**	-0.0820	-0.0419	0.2342
	(0.0741)	(0.0340)	(0.1312)		(0.0708)	(0.0629)	(0.1508)
LOC	-	-0.0319	-	**LOC**	-	-0.1265	-
	-	(0.1061)	-		-	(0.0905)	-
M/B	0.0297***	0.0161***	0.0065	**M/B**	0.0359***	0.0346***	-0.0366
	(0.0046)	(0.0038)	(0.0098)		(0.0121)	(0.0123)	(0.0263)
SIZE	0.0044	0.0061	-0.0042	**SIZE**	0.0264***	0.0126	0.0305*
	(0.0071)	(0.0066)	(0.0156)		(0.0081)	(0.0085)	(0.0179)
OP CF	0.4095***	0.3176***	-0.1973	**OP CF**	-0.0355	-0.1557	0.1935
	(0.1290)	(0.0740)	(0.2021)		(0.1206)	(0.0995)	(0.1899)
NWC	-0.2369**	-0.1154	0.0842	**NWC**	-0.0704	-0.0943	0.5655***
	(0.1031)	(0.0841)	(0.1515)		(0.0983)	(0.0869)	(0.1782)
CAPEX	0.5681	0.0986	1.2239	**CAPEX**	-0.3120	-0.2031	1.3916
	(0.6099)	(0.5353)	(0.8781)		(0.5577)	(0.3302)	(0.8901)
LEV	-0.2292**	-0.2445***	0.5817***	**LEV**	-0.3333***	-0.3265***	0.5646***
	(0.0980)	(0.0880)	(0.1759)		(0.0997)	(0.0922)	(0.1888)
LTDEBT	0.1552***	0.0878*	-0.0297	**LTDEBT**	0.1253***	0.0913***	-0.1089
	(0.0546)	(0.0479)	(0.0719)		(0.0461)	(0.0326)	(0.0925)
R&D	0.2453	0.3605***	-0.3259	**R&D**	-0.0698	0.0381	0.2400
	(0.1704)	(0.1302)	(0.2781)		(0.1297)	(0.1077)	(0.2325)
CF VOL	-0.0067	0.0081	-0.0447***	**CF VOL**	0.0812	0.1072*	-0.1060
	(0.0086)	(0.0066)	(0.0154)		(0.0532)	(0.0558)	(0.0786)
SEASON	1.6212***	1.4284***	-0.5921	**SEASON**	1.6585***	1.2127**	-0.5895
	(0.4924)	(0.3524)	(0.8345)		(0.5701)	(0.4730)	(0.9009)
DIV	0.0175	-0.0216	0.1425***	**DIV**	-0.0203	-0.0381	0.0413
	(0.0297)	(0.0255)	(0.0496)		(0.0406)	(0.0382)	(0.0787)
LOC*D2011	-	-0.0943	-	**LOC*D2007**	-	0.0947	-
	-	(0.1365)	-		-	(0.1364)	-
M/B*D2011	0.0059	0.0181	-0.0443*	**M/B*D2007**	-0.0062	-0.0185	0.0431
	(0.0122)	(0.0121)	(0.0261)		(0.0123)	(0.0121)	(0.0261)
SIZE*D2011	0.0218**	0.0062	0.0336*	**SIZE*D2007**	-0.0221**	-0.0065	-0.0347*
	(0.0094)	(0.0083)	(0.0183)		(0.0094)	(0.0084)	(0.0185)
OP CF*D2011	-0.4441**	-0.4722***	0.3944	**OP CF*D2007**	0.4450**	0.4733***	-0.3907
	(0.1763)	(0.1222)	(0.2738)		(0.1761)	(0.1221)	(0.2729)
NWC*D2011	0.1638	0.018	0.4706**	**NWC*D2007**	-0.1665	-0.0212	-0.4812**
	(0.1206)	(0.0925)	(0.2078)		(0.1213)	(0.0934)	(0.2094)
CAPEX*D2011	-0.8837	-0.306	0.1533	**CAPEX*D2007**	0.8801	0.3017	-0.1676
	(0.8221)	(0.6034)	(1.1536)		(0.8226)	(0.6041)	(1.1511)
LEV*D2011	-0.1034	-0.0813	-0.0146	**LEV*D2007**	0.1040	0.0820	0.0171
	(0.1241)	(0.1075)	(0.2187)		(0.1243)	(0.1075)	(0.2194)
LTDEBT*2011	-0.0292	0.0042	-0.0767	**LTDEBT*2007**	0.0299	-0.0035	0.0792
	(0.0694)	(0.0595)	(0.1126)		(0.0695)	(0.0597)	(0.1129)
R&D*D2011	-0.3163	-0.3237*	0.5614	**R&D*D2007**	0.3152	0.3224*	-0.5660
	(0.2283)	(0.1774)	(0.3529)		(0.2282)	(0.1771)	(0.3533)
CF VOL*D2011	0.0874	0.0984*	-0.0636	**CF VOL*D2007**	-0.0879*	-0.0991*	0.0613
	(0.0529)	(0.0556)	(0.0822)		(0.0530)	(0.0557)	(0.0827)
SEASON*D2011	0.0477	-0.2037	0.0436	**SEASON*D2007**	-0.0373	0.2157	-0.0026
	(0.7084)	(0.5555)	(1.1561)		(0.7121)	(0.5598)	(1.1624)
DIV*D2011	-0.0367	-0.0153	-0.0969	**DIV*D2007**	0.0378	0.0165	0.1012
	(0.0454)	(0.0373)	(0.0876)		(0.0460)	(0.0378)	(0.0882)
D2011	-0.0697	0.0141	-0.1889	**D2007**	0.0716	-0.0119	0.1964
	(0.0989)	(0.0673)	(0.1795)		(0.0990)	(0.0672)	(0.1802)
Prob(F-statistic)	0.000000	0.000000	0.000000	**Prob(F-statistic)**	0.000000	0.000000	0.000000
R^2	0.556145	0.628614	0.340293	**R^2**	0.556145	0.628614	0.340293
Adj. R^2	0.497136	0.574317	0.252587	**Adj. R^2**	0.497136	0.574317	0.252587
N	197	197	197	**N**	197	197	197

The table presents coefficients of the least square cross-sectional regressions 2.1, 2.2 and 2.3 of Swedish listed firms 2007 and 2011. The left-hand side of the table presents regression results with 2007 as reference category for the included year dummy variable, while the right-hand side of the table presents regression results with 2011 as reference category for the year dummy variable. The standard errors are robust for heteroscedasticity and autocorrelation using HAC (Newey-West), and are reported in brackets. ZSCORE has been excluded as of previous discusson presented in the panel data regression. Due to the small sample within regressions 2.1, 2.2 and 2.3, industry dummy variables have been excluded all together. *, ** and *** indicate that the coefficient is significant at the 10%, 5% and 1% level respectively.

Following the idea of the financing hierarchy one would expect such firm to have invested relatively more in liquid asset reserves. Also the agency cost of managerial discretion theory provides an explanation to the positive relationship, suggesting that larger firms have larger shareholder dispersion and more room for opportunistic cash hoarding. No support can however be found that economies of scale and the relatively higher cost of external financing cause smaller firms to hold more total liquidity compared to larger firms, as suggested by the transaction cost motive and precautionary motive. However, as depicted in the descriptive statistics, there is an indication that total liquidity, to some extent, in fact decreases with firm size in 2007, but this relationship is not statistically significant in this regression.

Cash Generation

The positive coefficient of operating cash flow in 2007 (0.4095) supports hypothesis 3a and the financing hierarchy view of corporate liquidity, which suggests that firms with strong internal cash generation can invest relatively more in liquid assets. The result is in line with the result of regression 1.1, but looking at the dummy variables in regression 2.1 for the two respective years, there is an indication that the relationship between cash generation and total liquidity has changed in 2011. Although not statistically significant individually in 2011, the slope dummy variables suggests that there is a statistically significant difference (-0.4441) between 2007 and 2011 indicating a negative relationship between cash generation and total liquidity in 2011. This relationship would instead support the transaction cost motive which puts forward that firms with week internal cash generation have higher probability of liquid asset shortage, shifting the curve in figure 2.1 outwards and ultimately increasing the optimal level of liquid assets post-crisis. All in all, the effect that internal cash generation has on Swedish firms' total liquidity is somewhat ambiguous, but a significant change in the variable's impact over the studied crisis period is identified.

Working Capital Intensity/ Liquid Asset Substitution

The working capital coefficient is statistically significant in 2007 and confirms the hypothesis that the amount of assets available that a firm cost-effectively can convert into cash affects total liquidity negatively. The result supports hypothesis 4 and is in line with the result in regression 1.1, thus no difference on the impact of liquid asset substitution when including pre-negotiated liquidity in the measure of corporate liquidity can be identified. The coefficient is however not significant in 2011, and none of the slope dummy variables are significant. Whether substitution between liquid assets and cash can explain total liquidity levels also in 2011 is thus less obvious.

Investment Intensity

No evidence that the level of capital expenditures is a determinant of total liquidity can be found. Similar results was found in regression 1.1, indicating that the variable have little impact on corporate liquidity management among Swedish firms. The

variable acts as a differentiator between the trade-off theory and the financing hierarchy theory, as the two models predict opposite impacts of level of investments on corporate liquidity. The trade-off theory highlights the cost of cash shortage that an investment intensive firm would face if cash flow is unexpectedly low, and hence such firms would value liquid asset reserves higher. The financing hierarchy model, on the other hand, highlights investment outlays' negative effect on the amount of internally generated surplus available to build up liquid asset reserves. Surprisingly, none of the theories' predictions conform to the results of this study regarding investment intensity's impact on corporate liquidity.

Leverage

In regression 1.1 it was evident that leverage and cash holdings are negatively related and the results of regression 2.1 suggests that the same relationship applies for leverage and total liquidity, again supporting hypothesis 6a. There is no statistically significant difference between the impact of leverage on total liquidity 2007 and 2011. The financing hierarchy's prediction that when investments exceed internally generated funds, debt increases, and when internally generated funds exceed investments, debt decreases seems to be equally true both pre- and post-crisis.

Debt Maturity Structure

Also the debt maturity variable is in line with the results of regression 1.1, suggesting that firms with longer debt maturities not only hold relatively more cash but relatively more total liquidity as well. The result contradicts hypothesis 7 and is at odds with the theoretical predictions of the trade-off theory, which suggests that the refinancing risk associated with short-term debt cause firms with shorter debt maturity structure to hold cash for precautionary reasons. It was further suggested that such firms would face higher transaction costs, again indicating relatively larger cash reserves. The explanation behind the positive relationship between portion of long-term debt and total liquidity does unfortunately not become any clearer in this regression, and remains unknown.

R&D Intensity

The trade-off theory suggests that R&D intensive firms face relatively higher cost of external financing due to the intangible and opaque nature of its asset structure. R&D intensive firms are in addition suggested to face relatively high costs of financial distress, all in all speaking for such firms holding relatively more liquid assets. On the other hand, financing hierarchy suggests that R&D intensive firms, all else equal, consume more of its internally generated surplus, and hence hold relatively less liquidity. The results of this study do not support any of the above-mentioned predictions, and no evidence that R&D intensity is a determinant of Swedish corporate liquidity can be found. The same result was found in regression 1.1, and there is thus no difference in the conclusion of the relationship between R&D intensity and cash, and R&D intensity and total liquidity.

Cash Flow Volatility

The results of regression 1.1 found no evidence on cash flow volatility's impact on cash holdings, but the results of regression 2.1 yield some indication on a relationship between the two variables. Although not statistically significant separately, the slope dummy variable of cash flow volatility suggests that 2007 is statistically significantly different from 2011. One should interpret the result with caution, but the result indicates that the impact of cash flow volatility on total liquidity was lower in 2007 than it was 2011. This implies that the precautionary need of liquidity holdings for volatile firms is stronger post-crisis on the Swedish market.

Seasonality

The seasonality variable shows both strong positive statistical and economical significance in regression 2.1, which is inconsistent with the findings of regression 1.1. This suggests that the level of seasonality has no impact on the level of cash holdings, but significantly impacts the level of total liquidity. The seasonality coefficient is significant at the 1% level and supports hypothesis 11 suggesting that firms with relatively large intra-year fluctuations hold relatively more liquidity for precautionary reasons to minimize the risk of liquidity shortage. The results highlight the issue that conclusions made on corporate cash holdings (when excluding pre-negotiated lines of credit) may not be representative for corporate liquidity management as a whole. However, in contrast to cash flow volatility, there is no significant change of the variable's impact pre- and post-crisis, indicating that there is no increased (or decreased) need for precautionary cash post-crisis to cover for intra-year fluctuations.

Dividends

Whether the firm pays dividends or not does not seem to affect its total liquidity. As previously mentioned, the empirical support for dividends as a determinant of corporate liquidity is somewhat ambiguous. The variable's impact on corporate liquidity could be investigated further on a larger sample, and perhaps using absolute numbers rather than a dummy variable (following e.g. Ozkan & Ozkan, 2004), before making any final conclusions.

4.2.3.2 The Relationship Between Cash and Lines of Credit – Regressions 2.2 and 2.3

Regression 2.2 and 2.3 further investigate the relationship between lines of credit and cash within Swedish listed firms' liquidity management 2007 and 2011. As described in 3.3.1, regression 2.2 investigates whether cash and lines of credit are substitutes or complements, by including undrawn lines of credit (LOC) as one of the independent variables. Table 4.6 shows no statistically significant relationship between the two sources of liquidity. Although not possible to conclude how lines of credit relate to cash within the subsample as a whole due to lack of significant results, the sign of the coefficient can provide an indication as to the true relationship. The coefficient from

lines of credit is consistently negative both 2007 (-0.0319) and 2011 (-0.1265) indicating that the relationship is substitutionary rather than complementary. It is important to emphasize that this is only an indication of the true relationship, and as mentioned it is not possible to draw any further statistical conclusions.

By analyzing the results of regression 2.3, it is however possible to further investigate the relationship between lines of credit and cash by studying the determinants of the proportionality of lines of credit (or cash) within firms' total liquid holdings (lines of credit and cash).

Growth Opportunities
As previously argued in section 2.3, the use of lines of credit can be both negatively and positively related to growth opportunities. From the results in table 4.6, it is not possible to establish a relationship between the market-to-book ratio and the portion of lines of credit in any of the two years. The market-to book ratio therefore does not explicitly determine the use of lines of credit as opposed to cash within firms' liquidity management, although the variable has been proven to significantly determine the level of both cash in regression 1.1 and the level of total liquidity in regression 2.1 positively. Further, Sufi (2009) finds a negative significant relationship between growth opportunities and the portion of lines of credit in his US sample. This is in line with hypothesis A1, following the idea that firms with high market-to-book ratios face larger information asymmetries and therefore hold less debt in general, but cannot be proven to be true also on the Swedish market.

However, one interesting finding is that there is a significant negative difference in the relationship of the market-to-book variable between 2007 and 2011 on the 10% level. The coefficient of the dummy variable included in the regression with 2007 as reference year (-0.0443), thus indicates that a firm with equal growth opportunities both years, would use relatively less portion of lines of credit post-crisis 2011 compared to 2007.

Firm Size
Size is shown to have a significant positive determining effect on the portion of lines of credit within Swedish firms' liquid holdings 2011 on a 10% level, but no such relationship can be concluded in 2007. The result of 2011 year's coefficient is in line with hypothesis B1 that larger firms are expected to benefit more from external financing than smaller firms. The positive affect of size on portion of lines of credit is also supported by findings on the US market (Sufi, 2009; Yun, 2009). The descriptive statistics, portraying portion of lines of credit by size quartiles also show a clear pattern that larger firms hold more lines of credit as opposed to cash, however the pattern is clear both 2007 and 2011. Although such evidence is not supported in the regression results for 2007, there is a significant difference between the two years in both directions, a positive difference 2007 to 2011 and a negative difference 2011 to 2007. This clearly indicates that there is a weaker determining effect of size on the

use of lines of credit as opposed to cash pre-crisis in 2007, and that the use of lines of credit is more size dependent (positively) post-crisis.

Cash Generation

Although cash generation has been proven to have a positive significant effect on cash holdings in regression 1.1, and by e.g. Dittmar et al. (2003), Kim et al. (1998), Opler et al. (1999) and Ferreira and Vilela (2004), as well as a positive effect on total liquidity in 2007 (regression 2.1), no such relationship can be found to affect the portion of lines of credit compared to cash. There is neither any significant difference in the effect of cash generation on portion of lines of credit pre- and post-crisis. Thus there is no statistical support for hypothesis C of a positive relationship, contrary to Sufi (2009) and Campello et al. (2011) who find that cash generation affects lines of credit positively.

Working Capital / Borrowing Base

Since accounts receivable and inventory commonly constitute collateral for lines of credit, hypothesis D predicts a positive relationship between the net working capital variable and the portion of lines of credit. The relationship is significantly positive (on a 1% level) post-crisis in 2011, but cannot be significantly determined pre-crisis 2007. The difference between both years is however also significant, negatively from 2011 to 2007 and positively 2007 to 2011. This suggests that the borrowing base played a larger determining factor in the use of lines of credit post-crisis compared to pre-crisis. This could be a factor of for example stricter requirements of collateral from external lenders post-crisis, or that firms with a larger borrowing base are granted more favorable terms and thus are more prone to use lines of credit as opposed to cash.

Investment Intensity

Although the coefficient indicates a strongly positive impact on the use of lines of credit, investment intensity has no significant effect on the use of lines of credit as opposed to cash within firms' liquidity management. The variable is not significant in any of the other regressions either, indicating no specific impact of capital expenditures on Swedish firms liquidity management. Further, since there are not many studies who investigate the use of lines of credit, and even fewer that consider investment intensity as a determinant, it is difficult to assess the absence of a significant relationship further.

Leverage

Leverage has a strongly significant (1% level) positive impact on Swedish firms' use of lines of credit as opposed to cash within their liquidity management. This relationship is in line with hypothesis E and indicates that less levered firms prefer to rely on cash to a greater extent in order to avoid monitoring from creditors. The leverage variable is the only variable that significantly affects the portion of lines of credit both years. The affect of leverage on lines of credit is almost equally large 2007

(0.5817) and 2011 (0.5646), which is also shown in the lack of significant differences between the two years. It can thus be concluded that leverage is one of the factors that impact Swedish firms' use of lines of credit irrespective of year.

Debt maturity and R&D Intensity

Neither debt maturity nor R&D intensity has any significant determining effects on the use of lines of credit 2007 or 2011. Further, there is no significant difference between the two years. Although debt maturity has shown to have highly significant positive determining affect on cash holdings (1% level) in regression 1.1, as well as on total liquidity both years (1% level) in regression 2.1, the proportional use of lines of credit remains unaffected by debt maturity.

Cash Flow Volatility

In line with hypothesis H1, cash flow volatility is a negatively significant determinant of the portion of lines of credit 2007, while no conclusion can be drawn when looking at 2011 or differences between the two years. This could be explained by the theoretical motivation that firms with larger variability in cash flows are less prone to use lines of credit due to less favorable (often cash flow based) covenants, as presented by Sufi (2009). Although neither Sufi (2009) nor Yun (2009) find any statistically significant relationship, the coefficients are generally negative on the US market, as are the coefficients in this study during both years. The lack of statistically significant result in 2011 indicates that cash flow volatility cannot be concluded to determine the use of lines of credit 2011. However, looking at the descriptive statistics in 4.1.2.3, the downward trend of cash flow volatility on the use of lines of credit is clear in 2007 as well as in 2011 (figure 4.4), indicating that the relationship is not entirely straightforward.

Seasonality

The effect of seasonality on cash holdings in regression 1.1 cannot be determined, at the same time as seasonality strongly determines total liquidity positively in regression 2.1 (1% level). It is therefore somewhat unexpected that seasonality is no determining factor in the proportionality between lines of credit and cash. The lack of statistically significant findings is in line with those on the US market (Sufi, 2009), although the coefficient is negative both years, contradicting the positive relationship indicated on the US sample as well as hypothesis I2. Since seasonality has not commonly been included in previous studies, and is also measured somewhat differently compared to Sufi (2009), it is difficult to draw any conclusions without further testing.

Dividends

The dividend dummy variable has not shown any significant determining factor in any of the previous regressions. However, in 2007 dividend-paying firms hold more lines of credit than cash, indicated by the highly significant positive coefficient (1% level). This is contrary to the predictions of hypothesis J that covenants incorporated

in the agreements of lines of credit would limit the amount of dividends paid out to shareholders, thus resulting in a negative relationship. One can only speculate why dividend-paying firms hold more lines of credit in 2007, without a more thorough look at the dividend-paying variable within the model. It could however be that the covenants were much more favorable pre-crisis, not restricting payouts to shareholders to the extent that was first predicted. Another possibility is that Swedish firms were in a generally healthy state in 2007 and therefore complied with the existing covenants, allowing dividend payouts.

4.2.4 The Third Regression Set – Liquidity Ratio

The third set of regressions was conducted as an attempt to investigate whether the definition commonly used by practitioners yielded a stronger explanatory power as to the determinants of corporate liquidity. The liquidity ratio incorporates present as well as future liquidity sources and uses in the measure, as presented in 3.3.1. Since this measure has not, to the knowledge of the authors, been used in any previous studies, it is difficult to compare the findings of the regression to previous findings. The regression model can however be interpreted and analyzed in comparison to regression model 2.1 of total liquidity, as to how the different definition of liquidity, the liquidity ratio, affects the success of the model in predicting the dependent variable, as well as to the explanatory power of the independent variables within the model.

Looking at the adjusted R^2 value of 0.1805 in regression 3.1, it is considerably lower compared to the adjusted R^2 of 0.4967 in regression 2.1, suggesting a significantly weaker "goodness of fit", though the number of observations is the same across the two samples. Further, the model in regression 3.1 is more vulnerable to the number of independent variables included, in order to compare differences across the two years. This is shown by the larger difference between the R^2 and the adjusted R^2, which indicates that there are relatively more variables included that do not add to the explanatory power of the regression model. The difference between the R^2 and the adjusted R^2 is 0.1070 in regression 3.1, almost twice as large as in regression 2.1 where it is 0.0594. Attempts on excluding certain independent variables where made, however no substantial improvements with regards to the R^2 values were obtained. Studying the F-statistic (0.0002), there are also indications of a weaker rejection of the null hypothesis that all regression coefficients are zero, although the difference when compared to all of the other regression sets (0.0000) is only very slight. The regression results for regression 3.1 are reported in Appendix F.

Although it is not possible to rule out the liquidity ratio as a more viable definition of firms' liquidity with the above discussion, the model as specified in regression set 3.1 does neither indicate a better goodness of fit, nor stronger explanatory power of the independent variables on the level of liquidity in this study. Further evaluation of the

model in regression 3.1 is needed, preferably using a larger sample, in order to avoid drawing incorrect conclusions regarding determinants of liquid holdings of Swedish firms 2007 and 2011, defined using the liquidity ratio. The regression model is thus not analyzed further in this study.

5 Concluding Remarks

This study has as a first step studied the determinants of cash holdings within Swedish listed firms 2007-2011. As a second step this study has incorporated lines of credit to the measure of cash and investigated the determinants of total liquidity on a subsample 2007 and 2011, as well as examining the relationship between lines of credit and cash within Swedish firms liquidity management. The time period was chosen in order to incorporate an analysis of the results before and after the recent financial crisis. Lastly, an alternative measurement of liquidity commonly used by practitioners was included as an attempt to bridge the gap between theory and practice.

The median Swedish firm is found to hold 6.8% of net assets in cash throughout the period 2007-2011, comparable to previous findings on the US market, however lower than findings on the European market. The cash levels have further decreased slightly post-crisis 2011 compared to pre-crisis 2007, contradicting previous results on corporate cash holdings subsequent of financially constrained times. The long-term effect on the Swedish market is however yet to be seen.

Further, this study finds that total liquidity amounts to 19.8% of net assets, and that undrawn lines of credit constitute a substantial portion of Swedish firms' liquidity management. Lines of credit amount to a total of 11.2% of net assets, and as much as 64.5% of total liquidity, significantly larger than findings on the US market. Lines of credit are thus clearly the major part of Swedish listed firms' liquidity, suggesting in line with previous findings that this form of pre-negotiated liquidity should not be overlooked within corporate liquidity literature. Comparing between the two years, this study also finds that the decrease in lines of credit is smaller than the decrease in cash 2007 to 2011, proving that Swedish firms rely more on lines of credit post-crisis compared to pre-crisis.

Although lines of credit constitute the majority of Swedish firms liquid holdings, this study does not find any larger differences in the determinants of cash holdings and the determinants of total liquidity on the Swedish market. This indicates that lines of credit are used as an important liquidity component, however lines of credit are not completely different from that of cash with regards to the underlying determinants. The result however shows that that growth opportunities, firm size and cash generation positively determine the level total liquidity, while leverage is a negative determinant. This is in line with the financing hierarchy theory that predicts that firms with more growth opportunities are exposed to larger information asymmetries and will rely on internal funds before external capital. Further the financing hierarchy theory postulates that larger firms and firms with stronger cash flows accumulate more liquidity over time, and are able to invest more in liquid assets compared to

other firms, or alternatively choose pay down its debt explaining the negative relationship with leverage.

However, the findings are also partially explained by the transaction cost motive arguing that the cost of liquid shortage is larger for firms with larger growth opportunities who will hold more liquidity, and that more levered firms will face higher cost of investing in liquid assets and thus hold less liquidity. Additional support for the transaction cost motive is found through the negative impact of liquid asset substitution on total liquidity, since the need for liquid reserves decreases with the amount of assets available that cost-efficiently can be converted into cash. The only support for the precautionary motive is found through the positive determinant of growth opportunities on liquidity, explained by the larger information asymmetries that make external capital more expensive, in line with the financing hierarchy theory. Also the theory on agency costs of managerial discretion is supported through the positive effect of size and the negative effect of leverage on liquid holdings. Debt maturity has a positive impact on total liquidity, contradicting prediction of both the transaction cost motive and the precautionary motive. However, this study finds no support that investment intensity, R&D intensity, cash flow volatility or dividends determine the level of total liquidity within Swedish listed firms.

Lastly, the measure of seasonality yields no determining impact on Swedish firms' cash holdings 2007-2011, however clearly determines total liquidity both 2007 and 2011. The positive relationship is in line with both the precautionary motive and the transaction cost motive, that seasonal firms hold more liquidity in order to minimize the risk of cash shortage and avoid external capital markets. This clearly highlights the importance of not drawing conclusions on cash holdings solely, since such conclusion may not be representative for corporate liquidity holdings as a whole. All in all, the results conclude that both the trade-off model and the financing hierarchy model play important roles in explaining the determinants of liquid holdings within Swedish listed firms, although none of the theories fully explain these determinants.

In addition to the above results this study finds significant differences pre- and post-crisis. Firm size has a stronger positive impact on total liquidity 2011 compared to 2007 implying that size has a stronger determining factor on liquidity post-crisis. At the same time cash generation has a stronger negative impact on total liquidity 2011, clearly indicating that a firm with equal levels of cash generation both years, hold less liquidity post-crisis compared to pre-crisis.

Although no conclusion can be drawn whether lines of credit and cash are used as substitutes or complements within Swedish listed firms liquidity management, this study finds several determinants behind the proportionality of lines of credit and cash in total liquidity. Leverage has an equally large positive determining effect on the use of lines of credits as opposed to cash both 2007 and 2011, indicating that less levered firms prefer to rely on cash to a greater extent in order to avoid monitoring from

creditors. No evidence that cash generation, investment intensity, debt maturity, R&D intensity or seasonality affect the proportionality of lines of credit within total liquidity is found. The absence of support for seasonality's effect on lines of credit is unexpected due to its strong positive impact on total liquidity. However size, borrowing base and cash flow volatility turn out to be important determinants during the studied period. Size and borrowing base are found to have a larger positive effect 2011, indicating that the use of lines of credit is more dependent on size and that the borrowing base plays a larger role post-crisis compared to pre-crisis. Cash flow volatility affects lines of credit negatively in 2007, although strong indications of a negative relationship are found 2011 as well. Lastly, this study finds a positive relationship between dividend-payments and the proportionality of lines of credit. This last result is unexpected and not equivalent to any previous findings, requiring further research to be conducted with regards to dividends impact on lines of credit.

The alternative measurement of liquidity, the liquidity ratio, did not yield a stronger explanatory power of determinants of corporate liquidity within Swedish listed firms. Although this study is not able to draw any conclusions as to whether the liquidity ratio is a more just definition of total liquidity, the aim at bridging the gap between theory and practice was not achieved.

5.1 Suggestions for Future Research

This study aimed at highlighting the drawbacks in previous liquidity management studies, which most commonly exclude lines of credit as a component of total liquidity. The findings in this paper conclude that lines of credit constitute the majority of Swedish firms' total liquidity. However there is much that needs to be investigated further in future coming studies on liquidity management. The remainder of this section outlines a few suggestions, which the authors wish to emphasize.

Firstly, for a more comprehensive analysis of the role of lines of credit in corporate liquidity management, future research may investigate some of the determinants highlighted in this study in greater detail. For example, this study has not been able to investigate any potential non-linear relationships or whether cash and lines of credit are used as a source of finance for different purposes (e.g., day-to-day transactions, hedge against cash shortfalls, funding acquisitions etc.). This study has neither been able to capture the effect of total liquidity on market performance.

Secondly, future research could incorporate more detailed characteristics of the lines of credit. This study has only been able to look at undrawn portions of the total lines of credit, but further analysis could be made with regards to drawdowns. In addition, this study was not able to make a distinction between committed and uncommitted lines of credit. In order to further analyze to what extent lines of credit substitute for cash, such differentiation should be sought.

However, in order for this to be examined quantitatively, several improvements regarding the reporting of lines of credit are required. Due to the proven importance of lines of credit within corporate liquidity management, will improved information regarding this source of financing be of interest to investors, credit rating agencies, creditors, as well as other stakeholders. The authors would thus lastly like to emphasize the importance of improved reporting standards that seek more detailed disclosure.

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Appendices

Appendix A: List of Companies

Table 6.1 – List of companies in full sample and subsample

Companies in total sample (2007-2011)	Companies in subsample (2007 & 2011)
A-COM AB	AARHUSKARLSHAMN AB
AARHUSKARLSHAMN AB	ACADEMEDIA AB
ACADEMEDIA AB	ACANDO AB
ACANDO AB	ACAP INVEST AB
ACAP INVEST AB	A-COM AB
ADDNODE GROUP AB	ADDNODE GROUP AB
ADDTECH AB	ADDTECH AB
AF AB	AF AB
ALFA LAVAL AB	ALFA LAVAL AB
ALLENEX AB	ANOTO GROUP AB
ALLTELE ALLMAENNA SVENSKA TELE	ASSA ABLOY AB
ANOTO GROUP AB	ATLAS COPCO AB
ASSA ABLOY AB	AXFOOD AB
ATLAS COPCO AB	AXIS COMMUNICATIONS AB
AXFOOD AB	BALLINGSLOV INTERNATIONAL AB
AXIS COMMUNICATIONS AB	BE GROUP AB
BALLINGSLOV INTERNATIONAL AB	BEIJER ALMA AB
BE GROUP AB	BEIJER ELECTRONICS AB
BEIJER ALMA AB	BERGS TIMBER AB
BEIJER ELECTRONICS AB	BILLERUDKORSNAS AB
BERGS TIMBER AB	BIOPHAUSIA AB
BILIA AB	BOLIDEN AB
BILLERUDKORSNAS AB	BONG LJUNGDAHL AB
BIOLIN SCIENTIFIC AB	BRIO AB
BIOPHAUSIA AB	BYGGMAX GROUP AB
BIOTAGE AB	CARL LAMM AB
BOLIDEN AB	CASHGUARD AB
BONG LJUNGDAHL AB	CISION AB
BRIO AB	CLAS OHLSON AB
BROSTROM AB	CLOETTA AB
BYGGMAX GROUP AB	CONSILIUM AB
CARL LAMM AB	CTT SYSTEMS AB
CASHGUARD AB	CYBERCOM GROUP AB
CISION AB	DGC ONE AB
CLAS OHLSON AB	DIN BOSTAD AB
CLOETTA AB	DORO AB
CONNECTA AB	DUNI AB
CONSILIUM AB	DUROC AB
CTT SYSTEMS AB	ELECTROLUX AB
CYBERCOM GROUP AB	ELEKTA AB
DGC ONE AB	ENIRO AB
DIN BOSTAD AB	ERICSSON LM
DORO AB	FEELGOOD SVENSKA AB
DUNI AB	FENIX OUTDOOR AB
DUROC AB	GETINGE AB
ELECTROLUX AB	GEVEKO AB
ELEKTA AB	GLOBAL HEALTH PARTNER AB
ELEKTRONIKGRUPPEN BK AB	GUNNEBO AB
ELOS AB	GUNNEBO INDUSTRIER AB
ENIRO AB	HAKON INVEST AB

ERICSSON LM
FAGERHULT AB
FEELGOOD SVENSKA AB
FENIX OUTDOOR AB
GETINGE AB
GEVEKO AB
GLOBAL HEALTH PARTNER AB
GUNNEBO AB
GUNNEBO INDUSTRIER AB
HAKON INVEST AB
HALDEX AB
HEMTEX AB
HEXPOL AB
HIFAB GROUP AB
HIQ INTERNATIONAL AB
HL DISPLAY AB
HMS NETWORKS AB
HOGANAS AB
HOLMEN AB
HUSQVARNA AB
IAR SYSTEMS GROUP AB
IBS AB
INDUST & FINANCIAL SYSTEM
INDUTRADE AB
INTELLECTA AB
ITAB SHOP CONCEPT AB
JEEVES INFORMATION SYSTEMS
KABE HUSVAGNAR AB
KAPPAHL AB
KNOW IT AB
LAGERCRANTZ GROUP AB
LAMMHULTS DESIGN GROUP AB
LINDAB INTERNATIONAL AB
MALMBERGS ELEKTRISKA AB
MEDA AB
MEDIVIR AB
MEKONOMEN AB
MICRONIC MYDATA AB
MIDSONA AB
MODERN TIMES GROUP
MSC KONSULT AB
MULTIQ INTERNATIONAL AB
MUNTERS AB
NCC AB
NEDERMAN HOLDING AB
NET INSIGHT AB
NETONNET AB
NEW WAVE GROUP AB
NIBE INDUSTRIER AB
NILORNGRUPPEN AB
NISCAYAH GROUP AB
NOBIA AB
NOLATO AB
NORDIC SERVICE PARTNERS HLDG
NOTE AB
NOVOTEK AB
OEM INTERNATIONAL AB
OPCON AB
HALDEX AB
HEMTEX AB
HEXPOL AB
HIQ INTERNATIONAL AB
HL DISPLAY AB
HMS NETWORKS AB
HOGANAS AB
HOLMEN AB
HUSQVARNA AB
IAR SYSTEMS GROUP AB
IBS AB
INDUST & FINANCIAL SYSTEM
INDUTRADE AB
INTELLECTA AB
ITAB SHOP CONCEPT AB
KAPPAHL AB
KNOW IT AB
LAGERCRANTZ GROUP AB
LAMMHULTS DESIGN GROUP AB
LINDAB INTERNATIONAL AB
MALMBERGS ELEKTRISKA AB
MEDA AB
MEDIVIR AB
MEKONOMEN AB
MICRONIC MYDATA AB
MIDSONA AB
MODERN TIMES GROUP
MUNTERS AB
NCC AB
NEDERMAN HOLDING AB
NET INSIGHT AB
NETONNET AB
NEW WAVE GROUP AB
NIBE INDUSTRIER AB
NOBIA AB
NOLATO AB
NOTE AB
OEM INTERNATIONAL AB
OPCON AB
ORTIVUS AB
PARTNERTECH AB
PEAB AB
POOLIA AB
PRECISE BIOMETRICS AB
PREVAS AB
PROACT IT GROUP AB
PROFFICE AB
PROFILGRUPPEN AB
READSOFT AB
REJLERKONCERNEN AB
RORVIK TIMBER AB
ROTTNEROS AB
SAAB AB
SANDVIK AB
SAS AB
SCANIA AB
SECO TOOLS AB
SECTRA AB

OREXO AB
ORTIVUS AB
PARTNERTECH AB
PEAB AB
POOLIA AB
PRECISE BIOMETRICS AB
PREVAS AB
PRICER AB
PROACT IT GROUP AB
PROFFICE AB
PROFILGRUPPEN AB
Q-MED AB
READSOFT AB
REJLERKONCERNEN AB
RORVIK TIMBER AB
ROTTNEROS AB
SAAB AB
SANDVIK AB
SAS AB
SCANIA AB
SECO TOOLS AB
SECTRA AB
SECURITAS AB
SECURITAS DIRECT AB
SEMCON AB
SENSYS TRAFFIC AB
SIGMA AB
SKANSKA AB
SKF AB
SKISTAR AB
SSAB AB
STJARNAFYRKANT AB
STUDSVIK AB
SVEDBERGS I DALSTORP AB
SVENSKA CELLULOSA AB
SWECO AB
SWEDISH MATCH AB
SWEDISH ORPHAN BIOVITRUM AB
SWEDOL AB
SYSTEMAIR AB
TELE2 AB
TELECA AB
TELELOGIC AB
TELIASONERA AB
TELIGENT AB
TICKET TRAVEL GROUP AB
TILGIN
TRADEDOUBLER
TRELLEBORG AB
VBG GROUP AB
VENUE RETAIL GROUP AB
VITROLIFE AB
VOLVO AB
XANO INDUSTRI AB
ZODIAK TELEVISION AB

Total number of firms: 163

SECURITAS AB
SEMCON AB
SIGMA AB
SKANSKA AB
SKF AB
SSAB AB
SWECO AB
SWEDISH MATCH AB
SWEDOL AB
SVENSKA CELLULOSA AB
SYSTEMAIR AB
TELE2 AB
TELECA AB
TELELOGIC AB
TELIASONERA AB
TELIGENT AB
HIFAB GROUP AB
TICKET TRAVEL GROUP AB
TRELLEBORG AB
VBG GROUP AB
VENUE RETAIL GROUP AB
VITROLIFE AB
VOLVO AB
XANO INDUSTRI AB
ZODIAK TELEVISION AB

Total number of firms: 133

Appendix B: Definitions of Dependent and Independent Variables

Table 6.2 – Definitions of Dependent and Independent Variables with Corresponding Bloomberg Functions (Mnemonics)

Variable	Short name	Definition	Bloomberg Functions (Mnemonics)
Cash	CASH	Cash & Marketable Securities / Net Assets	CASH_AND_MARKETABLE_SECURITIES / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Total liquidity	LIQUIDITY	Cash & Marketable Securities + Undrawn Lines of Credit / Net Assets	(CASH_AND_MARKETABLE_SECURITIES + undrawn lines of credit*) / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Liquidity ratio	LIQUIDITY RATIO	(Cash & Marketable Securities $_{t}$ + Operating Cash Flow $_{t+1}$ (if positive) + Net Working Capital $_{t+1}$ (if positive) + Undrawn Lines of Credit $_{t}$) / (Capital Expenditures $_{t+1}$ + Operating Cash Flow $_{t+1}$ (if negative) + Net Working Capital $_{t+1}$ (if negative) + Short-term Debt $_{t}$ + Dividends $_{t+1}$)	(CASH_AND_MARKETABLE_SECURITIES $_{t}$ + CF_CASH_FROM_OPER $_{t+1}$ (if positive) + CF_CHNG_NON_CASH_WORK_CAP $_{t+1}$ (if positive) + undrawn lines of credit* $_{t}$) / (CF_CASH_FROM_INV_ACT $_{t+1}$ + CF_CASH_FROM_OPER $_{t+1}$ (if negative) + CF_CHNG_NON_CASH_WORK_CAP $_{t+1}$ (if negative) + BS_ST_BORROW $_{t}$ + CF_DVD_PAID $_{t+1}$)
Growth opportunities	M/B	(BV Total Assets - BV Equity + MV Equity - Cash & Marketable Securities) / Net Assets	(BS_TOT_ASSET - TOTAL_EQUITY + HISTORICAL_MARKET_CAP - CASH_AND_MARKETABLE_SECURITIES) / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Firm size	SIZE	ln (BV Total Assets)	ln (BS_TOT_ASSET)
Cash generation	OP CF	Operating Cash Flow / Net Assets	CF_CASH_FROM_OPER / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Liquid asset substitution	NWC	Current Assets - Current Liabilities / Net Assets	WORKING_CAPITAL / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Investment intensity	CAPEX	Capital Expenditures / Net Assets	CAPITAL_EXPEND / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Leverage	LEV	Total Debt / Total Assets	SHORT_AND_LONG_TERM_DEBT / BS_TOT_ASSET
R&D intensity	R&D	Intagible Assets - Goodwill / Net Assets	(BS_TOT_ASSET - TANGIBLE_ASSETS - BS_GOODWILL) / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Z-score	ZSCORE	LN (1.2 × WC/Toal Assets + 1.4 × RE/Total Assets + 3.3 × EBIT/Total Assets + 0.6 × MV Equity/Total Assets + 1.0 × Sales/Total Assets)	LN ((1.2 × WORKING_CAPITAL/BS_TOT_ASSET) + (1.4 × BS_RETAIN_EARN/BS_TOT_ASSET) + (3.3 × EBIT/BS_TOT_ASSET) + (0.6 × HISTORICAL_MARKET_CAP/BS_TOT_ASSET) + (1.0 × SALES_REV_TURN/BS_TOT_ASSET))
Debt maturity	LTDEBT	Long-term Debt / Total Debt	BS_LT_BORROW / SHORT_AND_LONG_TERM_DEBT
Cash flow volatility	CF VOL	StDev of previous 10 year Operating Cash Flow / Net Assets	StDev 10y rolling CF_CASH_FROM_OPER / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)
Seasonality	SEASON	Yearly StDev of Operating Cash Flow / Net Assets using quarterly data	StDev CF_CASH_FROM_OPER / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES) using quarterly data
Lines of credit	LOC	Undrawn Lines of Credit / Net Assets	Undrawn lines of credit* / (BS_TOT_ASSET - CASH_AND_MARKETABLE_SECURITIES)

* Data on lines of credit is collected manually from the annual reports

Appendix C: Correlation Matrices of Independent Variables

Table 6.3 – Correlation Matrix of Independent Variables of Total Sample, Regression 1.1.

Total Sample	M/B	SIZE	OP CF	NWC	CAPEX	LEV	LT DEBT	ZSCORE	R&D	CF VOL	SEASON
M/B	1.0000										
SIZE	-0.1180	1.0000									
OP CF	0.0784	0.2112	1.0000								
NWC	0.1043	-0.0532	0.0012	1.0000							
CAPEX	0.0840	0.1760	0.1566	0.0096	1.0000						
LEV	-0.1668	0.3083	-0.0742	-0.0644	0.1030	1.0000					
LT DEBT	0.0304	0.2485	0.1313	0.2241	0.0188	0.2689	1.0000				
ZSCORE	0.5171	-0.2413	0.1968	0.1734	0.0588	-0.6730	-0.0690	1.0000			
R&D	0.0789	-0.2019	-0.1671	-0.2604	-0.2024	-0.0318	0.0207	0.0332	1.0000		
CF VOL	0.0525	-0.1595	-0.0709	-0.1798	0.0733	0.0801	-0.0271	0.1151	-0.0195	1.0000	
SEASON	0.0095	-0.0777	-0.0186	-0.0575	-0.0409	-0.0214	0.0022	0.0225	0.0041	0.0067	1.0000

Correlation matrix of independent variables (excluding divided dummy) in the total sample used in regression set 1.1. Note that ZSCORE is excluded from the regression as of previously discussed problems with circularity.

Table 6.4 – Correlation Matrix of Independent Variables of Subsample, Regression 2.1, 2.2, 2.3 and 3.1.

Subsample	M/B	SIZE	OP CF	NWC	CAPEX	LEV	LT DEBT	R&D	CF VOL	SEASON
M/B	1,0000									
SIZE	-0,1529	1,0000								
OP CF	0,2027	0,1655	1,0000							
NWC	0,1277	-0,0800	-0,1094	1,0000						
CAPEX	0,1214	0,1268	0,1134	0,0934	1,0000					
LEV	-0,1545	0,2769	-0,1105	0,0094	0,0739	1,0000				
LT DEBT	0,1261	0,2205	0,1679	0,2608	0,0791	0,2859	1,0000			
R&D	0,2319	-0,1498	-0,0617	-0,2167	-0,1535	0,0140	0,0101	1,0000		
CF VOL	0,0911	-0,1320	0,0838	-0,1475	0,1230	0,1084	0,0258	0,0768	1,0000	
SEASON	0,3448	-0,4126	-0,2770	-0,0785	0,0614	-0,1380	-0,2167	0,3157	0,1205	1,0000

Correlation matrix of independent variables (excluding dividend dummy) in the subsample used in regression sets 2.1, 2.2 and 2.3. Note that ZSCORE has been excluded from the regressions as of previously discussed problems with circularity in regression set 1.1.

Appendix D: Regression Results of Regression 1.1 including Z-score and Industry Dummy Variables

Table 6.5 – Regression Results of Regression 1.1 Including the Redundant Variable ZSCORE and Industry Dummy Variables Respectively

	Regression results - first set	
	Regression (1.1) with ZSCORE	**Regression (1.1) with industry dummy variables**
Dependent variable	CASH	CASH
Intercept	-0.4033**	0.1318***
	(0.1671)	(0.0246)
M/B	0.0300***	0.0452***
	(0.0054)	(0.0076)
SIZE	0.0463**	-0.0051
	(0.0202)	(0.0032)
OP CF	0.2480***	-0.1375
	(0.0467)	(0.0863)
NWC	-0.2159***	-0.1325***
	(0.0798)	(0.0336)
CAPEX	0.2012	-0.1635
	(0.1978)	(0.2081)
LEV	0.0038	-0.3199***
	(0.0463)	(0.0350)
LTDEBT	0.0561***	0.0579***
	(0.0184)	(0.0156)
R&D	-0.0383	0.0917*
	(0.0504)	(0.0481)
ZSCORE	0.0221***	
	(0.0054)	
CF VOL	0.0472	0.0179**
	(0.0354)	(0.0070)
SEASON	0.0024	0.0101
	(0.0040)	(0.0151)
DIV	0.0014	0.0001
	(0.0082)	(0.0115)
ICB1000		-0.0094
		(0.0175)
ICB3000		-0.0033
		(0.0151)
ICB4000		-0.0134
		(0.0132)
ICB5000		-0.0194
		(0.0134)
ICB6000		-0.0699**
		(0.0224)
ICB9000		-0.0299***
		(0.0121)
Prob(F-statistic)	0.000000	0.000000
R^2	0.905480	0.472833
Adj. R^2	0.862118	0.452520
N	567	567

The table presents coefficients of the least square panel data regression on cash holdings within Swedish listed firms 2007-2011. The standard errors are robust for heteroscedasticity using Whites (diagonal), and are reported in brackets. The regression incldng ZSCORE is conducted using fixed effects in both dimensions, while the regression including industry dummy variables is conducted using period fixed effects. Reference category for the industry dummy variables is ICB2000. ICB7000 dummy variable was excluded since this category included no companies. *, ** and *** indicate that the coefficient is significant at the 10%, 5% and 1% level respectively.

Appendix E: Fixed Effects Redundancy Test and Hausman Test for Random Effects

Table 6.6 – Redundant Fixed Effects Test for Regression 1.1

Redundant Fixed Effects Tests
Equation: Reg. 1.1
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	10.860306	-162.389	0.0000
Cross-section Chi-square	968.937897	162	0.0000
Period F	1.715048	-4.389	0.1458
Period Chi-square	9.912154	4	0.0419
Cross-Section/Period F	10.934479	-166.389	0.0000
Cross-Section/Period Chi-square	983.464816	166	0.0000

Table 6.7 – Hausman Random Effects Test

Correlated Random Effects - Hausman Test
Equation: Reg. 1.1
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	89.761705	11	0.0000

Appendix F: Regression Results for Regression 3.1 – Liquidity Ratio

Table 6.8 – Regression Results for Regression 3.1

	Regression results - reference category 2007		*Regression results - reference category 2011*
	Regression (3.1)		**Regression (3.1)**
Dependent variable	LIQUIDITY RATIO	**Dependent variable**	LIQUIDITY RATIO
Intercept	1.9888***	**Intercept**	1.3996
	(0.6612)		(0.9463)
M/B	-0.1186	**M/B**	-0.3079
	(0.1387)		(0.1844)
SIZE	-0.0848	**SIZE**	0.1220
	(0.0754)		(0.0979)
OP CF	1.2857	**OP CF**	-0.5678
	(1.5762)		(1.2163)
NWC	-2.2787**	**NWC**	2.5631
	(1.0762)		(2.0437)
CAPEX	-6.8884	**CAPEX**	-13.1580**
	(4.5786)		(5.8601)
LEV	-2.8389***	**LEV**	-1.7142
	(1.0619)		(1.7300)
LTDEBT	2.2855***	**LTDEBT**	1.7410***
	(0.4890)		(0.6145)
R&D	-2.2809*	**R&D**	-0.6681
	(1.2510)		(1.2553)
CF VOL	-0.0929	**CF VOL**	1.5935***
	(0.0627)		(0.3786)
SEASON	2.6753	**SEASON**	0.3183
	(4.3412)		(5.3384)
DIV	0.5563*	**DIV**	-0.1976
	(0.3348)		(0.6559)
M/B*D2011	-0.1893	**M/B*D2007**	0.1893
	(0.1857)		(0.1857)
SIZE*D2011	0.2068*	**SIZE*D2007**	-0.2068*
	(0.1138)		(0.1138)
OP CF*D2011	-1.8535	**OP CF*D2007**	1.8535
	(1.9047)		(1.9047)
NWC*D2011	4.8418**	**NWC*D2007**	-4.8418**
	(2.0721)		(2.0721)
CAPEX*D2011	-6.2696	**CAPEX*D2007**	6.2696
	(7.2538)		(7.2538)
LEV*D2011	1.1247	**LEV*D2007**	-1.1247
	(1.8258)		(1.8258)
LTDEBT*2011	-0.5445	**LTDEBT*2007**	0.5445
	(0.7371)		(0.7371)
R&D*D2011	1.6128	**R&D*D2007**	-1.6128
	(1.6047)		(1.6047)
CF VOL*D2011	1.6864***	**CF VOL*D2007**	-1.6864***
	(0.3883)		(0.3883)
SEASON*D2011	-2.3570	**SEASON*D2007**	2.3570
	(6.6830)		(6.6830)
DIV*D2011	-0.7539	**DIV*D2007**	0.7539
	(0.7598)		(0.7598)
D2011	-0.5891	**D2007**	0.5891
	(1.0477)		(1.0477)
Prob(F-statistic)	0.000177	**Prob(F-statistic)**	0.000177
R^2	0.287632	**R^2**	0.287632
Adj. R^2	0.180545	**Adj. R^2**	0.180545
N	197	**N**	197

The table presents coefficients of the least square cross-sectional regression 3.1 of Swedish listed firms 2007 and 2011. The left-hand side of the table presents regression results with 2007 as reference category for the included year dummy variable, while the right-hand side of the table presents regression results with 2011 as reference category for the year dummy variable. The standard errors are robust for heteroscedasticity and autocorrelation using HAC (Newey-West), and are reported in brackets. ZSCORE has been excluded as of previous discusson presented in the panel data regression. Due to the small sample within regression 3.1, industry dummy variables have been excluded all together. *, ** and *** indicate that the coefficient is significant at the 1%, 5% and 10% level respectively.