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Three Essays On Firm Liquidity Management

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THREE ESSAYS ON FIRM LIQUIDITY MANAGEMENT

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ABSTRACT

In Part 1, we study the costs associated with firm illiquidity. We specifically examine the impact of illiquidity on the costs of financing, financial distress, underinvestment, and competitiveness in product markets. We focus on a comprehensive definition of liquidity that expands upon the typical measure of liquidity, cash and markeappendix securities, commonly used in the management literature. Our liquidity index, derived from existing cash and markeappendix securities, available credit lines and cash volatility, measures the likelihood that a firm will become illiquid. Lastly, we address the endogeneity issue that plagues corporate literature linking firm performance to other firm attributes using a well-developed dynamic panel generalized method of moments (GMM) estimator. Our results indicate that illiquidity is associated with higher costs of financing, increased financial distress, and decreased competitive advantage. In Part 2, we examine the extent that firms utilize lines of credit to fund cash dividends. We find that higher dividend payouts are related to higher liquidity and dividend paying firms that experience cash shortages with utilize credit lines to continue dividend payments. Our sample statistics indicate that dividend paying firms are considerably different than non-payers. Dividend payers tend to be more liquid, despite having less cash, have smaller credit line balances, higher market capitalizations, less long-term debt, are more profiappendix, and spend less on capital investments. One of our keying findings indicates that liquidity is an important determinant of dividend payouts. In Part 3, we study the determinants of liquidity for 4,928 micro-firms surveyed by the Kauffman Foundation over the period 2004 – 2012. Female owned firms are more liquid, smaller, carry more inventories, and use less trade credit than male firms. White-owned firms are less liquid than Asian or African-American owned firms, while the Asian-owned are significantly larger than white- and African-American-owned, and the African-American-owned have the least inventory and land holdings. The most highly educated owners operated the largest firms, with the most equipment, and the least inventory and land. Firms with most experienced owners are the most liquid and largest. Additionally, we find that liquidity is negatively related to firm inventory levels and equipment holdings.

DEDICATION

This dissertation is dedicated to my wife who encouraged and supported me through this process.

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PART 1

INTRODUCTION

Managing liquidity has been an important issue to managers since Keynes (1936) argued that liquidity management and financial constraints are fundamentally linked. Keynes suggested that if financial markets were efficient, then firm liquidity decisions would be irrelevant. However, he argued that financial markets contain frictions, thus liquidity decisions are not irrelevant. Keynes assumed that firms are financially constrained and need liquidity to fund investment. Han and Qiu, (2007) suggest financially constrained firms cannot make future investments without reducing current investments because they have exhausted all external financing sources. Myers and Majluf (1984) suggest that asymmetric information will lead to financially constrained firms under investing in positive NPV projects. They propose that existing shareholders, bondholders, and other stakeholders are better off when firms' carry sufficient financial slack (cash and cash equivalents) to fund good investment opportunities, since external financing is costly. In a survey of CFOs, Graham and Harvey (2001) find that CFOs consider their decisions about corporate liquidity to be one the most important decisions that they make. CFOs view their primary job as finding ways to fund investment opportunities

suggested/proposed by the CEO. Several other studies have suggested that liquidity is linked to cost of capital, financial distress, investment, and competitiveness[1].

In his overview of the corporate cash holding literature, Denis (2011) indicates uncertain cash flows and unpredicappendix growth opportunities impact the liquidity of firms; however, several key issues remain unresolved. He suggest the existing literature does not address to what extent is financial flexibility a first-order determinant of financial policies, what are the relative costs and benefits of alternative sources of financial flexibility, and what are the benefits of corporate payouts. This study focuses on the relative costs of illiquidity using a comprehensive measure of financial flexibility. Specifically, we examine the relation between illiquidity and the cost of financing, financial distress, underinvestment, and competitive advantage in the market place. Using a sample of approximately 3,500 firms, our results indicate that illiquidity is related to a higher cost of capital, higher financial distress, and a competitive disadvantage in product markets.

We introduce a comprehensive measure of liquidity that combines cash and markeappendix securities as well as available credit lines.[2] While a few recent studies [Sufi (2009), Lins, Servaes, and Tufano (2010) and Kahle and Stulz (2013)] have expanded their definition of liquidity to include a firm's credit lines, they did not use the expanded measure of

[1] Myers & Majluf (1984), Minton & Schrand (1999), John (1993), DeAngelo, DeAngelo, & Wruck (2002), Fazzari, Hubbard, & Petersen (1988), Rauh (2006), Denis & Sibilkov (2010), Haushalter, Klasa, & Maxwell (2007), and Fresard (2010)

[2] OPSW (1999), Faulkender and Wang (2006), Bates, Kahle, and Stulz (2009), and Pinkowitz, Stulz, and Williamson (2013) all focus on cash and cash equivalents.

liquidity to analyze the impact of liquidity management on specific firm outcomes.[3]

Previous studies have focused solely on cash and cash equivalents. Almeida, et al. (2013) conclude that the predominate use of cash and cash equivalents in existing studies has clouded their findings and more comprehensive measures of liquidity should be used in future research. Our liquidity measure is an index based on Emery and Cogger's (1982) lambda[4]. Our liquidity index, $logLIQ_{i,t}$, is the sum of cash, cash equivalents, and available credit divided by cash volatility, where cash volatility is the quarterly standard deviation of cash and cash equivalents. The benefit of this index is it is more effective at assessing solvency since a lower (higher) measure indicates that a firm is more (less) likely to become insolvent (Emery, 1984).

We address the well documented issues of endogeneity using a dynamic panel generalized method of moments (GMM) estimator. Using a similar methodology, Wintoki, Linck, and Netter (2012) analyze the dynamic relation between board governance and firm performance. Using this methodology reduces endogeneity concerns in corporate governance research.

[3] Sufi (2009), Lins, Servaies and Tufano (2010), Kahle and Stulz (2013), Acharya, Almeida, and Campello (2013)
[4] Emery and Cogger's lambda is computed as the sum of daily cash & equivalents, available credit lines, and expected cash flow divided by daily standard deviation of cash. Using daily data their lambda can be interpreted as a Z-score that indicates the probability of being illiquid.

LITERATURE REVIEW AND DEVELOPMENT OF HYPOTHESES

The existing liquidity management literature focuses on three primary areas, including the determinants of cash holdings, the cash flow sensitivity of cash, and the value of cash. The determinants of liquidity literature includes work by Opler, Pinkowitz, Stulz, and Williamson (1999), Bates, Kahle, and Stulz (2009), Subramaniam, et al. (2011), and Ang and Smedema (2011), among others[5]. Opler et al examine the level of cash holdings for a large sample of publicly-traded U.S. firms and find that firms with more growth opportunities and riskier cash flows maintain higher liquidity positions, while firms with better access to capital markets have lower liquidity positions. These findings support the implications of Keynes' arguments for liquidity. Opler et al indicate a target level of cash exists and that it varies with the value of the firm's investments and financial constraints. Bates, et al find that increases in firm cash holdings are partially explained by increased cash flow volatility and decreased research and development spending, which is consistent with Keynes' precautionary motive for holding cash. Subramaniam, et al. find the non-diversified firms tend to have larger cash balances, while Ang and Smedema find evidence that less financially constrained firms build their cash balance ahead of recessions.

The cash flow sensitivity of cash literature includes studies by Almeida, Campello, and Weisbach (2004), Kusnadi and Wei (2011) and Erel, Jang and Weisbach (2013). The cash flow sensitivity of cash is the marginal propensity to save cash from incremental cash flows. Almeida

[5] Foley, Hartzell, Titman, & Twite (2007) examine the relation between repatriation taxes and the quantity of cash holdings; Pinkowitz, Stulz, & Williamson (2013) examine cash holdings since the Financial Crisis of 2008-09.

et al find the estimated cash flow sensitivity of cash is significantly positive for financially constrained firms and statistically insignificant for unconstrained firms. In a global study of cash flow sensitivity to cash, Kusnadi and Wei find that financially constrained firms exhibit a higher cash flow sensitivity of cash only in firms from countries with weak legal protection of investors. Erel et al examine if the cash flow sensitivity of cash impacts whether small, European merger targets were constrained prior to being acquired and if the constraints were relieved by the acquisition.

A third stream of liquidity management literature focuses on the market value of cash. Both Faulkender and Wang (2006) and Pinkowitz and Williamson (2006) estimate the market value of firm's cash by regressing excess market returns (proxy for market value of firm) on cash holdings. Both studies find that the marginal value of cash is higher for financially constrained firms than for unconstrained firms. Pinkowitz, Stulz, and Williamson (2006) verify these findings using international data from 35 countries. Denis and Sibilkov (2010) find that higher cash holdings are associated with greater investment for constrained firms and that investment is more positively associated with value in constrained firms relative to unconstrained firms.

A few recent studies have emphasized the importance of credit lines as part of a firm's overall liquidity. Sufi (2009), using a sample of 300 COMPUSTAT firms, finds that without credit lines have greater cash flow sensitivity. Lins, Servaies and Tufano (2010) survey CFOs from 29 countries and find that managers use cash as a way to hedge against negative cash flow shocks, while credit lines are used to enhance their firm's ability to exploit future business

opportunities. Kahle and Stulz (2013) use the Sufi approach to construct a random sample of 300 firms as of the second quarter of 2007 to examine the importance of credit line drawdowns during the recent financial crisis. Acharya, Almeida, and Campello (2013) provides theoretical predictions that the most efficient allocation of liquidity is one in which the firms with idiosyncratic liquidity risk use credit lines, while firms with liquidity risks that is highly correlated with aggregate liquidity shocks use cash in addition to credit lines. The importance of credit lines as part of a firm's liquidity motivates this study.

Several of the preceding studies indicate that holding more liquid assets for financially constrained firms is a value-enhancing response to costly external financing. Our study brings together elements from these streams of literature. We develop four hypotheses that link firm outcomes to the liquidity index, our measure of liquidity that includes cash, cash equivalents, as well as credit lines.

Endogeneity is a major concern for most corporate studies. To help mitigate the impact of endogeneity and reduce bias, for robustness we apply a well-developed dynamic panel generalized method of moments (GMM) methodology (Arrellano & Bond, 1991). We follow procedures for implementing a dynamic panel model recommended by Wintoki, Linck, and Netter (2012). Wintoki et al. (2012) uses a dynamic panel model to analyze the dynamics of internal corporate governance with specific instructions on implementing the methodology.

Our first hypothesis arises from the pecking order theory by Myers and Majluf (1984) that suggests external financing is more costly than internal funds. Minton and Schrand (1999)

shows that higher cash flow volatility (a component of liquidity) is associated with an increased likelihood that a firm will need to access external capital markets at higher costs. Since illiquid firms are more likely to require external financing, we hypothesize that illiquidity is negatively related to higher cost of external financing.

H_1: Costs of financing is negatively related to liquidity

John (1993) and DeAngelo, DeAngelo, and Wruck (2002) indicate that appropriate liquidity management can alleviate financial distress, while poor liquidity management may lead to financial distress costs. These costs include, but are not limited to, distressed asset sales and loss of going concern in liquidation (i.e. bankruptcy), thus we hypothesize that illiquidity may lead to financial distress.

H_2: Financial distress is negatively related to liquidity

Myers and Majluf (1984), Fazzari, Hubbard, and Petersen (1988), Minton and Schrand (1999) and Rauh (2006) theorize poor liquidity management leads to underinvestment by firms. More recently, Denis and Sibilkov (2010) find that cash holdings are positively associated with net investment for financially constrained firms; therefore, we hypothesize that illiquidity leads to underinvestment.

H_3: Investment is positively related to liquidity

Haushalter, Klasa, and Maxwell (2007) and Fresard (2010) document that liquidity management and product market behavior interacts. Fresard (2010) find that firms with more

cash tend to gain market share. Haushalter, Klasa, and Maxwell (2007) show that product market considerations influence cash management and hedging policies since the risk of predation encourages firms to save and hedge with derivatives. These papers suggest that illiquidity will adversely affect the competitive advantage of a firm, providing the rationale for our fourth and final hypothesis.

H_4: Competitive advantage is positively related to liquidity

DATA AND EMPIRICAL MODELS

The initial sample includes all Compustat firms, excluding financial service and utility firms. The computation of our liquidity index requires detailed credit line data that is obtained from Standard and Poor's Capital IQ (S & P) database. Capital IQ data includes information on bond issuances, long-term fixed-rate obligations, variable-rate obligations, commercial paper, credit facilities, and other obligations. Specifically we focus on the line of credit data from Capital IQ that is available for the past 12 years (2002 – 2013) for COMPUSTAT firms. Other firm characteristics are collected from COMPUSTAT and CRSP. Additionally, interest rate and market returns data were obtained from Ken French's website.[6] The final sample consists of an unbalanced panel of approximately 24,000 firm-year observations for over 3500 firms.[7] Appendix 1 provides definitions of key variables.

Appendix 2 presents descriptive statistics of our sample. The average firm in our sample has just over $5 billion in assets, $540 million in cash, and a liquidity index of 2.224. Panels A-D in Appendix 3 presents Spearman correlations between the various dependent variables, liquidity variables, and control variables. None of the correlations indicate multicollinearity concerns.

Equation (1) tests H_1: cost of financing is negatively related and the liquidity index.

[6] Ken French graciously provides data on the book-to-market and size portfolio breakpoints and returns (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

[7] The number of firm-years and firms varies for each model since some of the dependent variables require lags and/or have missing values.

$$WACC_{i,t} = \beta_o + \beta_1 logLIQ_{i,t} + \beta_2 logMCAP_{i,t} + \beta_3 logBM_{i,t} + \beta_4 BLEV_{i,t} + \beta_5 OROE_{i,t} + \beta_6 FA\_TA_{i,t} + \beta_7 RD\_TA_{i,t} + \beta_8 DIVDUM_{i,t} + \beta_j TimeandIndEffects_{j,t} + \epsilon_{i,t}, \quad (1)$$

where $WACC_{i,t}$ is the firm cost of capital financing for period t, $logLIQ_{i,t}$ is the sum of cash, cash equivalents, and available credit divided by cash volatility, where cash volatility is the quarterly standard deviation of cash and cash equivalents. $logMCAP_{i,t}$ is firm market capitalization and $logBM_{i,t}$ is book-to market control for firm size. $BLEV_{i,t}$ is book leverage and $DIVDUM_{i,t}$ is a dummy variable equal to 1 for firms that pay dividends control for financial policies. $OROE_{i,t}$ is operating return on equity computed by dividing earnings before interest and taxes (EBIT) by equity controls for profitability. $FA\_TA_{i,t}$ is fixed assets-to-total assets and $RD\_TA_{i,t}$ is research and development expenditures-to-total assets control for investment policies. Control variables are based on the findings of Opler et al (1999), and are used in a recent study on the cost of capital by Ortiz-Molina and Phillips (2014).

$WACC_{i,t}$ is the weighted average cost of debt and equity. To calculate the weights of debt and equity, we use the book value of long-term debt plus long term lease obligations added to the market value of equity as the denominator. The cost of debt is estimated as actual interest expense divided by long-term debt and leases. The cost of equity is estimated using the Fama-MacBeth (1973) approach with rolling betas estimated from monthly stock returns for the preceding three years. Equation (1) isolates the relation between liquidity and the cost of capital while controlling for firm size, financial policy, earnings, investment policy, and dividend

policy. It also includes fixed effects for time and industry (Fama and French, 1997). We expect a negative relation between $logLIQ_{i,t}$ and $WACC_{i,t}$.

Equation (2) tests H_2: financial distress is negatively related to liquidity.

$$ALTZ_{i,t} = \alpha_o + \alpha_1 logLIQ_{i,t} + \alpha_2 logMCAP_{i,t} + \alpha_3 logBM_{i,t} + \alpha_4 BLEV_{i,t} + \alpha_5 OROE_{i,t} + \alpha_6 FA\_TA_{i,t} + \alpha_7 RD\_TA_{i,t} + \alpha_8 DIVDUM_{i,t} + \alpha_j TimeandIndEffects_{j,t} + \epsilon_{i,t}, \quad (2)$$

where $ALTZ_{i,t}$ is our modified Altman (1968) Z-score, $logLIQ_{i,t}$ and the control variables are defined above. Financial distress is measured with a modified Altman (1968) Z-score[8]. The basic Altman Z-score is based on five financial ratios, including working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, market value of equity to total liabilities, and sales to total assets. Our modified Altman Z-score equation:

$$Z = 1.2\left(\frac{Net\ Working\ Capital - Cash}{Total\ Assets}\right) + 1.4\left(\frac{Retained\ Earnings}{Total\ Assets}\right) + 3.3\left(\frac{EBIT}{Total\ Assets}\right) + 0.6\left(\frac{Market\ Value\ of\ Equity}{Book\ value\ of\ total\ liabilities}\right) + 0.99\left(\frac{Sales}{Total\ Assets}\right) \quad (3)$$

Firms with a lower score would be more prone to experience financial distress. To decrease potential collinearity issues, our modified Altman Z uses net assets instead of total assets, where net assets equal total assets minus cash and markeappendix securities. Cash and markeappendix securities are also removed from net working capital. In a 1998 study on the determinants of corporate liquidity, Kim, Mauer, and Sherman measure financial distress using a modified

[8] Altman Z-score (1978) formula: Z=1.2(working capital-to-total assets)+1.4(retained earnings-to-total assets)+3.3(EBIT-to-total assets)+0.6(market value of equity-to-book value of total liabilities)+0.99(Sales-to-total assets)

Altman's Z-score that excludes the net working capital term. Equation (2) isolates the relation between liquidity and financial distress controlling for firm size, financial policy, earnings, investment policy, and dividend policy. It includes fixed effects for time and industry (Fama and French, 1997). We expect a positive relation between $logLIQ_{i,t}$ and $ALTZ_{i,t}$.

Equation (3) tests H_3: investment is positively related to liquidity.

$$CAPX_{TA_{i,t}}\ (or\ RD_{TA_{i,t}}) = \gamma_o + \boldsymbol{\gamma_1 logLIQ_{i,t}} + \gamma_2 logMCAP_{i,t} + \gamma_3 logBM_{i,t} + \gamma_4 BLEV_{i,t} + \gamma_5 OROE_{i,t} + \gamma_6 FA_{TA_{i,t}} + \gamma_7 RD_{TA_{i,t}}\ (or\ CAPX_{TA_{i,t}}) + \gamma_8 DIVDUM_{i,t} + \gamma_j TimeandIndEffects_{j,t} + \epsilon_{i,t}, \quad (4)$$

where $CAPX\_TA_{i,t}$ is capital expenditures-to-net assets, $RD\_TA_{i,t}$ is research and development expenditures-to-total assets, $logLIQ_{i,t,}$ and the control variables are defined above. $CAPX\_TA_{i,t}$ and $RD\_TA_{i,t}$ are proxies for underinvestment. Equation (4) isolates the relation between liquidity and underinvestment controlling for firm size, financial policy, earnings, investment policy, and dividend policy. We also include fixed effects for time and industry (Fama and French, 1997). We expect a positive relation between $logLIQ_{i,t}$ and $CAPX\_TA_{i,,t}$.

Equation (4) tests H_4: competitive advantage is positively related to liquidity.

$$MSHARE_{i,t} = \delta_o + \boldsymbol{\delta_1} logLIQ_{i,t} + \delta_2 logMCAP_{i,t} + \delta_3 logBM_{i,t} + \delta_4 BLEV_{i,t} + \delta_5 OROE_{i,t} + \delta_6 FA\_TA_{i,t} + \delta_7 RD\_TA_{i,t} + \delta_8 DIVDUM_{i,t} + \delta_j TimeandIndEffects_{j,t} + \epsilon_{i,t}. \quad (5)$$

where $MSHARE_{i,t}$ is the firm's share of the industry revenues, $logLIQ_{i,t}$ and the control variables are defined above. Firm competitiveness is primarily proxied by firm market share

(*MSHARE*)[9]. Industry designations are based on Fama & French (1997) industry definitions. Alternate proxies, annual revenue growth ($REV\_G_{i,t}$) and profitability ($OROA_{i,t}$) are also examined. Equation (5) isolates the relation between liquidity and competitiveness controlling for firm size, financial policy, earnings, investment policy, and dividend policy. We also includes fixed effects for time and industry (Fama and French, 1997). We expect a positive relation between $logLIQ_{i,t}$ and $MSHARE_{i,,t.}$.

We also use an alternative, and more traditional measure of liquidity: cash & markeappendix securities-to-net assets ($CASH\_TA_{i,t}$) in our tests. Spearmen correlations and the multivariate models suggest that our liquidity index, $logLIQ_{i,t}$, and $CASH\_TA_{i,t}$ are measuring different aspects of firm liquidity. Three of the Spearmen correlations between $logLIQ_{i,t}$ and $CASH\_TA_{i,t}$ found in Appendix 3 (Panels B, C, & D) are a statistically significant -0.21. This is a strong indication that our measure is a different measure of liquidity than used in previous studies. The negative relation potentially arises from the negative relation between cash volatility, the denominator of our liquidity index, and the level of cash.[10] Another possible explanation is the potential substitution effect between cash and credit lines that is captured by our liquidity index, but not $CASH\_TA_{i,t}$. Multi-variate results indicate that $logLIQ_{i,t}$ and $CASH\_TA_{i,t}$ capture different aspects of firm liquidity.

[9] Irvine & Pontiff (2009) uses market share as a proxy for firm competitiveness.
[10] Han & Qiu (2007) show that financially constrained firms increase their cash holdings in response to cash flow volatility.

Corporate finance models that link firm performance/outcomes to other firm variables are often subject to endogeneity. We need to determine if the observed relations are driven by liquidity or if the variables influence firms' liquidity positions, all while controlling for other possible determinants. To help mitigate the impact of endogeneity and reduce bias, we apply a well-developed dynamic panel generalized method of moments (GMM) methodology. (Arrellano & Bond, 1991) This method obtains consistent parameter estimates by using instruments that come from the orthogonality conditions existing between the lagged values of the endogenous variables and the disturbance terms.

EMPIRICAL RESULTS

In Appendix 4 we relate the various dependent variables to our liquidity index using univariate tests. We sort the total sample into quintiles (deciles) based on the liquidity index, where Q1 denotes lowest liquidity and Q5 (Q10) denotes highest liquidity quintile (decile). Most of the differences are significant, providing initial support for our hypotheses that liquidity is related to a firm's cost of capital, financial distress, underinvestment and competitiveness. Figure 1 shows the average level of outcome/performance by liquidity index quintile. The graphs provide a clear picture of the difference in firm performance at the different levels of liquidity, especially between quintiles 1 and 5.

The Q1-Q5 spread for *WACC* is an economically significant -1.127% indicating that illiquid firms payer have a higher cost of capital. The Altman Z-score is almost five times lower for firms in Q1 relative to Q5 which suggest that our liquidity index is strongly related to financial distress. Capital expenditures and research & development expenditures are higher for the least liquid firms suggesting that these firms spend a larger percentage of their net assets on these expenditures resulting in lower liquidity. This does not support our hypothesis that illiquid firms underinvest. Market share and profits are significantly larger for more liquid firms. Q5 firms' market share (profits) are 6.627 (24.587) percentage points higher than Q1 firms. This supports the hypothesis that illiquid firms have a competitive disadvantage relative to more liquid firms. Multivariate Analysis

Multivariate analysis provides additional evidence of the relation between illiquidity and various firm characteristics[11]. Appendix 5 provides support for our first hypothesis that the cost of capital is higher for illiquid firms holding other factors constant. This result implies illiquid firms will require more costly external funds providing support for Myers and Majluf's (1984) pecking order theory. L*ogLIQ*$_{i,t}$, is negative and significant supporting using our alternative measure of liquidity. We find the traditional measure of liquidity (*CASH_TA*$_{i,t}$) is positively significant. This difference is potentially explained by previous findings that indicate financially constrained firms tend to hold more cash. Additionally, firms with higher book-to-market, more financial leverage, more fixed assets, and that pay dividends experience lower capital costs (*WACC*$_{i,t}$).

Appendix 6 displays results supporting for the hypothesis that poor liquidity management leads to financial distress cost as indicated by John (1993) and DeAngelo, DeAngelo, and Wruck (2002). L*ogLIQ*$_{i,t}$ is positive and significant at the 5% level and the significantly positive coefficient of *CASH_TA*$_{i,t}$ reinforces the hypothesis that illiquid firms have more financial distress. The results in this appendix also indicate that smaller and less profiappendix firms are more financially distressed, while less financially distressed firms spend more on research and development and pay dividends.

[11] All regressions are run using pooled OLS with standard errors that are corrected for heteroskedasticity and firm-level clustering.

Appendix 7 tests our third hypothesis that capital expenditures are positively related to liquidity. Interestingly our results indicate capital expenditures are not significantly related to our measure of liquidity; however, R & D expenditures are negative and significantly related to liquidity. More liquid firms are spending a smaller percentage of net assets on research and development. Thus we reject the hypothesis of a positive relation between liquidity and investment, but we cannot conclude that liquidity is unrelated to investment. Capital expenditures are inversely related to size and dividend payouts and directly related to fixed assets. Research and development spending is negatively related to size, profitability, and fixed assets and positively related to leverage and capital expenditures.

Appendix 8 reports results for hypothesis four that a firm's competitive advantage is negatively related to liquidity. Our results are consistent with Fresard (2010) who finds that firms with more cash tend to gain market share. Market share is not significantly related to the liquidity index; however, revenue growth is negatively related and profitability is positively related. These results support that lower liquidity firms correspond with higher revenue growth which is consistent with the fact that high growth firms tend to have liquidity issues. The positive relation between profits and liquidity confirms the univariate results that illiquid firms are the least profiappendix firms. Market share is positively related to size and leverage, but negatively related to fixed asset levels and dividend payouts. Revenue growth is negatively related to size and positively related to fixed asset levels, research and development spending, and dividend payouts. Profitability is positively related to size and dividend payouts, but negatively related to fixed asset levels.

Finally we present our analysis using a dynamic panel GMM estimator. Previous research by Glen, Lee, and Singh (2001), Gschwandtner (2005) and, Wintoki, et. al. (2012) suggests that two lags are sufficient to ensure dynamic completeness, thus we use two lags[12] of our dependent variables and potential endogenous independent variables. Results from this methodology strengthen our above findings for the relation between capital expenditures, market share, profitability and liquidity. However no relation is found between cost of capital or financial distress and liquidity. Liquidity has a positively significant impact on capital expenditures, market share, and profitability.

[12] Similar results were produced with lag periods of 1 & 3.

CONCLUSION

We examine the impact of illiquidity on cost of financing, financial distress, underinvestment, and competitive advantage in the product markets. An important contribution of this study is that our liquidity index is a more comprehensive liquidity measure than used in previous studies. Our measure more effectively assesses long-term solvency since a lower (higher) index indicates that a firm is more (less) likely to become insolvent.

We hypothesize that illiquidity is related to a higher cost of capital, higher financial distress, underinvestment, and a competitive disadvantage in the product markets. Our univariate results provide support all our hypotheses, except the relation between liquidity and underinvestment. The multivariate results strengthen our conclusions by confirming the relation between our liquidity index and cost of capital, financial distress, and competitive advantage while controlling for other firm characteristics, time, and industry effects. These results are supported by dynamic panel generalized method of moments estimates that control for potential endogeneity issues using lags of the dependent variable of interest and potentially endogenous control variables.

Our results indicate that firm illiquidity has negative economic consequences that managers should consider when determining liquidity management policies. Typically managers focus on minimizing their liquid holdings, which may be fine if the firm has available credit lines, but if not, they need to at least consider the costs of illiquidity.

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LISTS OF APPENDICES

APPENDIX 1: DEFINITION OF KEY VARIABLES

Variable	*Definition*
logLIQ	The natural log of the liquidity index; Liquidity index is the sum of cash & market securities (CHE) and available line of credit divided by volatility of cash.
TA	Net assets is total assets minus cash & markeappendix securities: (AT – CHE)
CASH_TA	Cash & markeappendix securities (CHE) scaled by net assets (TA)
WACC	The weighted average cost of debt and equity. The denominator for the weights are the book value of long-term debt plus long term lease obligations added to the market value of equity, with the weight of debt computed as the fraction of the total from debt and the weight of equity is the fraction of the total from equity. The cost of debt is estimated as interest expense divided by long-term debt and leases. The cost of equity is estimated using CAPM.
ALTZ	The Altman Z-score is based on five financial ratios, including working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, market value of equity to total liabilities, and sales to total assets. To decrease potential collinearity issues, our modified Altman Z uses net assets. Cash and markeappendix securities is removed from net working capital.
DIFDVC_NETAT	The change in dividends (DVC) scaled by net assets (TA)
CAPX_TA	Capital expenditures (CAPX) scaled by net assets (TA)
RD_TA	Research and development (XRD) expenditures scaled by net assets (TA)
MSHARE	Firm market share: (Percent of industry revenues)
REV_G	The logarithm of the growth rate of annual revenues (REVT)
OROA	Operating return on assets: EBIT (EBIT) divided by net assets (TA)
logMCAP	The logarithm of firm market capitalization: (CSHPRI*PRCC_F)
logBM	The logarithm of the book-to-market ratio: [(BKVLPS*CSHO)/MCAP]
BLEV	Book leverage (DLTT) scaled by net assets (TA)
OROE	Operating return on book equity: EBIT divided by equity (EBIT/CEQ)
FA_TA	Fixed assets (AT-ACT) scaled by net assets (TA)
DIVDUM	A dummy variable equal to 1 if the firm pays dividends and 0 otherwise.

Appendix I. Definition of Key Variables

APPENDIX 2: SUMMARY STATISTICS

Variable	*Mean*	*Std. Dev.*	*Min*	*5th %*	*Median*	*95th %*	*Max*
logLIQ	2.224	1.250	-0.693	0.398	2.120	4.355	12.398
CASH_TA	154.937	4355.50	0	0.541	13.062	216.344	463990.000
*WACC (%)**	13.800	12.086	0.003	0.448	10.011	39.189	49.997
ALTZ	-3.013	215.605	-36795.890	-18.343	2.964	13.194	4723.760
DIVDIF	-0.013	2.436	-438.840	-0.003	0	0.014	28.714
CAPX_TA (%)	7.117	10.918	-33.937	0.543	4.229	23.383	1245.080
RD_TA (%)	37.518	287.127	-87.965	0	4.322	133.662	36111.430
MSHARE (%)	10.678	21.088	-0.055	0.005	1.433	61.210	100.000
OROA	-10.556	1128.09	-234800.000	-51.530	5.920	21.505	878.544
REV_G	2.928	2.427	-7.851	0.261	2.650	6.327	18.378
logMCAP	19.112	4.121	-2.952	7.940	19.821	23.760	27.059
lobBM	-0.748	0.946	-8.993	-2.240	-0.708	0.620	12.211
BLEV	28.167	282.048	0.000	0.000	15.327	74.601	57054.030
FA_TA	62.728	23.025	0	20.488	65.210	94.887	100.000
OROE	-125575.000	3268.960	-125575.000	-96.386	13.538	74.543	551925.000
DIVDUM	0.317	0	0	0	0	1	1

Appendix 2 reports summary statistics for the measures of the liquidity, weighted average cost of capital, Altman Z-score, dividend change, capital expenditures, research and development expenditures, firm market share, operating return on assets, and revenue growth rates, and the control variables. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_TA* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *WACC* is the weighted average cost of capital; *ALTZ* is the Altman (1968) Z-score of financial distress; *DIVDIF* is the annual dividend change; *CAPX_TA* is capital expenditures scaled by net assets; *RD_TA* is research and development expenses scaled by net assets; MSHARE is firm's market share, calculated as percentage of industry revenues; *OROA* is operating return on assets, which is earnings before interest and taxes divided by net assets; *REV_G* is annual growth rate of sales; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *FA_TA* is fixed assets scaled by net assets; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *DIVDUM* is a dummy variable equal to one if firm pays dividends, and 0 otherwise.

*Trimmed (Removed negative values and values above 95th percentile)

APPENDIX 3: SPEARMEN CORRELATIONS

Panel A. Correlations between WACC, liquidity measures, and control variables.											
	WACC	*LogLIQ*	*CASH_TA*	*LogMCAP*	*LogBM*	*BLEV*	*OROA*	*OROE*	*FA_TA*	*RD_TA*	*DIVDUM*
WACC	1.0										
LogLIQ	**-0.022**	1.0									
CASH_TA	**0.157**	**-0.316**	1.0								
LogMCAP	**0.096**	**0.186**	0.006	1.0							
LogBM	**-0.094**	**0.095**	**-0.219**	**-0.334**	1.0						
BLEV	**-0.142**	**-0.029**	**-0.132**	**0.066**	**-0.086**	1.0					
OROA	**-0.43**	**0.201**	**-0.137**	**0.462**	**-0.307**	**-0.063**	1.0				
OROE	**-0.076**	**0.125**	**-0.163**	**0.366**	**-0.341**	**0.140**	**0.696**	1.0			
FA_TA	**-0.061**	**-0.042**	**-0.150**	**0.235**	**-0.021**	**0.341**	**-0.039**	**-0.012**	1.0		
RD_TA	**0.135**	**-0.206**	**0.571**	**-0.075**	**-0.249**	**-0.031**	**-0.364**	**-0.296**	*-0.021*	1.0	
DIVDUM	**-0.045**	**0.197**	**-0.167**	**0.466**	**-0.059**	-0.008	**0.353**	**0.294**	**0.094**	**-0.248**	1.0

*Bold and italicized values are significant at the 1.0% and 5.0% level, respectively, otherwise not significantly different than zero.

Panel B. Correlations between ALTZ, liquidity measures, and control variables.											
	ALTZ	*LogLIQ*	*CASH_TA*	*LogMCAP*	*LogBM*	*BLEV*	*OROA*	*OROE*	*FA_TA*	*RD_TA*	*DIVDUM*
ALTZ	1.0										
LogLIQ	**0.169**	1.0									
CASH_TA	**0.131**	**-0.209**	1.0								
LogMCAP	**0.297**	**0.257**	**-0.049**	1.0							
LogBM	**-0.224**	**0.090**	**-0.229**	**-0.319**	1.0						
BLEV	**-0.373**	**0.040**	**-0.319**	**0.166**	**-0.024**	1.0					
OROA	**0.584**	**0.225**	**-0.198**	**0.467**	**-0.254**	**0.038**	1.0				
OROE	**0.285**	**0.137**	**-0.237**	**0.362**	**-0.261**	**0.189**	**0.698**	1.0			
FA_TA	**-0.239**	**-0.034**	**-0.195**	**0.225**	**-0.021**	**0.353**	**-0.027**	**0.004**	1.0		
RD_TA	**-0.221**	**-0.189**	**0.643**	**-0.203**	**-0.249**	**-0.187**	**-0.446**	**-0.349**	**-0.119**	1.0	
DIVDUM	**0.201**	**0.207**	**-0.221**	**0.422**	**-0.045**	**0.099**	**0.372**	**0.320**	**0.094**	**-0.304**	1.0

*Bold and italicized values are significant at the 1.0% and 5.0% level, respectively, otherwise not significantly different than zero.

Panel C. Correlations between capital expenditures, research and development expenditures, liquidity measures, and control variables											
	CAPX_TA	*RD_TA*	*LogLIQ*	*CASH_TA*	*LogMCAP*	*LogBM*	*BLEV*	*OROA*	*OROE*	*FA_TA*	*DIVDUM*
CAPX_TA	1.0										
RD_TA	*-0.015*	1.0									
LogLIQ	**0.013**	**-0.189**	1.0								
CASH_TA	**0.075**	**0.643**	**-0.209**	1.0							
LogMCAP	**0.142**	**-0.203**	**0.257**	**-0.049**	1.0						
LogBM	**-0.149**	**-0.249**	**0.090**	**-0.229**	**-0.319**	1.0					
BLEV	**0.036**	**-0.187**	**0.040**	**-0.319**	**0.166**	**-0.024**	1.0				
OROA	**0.094**	**-0.446**	**0.225**	**-0.198**	**0.467**	**-0.254**	**0.038**	1.0			
OROE	**0.040**	**-0.349**	**0.137**	**-0.237**	**0.362**	**-0.261**	**0.189**	**0.698**	1.0		
FA_TA	**0.219**	**-0.119**	**-0.034**	**-0.195**	**0.225**	**-0.021**	**0.353**	**-0.027**	**0.004**	1.0	
DIVDUM	**0.057**	**-0.304**	**0.207**	**-0.221**	**0.422**	**-0.045**	**0.099**	**0.372**	**0.320**	**0.094**	1.0

*Bold and italicized values are significant at the 1.0% and 5.0% level, respectively, otherwise not significantly different than zero.

Panel D. Correlations between market share, profitability, liquidity measures, and control variables											
	MSHARE	*OROA*	*LogLIQ*	*CASH_TA*	*LogMCAP*	*LogBM*	*BLEV*	*OROE*	*FA_TA*	*RD_TA*	*DIVDUM*
MSHARE	1.0										
OROA	**0.457**	1.0									
LogLIQ	**0.253**	**0.225**	1.0								
CASH_TA	**-0.348**	**-0.198**	**-0.209**	1.0							
LogMCAP	**0.489**	**0.467**	**0.257**	**-0.049**	1.0						

LogBM	**0.039**	**-0.253**	**0.090**	**-0.229**	**-0.319**	1.0					
BLEV	**0.209**	**0.038**	**0.040**	**-0.319**	**0.166**	**-0.024**	1.0				
OROE	**0.376**	**0.698**	**0.137**	**-0.237**	**0.362**	**-0.261**	**0.189**	1.0			
FA_TA	**-0.036**	**-0.027**	**-0.034**	**-0.195**	**0.225**	**-.021**	**0.353**	0.004	1.0		
RD_TA	**-0.538**	**-0.446**	**-0.189**	**-0.643**	**-0.203**	**-0.249**	**-0.187**	**-0.349**	**-0.119**	1.0	
DIVDUM	**0.412**	**0.372**	**0.207**	**-0.221**	**0.422**	**-0.045**	**0.099**	**0.320**	**0.094**	**-0.304**	1.0

*Bold and italicized values are significant at the 1.0% and 5.0% level, respectively, otherwise not significantly different than zero.

APPENDIX 4: UNIVARIATE TESTS OF ILLQUIDITY

		Liquidity Quintile				*Liquidity Decile*			
	Variable	*Q1*	*Q5*	*Q5-Q1*	*p-value*	*Q1*	*Q10*	*Q10-Q1*	*p-value*
H1	*WACC*	13.884	12.757	-1.127	0.000	13.654	12.338	-1.316	0.000
H2	*ALTZ*	-23.365	5.883	29.248	0.000	-38.671	8.668	47.339	0.000
	DIVDIF	-0.042	-0.000	-0.042	0.115	-0.088	0.001	0.089	0.000
H3	*CAPX_TA*	8.563	6.728	-1.835	0.000	9.150	6.944	-2.206	0.000
	RD_TA	87.737	9.067	-78.670	0.000	105.652	6.558	-99.094	0.000
	MSHARE	6.791	13.418	6.627	0.000	6.078	14.025	7.947	0.000
H4	*REV_G*	3.874	2.476	-1.398	0.000	4.356	2.456	-1.900	0.000
	OROA	-17.221	7.366	24.587	0.000	-30.556	7.183	37.739	0.000

Appendix 4 reports the average weighted average cost of capital, Altman Z-score, dividend change, capital expenditure, research and development expenditure, market share, revenue growth rate, and operating return on assets by liquidity quintile and decile. The p-value columns report the p-value corresponding to the test of the difference in means between Q1 and Q5 and Q1 and Q10. *WACC* is the weighted average cost of capital; *ALTZ* is the Altman (1968) Z-score of financial distress; *DIVDIF* is the annual dividend change; *CAPX_TA* is capital expenditures scaled by net assets; *RD_TA* is research and development expenses scaled by net assets; *MSHARE* is firm's market share, calculated as percentage of industry revenues; *OROA* is operating return on assets, which is earnings before interest and taxes divided by net assets; *REV_G* is annual growth rate of sales.

APPENDIX 5: LIQUIDITY AND THE COST OF CAPITAL

Independent Variables	*1* *(WACC)*	*2* *(WACC)*	*3* *(WACC)*	*4* *(WACC)*
logLIQ	-0.419***	-0.419***		
	[0.000]	[0.000]		
CASH_TA			0.412***	0.412***
			[0.000]	[0.000]
logMCAP	0.180***	0.180***	0.155**	0.155***
	[0.006]	[0.000]	[0.017]	[0.001]
logBM	-0.885***	-0.885***	-0.948***	-0.948***
	[0.000]	[0.000]	[0.000]	[0.000]
BLEV	-0.924***	-0.924***	-1.594***	-1.594***
	[0.002]	[0.000]	[0.000]	[0.000]
OROE	-0.035	-0.035	-0.038	-0.038
	[0.292]	[0.290]	[0.262]	[0.260]
FA_TA	-1.569**	-1.569***	-0.989	-0.989*
	[0.022]	[0.003]	[0.151]	[0.060]
RD_TA	0.000	0.000	-0.000	-0.000
	[0.792]	[0.743]	[0.545]	[0.564]
DIVDUM	-2.482***	-2.482***	-2.572***	-2.572***
	[0.000]	[0.000]	[0.000]	[0.000]
CONSTANT	5.906***	5.906***	5.422***	5.422***
	[0.001]	[0.000]	[0.001]	[0.000]
Observations	12,428	12,428	12,428	12,428
R-squared	0.538	0.538	0.540	0.540
Firm Fixed Effects	YES	NO	YES	NO
Time dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES

Appendix 5 presents the fixed effects regressions estimating the relation between cost of capital and liquidity for a sample of publicly-traded firms. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_TA* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *FA_TA* is fixed assets scaled by net assets; *RD_TA* is research and development expenses scaled by net assets; *DIVDUM* is a dummy variable equal to one if firm pays dividends, and 0 otherwise. All models include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. P-values appear in brackets. For brevity, the annual time dummies and industry dummies are not presented. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 6: LIQUIDITY AND FINANCIAL DISTRESS

Independent Variables	*1* *(ALT-Z)*	*2* *(ALT-Z)*	*3* *(ALT-Z)*	*4* *(ALT-Z)*
logLIQ	0.601**	0.601**		
	[0.024]	[0.018]		
CASH_TA			0.007*	0.007*
			[0.055]	[0.085]
logMCAP	2.679***	2.679***	2.680***	2.680***
	[0.000]	[0.000]	[0.000]	[0.000]
logBM	-1.271	-1.271	-1.255	-1.255
	[0.399]	[0.308]	[0.409]	[0.319]
BLEV	-0.347	-0.347*	-0.355	-0.355*
	[0.156]	[0.055]	[0.147]	[0.050]
OROE	0.002***	0.002***	0.002***	0.002***
	[0.005]	[0.005]	[0.007]	[0.007]
FA_TA	0.104	0.104	0.120	0.120*
	[0.255]	[0.129]	[0.197]	[0.075]
RD_TA	-0.095***	-0.095***	-0.106***	-0.106***
	[0.000]	[0.000]	[0.000]	[0.000]
DIVDUM	-4.621***	-4.621***	-4.168**	-4.168***
	[0.009]	[0.000]	[0.017]	[0.000]
CONSTANT	-7.285	-7.285	-14.212**	-14.212***
	[0.555]	[0.543]	[0.021]	[0.006]
Observations	24,684	24,684	24,684	24,684
R-squared	0.302	0.302	0.308	0.308
Firm Fixed Effects	YES	NO	YES	NO
Time dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES

Appendix 6 presents the fixed effects regressions estimating the relation between the Altman Z-score and liquidity for a sample of publicly-traded firms. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_TA* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *FA_TA* is fixed assets scaled by net assets; *RD_TA* is research and development expenses scaled by net assets; *DIVDUM* is a dummy variable equal to one if firm pays dividends, and 0 otherwise. All models include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. P-values appear in brackets. For brevity, the annual time dummies and industry dummies are not presented. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 7: LIQUIDITY AND UNDERINVESTMENT

Independent Variables	*1 (CAPX_TA)*	*2 (CAPX_TA)*	*3 (CAPX_TA)*	*4 (CAPX_TA)*	*5 (RD_TA)*	*6 (RD_TA)*	*7 (RD_TA)*	*8 (RD_TA)*
logLIQ	-0.018	-0.018			-6.942***	-6.942***		
	[0.772]	[0.657]			[0.001]	[0.001]		
CASH_TA			0.000	0.000			0.161	0.161
			[0.242]	[0.237]			[0.203]	[0.203]
logMCAP	-0.049	-0.049*	-0.054	-0.054**	-5.503***	-5.503***	-6.188***	-6.188***
	[0.270]	[0.063]	[0.236]	[0.047]	[0.000]	[0.000]	[0.000]	[0.000]
logBM	-1.139***	-1.139***	-1.147***	-1.147***	-4.518*	-4.518**	-7.706***	-7.706***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.052]	[0.035]	[0.000]	[0.000]
BLEV	0.000	0.000	-0.000	-0.000	0.803***	0.803***	0.429	0.429
	[0.934]	[0.924]	[0.931]	[0.922]	[0.000]	[0.000]	[0.208]	[0.222]
OROE	0.000	0.000	0.000	0.000	-0.007***	-0.007***	-0.007***	-0.007***
	[0.829]	[0.824]	[0.854]	[0.850]	[0.003]	[0.002]	[0.001]	[0.001]
FA_TA	0.048***	0.048***	0.049***	0.049***	-0.895***	-0.895***	-0.253	-0.253
	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]	[0.364]	[0.359]
RD_TA	0.002	0.002	0.001	0.001				
	[0.113]	[0.111]	[0.255]	[0.253]				
CAPX_TA					2.785***	2.785***	1.603*	1.603*
					[0.000]	[0.000]	[0.058]	[0.055]
DIVDUM	-1.378***	-1.378***	-1.371***	-1.371***	2.196	2.196	5.727*	5.727*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.332]	[0.155]	[0.087]	[0.069]
CONSTANT	5.476***	5.476***	5.147***	5.147***	69.901***	69.901***	-112.489	-112.489
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.323]	[0.301]
Observations	24,713	24,713	24,713	24,713	24,713	24,713	24,713	24,713
R-squared	0.124	0.124	0.125	0.125	0.077	0.077	0.299	0.299
Firm Fixed Effects	YES	NO	YES	NO	YES	NO	YES	NO
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES

Appendix 7 presents the fixed effects regressions estimating the relation between the capital expenditures, research and development expenditures and liquidity for a sample of publicly-traded firms. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_TA* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *FA_TA* is fixed assets scaled by net assets; *RD_TA* is research and development expenses scaled by net assets; *DIVDUM* is a dummy variable equal to one if firm pays dividends, and 0 otherwise. All models include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. P-values appear in brackets. For brevity, the annual time dummies and industry dummies are not presented. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 8: LIQUIDITY AND COMPETITIVE ADVANTAGE

Independent Variables	*1* *(MSHARE)*	*2* *(MSHARE)*	*3* *(REV_G)*	*4* *(REV_G)*	*5* *(OROA)*	*6* *(OROA)*
logLIQ	0.004		-0.167***		2.074***	
	[0.985]		[0.000]		[0.000]	
CASH_TA		-0.000**		0.001**		0.001
		[0.014]		[0.014]		[0.171]
logMCAP	3.056***	3.059***	-0.037***	-0.055***	5.540***	5.761***
	[0.000]	[0.000]	[0.002]	[0.000]	[0.000]	[0.000]
logBM	1.276***	1.284***	-0.159***	-0.203***	5.116***	5.555***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
BLEV	0.006***	0.007***	0.001	-0.000	-0.000	-0.001
	[0.001]	[0.000]	[0.219]	[0.911]	[0.979]	[0.918]
OROE	-0.000	-0.000	-0.000	-0.000		
	[0.420]	[0.433]	[0.491]	[0.382]		
FA_TA	-0.034**	-0.035**	0.003***	0.005***	-0.198***	-0.205***
	[0.018]	[0.016]	[0.005]	[0.000]	[0.000]	[0.000]
RD_TA	0.001	0.001**	0.002***	0.001**	-0.016	-0.018
	[0.170]	[0.021]	[0.000]	[0.042]	[0.132]	[0.104]
DIVDUM	-0.137***	-0.136***	0.024***	0.022***	1.591**	2.203***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.010]	[0.000]
CONSTANT	1.764	2.126	-0.024	-0.182	-43.219***	-42.476***
	[0.568]	[0.494]	[0.976]	[0.817]	[0.000]	[0.000]
Observations	24,711	24,711	13,908	13,908	24,766	24,766
R-squared	0.303	0.303	0.422	0.418	0.324	0.318
Firm Fixed Effects	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES

Appendix 8 presents the fixed effects regressions estimating the relation between market share, revenue growth, profitability and liquidity for a sample of publicly-traded firms. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_TA* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *FA_TA* is fixed assets scaled by net assets; *RD_TA* is research and development expenses scaled by net assets; *DIVDUM* is a dummy variable equal to one if firm pays dividends, and 0 otherwise. All models include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. P-values appear in brackets. For brevity, the annual time dummies and industry dummies are not presented. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

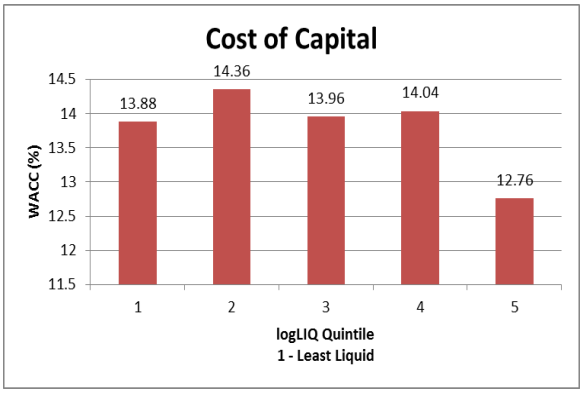
APPENDIX 9: DYNAMIC GMM ESTIMATORS

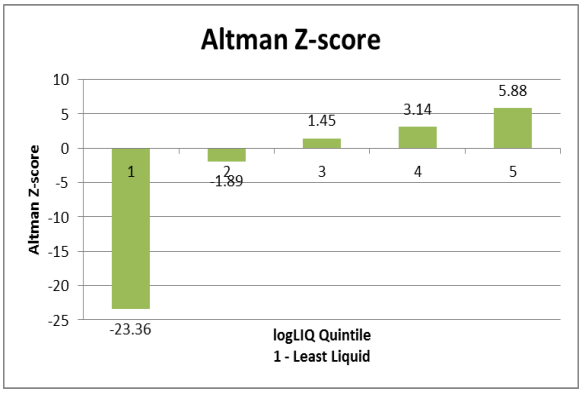
Independent Variables	*1* *(WACC)*	*2* *(ALTZ)*	*3* *(CAPX)*	*4* *(MSHARE)*	*5* *(OROA)*
logLIQ	0.558	-0.278	0.106**	0.074*	0.283***
	[0.140]	[0.102]	[0.034]	[0.097]	[0.009]
logMCAP	16.715***	3.325***	0.036	0.866***	8.329***
	[0.000]	[0.000]	[0.719]	[0.004]	[0.000]
logBM	-5.703	0.271	-0.199*	0.667***	5.355***
	[0.000]	[0.671]	[0.095]	[0.007]	[0.000]
BLEV	0.030	-0.100***	0.004**	0.001	0.004
	[0.972]	[0.003]	[0.076]	[0.244]	[0.709]
OROE	-0.161	-0.000	0.000	-0.000**	
	[0.106]	[0.825]	[0.771]	[0.045]	
FA_TA	20.463***	0.039	-0.011	-0.003	-0.118***
	[0.001]	[0.484]	[0.279]	[0.568]	[0.000]
RD_TA	0.008	-0.157***	0.002	0.000**	-0.34***
	[0.613]	[0.000]	[0.294]	[0.074]	[0.001]
$WACC_{t-1}$	-0.456***				
	[0.000]				
$WACC_{t-2}$	-0.438***				
	[0.000]				
$ALTZ_{t-1}$		0.316***			
		[0.000]			
$ALTZ_{t-2}$		-0.580***			
		[0.000]			
$CAPX_{t-1}$			0.413***		
			[0.000]		
$CAPX_{t-2}$			0.008***		
			[0.701]		
$MSHARE_{t-1}$				0.459****	
				[0.000]	
$MSHARE_{t-2}$				-0.025	
				[0.167]	
$OROA_{t-1}$					-0.020
					[0.682]
$OROA_{t-2}$					0.003
					[0.866]
Observations	5,732	14,067	14,153	14,212	14,210
AR(1) test (p-value)	[0.000]	[0.019]	[0.000]	[0.000]	[0.002]
AR(2) test (p-value)	[0.003]	[0.114]	[0.2755]	[0.495]	[0.025]
Sargan test (p-value)	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

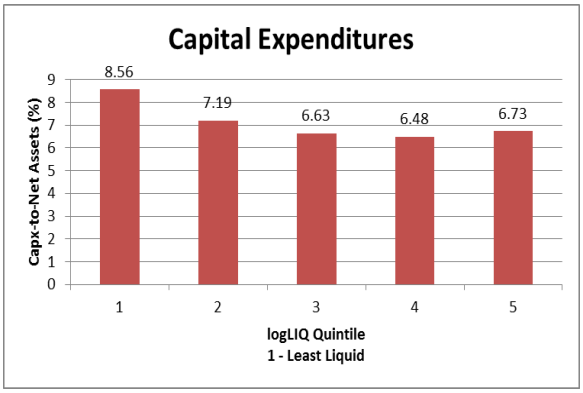
Appendix 9 presents the dynamic GMM estimate of the relation between cost of capital, financial distress, capital expenditures, market share, profitability and liquidity for a sample of publicly-traded firms. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_TA* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *FA_TA* is fixed assets scaled by net assets; *RD_TA* is research and development expenses scaled by net assets; All models include dummies for time. Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. AR(1) and AR(2) are tests for first-order and second order serial correlation, under the null of no serial correlation. The Sargan test of over-identification is under the null that all instruments are valid. P-values appear in brackets. For brevity, the annual time dummies are not presented. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively..

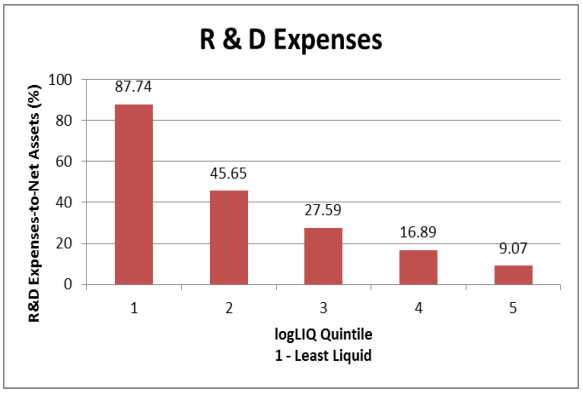
FIGURES

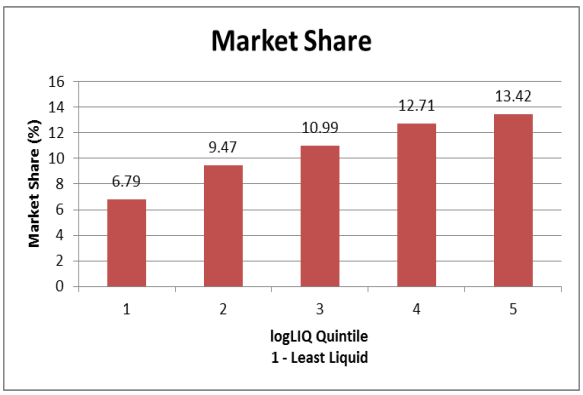
FIGURE 1: UNIVARIATES BY QUINTILE











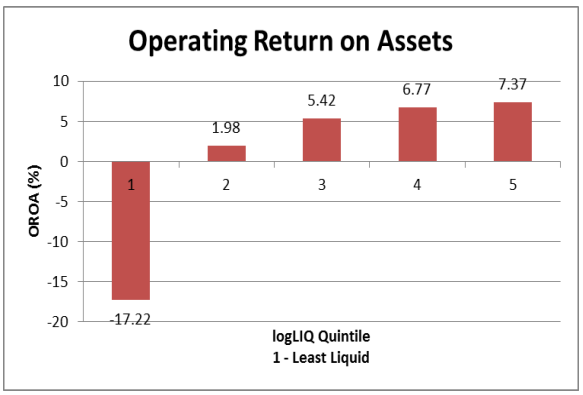


Figure 1 presents univariates of key variables by liquidity quintile. (Quintile 1 contains the least liquid firms. Quintile 5 contains the most liquid firms). logLIQ is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); Cost of capital is the weighted average cost of capital (WACC); Altman Z-score is a modified Altman (1968) Z-score of financial distress; Capital expenditures is capital expenditures scaled by net assets; R & D expenses are research and development expenses scaled by net assets; Market share is firm's market share, calculated as percentage of industry revenues; Operating return on assets is earnings before interest and taxes divided by net assets.

PART 2: LIQUIDITY, CREDIT LINES, AND DIVIDEND PAYOUTS

PART 2

INTRODUCTION

Dividend policy is an important decision in the life of a firm. Graham and Harvey (2001) finds that CFOs consider their decisions regarding dividend distributions to be one of the most important decisions they make. Young firms that are growing quickly and subject to liquidity issues typically choose not to pay dividends. DeAngelo & DeAngelo (2006) find that investors are willing to forgo dividends for potential growth opportunities; however as a firm matures and its growth opportunities begin to decrease, investors expect management to payout excess cash as dividends or stock repurchases.[13] Once the firm begins paying dividends, their continued payment is expected and is priced into a firm's stock (Lintner, 1956). Additionally Lintner hypothesizes that firms that decrease dividends will experience a dramatic decline in stock prices, thus managers are hesitant to changes dividends. Pettit (1972), Ahrony & Swary (1980), Woolridge (1982, 1983), Eades et al. (1985), and Healy & Palepu (1988) show that dividend paying firms that decrease dividend payouts experience price declines. This is why dividends are considered to be "sticky". Given the managers desire to maintain dividends, we investigate if dividend paying firms use credit lines (i.e. lines of credit) to pay dividends when cash is scarce. Brav, Graham, Harvey, and Michaely (2005) finds that maintaining dividend levels in on par with investment decisions and managers only cut dividends in extraordinary circumstances.

[13] Gaver & Gaver (1993)

The stickiness of dividends in reaffirmed in a 2004-05 survey of CFOs by Brav, Graham, Harvey, & Michaely.

Credit lines occupy an unusual space in corporate research. As a short-term liability, credit lines are considered part of a firm's capital structure; whereas recent research considers credit lines as cash substitutes. Sufi (2009), Lins, Servaes, and Tufano (2010) and Kahle and Stulz (2013) provide a strong rationale for including available credit lines in liquidity measures. Since dividend payouts are dependent on firm liquidity, credit lines through their dual role as liquidity substitute and capital structure component provide a link between payout policy and capital structure. We utilize a comprehensive measure of liquidity that combines cash and markeappendix securities as well as available credit lines.[14] Almeida, et al. (2013) conclude that the predominate use of cash and cash equivalents in existing studies has clouded their findings and more comprehensive measures of liquidity should be used in future research. Our liquidity measure is an index based on Emery and Cogger's (1982) lambda[15]. Our liquidity index, $logLIQ_{i,t}$, is the sum of cash, cash equivalents, and available credit divided by cash volatility, where cash volatility is the quarterly standard deviation of cash and cash equivalents. The benefit of this index is it is more effective at assessing solvency since a lower (higher) measure indicates that a firm is more (less) likely to become insolvent (Emery, 1984).

[14] OPSW (1999), Faulkender and Wang (2006), Bates, Kahle, and Stulz (2009), and Pinkowitz, Stulz, and Williamson (2013) all focus on cash and cash equivalents.

[15] Emery and Cogger's lambda is computed as the sum of daily cash & equivalents, available credit lines, and expected cash flow divided by daily standard deviation of cash. Using daily data their lambda can be interpreted as a Z-score that indicates the probability of being illiquid.

Additionally, we investigate DeAngelo, DeAngelo, and Skinner ‘s (2009) hypothesis that there is a link between a firm’s payout policy and its capital structure. They posit that payout policy, especially for firms trying to maintain or establish a managerial reputation for returning cash to investors, is an important determinant of a firm’s ability to raise capital. Due to the potential agency costs associated with excess cash, liquidity from credit lines could help firms mitigate investor concerns, while allowing firms to maintain optimal payouts.

Using a sample of over 5,400 publicly traded firms we find that there is a positive relation between firm liquidity and dividend payouts. We also find a significant positive relation between credit line balances and dividends for cash constrained dividend paying firms. Additionally, trend analysis indicates that dividend paying firms consistently utilize credit lines, with a noappendix increase in credit line balances in the few years prior to the 2008-2009 financial crisis. Our results indicate that credit lines are related to dividend payouts.

Our paper is closely related to Farre-Mensa, Michaely, and Schmalz (2015). They examine the use of debt and equity to finance dividends and share repurchases. They find 32% of firm payouts are simultaneously raised in capital markets. This suggests that firms use financed payouts to manage their capital structure, monitor managers, engage in market timing, and boost earnings-per-share. We focus specifically on the use of credit lines as an alternate source of liquidity to fund cash payouts, and not the firms use of equity or other debt securities. We see our results as complementary to the findings Farre-Mensa et.al. (2015) and believe both contribute to the overall dividend literature.

LITERATURE REVIEW AND DEVELOPMENT OF HYPOTHESES

Lintner's (1956) seminal survey article found managers were reluctant to cut dividends. Not much has changed since, as firms are still hesitant to decrease dividend payouts. Brav et al. (2005) finds that firms would sacrifice positive NPV projects in order to maintain the expected dividend payout. In their survey 94% of the managers strongly agreed that they try to avoid reducing dividends. Daniel, Denis, and Naveen (2008) find that only about six percent of firms will cut dividends when facing a cash shortage that would require the firm to reduce investment, cut dividends or raise outside funds. Research indicates that managers are wise to not to reduce dividends since dividend reductions are often followed by a significant decline in the firm's share price. Ghosh and Woolridge (1989) find a significant negative response to dividend cuts even when accompanied by a management statement that indicates the cuts are necessary to fund profiappendix investment opportunities. Healy & Palepu (1988) and DeAngelo, DeAngelo, and Skinner (1992) show this negative reaction is a rational response to a negative signal. Both show dividends cuts are usually associated with significant earnings declines.

Over the years a number of studies have examined the relation between cash flows and payout policies. Healy (1985) suggests that cash flows are better predictors of dividend policy than earnings due to the potential manipulation of earnings through accruals management. Jensen (1986) posits that if firms have free cash flows, they should return excess cash to shareholders via dividend payout to reduce potential agency costs. Charitou, Clubb, and Andreou (1998) suggest that cash flows are more useful than accruals in predicting dividends since cash flows are

a more direct liquidity measure and liquidity is likely to be a determinant of dividend policy. Simons (1994) finds a positive association between cash flows and dividends through a more refined version of the Lintner (1956) cash flow measure. Grullon, Michaely, and Swaminathan (1999) suggest the declining reinvestment of mature firms generate excess cash which is then paid out as dividends.

Lawson and Moeller (1996) suggest that dividend payments should be based on cash flows, and not on accrual earnings, because cash flows better reflect the liquidity position of a company rather than earnings. They assert that dividend payments made based on accrual earnings may lead to 1) dividends payments not funded by internal finance, 2) external borrowing to fully or partially fund dividend payments, 3) deterioration of the liquidity and solvency position of the firm, and 4) transfer shareholder wealth to lenders via financing costs. They show that for the period 1946-1977, dividends exceeded cash flows and that dividends based on accrual earnings were mostly debt financed. Since liquid firms are more likely to pay dividends, we hypothesize that liquidity impacts firm dividend policy.

H_1: Dividend policy is positively related to firm liquidity.

Firms that historically pay dividends are reluctant to cut dividend payouts due to the negative stock price reaction when dividends are cut. Thus we hypothesize that dividend paying firms will use credit lines to maintain dividend payouts.

H_2: Dividend paying firms that experience a cash shortage will use credit lines to pay dividends.

We also investigate DeAngelo et al.'s (2009) suggestion that dividend policy and capital structure are related. We test the permanence of credit lines in dividend paying firm's capital structure.

H_3: Dividend paying firms rely more heavily on credit lines than non-payers.

DATA AND EMPIRICAL MODELS

We collect all Compustat firms excluding firms in the financial service and utility industries. In order to compute our liquidity index, we merge the Compustat sample with the Standard & Poors Capital IQ database which contains line of credit data for all publicly traded firms. The Capital IQ data includes information on bond issuances, long-term fixed-rate obligations, variable-rate obligations, commercial paper, credit facilities, and other obligations. Our Capital IQ data is available for the period 2002 – 2013. Other firm characteristics used as control variables come from COMPUSTAT. Finally we trim the variables below the one percent and above the ninety-nine percent levels to mitigate the impact of extreme outliers. The final sample consists of a panel of 41,397 firm-year observations for 5,430 firms.

Appendix 1 presents the descriptive statistics for our sample. The typical firm in our sample has just over $5.2 billion in assets, $534 million in cash and markeappendix securities, $143 million on credit lines, almost a $5.0 billion market capitalization, a liquidity index of 2.226, and pays almost $99 million in dividends.

Appendix 2 reports the Spearmen Correlations for our primary variables of interest and the control variables. Three correlation matrices are reported: Panel A reports the correlations for the full sample, Panel B for the dividend paying firms and Panel C for the non-payers. Two additional variables are included in the correlation matrix, the change in dividends from period t to t-1 (*DIV_dif*) and the change in credit lines for period t to t-1 (*LOC_dif*). Panels A and B

report significant and negative correlations between the change in credit lines and dividends, while Panel C for non-payers reports a significant and positive correlation.[16]

Equation 1 examines the relation between cash dividends paid and firm liquidity. We expect to find a positive relation between $loqliq_{i,t}$ and $DIVS_{i,t}$.

$$DIVS_{i,t} = \beta_o + \beta_{1a} logLIQ_{i,t} + (\beta_{1b} Cash_{i,t}) + \beta_2 logMCAP_{i,t} + \beta_3 logBM_{i,t} + \beta_4 BLEV_{i,t} + \beta_5 OROA_{i,t} + \beta_6 CAPX_{i,t} + \beta_j TimeandIndEffects_{j,t} + \epsilon_{i,t}, \quad (1)$$

where $DIVS_{i,t}$ is cash dividends scaled by net assets paid by firm *i* for period *t*, and net assets is total assets minus cash and cash equivalents; $logLIQ_{i,t}$ is our liquidity index, computed as the sum of cash, cash equivalents, and available credit divided by cash volatility, where cash volatility is the quarterly standard deviation of cash and cash equivalents. We believe this measure of liquidity better captures overall firm liquidity by including available credit lines.[17] We will also test $Cash_{i,t}$ as an alternative definition of liquidity. $Cash_{i,t,}$is firm cash and cash equivalents scaled by net assets. $logMCAP_{i,t}$, firm market capitalization and $logBM_{i,t}$, book-to-market, control for firm size. $BLEV_{i,t}$ is long-term debt scaled by net assets and controls for firm financial policies. $OROA_{i,t}$, operating return on assets computed by dividing earnings before interest and taxes (EBIT) scaled by net assets, controls for firm profitability. $CAPX_{i,t}$, which is capital expenditures divided by net assets, controls for investment policies. We expect a positive

[16] None of the correlations cause multicollinearity concerns.

[17] Recent studies by Sufi (2009), Lins, Servaes, and Tufano (2010) and Kahle and Stulz (2013) have expanded their definition of liquidity to include a firm's credit lines.

relation between dividends, liquidity, cash, firm size, and profitability. Debt servicing and capital expenditures require are expected to be negatively related to dividend payouts. It also includes fixed effects for time and industry (Fama & French, 1997).

Equation 2 is a probit model that examines the likelihood that a firm's liquidity increases the probability that a firm pays a dividend.

$$DIVDUM_{i,t} = \alpha_o + \alpha_{1a} logLIQ_{i,t} + (\alpha_{1b} Cash_{i,t}) + \alpha_2 logMCAP_{i,t} + \alpha_3 logBM_{i,t} + \alpha_4 BLEV_{i,t} + \alpha_5 OROE_{i,t} + \alpha_6 CAPX_{i,t} + \alpha_j TimeandIndEffects_{j,t} + \epsilon_{i,t}, \quad (2)$$

where $DIVDUM_{i,t}$ is dummy variable equal to 1 if the firm pays dividends and 0 otherwise. $ROE_{i,t}$ is operating return on equity computed by dividing earnings before interest and taxes (EBIT) scaled by equity controls for firm profitability.[18] All other variables are defined above.

Equation 3 tests hypothesis 2: the relation between dividends and lines of credit for dividend paying firms.

$$DIVS_{i,t} = \gamma_o + \boldsymbol{\gamma_{1a} LOC_{i,t}} + \gamma_2 Cash_{i,t} + \gamma_3 logmcap_{i,t} + \gamma_4 logBM_{i,t} + \gamma_5 BLEV_{i,t} + \gamma_6 OROA_{i,t} + \gamma_7 CAPX_{i,t} + \gamma_8 lowmed\_cash_{i,t} + \gamma_9 LOC\_x\_lowmed_{i,t} + \gamma_j TimeandIndEffects_{j,t} + \epsilon_{i,t}, \quad (3)$$

[18] The probit model would not converge using $ROA_{i,t}$.

where $LOC_{i,t}$ is firm line of credit balances scaled by net assets for firm *i* in period *t*. $lowmed\_cash_{i,t}$ ($lowqtr\_cash_{i,t}$) is a dummy variable set equal to equal to 1 if the firm's cash is below the median (first quartile). $LOC\_x\_lowmed_{i,t}$ is an interaction term between firm credit lines and the low cash dummy that measures the utilization of credit lines by firms with below average cash. We expect a positive relation between $LOC_{i,t}$ and $DIVS_{i,t}$. We want to specifically examine the use of credit lines by firms that are cash constrained. We anticipate that cash constrained firms will utilize credit lines to continue to pay dividends, thus we expect a positive relation between $DIVS_{i,t}$ and *LOC_x_lowmed* (and *LOC_x_lowqtr*).

EMPIRICAL RESULTS

Appendix 3 compares means and medians for dividend payers versus non-dividend payers. Our univariate differences indicate the liquidity ($logLIQ_{i,t}$) of dividend payers is significantly higher than non-payers which warrant further examination in multivariate models. Also, dividend payers have a significantly lower (higher) mean (median) $LOC_{i,t}$ than non-payers. Overall, dividend paying firms are larger, more liquid, more profiappendix, have larger market-to-book, less long-term debt, and less capital expenditures than non-payers. At first glance, the higher liquidity index with less cash seems counterintuitive; however, this is most likely due to higher unused credit line balances and/or less volatile cash balances. Additionally non-payers may accumulate larger cash balances since they do not have quarterly dividend payouts or more financially constrained firms.

Multivariate analysis provides additional evidence of the relation between dividends, liquidity, credit lines, and other firm characteristics.[19] Results in Appendix 4, based on equations (1) and (2), provide support for our first hypothesis that dividend payments are related to firm liquidity. The parameter estimate of interest, β_{1a} from columns 1 & 3, is positive and significant supporting the hypothesis that dividend payments are positively related to firm liquidity. The model in Column 2 uses an alternative measure of liquidity, cash scaled by net assets ($CASH_{i,t}$). The coefficient, β_{1b}, is not significant. $logLIQ_{i,t}$ and $CASH_{i,t}$ appear to be measuring different aspects of firm liquidity, so we include both measures of liquidity in the model as reported in Column 3. $logLIQ_{i,t}$ is still positive and significant while $CASH_{i,t}$ is not significant. Additional

[19] All regressions are run using pooled OLS with standard errors that are corrected for heteroskedasticity and firm-level clustering.

results from Columns 1-3 indicate that dividend paying firms are larger, more profiappendix, have less debt, and have less capital expenditures.

Appendix 5 reports the results from a probit model where the dependent variable is a dummy variable equal to 1 if the firm pays a dividend and 0 otherwise. The positive and significant coefficient of $logLIQ_{i,t}$ in this model indicates that more liquid firms are more likely to pay dividends; whereas the negative and significant coefficient of $CASH_{i,t}$ suggest that firms with more cash are less likely to pay a dividend, supporting the relation found in the univariate results. Other results from the probit model indicate that firms with higher market capitalization, higher market-to-book, less leverage, and higher capital expenditures are less likely to pay dividends.

We use a sample of only on dividend paying firms to test our second hypothesis that firms with below average cash use credit lines to pay dividends. Appendix 6 reports the results based on equation (3). The results presented in this appendix support Column 1 reports the results of the base pooled OLS model. Our base model indicates a positive and significant relation between credit lines and dividends. Additionally, as expected firms that pay dividends have more cash, less debt, and are more profiappendix. Two unexpected results from this model show that dividend paying firms are smaller and have more capital expenditures warrants further investigation.

The main results in Appendix 6 are presented in columns 2 and 3 which include $lowmed\_cash_{i,t}$ ($lowqtr\_cash_{i,t}$) a dummy variable equal to 1 if the firm's cash position is below the median (first quartile) and 0 otherwise. The coefficients for these variables are negative and

significant indicating that firms with below average cash pay fewer dividends; however, the interaction term between the credit line variable and low cash dummies ($LOC\_x\_lowmed_{i,t}$) is positive and significant. This indicates that if a firm has low cash they are more likely to pay dividends from credit lines. Results also indicate firms with higher market capitalization, higher book-to-market, and higher debt levels pay fewer dividends; whereas, more profiappendix firms tend to pay more.

Column 4 provides additional support for this conclusion by analyzing only the firms with below median cash. In this model, the coefficient for credit lines is positive and significant while the coefficient for cash is insignificant, which indicates that these firms rely more heavily on credit lines to pay dividends than their cash reserves.

Dividend paying firms are further examined in columns 1 & 2 of Appendix 7. Pooled regressions that examine the relation between changes in dividends (*div_dif*), changes in credit lines (*loc_dif*), liquidity (*logliq*) and cash levels *(cash_ta*) indicate that changes in dividends are not significantly related to changes in credit lines; however, they are associated with lower liquidity and higher cash balances which may indicate that paying dividends decreases firm liquidity by using available credit lines while preserving cash. In column 3, this relation is further examined for all firms using a probit model where the dependent variable is an indicator variable equal to 1 for firms that had a positive change in dividends. This model shows a positive relation between firm liquidity and positive dividend changes indicating that more liquid firms are more likely to increase their dividends providing additional support for hypothesis 1.

Appendix 8 and Figures 1 – 3 examine the trend of credit lines as part of firm capital structure. The results show that dividend payers consistently utilize credit lines in the capital structure; however, non-payers also utilize them to an even larger extent. For the period 2002 – 2013, dividend paying firms had smaller credit line to net asset ratios and smaller long-term debt ratios than non-payers. The only exception to this was for the period 2006 – 2008 when dividend paying firms had higher credit line to net asset ratios than dividend payers. This period leads into the financial crisis and warrants further investigation.

CONCLUSION

This paper is the first to examine the extent to which firms utilize credit lines to fund cash dividends, and the relation between an expanded measure of liquidity (*logLIQ)* and dividends. We hypothesize that higher dividend payouts are related to higher liquidity and dividend paying firms that experience cash shortages with utilize credit lines to continue dividend payments. Additionally we hypothesize that credit lines are a permanent component of dividend paying firms' capital structure. Our univariate results indicate that dividend paying firms are considerably different than non-payers. Dividend payers tend to have higher liquidity, less cash, smaller credit line balances, higher market capitalizations, less long-term debt, are more profiappendix, and spend less on capital investments. Multivariate results indicate that liquidity is an important determinant of dividend payouts; however, cash is not. Additionally, our analysis supports the hypothesis that cash strapped dividend paying firms will use credit lines to continue dividend payments. Trend analysis indicates credit lines are a consistently over four percent of dividend paying firms' capital structure; however, non-payers may use credit lines to an even larger extent.

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LISTS OF APPENDICES

APPENDIX 1: SUMMARY STATISTICS FOR MAIN VARIABLES AND CONTROL VARIABLES

Panel A: Level values (n = 41,397)							
Variable	*Mean*	*Std. Dev.*	*Min*	*5th %*	*Median*	*95th %*	*Max*
Cash & MS	534,027,076	2,650,343,135	0.004	244.500	48,206,290	2,062,280,000	91,052,000,000
Dividends	98,710,223	593,071,737	0	0	0	328,554,920	13,660,920,000
LOC	142,752,997	1,271,087,012	0	0	4,687,000	455,370,000	70,603,680,000
Market Cap	4,983,368,773	20,589,358,546	0	2,961.150	418,758,840	20,780,066,824	564,748,329,600
Total assets	5,236,253,220	24,656,634,119	0.240	3,232.190	439,999,290	20,826,640,000	923,123,610,000

Panel B: Scaled Variables (n =41,397)							
Variable	*Mean*	*Std. Dev.*	*Min*	*5th %*	*Median*	*95th %*	*Max*
logLIQ	2.200	1.095	-0.161	0.498	2.129	4.158	6.167
CASH_net	0.426	0.948	0.001	0.007	0.131	1.830	10.135
DIVS_net	0.926%	2.203	0.000	0.000	0.000	5.069	19.786
LOC_net	4.475%	9.116	0.000	0.000	0.000	24.253	65.795
logMCAP	19.143	4.099	-2.952	7.998	19.853	23.758	27.060
logBM	-0.743	0.936	-8.993	-2.216	-0.704	0.617	12.211
BLEV	24.626%	52.759	0.000	0.000	15.278	71.553	3,080.360
OROA	-12.543%	134.740	-13,476.920	-98.412	6.867	28.326	2,729.760
OROE	25.136%	3,359.920	-125,575.000	-91.464	13.562	70.495	551,925.000
FA_net	62.760%	22.844	0.000	20.890	65.145	94.821	100.0000
RD_EXP	363.010	18,620.630	-21873.680	0.000	3.995	133.258	2,568,440.000
CAPX_net	6.923	8.675	-33.937	0.582	4.182	22.644	237.707

Appendix 1 reports summary statistics for the measures of liquidity, dividends, line of credit balance, firm size, leverage, profitability, fixed assets, and research and development expenditures. *Cash & MS* is firm cash balances; *Dividends* are firm cash dividends; *LOC* is firm credit line balances; *Market Cap* is firm's market capitalization; *Total assets* is firm's total assets; *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_*net is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *DIVS_net* is ordinary dividends scaled by net assets; *LOC_net* is the line of credit balance scaled by net assets; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROA* is operating return on assets, which is earnings before interest and taxes divided by net assets; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *FA_net* is fixed assets scaled by net assets; and *RD_EXP* is research and development expenses scaled by net assets; *CAPX_net* is firm's capital expenditures scaled by net assets.

APPENDIX 2: SPEARMEN CORRELATIONS

Panel A: Correlations between dividends, lines of credit, liquidity measures, and controls (Full sample)											
	LOC_net	*DIV_net*	*LOC_dif*	*DIV_dif*	*LogLIQ*	*CASH_net*	*logMCAP*	*logBM*	*BLEV*	*OROA*	*OROE*
LOC_net	1.000										
DIV_net	*0.017*	1.000									
LOC_dif	**0.236**	-0.003	1.000								
DIV_dif	**-0.028**	**0.251**	**-0.034**	1.000							
LogLIQ	**0.223**	**0.166**	**-0.017**	**0.036**	1.000						
CASH_net	**-0.479**	**-0.189**	**-0.036**	**0.024**	**-0.248**	1.000					
LogMCAP	**-0.080**	**0.442**	**-0.034**	**0.113**	**0.147**	**-0.082**	1.000				
LogBM	**0.154**	**-0.099**	**0.026**	**-0.055**	**0.0827**	**-0.208**	**-0.366**	1.000			
BLEV	**0.213**	**0.097**	0.011	-0.005	**0.053**	**-0.341**	**0.232**	**-0.040**	1.000		
OROA	**-0.016**	**0.343**	**-0.053**	**0.126**	**0.144**	**-0.055**	**0.457**	**-0.303**	*-0.016*	1.000	
OROE	**0.104**	**0.378**	**-0.043**	**0.110**	**0.182**	**-0.276**	**0.492**	**-0.307**	**0.253**	**0.850**	1.000
Panel B: Correlations between dividends, lines of credit, liquidity measures, and controls (Dividend Payers)											
	LOC_net	*DIV_net*	*LOC_dif*	*DIV_dif*	*LogLIQ*	*CASH_net*	*logMCAP*	*logBM*	*BLEV*	*OROA*	*OROE*
LOC_net	1.000										
DIV_net	**-0.160**	1.000									
LOC_dif	**0.209**	0.018	1.000								
DIV_dif	**-0.064**	**0.252**	**-0.051**	1.000							
LogLIQ	**0.218**	**-0.059**	-0.010	*-0.022*	1.000						
CASH_TA	**-0.389**	**0.272**	**-0.035**	**0.167**	**-0.300**	1.000					
LogMCAP	**-0.198**	**0.097**	*-0.022*	*0.019*	-0.013	0.008	1.000				
LogBM	**0.112**	**-0.360**	0.005	**-0.089**	**0.034**	**-0.121**	**-0.413**	1.000			
BLEV	**0.228**	**-0.160**	0.010	**-0.082**	**0.052**	**-0.328**	**-0.143**	**-0.065**	1.000		
OROA	**-0.180**	**0.386**	*-0.028*	**0.179**	**-0.077**	**0.304**	**-0.259**	**-0.582**	**-0.199**	1.000	
OROE	**-0.038**	**0.208**	-0.005	**0.085**	*-0.020*	**-0.031**	**0.360**	**-0.663**	**0.240**	**0.717**	1.000
Panel C: Correlations between dividends, lines of credit, liquidity measures, and controls (Non-dividend payers)											
	LOC_net	*DIV_net*	*LOC_dif*	*DIV_dif*	*LogLIQ*	*CASH_net*	*logMCAP*	*logBM*	*BLEV*	*OROA*	*OROE*
LOC_net	1.000										
DIV_net	-	1.000									
LOC_dif	**0.252**	-	1.000								
DIV_dif	**-0.043**	-	**0.001**	1.000							
LogLIQ	**0.219**	-	**-0.019**	-0.014	1.000						
CASH_TA	**-0.518**	-	**-0.039**	**0.072**	**-0.172**	1.000					
LogMCAP	**-0.090**	-	**-0.042**	**-0.019**	**0.123**	**0.039**	1.000				
LogBM	**0.177**	-	**0.037**	**-0.075**	**0.119**	**-0.272**	**-0.365**	1.000			
BLEV	**0.209**	-	0.013	**-0.039**	**0.021**	**-0.318**	**0.196**	**-0.020**	1.000		
OROA	**0.054**	-	**-0.065**	0.003	**0.186**	**-0.142**	**0.426**	**-0.161**	0.013	1.000	
OROE	**0.153**	-	**-0.061**	**-0.022**	**0.211**	**-0.294**	**0.419**	**-0.142**	**0.203**	**0.898**	1.000

Appendix 2 ; *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH*_net is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *DIVS_net* is ordinary dividends scaled by net assets; *LOC_net* is the line of credit balance scaled by net assets; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROA* is operating return on assets, which is earnings before interest and taxes divided by net assets; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity; *FA_net* is fixed assets scaled by net assets; and *RD_EXP* is research and development expenses scaled by net assets; *CAPX_net* is firm's capital expenditures scaled by net assets. *Bold and italicized values are significant at the 1.0% and 5.0% level, respectively, otherwise not significantly different than zero.

APPENDIX 3: DIVIDEND PAYERS VS NON-DIVIDEND PAYERS

	Dividend Payers (n = 12,985)	*Non-dividend Payers (n = 28,412)*		*Dividend Payers (n = 12,985)*	*Non-dividend Payers (n = 28,412)*	
Variable	*Mean*	*Mean*	*Difference*	*Median*	*Median*	*Difference*
logLIQ	2.524	2.051	2.473***	2.432	1.985	0.447**
CASH_net	0.157	0.550	-0.393***	0.080	0.176	-0.096*
DIVS_net	2.953	0.000	2.953***	1.952	0.000	1.952***
LOC_net	4.194	4.603	-0.409***	0.055	0.000	0.055**
logMCAP	20.844	18.364	2.480*	21.395	19.191	2.204
logBM	-0.780	-0.725	0.055	-0.743	-0.682	0.058
BLEV	21.940	25.857	-3.917***	19.865	11.638	8.227***
OROA	11.878	-23.710	-13.979***	10.368	4.238	5.988***
OROE	26.717	24.414	2.303*	21.439	8.527	12.912***
CAPX_net	6.444	7.141	-0.697	4.459	4.013	0.446

Appendix 3 compares means and medians for dividend payers versus non-dividend payers. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *CASH_net* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *DIVS_net* is ordinary dividends scaled by net assets; *LOC_net* is the line of credit balance scaled by net assets; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROA* is operating return on assets, which is earnings before interest and taxes divided by firm assets; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity. . *, **, and *** indicate statistically significant differences at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 4: LIQUIDITY AND DIVIDENDS

Independent Variables	*1 (DIVS_Net)*	*2 (DIVS_Net)*	*3 (DIVS_Net)*
logliq	0.068***		0.068***
	[0.000]		[0.000]
cash_net		0.011	0.011
		[0.609]	[0.618]
logmcap	0.218***	0.225***	0.218***
	[0.000]	[0.000]	[0.000]
logbm	-0.227***	-0.217***	-0.226***
	[0.000]	[0.000]	[0.000]
blev	-0.006***	-0.006***	-0.006***
	[0.000]	[0.000]	[0.000]
oroa	0.001***	0.001***	0.001***
	[0.000]	[0.000]	[0.000]
capx_net	-0.006**	-0.007***	-0.006**
	[0.013]	[0.009]	[0.013]
constant	-0.985***	-0.938***	-0.986***
	[0.000]	[0.000]	[0.000]
Observations	38,138	38,138	38,138
R-squared	0.138	0.137	0.138
Time dummies	YES	YES	YES
Industry dummies	YES	YES	YES

Appendix 4 presents the fixed effects regressions estimating the relation between dividends and liquidity for a sample of publicly-traded firms**.** *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *DIVDUM* is a dummy variable equal to one if firm pays dividends, and 0 otherwise; *CASH_NET* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROA* is operating return on assets, which is earnings before interest and taxes divided by firm assets; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity;. All models include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. For brevity, the annual time dummies and industry dummies are not presented. P-values appear in brackets. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 5: LIQUIDITY AND DIVIDENDS – PROBIT

Independent Variables	*1 (DIV_DUM)*	*2 (DIV_DUM)*	*3 (DIV_DUM)*
logliq	0.163***		0.133***
	(0.007)		(0.011)
cash_net		-0.994***	-0.949***
		(0.042)	(0.063)
logmcap	0.106***	-0.030***	-0.045**
	(0.004)	(0.009)	(0.016)
logbm	0.040***	0.000***	0.000***
	(0.008)	(0.000)	(0.001)
blev	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
oroe	0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
capx_net	-0.007***	-0.006***	-0.005***
	(0.001)	(0.001)	(0.002)
constant	-2.844***	-2.295***	-2.454***
	(0.076)	(0.071)	(0.086)
Observations	38,138	38,138	38,138
R-squared			
Time dummies	NO	NO	NO
Industry dummies	NO	NO	NO

Appendix 5 presents the Probit models estimating the likelihood of paying dividends for a sample of publicly-traded firms. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *DIVDUM* is a dummy variable equal to one if firm pays dividends, and 0 otherwise; *CASH_NET* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logMCAP* is the logarithm of firm market capitalization; *logBM* is the logarithm of the book-to-market equity ratio; *BLEV* is book leverage; *OROE* is operating return on equity, which earnings before and interest and taxes divided by firm equity;. All models include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. For brevity, the annual time dummies and industry dummies are not presented. P-values appear in brackets. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 6: DIVIDENDS AND LINES OF CREDIT

Independent Variables	*1* *(DIVS_net)*	*2* *(DIVS_net)*	*3* *(DIVS_net)*	*4* *(DIVS_net)* *lowmed=1*
loc_net	0.007**	0.002	0.005	0.011*
	[0.014]	[0.855]	[0.383]	[0.057]
cash_net	2.411***	2.518***	2.622***	2.485
	[0.000]	[0.000]	[0.000]	[0.226]
logmcap	-0.219***	-0.027***	-0.027***	-0.176***
	[0.000]	[0.001]	[0.002]	[0.000]
logbm	-0.979***	-0.754***	-0.756***	-0.834***
	[0.000]	[0.000]	[0.000]	[0.000]
blev	-0.012***	-0.011***	-0.011***	-0.003
	[0.000]	[0.002]	[0.001]	[0.550]
oroa	0.058***	0.056***	0.056***	0.063***
	[0.000]	[0.000]	[0.000]	[0.000]
capx_net	0.012***	0.014*	0.015*	-0.001
	[0.002]	[0.093]	[0.077]	[0.892]
lowmed_cash		-0.259***		
		[0.010]		
LOC_x_lowmed		0.032***		
		[0.001]		
lowqtr_cash			-0.267***	
			[0.006]	
LOC_x_lowqtr			0.024**	
			[0.014]	
constant	2.028***	1.226***	1.159***	1.587***
	[0.000]	[0.005]	[0.008]	[0.001]
Observations	12,663	12,663	12,663	6,302
R-squared	0.276	0.247	0.247	0.205
Time dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES

Appendix 6 presents the pooled fixed effects regressions estimating the relation between dividends and lines of credit for a sample of publicly-traded firms that pay dividends. *loc_net* is line of credit balance divided by net assets; *cash_net* is cash & cash equivalents scaled by net assets, net assets is total assets minus cash & cash equivalents; *logmcap* is the logarithm of firm market capitalization; *logbm* is the logarithm of the book-to-market equity ratio; *blev* is book leverage; *oroa* is operating return on assets, which is earnings before interest and taxes divided by firm assets; *lowmed_cash* is a dummy variable set equal to 1 if the firm's *cash_net* is below the median; *LOC_x_lowmed* is an interaction term that is the product of *loc_net* and *lowmed_cash*; *lowqtr_cash* is a dummy variable set equal to 1 if the firm's *cash_net* is below the first quartile; *LOC_x_lowqtr* is an interaction term that is the product of *loc_net* and *lowqtr_cash*; . All models include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. For brevity, the annual time dummies and industry dummies are not presented. P-values appear in brackets. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 7: CHANGES IN DIVIDENDS RELATIVE TO CHANGES IN CREDIT LINES

Independent Variables	*1* *(Div_dif)*	*2* *(Div_dif)*	*3* *(Pos_div=1)*
loc_dif	-0.0001		0.002
	(0.272)		(0.261)
loc_lag		-0.0000	
		(0.415)	
logliq	-0.0007***	-0.0007**	0.134***
	(0.000)	(0.000)	(0.000)
cash_net	0.0087***	0.0089***	-0.719***
	(0.000)	(0.000_	(0.000)
logmcap	-0.0009***	-0.0009***	0.284***
	(0.000)	(0.000)	(0.000)
logbm	-0.0019***	-0.0019***	0.076***
	(0.003)	(0.003)	(0.000)
blev	-0.0000***	-0.0000***	-0.002***
	(0.004)	(0.003)	(0.003)
oroa	0.0003***	0.0003***	
	(0.000)	(0.000)	
oroe			0.000
			(0.111)
capx_net	-0.0001	-0.0001	-0.004***
	(0.005)	(0.006)	(0.000)
constant	0.963**	0.936**	
	(0.022)	(0.025)	
Observations	11,036	11,036	31,686
R-squared	0.094	0.094	
Time dummies	YES	YES	NO
Industry dummies	YES	YES	NO

Appendix 7: Columns 1 & 2 present the pooled fixed effects regressions estimating the relation between change in dividends and changes in lines of credit for a sample of publicly-traded firms that pay dividends. Column 3 presents the Probit model estimating the likelihood of a positive change in dividends given a change in credit lines for a sample of publicly-traded firms. *Div_dif* is the change dividends from period *t* to *t-1* divided by net assets from period *t*; *Pos_div* is an indicator variable equal to one if the change in dividends is positive, and 0 otherwise; *loc_dif* is the change line of credit balance divided by net assets from period *t* to *t-1*; *loc_lag* is the lagged change in line of credit variable (*loc_dif*); *logliq* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *logmcap* is the logarithm of firm market capitalization; *logbm* is the logarithm of the book-to-market equity ratio; *blev* is book leverage; *oroa* is operating return on assets, which is earnings before interest and taxes divided by firm assets; *oroe* is operating return on equity, which earnings before and interest and taxes divided by firm equity; . Pooled regressions include dummies for time and industry affiliation (Fama-French, 1997). Unreported standard errors are robust to heteroskedasticity and are clustered at the firm level. For brevity, the annual time dummies and industry dummies are not presented. P-values appear in brackets. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 8: LIQUIDITY, LINES OF CREDIT, AND LONG-TERM DEBT BY YEAR FOR DIVIDEND PAYERS AND NON-PAYERS

	Dividend Payers			Non-dividend Payers			Difference		
FYEAR	logLIQ	LOC_net	BLEV	logLIQ	LOC_net	BLEV	logLIQ	LOC_net	BLEV
2002	2.390	4.011	22.326	1.882	5.436	24.478	0.508**	-1.425**	-2.152***
2003	2.629	3.455	20.130	2.008	4.476	26.518	0.621**	-1.021**	-6.388***
2004	2.558	3.127	19.530	2.077	3.938	25.489	0.481*	-0.811*	-5.959***
2005	2.569	3.564	19.731	2.118	3.772	23.688	0.451*	-0.208	-3.957***
2006	2.560	4.177	20.864	2.128	4.079	25.103	0.432*	0.098	-4.239***
2007	2.644	5.042	22.426	2.097	4.319	26.167	0.547**	0.723**	-3.741***
2008	2.532	6.058	23.360	2.108	5.357	28.423	0.424*	0.701**	-5.063***
2009	2.507	4.043	22.797	2.119	4.861	25.142	0.388*	-0.818**	-2.345***
2010	2.563	3.871	21.515	2.181	4.401	22.787	0.382*	-0.530*	-1.272*
2011	2.658	3.838	21.501	2.185	4.522	27.158	0.473*	-0.684*	-5.657***
2012	2.632	3.988	23.128	2.207	4.664	26.520	0.425*	-0.676*	-3.392***
2013	2.571	3.969	24.782	2.094	4.554	29.167	0.477*	-0.585*	-4.385***

Appendix 8 presents yearly means for firm liquidity, credit lines and long-term debt. *logLIQ* is the logarithm of the liquidity index (the liquidity index is the sum of cash, cash equivalents, and available line of credit divided by cash volatility); *loc_net* is line of credit balance divided by net assets; and *BLEV* is book leverage. *, **, and *** indicate statistically significant differences at the 10 %, 5 %, and 1%, levels, respectively.

FIGURES

FIGURE 1: TREND OF LIQUIDITY INDEX

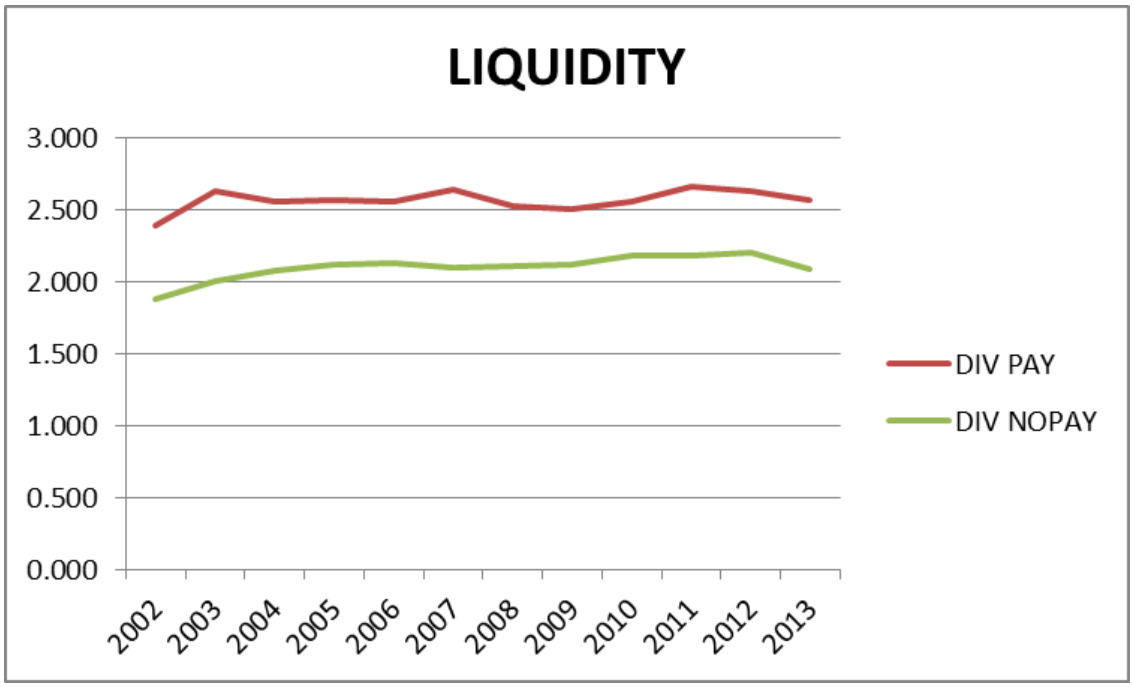

LIQUIDITY
3.000
2.500
2.000
1.500
1.000
0.500
0.000
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
DIV PAY
DIV NOPAY

FIGURE 2: TREND OF CREDIT LINES TO NET ASSETS

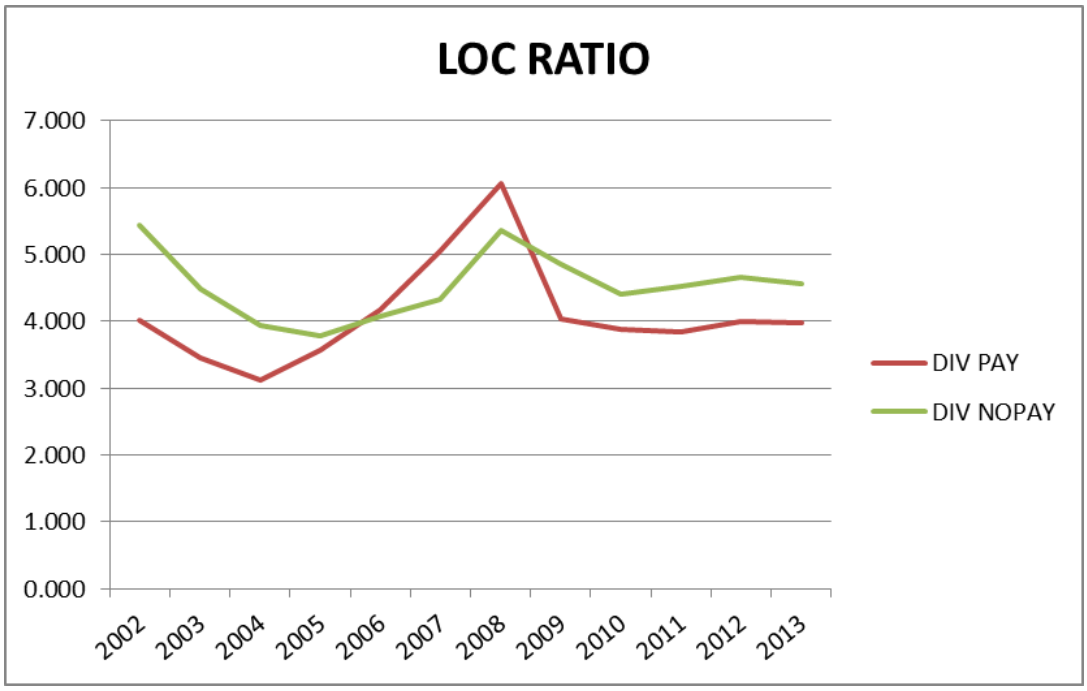
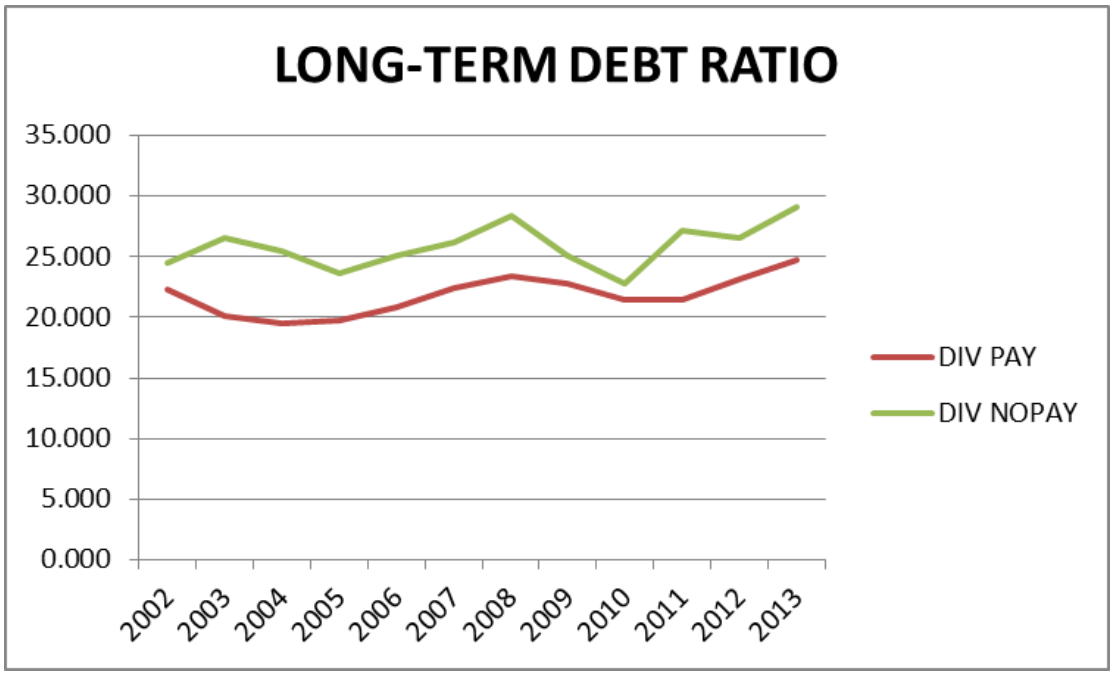

LOC RATIO
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
DIV PAY
DIV NOPAY

FIGURE 3: TREND OF LONG-TERM DEBT RATIO


LONG-TERM DEBT RATIO
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0.000
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
DIV PAY
DIV NOPAY

PART 3

THE DEMOGRAPHIC DETERMINANTS OF SMALL FIRM LIQUIDITY AND THE RELATION TO FIRM PERFORMANCE

PART 3

INTRODUCTION

Properly managing liquidity is major challenge for small businesses. According to a report by the Corporation for Enterprise Development, about 37.0% of experienced business owners have cash shortages. Furthermore, a September 2013 Forbes magazine article states that 8 out of 10 small businesses fail[20] for various reasons including poor liquidity. To increase their likelihood of survival, small business owners need to be aware the factors that influence their cash management behavior.

A substantial body of literature examines the impact of liquidity management of publicly traded firms; however, very little research focuses on the determinants of the liquidity of small private firms. Walker and Petty (1978) find small manufacturing firms with less than $5 million in total assets have less liquidity and working capital than large firms, but do not investigate the determinants of that drives that difference. Another stream of literature focuses on how demographic characteristics of firm owners and managers impact firm performance. Cole (2013), Fairlie and Robb (2007), Robb and Robinson (2012), Robb and Watson (2012) examine how characteristics such as gender and race affect firm performance and capital structure. At this time no studies of small firms exist that relate owner characteristics and firm liquidity. Recent

[20] Forbes Magazine, September 12, 2013

studies[21] investigate liquidity management in large private firms; however, they do not relate liquidity management practices to owner characteristics.

This study examines the determinants of liquidity for small firms and their relation to firm performance. Using data from the Kauffman Firm Survey (KFS), we analyze several aspects of small private firm liquidity, including 1) determinants of firm liquidity, 2) trends in small firm liquidity over the time period 2004 – 2012, and 3) the relation between firm liquidity and firm performance. Determinants examined include firm characteristics such as size, profitability, debt levels, and expenditures, as well as, demographic variables such as gender, race, education, and experience of owner.

We find that female-owned firms are more liquid than male-owned firms and white-owned firms are less liquid than Asian- or African American-owned firms. Additionally, our findings indicate that firms with highly educated owners have more liquidity than firms with less educated owners, and firms with the least experienced owners are less liquid than firms with more experienced owners. We also show a negative relation between inventory levels, equipment holdings, and liquidity. Our findings provide insight into the determinants of small firm liquidity, which could benefit other small business owners struggling with liquidity issues.

[21] Gao, Harford, & Li (2014), Decman & Sever (2014), and Mortal & Reisel (2014)

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Managing liquidity is an important issue to owners/managers ever since Keynes (1936) argued liquidity management and financial constraints are fundamentally linked. He suggested if financial markets were efficient then firm liquidity decisions would be irrelevant. However, given that financial markets contain frictions, liquidity decisions matter. Keynes' motive for liquidity is precautionary, as he assumes firms are typically financially constrained. According to Myers and Majluf (1984), a firm with no financial slack will bypass some positive NPV projects, given asymmetric information in financial markets They suggest existing investors are better off when firms' have sufficient financial slack (cash and cash equivalents) to fund investment opportunities, since external financing is costly. In Graham and Harvey's (2001) survey of CFOs, CFOs consider their decisions about corporate liquidity to be one the most important decisions they make. Further they view their primary job as finding ways to fund investment opportunities proposed by the CEO.

The existing liquidity management literature focuses on three primary areas: the determinants of cash holdings, the propensity to save cash (i.e. cash flow sensitivity of cash), and the value of cash. The determinants literature includes work by Opler, Pinkowitz, Stulz, and Williamson (1999), Bates, Kahle, and Stulz (2009), Subramaniam, Tang, Yue, and Zhou (2011), and Ang and Smedema (2011), among others. Opler et al examine the level of cash holdings for a large sample of publicly-traded U.S. firms. They find firms with more growth opportunities and riskier cash flows maintain larger liquidity positions, while firms with better access to capital markets have lower liquidity positions. These findings support the Keynes' (1936) arguments for

liquidity. Additionally, Opler et al suggest firms have a target or optimal level of liquidity that varies with the value of the firm's investments and the likelihood these investments cannot be financed with external sources.

Bates, Kahle, and Stulz (2009) find recent increases in firm cash holdings are partially explained by increased cash flow volatility and increased R&D spending. These results are again consistent with precautionary motive for holding cash. Subramaniam, Tang, Yue, and Zhou (2011) show non-diversified firms tend to have larger cash balances, while Ang and Smedema (2011) find evidence that less financially constrained firms build their cash balance ahead of recessions. We explore whether small firms have similar liquidity determinants and the impact of owner characteristics on those determinants.

Another area of research examines the propensity of firms to save cash from operating cash flows, which is referred to as the cash flow sensitivity of cash in cash management literature. Almeida, Campello, and Weisbach (2004) find financially constrained firms have a higher propensity to save. In a global study of cash flow sensitivity to cash, Kusnadi and Wei (2011) find financially constrained firms exhibit a higher propensity to save in countries with weak legal protection of investors. Erel, Jang, and Weisbach (2013) examine European mergers and find that target firms with a higher propensity to save cash were constrained prior to being acquired. We believe that demographic characteristics may impact a firm's propensity to save, but the Kauffman survey does not contain the accounting measures needed to analyze this area of liquidity management.

The most recent stream of liquidity management literature focuses on the value of cash. Both Faulkender and Wang (2006) and Pinkowitz and Williamson (2006) estimate the value of firm liquidity by regressing market value of firm on cash holdings. Both studies find the marginal value of cash is higher for financially constrained firms than for unconstrained firms. Pinkowitz, Stulz, and Williamson (2006) verify these findings internationally. Denis and Sibilkov (2010) find higher cash holdings are associated with greater investment for constrained firms and that investment is positively associated with value in constrained firms relative to unconstrained firms.

All of these studies indicate that greater corporate liquidity in financially constrained firms is a value-enhancing response to costly external financing. While the market value of small firms cannot be directly ascertained, given that most small firms would be considered financially constrained[22], proper liquidity management should enhance firm value or performance. To evaluate the impact of liquidity on firm performance, we analyze how liquidity relates to profitability. Based on the aforementioned corporate liquidity literature, we anticipate that liquidity will be positively related to profitability.

H_1: Liquidity is positively related to profitability for small firms

Over the years corporate governance literature has examined the impact of CEO characteristics, board demographics, and the characteristics of other executives on firm performance. A recent study even examines the effect of CEO attractiveness on shareholder

[22] Opler et al (1999) indicates that small firms are financially constrained

value and finds that higher returns are associated with more attractive CEOs (Halford and Hsu, 2014). A narrower stream of this literature focuses on the relation between owner characteristics and small firm performance. Bosma, van Praag, Thruik, and deWit (2004), Fairlie & Robb (2009), Fasci & Valdez (1998), Honig (1998), Loscocco (1991), Robb (2002) and Rosa, Carter, and Hamilton (1996) have examined gender differences in firm performance including sales, profits, and firm closure rates. Based on the findings in these studies, Klapper and Parker (2011) suggest women entrepreneurs tend to underperform their male counterparts. Robb and Watson (2012) counter these findings by showing many of the previous studies do not control for the size or scale of the firm. Using Kauffman survey data they find no difference in the performance of female- and male-owned new enterprises based on four year closure rates, return on assets, and the Sharpe ratio for small firms. Other studies find females are generally more risk averse than males.[23] More risk adverse business owners would prefer to have more precautionary liquidity; thus higher liquidity measures. Based on these conflicting findings, we test the null hypothesis that there is no relation between gender and liquidity.

H_2: Liquidity in unrelated to gender

Fairlie and Robb (2007) analyze business performance based on race using confidential small firm data from the Characteristics of Business Owners survey. They find white-owned businesses significantly outperform African-American owned businesses. White-owned businesses have higher sales, profits, employment, and survival. They conclude the lack of prior work experience in a family business among African-American managers contributes to the poor

[23] Jianakoplos and Bernasek (1998), Barber and Odean (2001), Kepler and Shane (2007), Watson and Newby (2005)

performance. Fairlei and Robb mention the liquidity constraints that new businesses face due to start-up capital issues; however, they do not formally compare the liquidity of white-owned to African-American owned businesses. Based on previous findings, we hypothesize the African-American businesses will be less liquid than white owned ventures.

H_3: Liquidity is unrelated to race

Bates (1990) finds college education is significantly positively related to firm survival. Bosma, van Praag, Thruik, and deWit (2004) find that prior industry experience improves firm survival, profitability, and growth. Headd (2003) hypothesizes more education and experience positively correlated with survival, as lessons learned often translate into competent decision making. Robb and Watson (2012) do not find a significant relation between education or experience and firm performance for small firms. Thus we test the null hypothesis that liquidity is not related to education or experience.

H_{4A}: Liquidity is unrelated to education of owners

H_{4B}: Liquidity is unrelated to experience of owners

DATA AND EMPIRICAL MODEL

This study uses the Kauffman Firm Survey micro-firm data for the period 2004-2012. The Kauffman Institute collected data on almost 8,000 firms that began operations in 2004. Every year the Kauffman Institute surveys the same group of firms. The survey data contain detailed information about the firms and their owners. Firm information includes: financial information including cash, revenues, net income, and assets; as well as industry, number of employees, and the legal form of business. Owner information includes: gender, race, age, average hours worked per week, education, and years of previous industry experience. We constrain firms to report data for all years from 2004 to 2012. Our final sample includes 23,780 firm-year observations on over 4,500 firms. The typical firm in our sample has revenues of $857,630, almost $900,000 in total assets, net income of $35,333, and a little over $230,000 in cash. The typical owner in our sample is a white male in his mid-30s, with less than 10 years of experience in the industry and some post high-school education or training. Firm characteristics are presented in Appendix 1.[24]

Equation 1 examines the relation between liquidity (cash), firm characteristics and owner demographics.

$$Cash_{i,t} = \beta_o + \beta_1 Revenue_{i,t} + \beta_2 Net\ Inc_{i,t} + \beta_3 Inventory_{i,t} + \beta_4 Equip_{i,t}$$
$$+\beta_5 A/P_{i,t} + \beta_6 DemoDUM_{i,t} + \beta_j TimeandFirmEffects_{j,t} + \epsilon_{i,t}, \quad (1)$$

[24] Only mean values are presented in tables, as we are not allowed to present medians, minimums, and maximums for privacy reasons as the Kauffman foundation does not allow the reporting of any statistic that would represent a single firm thus violating the privacy of that firm

where $Cash_{i,t}$ is the firm's cash scaled by total assets, net of cash (referred to as net assets). $Revenue_{i,t}$ is the firm's revenues scaled by net assets, $Net\ Inc_{i,t}$ is the firm's net income scaled by net assets, $Inventory_{i,t}$ is the firm's inventories scaled by net assets, $Equip_{i,t}$ is the firm's equipment scaled by net assets and $A/P_{i,t}$ is the firm's accounts payable scaled by net assets. $DemoDUM_{i,t}$ are various demographic indicator variables. *Male_DV* is an indicator variable set equal to 1 if the primary owner is male. *White_DV* (*Black_DV*) is an indicator variable set equal to 1 if the primary owner is white (African-American). *Low_exp* (*High_exp*) is an indicator variable set equal to 1 if the primary owner has less 10 years (more than 20 years) of experience in the industry. *Degree_DV* is an indicator variable set equal to 1 if the primary owner has some post-high school vocational training or college (AS, BS, BA), while the *postDegree_DV* is an indicator variable set equal to 1 if the primary owner has any post graduate education (MS, MA, MBA, JD, PhD)

EMPIRICAL RESULTS

Figure 1 shows the trend of liquidity for sample firms during the period from 2004 – 2011. The average cash-to-net assets over the period is 0.261 with the minimum occurring in 2008 at 0.245 and the maximum of 0.274 in 2011. Since 2008, liquidity positions have increased dramatically for our sample firm, which is consistent with recent liquidity studies of publicly traded firms, see Bates, Kahle, and Stulz (2009), Foley, Hartzell, Titman, and Twite (2007), Pinkowitz, Stulz, and Williamson (2012), and Sanchez and Yurdagul (2013), for example.

Appendix 2 compares the results for different genders. Of 23,780 firm-observations, only 20,511 reported the gender of the primary owner/operator. Seventy-five of the firms are owned by men. These firms have twice as many assets, and substantially more revenues. Also, male owned firms have higher wage expenses, research and development expenditures and net income, while female firms have higher total expenditures. Our variable of interest, $Cash_{i,t}$, is not significantly different for female owned firms and contradicts the findings of previous studies that suggest women tend to be more risk averse (Jianakoplos and Bernasek, 1998, Barber and Odean,2001, Kepler and Shane, 2007, and Watson and Newby, 2005) More risk averse managers may tend to hold higher cash balances for precautionary purposes, our univariate statistics do not show that female owners are more risk averse than male owners.

Appendix 3 compares company characteristics by race. Of the 23,780 firm-observations, only 20,890 reported the race of the primary owner/operator. 89.7% of the firms are owned by whites, 6.7% by African Americans, and 3.6% by Asians, with less than 1% owned by all other races.

Asian owned firms are the largest firms with the highest values across all characteristics, including cash. Our variable of interest, $Cash_{i,t}$, indicates that the Asian owned firms are the most risk averse with a mean value of 0.311 versus, 0.257 for white owned firms, and 0.280 for African-American owned firms. These results do not indicate that African-American owned firms are significantly less liquid as previous studies imply. Our findings indicate that African American owners are more risk averse than white owners or more financially constrained thus need larger cash balances. Since African American owned firms are significantly smaller and more financially constrained, we think the latter explanation is more likely.

Appendix 4 compares firm characteristics by owner education level. Of the 23,780 firm-observations, only 1 report owner education levels. Sixty-percent of the owners have post-high school education (*Degree*), with only 11% without any post-high school education or training (*No degree*), and 29% have at least some graduate education (*Post Degree*). Univariate results indicate that firms with the most educated owners have more assets, expenses and net income; whereas, the firms with the least educated owners have the lowest mean values across all characteristics. Our variable of interest, *Cash*, is slightly higher for firms with the least educated owners and highest for the least educated ones; however, the differences are insignificant and provide no meaningful insight.

Appendix 5 compares firm characteristics by owner experience levels. Of the 23,780 firm-observations, only 17,194 report owner experience levels. We divide owner experience levels into three categories. Owners with less than 10 years of experience in the industry are considered *low experience* owners. Owners with more than 20 years of industry experience are

considered *high experience* owners and those in between are categorized as *medium experience* workers. The majority (45%) of the owners have less than 10 years' experience, with 29% of the owners having more than 20 years of experience. Firm characteristics are more diverse based on experience. Firms with high experience owners are significantly larger and more liquid. High experience firms also appear to have more revenues, total expenses and wages. High experience firms have significantly less inventory and land than low experience firms and less equipment than medium experience firms. Our primary variable of interest, *Cash*, is significantly higher for firms with experienced owners indicating that experience increases risk aversion and reinforces the notion that experience enhances wisdom.

Appendix 6 reports the multivariate results of the relation between cash, control variables, and demographic determinants. Liquidity is negatively related to inventory and equipment, but not significantly related revenues or profitability. The insignificant relation between liquidity and net income is surprising and does not support our hypothesis one. The demographic determinants that influence firm liquidity are gender and education. The multivariate results confirm our univariate results that female-owned firms hold more cash than male-owned firms suggesting that women are more risk averse and providing support for second hypothesis. Additionally, the education dummy variables indicate the firms of the least educated owners are less liquid, while the firms with the most educated owners are more liquid. While the results in Appendix 6 do not confirm our univariate results for race and experience, they do not invalidate them either by indicating an opposite relation exists.

CONCLUSION

We examine the determinants of liquidity for over 2,600 micro-firms surveyed by the Kauffman Foundation over the period 2004 – 2012. Univariate results indicate liquidity is related to the gender, race, education and experience level of the primary firm owner. Female owned firms are more liquid than male-owned firms, White owned firms are less liquid than Asian- or African American-owned firms, firms with highly educated owners have more liquidity than firms with less educated owners, and firms with the least experienced owners are less liquid than firms with more experienced owners. Multivariate models that control for firm size, profitability, and debt level show significant relations between firm liquidity, owner gender, and owner education that confirm univariate results.

Small firms are vital to the U.S. economy. They create jobs, innovate, and help maintain a competitive market economy. The Kauffman survey data provides a plethora of information for analyzing the characteristics of small firms and we intend to continue our investigation of small firms, their characteristics, and hopefully increase the likelihood of small firm survival by helping owners and managers make more informed decisions.

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LISTS OF APPENDICES

APPENDIX 1: DESCRIPTIVE STATISTICS

	Mean	Std error
Firm Characteristics		
Cash_net	0.26	0.312
Revenue_net	62.54	6,708.53
Total Exp_net	23.14	1,075.63
Wages_net	70.95	9,573.72
Net Inc_net	-4.43	707.16
Equip_net	0.26	0.305
Inventory_net	0.13	0.247
Land_net	0.74	0.228
A/P_net	1.92	124.99
R&D Exp_net	1.22	105.01
Cash	$230,000	
Revenues	$857,630	
Total Assets	$893,927	$1,700,000
Net Income	$35,333	

Owner Demographics			
Gender	75% Male	25% Female	
Race	90% White	6.7% African-American	3.6% Asian
Education	14.4% No degree	82% degree	3.7% Post degree
Experience	26% High	45% Low	29% Medium

Appendix 1 reports the descriptive statistics for the sample. *Cash_net* is f29_assetval_cash scaled by net assets, where net assets is the sum of f29_assetval_acctrec, f29_assetval_inventory, f29_assetval_equip, f29_assetval_landbuild, f29_assetval_veh, f29_othbusprop, and f29_assetval_other; *Revenue_net* is f16a_rev_amt scaled by net assets; *Total Exp_net* is f17a_tot_exp_amt scaled by net assets; *Wages_net* is f18a_wage_exp_amt scaled by net assets; *Net Inc_net* is f24_profitloss_amt scaled by net assets; *Equip_net* is f29_assetval_equip scaled by net assets; *Inventory_net* is f29_assetval_inv scaled by net assets; *Land_net* is f29_assetval_landbuild scaled by net assets; *A/P* is f31_value_acctpay scaled by net assets; *R&D Exp* is f19a_res_dev_amt scaled by net assets; *Cash* is f29_assetval_cash; *Revenue* is f16a_rev_amt; Total Assets is the sum of f29_assetval_cash, f29_assetval_acctrec, f29_assetval_inventory, f29_assetval_equip, f29_assetval_landbuild, f29_assetval_veh, f29_othbusprop, and f29_assetval_other; *Net Inc* is f24_profitloss_amt

APPENDIX 2: UNIVARATE STATISTICS BY GENDER

	Male	Female	Male-Female	
	Mean	Mean	Diff	t-stat
Cash	0.259	0.260	0.001	0.192
	(0.002)	(0.004)		
Total Assets	1,004,088	407,733	596,355**	2.385
	(142,209)	(85,436)		
Revenue	81.678	9.607	72.071	0.683
	(60.856)	(1.897)		
Total Exp	28.877	7.559	-21.318	1.260
	(11.536)	(34.158)		
Wages	96.174	2.139	94.035	0.624
	(86.852)	(0.724)		
Net Inc	-4.408	-5.251	0.833	0.075
	(6.179)	(5.176)		
Equip	0.262	0.256	0.006	1.217
	(0.002)	(0.004)		
Inventory	0.115	0.178	-0.063***	16.546
	(0.002)	(0.004)		
Land	0.074	0.077	-0.002	0.683
	(0.002)	(0.004)		
A/P	1.850	2.265	0.416	0.211
	(1.007)	(1.569)		
R&D Exp	1.636	0.139	1.497	0.624
	(1.368)	(0.069)		
Observations	16,599	5,520		
	75%	25%		

Appendix 2 reports the univariate statistics for male and female owned firms. *Cash* is f29_assetval_cash scaled by net assets, where net assets is the sum of f29_assetval_acctrec, f29_assetval_inventory, f29_assetval_equip, f29_assetval_landbuild, f29_assetval_veh, f29_othbusprop, and f29_assetval_other; *Revenue* is f16a_rev_amt scaled by net assets; *Total Exp* is f17a_tot_exp_amt scaled by net assets; *Wages* is f18a_wage_exp_amt scaled by net assets; *Net Inc* is f24_profitloss_amt scaled by net assets; *Equip* is f29_assetval_equip scaled by net assets; *Inventory* is f29_assetval_inv scaled by net assets; Land is f29_assetval_landbuild scaled by net assets; *A/P* is f31_value_acctpay scaled by net assets; and *R&D Exp* is f19a_res_dev_amt scaled by net assets. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 3: UNIVARIATE STATISTICS BY RACE

	White-owned	Black-owned	Asian-owned	White-Black		White-Asian	
	Mean	Mean	Mean	Diff	t-stat	Diff	t-stat
Cash	0.257	0.280	0.311	-0.022***	-2.592	-0.053***	-4.651
	(0.002)	(0.009)	(0.012)				
Total Assets	880,046	188,466	2,608,129	691,580*	1.752	-1,728,082***	-2.717
	(114,180)	(35,018)	(1,471,623)				
Revenue	19.986	7.326	1,319.065	12.660	0.453	-1,299.079***	-4.870
	(7.639)	(1.168)	(1,307.183)				
Total Exp	23.316	5.405	86.855	17.911	0.610	-63.539*	-1.485
	(80.33)	(0.805)	(78.467)				
Wages	82.731	2.034	67.496	80.697	0.287	15.235	0.040
	(76.953)	(0.629)	(65.359)				
Net Inc	-6.113	-0.771	19.962	-5.341	-0.260	-26.075	-0.927
	(5.629)	(0.464)	(19.621)				
Equip	0.260	0.267	0.215	-0.007	-0.834	0.045***	4.103
	(0.002)	(0.009)	(0.011)				
Inventory	0.131	0.121	0.143	0.010*	1.429	-0.012*	-1.372
	(0.002)	(0.007)	(0.009)				
Land	0.077	0.064	0.076	0.013**	1.973	0.001	0.087
	(0.002)	(0.006)	(0.009)				
A/P	2.061	2.523	0.206	-0.462	-0.126	1.855	0.376
	(0.997)	(1.691)	(0.036)				
R&D Exp	1.433	0.338	0.165	1.095	0.241	1.268	0.210
	(1.210)	(0.276)	(0.036)				
Observations	18,723	1,402	765				
	90%	6.7%	3.6%				

Appendix 3 reports univariate statistics white- and African American- and Asian-owned firms. *Cash* is f29_assetval_cash scaled by net assets, where net assets is the sum of f29_assetval_acctrec, f29_assetval_inventory, f29_assetval_equip, f29_assetval_landbuild, f29_assetval_veh, f29_othbusprop, and f29_assetval_other; *Revenue* is f16a_rev_amt scaled by net assets; *Total Exp* is f17a_tot_exp_amt scaled by net assets; *Wages* is f18a_wage_exp_amt scaled by net assets; *Net Inc* is f24_profitloss_amt scaled by net assets; *Equip* is f29_assetval_equip scaled by net assets; *Inventory* is f29_assetval_inv scaled by net assets; *A/P* is f31_value_acctpay scaled by net assets; and *R&D Exp* is f19a_res_dev_amt scaled by net assets. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 4: UNIVARIATE STATISTICS BY EDUCATION

	No Degree	Degree	Post Degree	No Degree-Degree		Degree-Post	
	Mean	Mean	Mean	Diff	t-stat	Diff	t-stat
Cash	0.891	0.824	.706	0.066	0.330	0.124	0.365
	(0.264)	0.070	0.706				
Total Assets	38,242	609,680	1,939,161	-227,258	-1.039	-1,390,576***	-3.266
	148,531	87,308	811,169				
Revenue	11.659	16.726	24.066	-5.066	-0.656	-7.685	-0.496
	2.737	3.205	6.867				
Total Exp	12.545	28.359	9.802	-15.814	-0.437	19.428	0.265
	5.065	15.154	1.981				
Wages	1.383	5.360	2.000	-3.977	-0.841	3.517	0.367
	0.241	1.985	0.338				
Net Inc	0.830	3.754	3.481	-2.924	-0.592	0.286	0.029
	0.381	2.072	3.070				
Equip	0.363	0.364	0.344	-0.001	-0.112	0.021*	1.307
	0.008	0.003	0.015				
Inventory	0.194	0.175	0.231	0.019***	2.715	-0.060***	-4.589
	0.007	0.003	0.014				
Land	0.103	0.089	0.068	0.014***	2.472	0.022**	1.987
	0.006	0.002					
A/P	0.388	3.579	0.650	-3.191	-0.618	3.067	0.293
	0.146	2.167	0.197				
R&D Exp	0.030	0.122	0.229	-0.092	-1.057	-0.115	-0.882
	0.011	0.035	0.142				
Observations	2,084	11,823	530				
	14.4%	82%	3.7%				

Appendix 4 reports univariate statistics by owner education levels. No degree owners only have a high school diploma (or below); Degree owners have some college or training up to a bachelor's degree; Post degree owners have education or training beyond a bachelor's degree; *Cash* is f29_assetval_cash scaled by net assets, where net assets is the sum of f29_assetval_acctrec, f29_assetval_inventory, f29_assetval_equip, f29_assetval_landbuild, f29_assetval_veh, f29_othbusprop, and f29_assetval_other; *Revenue* is f16a_rev_amt scaled by net assets; *Total Exp* is f17a_tot_exp_amt scaled by net assets; *Wages* is f18a_wage_exp_amt scaled by net assets; *Net Inc* is f24_profitloss_amt scaled by net assets; *Equip* is f29_assetval_equip scaled by net assets; *Inventory* is f29_assetval_inv scaled by net assets; *A/P* is f31_value_acctpay scaled by net assets; and *R&D Exp* is f19a_res_dev_amt scaled by net assets. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 5: UNIVARIATE STATISTICS BY EXPERIENCE

	High Exp	Medium Exp	Low Exp	High-Low		High-Medium	
	Mean	Mean	Mean	Diff	t-stat	Diff	t-stat
Cash	1.201	0.865	0.967	0.234	1.037	0.336**	1.795
	(0.183)	(0.069)	(0.135)				
Total Assets	1,108,003	519,911	391,963	716,040***	3.626	588,092***	2.277
	(233,221)	(127,423)	(66,198)				
Revenue	61.345	12.118	19.173	42.172	1.210	49.228	1.156
	(45.185)	(1.276)	(4.853)				
Total Exp	55.631	11.732	39.080	16.552	0.402	43.900*	1.275
	(36.438)	(2.409)	(23.142)				
Wages	14.275	3.232	6.482	7.793	0.784	11.043	0.971
	(12.037)	(0.821)	(2.984)				
Net Inc	-5.662	1.257	5.106	-10.768	-1.060	-6.919	-0.601
	(12.213)	(0.257)	(3.171)				
Equip	0.357	0.370	0.355	0.002	0.3212	-0.013**	-1.785
	(0.005)	(0.005)	(0.004)				
Inventory	0.135	0.135	0.213	-0.078***	13.711	-0.000	-0.068
	(0.004)	(0.004)	(0.004)				
Land	0.076	0.074	0.102	-0.026***	-5.344	0.003	0.551
	(0.003)	(0.003)	(0.003)				
A/P	4.323	0.546	3.535	0.788	0.172	3.776	1.182
	(3.386)	(0.135)	(2.888)				
R&D Exp	7.451	0.530	0.073	7.378*	1.2757	6.921	0.985
	(7.253)	(0.294)	(0.012)				
Observations	4,447	5,008	7,739				
	26%	45%	29%				

Appendix 5 reports the univariate statistics by owner experience level. Low experience indicates the primary owner has less than 10 years of experience; medium experience indicates the primary owner has 10 – 20 years of experience; high experience indicates the primary owner has more than 20 years of experience; *Cash* is f29_assetval_cash scaled by net assets, where net assets is the sum of f29_assetval_acctrec, f29_assetval_inventory, f29_assetval_equip, f29_assetval_landbuild, f29_assetval_veh, f29_othbusprop, and f29_assetval_other; *Revenue* is f16a_rev_amt scaled by net assets; *Total Exp* is f17a_tot_exp_amt scaled by net assets; *Wages* is f18a_wage_exp_amt scaled by net assets; *Net Inc* is f24_profitloss_amt scaled by net assets; *Equip* is f29_assetval_equip scaled by net assets; *Inventory* is f29_assetval_inv scaled by net assets; *A/P* is f31_value_acctpay scaled by net assets; and *R&D Exp* is f19a_res_dev_amt scaled by net assets.. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

APPENDIX 6: MULTIVARIATE MODELS

Independent Variables	*1* *(Cash)*	*2* *(Cash)*	*3* *(Cash)*
Revenues	0.000	0.000	0.000
	(0.784)	(0.501)	(0.388)
Net Inc	0.000	0.000	0.000
	(0.140)	(0.384)	(0.400)
Inventory	-0.433***	-0.433***	-0.434***
	(0.000)	(0.000)	(0.000)
Equip	-0.447***	-0.447***	-0.450***
	(0.000)	(0.000)	(0.000)
A/P	-0.000**	-0.000	-0.000
	(0.013)	(0.279)	(0.273)
Male_dv	-0.017**	-0.017**	-0.017**
	(0.016)	(0.018)	(0.018)
White_dv	-0.014	-0.014	-0.013
	(0.170)	(0.158)	(0.194)
Black_dv	-0.004	-0.004	-0.004
	(0.783)	(0.783)	(0.805)
No_degree	-0.026***	-0.026***	-0.026***
	(0.002)	(0.001)	(0.001)
Post_degree	0.039***	0.039***	0.039***
	(0.000)	(0.000)	(0.000)
Owner_experience	0.000	0.000	0.000
	(0.039)	(0.419)	(0.352)
Constant	0.451***	0.451***	0.469***
	(0.000)	(0.000)	(0.000)
Firm-year Observations	22,119	22,119	22,119
R-squared	0.239	0.239	0.241
Firm Fixed Effects	No	Yes	Yes
Time dummies	No	No	Yes
Robust Std errors	No	Yes	Yes

Appendix 6 reports the fixed effect regressions estimating the relation between net cash and firm characteristics for a sample of KFS firms. *Cash* is f29_assetval_cash scaled by *net assets*, where *net assets* is the sum of f29_assetval_acctrec, f29_assetval_inventory, f29_assetval_equip, f29_assetval_landbuild, f29_assetval_veh, f29_othbusprop, and f29_assetval_other; *Revenue* is f16a_rev_amt scaled by *net assets*; *Net Inc* is f24_profitloss_amt scaled by *net assets*; *Equip* is f29_assetval_equip scaled by *net assets*; *Inventory* is f29_assetval_inv scaled by *net assets*; *A/P* is f31_value_acctpay scaled by *net assets*. *Male_DV* is an indicator variable set equal to 1 if the primary owner is male. *White_DV* is an indicator variable equal to 1 if the primary owner is white; *Black_DV* is an indicator variable equal to 1 if the primary owner is black. No_d*egree* is an indicatory equal to 1 if the primary owner has no post high-school education; P*ost_degree* is an indicator variable equal to 1 if the primary owner has education beyond a bachelor's degree. *Owner_Experience* is the years of experience of the primary owner. For brevity, the annual time dummies and industry dummies are not presented. *, **, and *** indicate statistical significance at the 10 %, 5 %, and 1%, levels, respectively.

FIGURES

FIGURE 1: TREND OF CASH

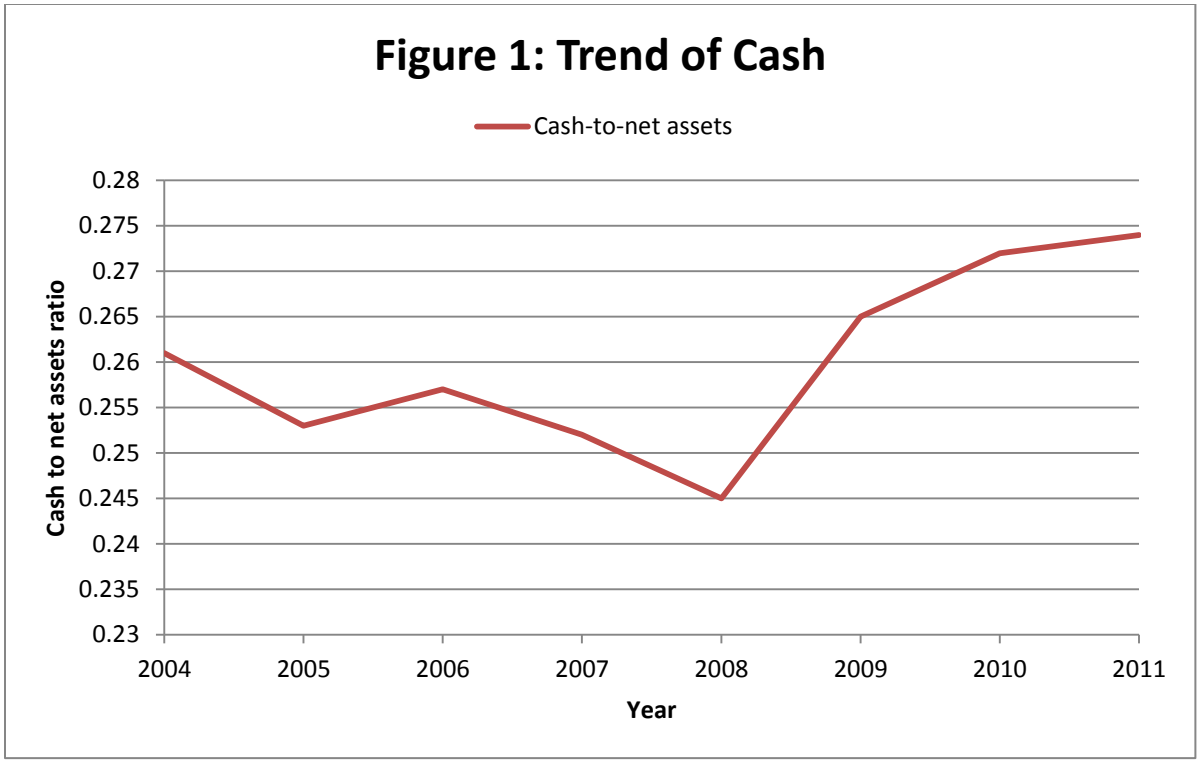
Figure 1: Trend of Cash
Cash-to-net assets
0.28
0.275
0.27
0.265
0.26
0.255
0.25
0.245
0.24
0.235
0.23
Cash to net assets ratio
2004
2005
2006
2007
2008
2009
2010
2011
Year

VITA

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ACADEMIC EXPERIENCE

June 2015 – present	Assistant Professor of Finance – University of South Alabama
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August 1998 – May 2011	Assistant Professor – Williams Baptist College
August 1996 – May 1998	Instructor – Arkansas State University

EDUCATION

Ph.D. – Major: Finance – Deember 2015
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PUBLICATIONS

Frictions and the Contribution of Inventory to Shareholder Wealth with Charles Beauchamp, William Hardin and Matthew D. Hill (2014), Forthcoming at *Journal of Financial Research*

WORKING PAPERS

"Costs of Illiquidity" with Kathleen Fuller

"Operating Performance and Aggressive Trade Credit Policies" with Ryan Davis and Matthew D. Hill

CONFERENCE PRESENTATIONS

Costs of Illiquidity
Spring 2015 – Eastern Finance Association Conference, New Orleans, LA
Fall 2015 – Southern Finance Association Conference, Captiva, FL

Frictions and the Contribution of Inventory to Shareholder Wealth
Spring 2014 - Eastern Finance Association Conference, Pittsburgh, PA
Fall 2012 - University of Memphis/University of Mississippi Symposium, Southhaven, MS

An International Evaluation of Short-Term Interest Rate Models
Decision Sciences Institute, Southwest Region Conference, Dallas, TX – Spring 1998

RESEARCH

Primary Interest: Liquidity management, cash, trade credit, working capital, corporate finance

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Chair: Kathleen Fuller
Member: Seong Byun
Member: Mark Walker
Member: Josh Hendrickson

Essay 1: Costs of Illiquidity

Essay 2: Liquidity and Dividend Policy

Essay 3: The Demographic Determinants of Small Firm Liquidity and the Impact on Firm Performance

ACADEMIC SERVICE

Discussant, EFA Annual Meeting – Spring 2014
Reviewer, *Financial Review* – Spring 2014
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Participant, FMA Annual Meeting – Fall 2012
HLC Steering Committee – 2010/11
General Education Requirement Committee – 2008/09
Faculty Senate President – 2007/08
Faculty Senate Representative – 2006 - 2008
Long-term Strategic Planning Committee – 2005/06
Participant, International Forum on Christian Higher Education – Spring 2006
Book review, *Money, The Financial System, and the Economy 4th ed*. By Glenn Hubbard (2002) – Summer 2000
Participant, Association of Financial Professionals Conference – Fall 2000
Phi Beta Lambda Sponsor – Fall 1999 – Spring 2011 – WBC
FMA Sponsor – Fall 1996 – Spring 1998 – ASU

TEACHING EXPERIENCE

University of South Alabama
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  - Most recent rating: 3.36/4.0
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  - Most recent rating: 3.20/4.0
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  - Most recent rating: 3.28/4.0

Williams Baptist College
- Introduction to Financial Management (13 semesters)
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- Working Capital Management (7 semesters)
- Consumer (Personal) Finance (8 semesters)
- Money and Banking (8 semesters)
- Macroeconomics (13 semesters)
- Microeconomics (13 semesters)
- Survey of International Business (11 semesters)
- Principles of Accounting I (6 semesters)
- Principles of Accounting II (6 semesters)
- Intermediate Accounting I (6 semesters)
- Managerial Accounting (7 semesters)
- Operations Management (9 semesters)
- Microcomputer Applications I (2 semesters)
- Microcomputer Applications II (7 semesters)
- Intermediate Algebra (1 semester)
- Contemporary Math (1 semester)

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PROFESSIONAL EXPERIENCE

May 1996 – July 1996	Credit Manager – Norwest Financial
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AFFILIATIONS AND HONORS

Director (Past Chair) of Northeast Arkansas Federal Credit Union Board
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Recipient of Arkansas Academic Distinction Scholarship

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- Eastern Finance Association
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