Investment Decisions, Asset Liquidity, and Stock Liquidity

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Abstract

Do managerial investment decisions affect the liquidity of a firm's stock? We answer this question through a model that links investment decisions to the liquidity of a firm's assets and the liquidity of its stock. Our model highlights the ambiguous effect of asset liquidity on stock liquidity. While greater asset liquidity reduces uncertainty regarding valuation of assets-in-place, it also increases future investments and the associated uncertainty. The model shows that asset liquidity has a more positive effect on stock liquidity for firms with less growth opportunities and for financially constrained firms. Empirically, we find a positive and economically large correlation between asset liquidity and stock liquidity. After controlling for firm fixed-effects, a one standard deviation increase in asset liquidity increases stock liquidity by 15%. The relation is more positive for firms with low growth opportunities, for financially constrained firms and for poorly governed firms. We find that a dollar of cash is worth seven to ten cents more for firms with less liquid stock. Apart from identifying a new determinant of stock liquidity, our analysis also promotes a new rationale for several empirical regularities such as the commonality in stock liquidity, and the improvement in stock liquidity following firm financing.

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1 Introduction

Do managerial investment decisions affect the liquidity of a firm's stock? Answer to this question is important not only to further our understanding about the determinants of stock liquidity but also to better understand observed managerial decisions.[1] While past research shows that uncertainty and asymmetric information about firm value are two fundamental drivers of stock illiquidity, there is no attempt yet at formally linking the two drivers to managerial investment decisions. We fill this gap in literature. We start by highlighting a hitherto unexplored but important link between the liquidity of a firm's real assets and the liquidity of its traded stock. We show that the balance sheet equivalence between the value of assets and liabilities may also carry over to their respective liquidities. We formalize this equivalence in a model that shows how managerial investment decisions that routinely transform the liquidity of both the firm's current and future assets can affect stock liquidity. Our model generates predictions on how the relation between asset liquidity and stock liquidity will vary with a firm's growth opportunities and financial constraints. We test the model's predictions in our empirical analysis and find significant support.

To guide our thinking we offer a simple model of a firm with liquid cash, an illiquid project and a growth option. The manager decides on the optimal allocation of cash between investment in the growth option and payment of dividends. A more productive growth option implies more investment, but a firm's investment may be limited if it is financially constrained. The price and liquidity of the firm's shares are determined in a market similar to that in Kyle (1985).

Our first result relates the liquidity of the firm's assets-in-place, which we measure by the proportion of cash on the balance sheet, to stock liquidity. We show that the relationship is ambiguous. While on the one hand, more cash lowers valuation uncertainty associated with assets-in-place and improves stock liquidity, on the other, it also implies more future investments, greater uncertainty about future assets and lower stock liquidity. The latter effect will be important if the level of future investments depends on current liquidity, say due to costs of raising external finance. Thus, the net effect of asset liquidity on stock liquidity is an empirical question.

We then study how the relation between asset liquidity and stock liquidity will vary in the cross-section. We show that this relation is more positive (or less negative) in firms with less growth opportunities. Intuitively, in firms with less growth opportunities, additional

[1] A large literature in accounting highlights how managerial disclosure policy can affect stock liquidity (). In this paper we are interested in how managerial investment decisions can affect stock liquidity.

cash on the balance sheet is allocated more towards dividends and less towards investments in new projects. Finally, we examine how the relation between asset liquidity and stock liquidity is affected by financial constraints. Our model shows that this relation is expected to be more positive among financially constrained firms because such firms are more likely to limit investments and conserve the cash on their balance sheet.

We next turn to testing the model predictions. While our theoretical measure of stock liquidity is Kyle's lambda, there is no unanimity in the literature on how to empirically measure stock liquidity. In our tests we employ four alternative measures of stock liquidity: the illiquidity measure proposed by Amihud (2002), the implicit bid-ask spread proposed by Roll (1984) as estimated by Hasbrouck (2006), the effective bid-ask spread calculated from intra-day data, and a measure based on the number of days with zero returns proposed by Lesmond, Ogden, and Trzcinka (1999). While stock liquidity is determined on a daily basis, the focus of this paper is on the relation between stock liquidity and managerial decisions, which are only announced and recorded periodically. Hence, in our tests we use annual averages of the four stock liquidity measures.

To measure asset liquidity, we sort the firm's assets based on their liquidity and assign liquidity scores between zero and one to each asset class. We then calculate a weighted liquidity score for the firm using the book value or market value of the different assets on the firm's balance sheet as weights. Finally, we normalize this weighted score by the lagged value of total assets of the firm. This approach to measuring asset liquidity is similar to Berger and Bouwman (2008). Using this approach we come up with four alternate measures of asset liquidity that vary based on the liquidity scores assigned to the different assets.

In our first set of tests we estimate the time-series and cross-sectional relation between asset liquidity and stock liquidity. These tests help understand which among the two effects identified by our model is empirically relevant. We use a panel data of all Compustat firms during the time period 1962-2006. In our main tests, we employ a model with time and firm fixed effects to understand how time-series changes in asset liquidity are related to time-series changes in stock liquidity for a particular firm. Our results indicate that after controlling for known determinants of stock liquidity, there is a positive, robust, and economically significant correlation between the alternative measures of asset liquidity and those of stock liquidity. For example, for a firm with median level of stock liquidity, a one standard deviation increase in asset liquidity as measured by assigning a liquidity score of one to cash and zero to all other assets, results in a 15% increase in Amihud's illiquidity measure.

To isolate the cross-sectional correlation between asset liquidity and stock liquidity, in our second set of tests, we adopt the Fama-Macbeth approach and conduct annual regressions of stock liquidity on asset liquidity, and test for significance of the average coefficients. Consistent with the results from the panel analysis, we find a strong, positive correlation between asset liquidity and stock liquidity in the cross-section as well. Thus, our empirical analysis shows that, on average, improvements in asset liquidity, lower uncertainty related to assets-in-place more than they increase uncertainty about future investments. Moreover, asset liquidity appears to be a strong empirical determinant of stock liquidity.

The second prediction of our model is that the positive relation between asset liquidity and stock liquidity should be weaker for firms with more growth opportunities. Using market to book ratio and capital expenditures to identify growth firms, we find that the relation between asset liquidity and stock liquidity is indeed weaker for firms with more growth opportunities.

To further explore how the relation between asset liquidity and stock liquidity relates to investment decisions, we carry out an event study around seasoned equity offerings (SEOs). Masulis, Eckbo, and Norli (2000) document an increase in stock liquidity following an SEO. An SEO leads to an immediate inflow of cash and an increase in asset liquidity. Our model predicts that the increase in stock liquidity following the SEO will be less for firms that invest the proceeds as compared to those that retain the proceeds as cash. Consistent with this prediction we find that stock liquidity in the post-SEO period is positively related to the fraction of the SEO proceeds the firm retains as cash at the end of the year.

We next test the prediction that the relation between asset liquidity and stock liquidity is more positive for financially constrained firms. Following the literature we use firm size, the presence of debt-ratings, and the probability of default to proxy for the presence of financial constraints. Consistent with our prediction, we find that the relationship between asset and stock liquidity is stronger for small firms, firms without debt rating, and firms with above median probability of default.

Summarizing, our empirical tests support all our model predictions and show that asset liquidity and stock liquidity are positively related and the relationship is weaker for firms with growth opportunities and stronger for financially constrained firms.

Research on corporate governance shows that the stock market puts a lower valuation on corporate cash holdings of poorly governed firms because the managers of such firms are more likely to waste some of the cash in perquisite consumption (Dittmar and Mahrt-Smith, 2007). Such perquisite consumption should also weaken the relation between asset liquidity and stock liquidity for such firms. Following this logic, we expect the relation between asset liquidity and stock liquidity to be weaker in firms with poor corporate governance. To test this prediction we use the index of anti-takeover charter provisions developed in Gompers, Ishii and Metrik (2002) and find that the relation between asset liquidity and stock liquidity is indeed weaker in firms with more anti-takeover charter provisions. These tests not only offer support for our theory but also offer additional support to the contention that managers of poorly governed firms are more likely to spend a part of the firm's cash holding in wasteful expenditures.

In our final set of tests, we estimate the value implications of the relation between asset liquidity and stock liquidity that we uncover. If the improvements in stock liquidity that result from an increase in asset liquidity lead to higher firm value – by reducing the firm's cost of capital or the costs of raising external finance – then asset liquidity should be more valuable for firms with an illiquid stock. To test this prediction we use the methodology in Faulkender and Wang (2006) and estimate the value of corporate cash holdings for firms with more and less liquid stock. To avoid spurious correlations, we take care to control for firm size and access to external finance as identified by the presence of credit ratings. Consistent with our prediction we find that an increase in corporate cash holding is more valuable for firms with less liquid stock. As compared to a firm with above median stock liquidity, a $ 1 increase in cash holdings is worth seven to ten cents more for a firm with below median stock liquidity.

This paper makes a number of contributions. Our results uncover a hitherto unexplored and economically significant determinant of stock liquidity, namely the liquidity of the firm's assets-in-place. We further show that this relationship depends on market's expectations regarding future investments, and financial constraints facing the firm. Our paper thus establishes a link between the corporate finance and market microstructure literatures.[2] Understanding this link is important not only to understand the determinants of stock liquidity but also to evaluate different managerial actions. For example, the effect of high cash balances in improving stock liquidity is a hitherto unknown benefit of cash.

The link between asset and stock liquidity also helps us understand some documented empirical regularities. For example, our theory offers a rational explanation for the documented stock under-performance following corporate events that result in cash infusions such as SEOs and IPOs. The improvement in stock liquidity following the cash infusion– as highlighted by our results– is likely to reduce the liquidity risk premium for the stock

[2] A recent line of literature relates stock liquidity to the funding liquidity of traders in the stock (see Brunnermeier and Pedersen, 2008). Unlike this literature's focus on relating the asset structure of traders to stock liquidity, our focus is on relating the asset structure of the firm to the liquidity of its stock.

which in turn is likely to reflect as stock under-performance based on the ex ante risk characteristics. Our theory also predicts how the under-performance is likely to vary in the cross-section. Furthermore, the link between cash balances and stock liquidity may go some way towards explaining the secular increase in both stock liquidity and the level of cash balances in the recent years (Chordia, Roll, and Subrahmanyam (2007) and Foley et, al. (2007)). Finally, our results also offer a potential explanation for commonality and non-diversifiability of stock liquidity.[3] Indeed, changes in macroeconomic conditions affect firm's growth opportunities and financial constraints, and hence, according to this paper, stock liquidity.

The rest of the paper is organized as follows. In the next two sections, we describe our theoretical model and derive the main empirical predictions on the basis of this model. Section 4 describes our data, and our measures of stock and asset liquidity. Section 5 discusses our main empirical results while Section 6 concludes.

2 Model

In this section we develop a simple model that highlights the relationship between asset liquidity, future investments, and stock liquidity. The key feature of the model is that stock liquidity today is affected by the structure of the firm's assets today, and by expectations regarding future investments.

There are three dates 0, 1, and 2. At date 0, we consider a firm with assets-in-place whose value is normalized to \$1. The assets comprise of cash of value $\$\alpha$ and a project of value $\$[1-\alpha]$, ($\alpha \in [0,1]$). We refer to α as the "asset liquidity" of the firm. Each dollar of the project will return $\tilde{x}$ units of cash at date 2, where $\tilde{x} = \mu_x + \tilde{\varepsilon}_x$, and $\tilde{\varepsilon}_x \sim N\left(0, \sigma_x^2\right)$.

At date 1, the firm gets a new project and the manager decides on the allocation of the cash between an interim dividend and investment in the new project. We assume that the manager's objective is aligned with that of the current shareholders of the firm. Let $\gamma \geq 0$, represent the fraction of the cash invested in a new project and $1-\gamma$ the fraction of cash that is paid out as dividends. Note that $\gamma > 1$, indicates investment in excess of the cash available with the firm at date 0. In this case the firm will raise outside financing to invest in the project. In that case we will have $1-\gamma < 0$, reflecting a negative interim dividend which can be interpreted as an equity issuance. This is similar to Miller and Rock (1985).

[3] See Chordia, Roll, and Subrahmanyam (2000), Huberman and Halka (2001), Hasbrouck and Seppi (2002), Pastor and Stambaugh (2003), Acharya and Pedersen (2005), Sadka (2006), and Korajczyk and Sadka, (2007).

The output from investing a dollar amount $\alpha\gamma$ in the project is given by the stochastic production function

$$\tilde{y} = k\alpha h(\gamma)(1 + \tilde{\varepsilon}_y), \tag{1}$$

where $\tilde{\varepsilon}_y \sim N(0, \sigma_y^2)$ is an unexpected shock to production. Thus, the expected output from the project is $k\alpha h(\gamma)$. We assume that $h(\cdot)$ satisfies $h'(\cdot) > 0$, and $h''(\cdot) < 0$, reflecting diminishing marginal returns to investment. A few comments on our production technology are in order. Note that the technology is concave in the fraction of cash invested in the project, γ. In other words, the marginal returns to investment depend on the source of finance. Marginal returns are higher if the firm has a high cash balance and uses a part of it to invest in the project – instances when γ is low – as compared to when the firm raises external finance to invest in the project – instances when γ is high. This is a departure from a Modigliani-Miller world, and we use this assumption to capture the presence of costs of raising external finance in a reduced form. The costs of raising external finance reduce the marginal returns from investing outside cash. We discuss the implications of this assumption for all our results and also discuss how our empirical tests help validate the assumption.

We also assume that $h'(0) = \infty$, implying that some positive investment is optimal. Parameter $k > 0$ is a productivity parameter. A higher k indicates higher marginal productivity at all investment levels, and thereby captures better growth opportunities. We let the correlation between $\tilde{\varepsilon}_x$ and $\tilde{\varepsilon}_y$ be $\rho \geq 0$. The firm is liquidated at date 2 and a liquidating dividend is paid to the equity holders. All agents are risk-neutral and the risk free interest rate is 0.

At date 0, the firm's stock is traded in a market *á la* Kyle (1985). Specifically, there are three types of traders: an insider, noise traders, and a market-maker. We assume that the insider knows the actual realizations of both $\tilde{\varepsilon}_x$ and $\tilde{\varepsilon}_y$. While this assumption is unrealistic, it is actually innocuous. Our results are robust to assuming that the insider obtains a partially informative signal about $\tilde{\varepsilon}_x$ and $\tilde{\varepsilon}_y$,. We assume perfect knowledge to limit the complexity of the analysis. Noise traders are uniformed and trade an exogenously given amount distributed according to $\tilde{u} \sim N\left(0, \sigma_u^2\right)$, where $\tilde{u}$ is uncorrelated with either $\tilde{x}$ or $\tilde{y}$. The market-maker is uninformed and sets the price to clear the market. The market-maker observes the total order flow (both informed and uninformed), but cannot distinguish between the two. As in Kyle (1985), we assume that the market-maker breaks even due to price competition in the market-making business. The insider trades to maximize his profit, trying to use the noise traders to hide his trades.

We solve the model backwards, restricting attention to sub-game perfect equilibria, where (as in Kyle (1985)) both the market-maker and the informed traders use linear trading strategies. First, we solve the date 1 investment problem. At date 1 the manager optimally decides on the allocation of cash between interim dividend and investment. Firm value as a function of the fraction of cash invested in the new project, γ, is

$$V(\gamma) \equiv (1-\alpha)\mu_x + k\alpha h(\gamma) + \alpha(1-\gamma). \tag{2}$$

The first term represents the expected cash flow from the existing project. The second and third terms represent the expected cash flows from the new project, and the interim dividend respectively. Since the manager's objective is aligned with that of the shareholders, at date 1 the manager will choose γ to maximize (2). Thus, the manager's problem can be represented as:

$$\max_{\gamma} \quad V(\gamma). \tag{3}$$

The first order condition of this problem implies that the optimal proportion of cash invested is

$$\gamma^* = h'^{-1}\left(\frac{1}{k}\right). \tag{4}$$

The second order condition is satisfied due to the concavity of $h(\cdot)$. Thus the optimal investment level satisfies,

$$\frac{\partial \gamma^*}{\partial k} = -\frac{1}{k^2 h''\left(h'^{-1}\left(\frac{1}{k}\right)\right)} > 0. \tag{5}$$

That is, firms with better investment opportunities invest a higher proportion of their cash.

Consider now the trading in the firm's shares at date 0. Both the market-maker and the insider anticipate the optimal investment/payout decision of the manager in date 1. As a result, the expected firm value is $V(\gamma^*)$. The variance of the firm value at time 0 is given by

$$\sigma_0^2 \equiv (1-\alpha)^2\sigma_x^2 + \alpha^2 k^2 h(\gamma^*)^2\sigma_y^2 + 2\alpha(1-\alpha)kh(\gamma^*)\sigma_x\sigma_y\rho. \tag{6}$$

The first term reflects the variability of the assets-in-place, the second term reflects the variability of the expected investment, taking into account the optimization of the manager. Finally, the third term reflects the contribution of the correlation between the current and future project to the total variability of the firms assets. In equilibrium, the market-maker uses a linear pricing function with slope equal to Kyle's lambda. That is, lambda measures the price impact per \$1 of order flow, and is a conventional measure of stock illiquidity.

Applying the results in Kyle (1985), we can represent λ as

$$\lambda = \frac{1}{2}\frac{\sigma_0}{\sigma_u}, \tag{7}$$

where unlike in Kyle's original model, σ_0 is endogenous and given by (6). As usual, λ is large when σ_0 is large in comparison to σ_u. That is, when variations in fundamentals are large relative to variations in noise trading, which implies that the market-makers responds more drastically to variations in order flow since they are more likely to reflect fundamental information.

Our first result illustrates how asset liquidity is related to stock liquidity in our model. To simplify the analysis we assume from now on that $\rho = 0$. All of the conclusions are qualitatively similar when ρ is strictly positive. Interestingly, the relation between the liquidity of the assets-in-place and stock liquidity is not monotonic.

Proposition 1 *The relation between asset liquidity and stock liquidity is ambiguous. Higher asset liquidity is associated with higher stock liquidity (lower λ) if and only if $\alpha < \hat{\alpha}$, where $\hat{\alpha} \equiv \frac{1}{1+\left(k\frac{\sigma_y}{\sigma_x}h(\gamma^*)\right)^2}$, and γ^* is given by (4).*

All proofs are presented in the Appendix. An increase in α has two conflicting effects on the variance of the firm's cash flows, σ_0. First, a higher α corresponds to a higher proportion of cash within assets-in-place, contributing to a reduction in σ_0. However, a higher α also implies that the manager has more cash in hand which is likely to be converted to a new project, which contributes into an increase in σ_0. Since returns are higher for investment of internal cash, a higher cash balance also implies more investment. As long as α is small enough (smaller than $\hat{\alpha}$), the first effect dominates, and an increase in alpha translates into higher stock liquidity. Once α becomes sufficiently large, the second effect dominates and an increase in asset liquidity lowers stock liquidity.

Note that the second effect results from our assumption that the returns to investment are concave in γ. If alternatively, the returns are linear in γ (and α), it is easy to show that total investment, $\alpha \times \gamma^*$ will depend only on the productivity parameter k and stock liquidity will unconditionally increase in asset liquidity.

Note that the cutoff level $\hat{\alpha}$ is determined by growth opportunities k, optimal investment γ^*, and by the ratio between the variability of the future vs. current project: $\frac{\sigma_y}{\sigma_x}$. Intuitively, the higher are k, γ^*, and $\frac{\sigma_y}{\sigma_x}$, the effect of future investments on the variance of the future cash flows is larger, lowering the cutoff level under which asset liquidity and stock liquidity are positively correlated.

To illustrate this result consider the following example. Assume $\sigma_x = \sigma_y$, that is, growth opportunities have the same underlying uncertainty as assets-in-place. Also assume a production function given by $h(\gamma) = 2\sqrt{\gamma}$. Then, from (4), $\gamma^* = k^2$ and $\hat{\alpha} = \frac{1}{1+2k^3}$. Thus a firm with growth opportunities $k = 1$, will optimally invest $\gamma^* = 1$ (100%) of the available cash in growth opportunities. For such a firm, an increase in asset liquidity is associated with higher stock liquidity, as long as liquid assets (cash) account for less than $\frac{1}{3}$ of the total assets.

We next turn to the study of cross-sectional variations in the relation between asset liquidity and stock liquidity. Our focus is on variations in growth opportunities and financial constraints. Such variations have an important effect on investment decisions, and thereby on the relation between asset liquidity and stock liquidity. Recall that a higher k indicates a higher marginal productivity at all investment levels, and hence better growth opportunities.

Proposition 2 *The relation between asset liquidity and stock liquidity is less positive (or more negative) for firms with more growth opportunities.*

The intuition for this result is simple. For a given α, a firm with more growth opportunities (higher k) obtains a higher expected output for every dollar invested in the new project. Furthermore, from (5), we see that firms with more growth opportunities are also likely to invest a larger fraction of the cash balance in the project (higher γ^*). Both these effects increase the proportion of the new project cash flows in firm value. Since project cash flows are risky, this contributes to increasing σ_0 relative to σ_u, thereby reducing stock liquidity. Thus, if originally the relation between asset liquidity and stock liquidity was positive ($\alpha < \hat{\alpha}$) this relation would become even stronger, whereas if the relation were negative, it would become less so.

Note that this result depends on our assumption that returns to investment are concave in γ. If alternatively, returns are linear in both γ (and α), it can be shown that growth opportunities will not effect the relation between asset liquidity and stock liquidity. In that case the amount of investment will only depend on growth opportunities k and will be independent of the amount of cash with the firm. We use the tests of this proposition as additional validation for our technology assumption.

We next consider the effect of financial constraints on the relation between asset liquidity and stock liquidity. While our assumption of differential returns to investment of internal vs external cash can be considered as representing costs of raising external finance, to better highlight the comparative statics of the presence of financial constraints, we model such constraints as imposing a hard constraint on the amount that the firm can invest. That is we assume that firms facing financial constraints have an upper bound on γ. That is for such firms, there exists a $\hat{\gamma} > 0$ such that $\gamma \leq \hat{\gamma}$. This can be interpreted as representing a precautionary savings motive for financially constrained firms or a hard constraint on the amount of external finance that a firm can raise. Note that a firm that faces binding financial constraints will have $\gamma^* = \hat{\gamma}$. Thus, in general, the optimal investment level is given by

$$\gamma^* = \min\left(\hat{\gamma}, h'^{-1}\left(\frac{1}{k}\right)\right). \tag{8}$$

Consider two firms with the same growth opportunities (same k) and asset liquidity. Assume, however that firm 1 is unconstrained whereas firm 2 faces binding constraints. Then, the optimal investment level will be higher for firm 1 $\left(\gamma_1^* = h'^{-1}\left(\frac{1}{k}\right)\right)$ as compared to firm 2 $\left(\gamma_2^* = \hat{\gamma}\right)$. Given this, the following proposition derives the effect of financial constraints on the relation between asset liquidity and stock liquidity.

Proposition 3 *The relation between asset liquidity and stock liquidity is more positive (or less negative) for constrained firms.*

Intuitively, a binding upper bound on γ^* means that for a constrained firm, a lower proportion of each additional dollar of cash is invested in a new project. Thus, the relation between asset liquidity and stock liquidity is more positive.

3 Empirical Predictions

In this section, we describe the main empirical predictions of our model. These predictions enable us to study how managerial investment decisions affect stock liquidity. They also link variations in growth opportunities and financial constraints to the liquidity of the firm's stock.

From Proposition 1 we know that the relation between asset liquidity and stock liquidity can be either positive or negative. While a higher proportion of liquid assets on the balance sheet reduces the uncertainty regarding assets-in-place, it also enables more future investment, thereby increasing the level of uncertainty. These two effects work in opposite directions on stock liquidity. In our empirical analysis we test to see which effect is empirically relevant. Thus, our first prediction is:

Prediction 1 *The liquidity of the firm's stock may be either positively or negatively related* *to the liquidity of the firm's assets.*

Proposition 2 implies that the relation between asset liquidity and stock liquidity is less positive for firms with more growth opportunities. For such firms, an additional dollar of cash is more likely to be invested, increasing the variability of the cash flow and hence weakening the relation between asset liquidity and stock liquidity. We use firm capital expenditures and market to book ratios to proxy for the level of growth opportunities. Firms with higher capital expenditure and those with high market to book ratios are likely to have more growth opportunities. Hence our second prediction is:

Prediction 2 *The relation between asset liquidity and stock liquidity will be weaker for firms with high capital expenditure and high market to book ratios.*

As a further test of how managerial investment decisions affect the relation between asset liquidity and stock liquidity, we study the changes in stock liquidity following instances of firm financing. Say, when a firm raises financing through a SEO, the cash infusion is likely to result in high cash balances relative to total assets and hence high asset liquidity. However, if the manager is expected to invest the cash in projects and growth opportunities, then despite the high asset liquidity, there is likely to be a lot of uncertainty regarding future value. Thus the improvement in stock liquidity following firm financing will depend on the future utilization of the proceeds. Hence, we predict:

Prediction 3 *The improvement in stock liquidity following financing will depend on the extent to which the proceeds are retained as cash.*

Proposition 3 shows that the relation between asset liquidity and stock liquidity will be more positive for firms that face constraints in raising external finance. Such firms invest a smaller proportion of their liquid assets in new projects, hence more liquid assets on the balance sheet reduce the variability of the terminal cash flows, improving stock liquidity. We use firm size and the presence of credit ratings to identify firms that face constraints in raising external finance. Smaller firms and firms without credit rating are more likely to face constraints in raising external finance. Furthermore, firms that are closer to financial distress are not only likely to face constraints in raising external finance, but they are also likely to be subject to an underinvestment problem (Myers (1979)).[4] For such firms as well

[4] An alternate view emphasizes agency conflicts when firms are in financial distress, and argues that asset liquidity may give managers of such firms greater discretion. Managers may be able to sustain inefficient operations by liquidating the assets (see DeAngelo, DeAngelo, and Wruck (2002)). Our empirical tests try to distinguish this view from the one described in the text.

we expect the relation between asset liquidity and stock liquidity to be more positive. Thus our third prediction is:

Prediction 4 *The relation between asset liquidity and stock liquidity will be stronger for financially constrained firms, in particular for smaller firms, firms without credit ratings and for firms with higher default likelihood.*

We now describe the data we use to test these predictions.

4 Data and Liquidity Measures

To test our predictions we construct a sample that spans 1964-2006. Our analysis focuses on annual firm level data for all Compustat firms. We obtain data for two measures of stock liquidity from Joel Hasbrouck's website. We use TAQ data to construct one of our stock liquidity measures. We complement these data with daily stock returns and trading volume from CRSP and annual firm financial data from Compustat. Finally, we use the SDC database to identify SEOs. Apart from availability of liquidity measures and financial information in Compustat, we also limit our sample to firms with book value of assets higher than $5 million and with a minimum of two years of financial data. These restrictions ensure that very small firms do not disproportionately influence our results.

In our empirical tests we are broadly interested in examining how the liquidity of the firm's assets affects the liquidity of its stock, and how this relation varies with a firm's growth opportunities and financial constraint status. We use four popular measures of stock liquidity. The first one is the illiquidity measure proposed by Amihud (2002). Since the raw Amihud measure is highly skewed, we use the square root version of the raw measure in our empirical analysis. For every stock in our sample and for every year it is calculated as:

$$Illiq_{i,t} = \frac{1}{N_{i,t}} \sum_{j=1}^{N_{i,t}} \sqrt{\frac{|R_{i,j}|}{Vol_{i,j} \cdot P_{i,j-1}}}$$

where $N_{i,t}$ is the number of trading days for stock i during year t, $R_{i,j}$ is the return on day j, $Vol_{i,j}$ is trading volume in millions of shares, and $P_{i,j-1}$ is the closing stock price. *Illiq* is a price impact measure and captures the stock return per one million dollars of trading volume along the lines of Kyle's (1985) 'lambda'. We obtain the annual average *Illiq* measure for all the stocks in our sample from Joel Hasbrouck's website.

Our second measure of stock liquidity is the implicit bid-ask spread, s, first proposed in

Roll (1984). This measure is calculated as the square root of the negative daily autocorrelation of individual stock returns. i.e.

$$s_{i,t} = \sqrt{-Cov(R_{i,j}, R_{i,j-1})},$$

and should correspond to one half of the bid-ask spread. Since the autocorrelation of stock returns is often positive, this measure is not well defined in many cases. To overcome this problem, Hasbrouck (2005) introduced a Gibbs sampler estimate which imposes a negative prior on the autocorrelation. We use this modified version for our empirical analysis. We obtain data on this measure as well from Joel Hasbrouck's website.

Our third measure of stock liquidity is the annual average effective bid-ask spread, *Spread*, calculated from intra-day TAQ data. The bid and ask prices are identified from the intra-day transaction data using the Lee and Ready (1991) algorithm. The effective bid-ask spread for any trade is equal to the ratio between the absolute difference between the trade price and the mid-point of the associated quote and the trade-price. The effective spread is then averaged over the year to obtain *Spread.* This data on the average effective spread was obtained from the web site of the University of Vanderbilt's Center for Research on Financial Markets and is available to us only for the sub-period 1994-2006.

Our final measure of stock liquidity is the proportion of days in a year in which the stock has zero returns, *Zero Ret.* This measure was first proposed by Lesmond, Ogden, and Trzcinka (1999). The rationale is that illiquid stocks are likely to be traded infrequently. We calculate this measure at annual frequencies using daily stock returns from CRSP.

Our main independent variable is a measure of asset liquidity. We assign liquidity scores between zero and one to all the assets on a firm's balance sheet based on their level of liquidity. We then calculate a weighted asset liquidity score using the book value of the different assets as weights and normalize using the lagged value of total assets. Using this approach we come up with four alternate measures of asset liquidity. These measures differ in terms of the liquidity score assigned to the balance sheet items. This approach to measuring asset liquidity is similar to Berger and Bouwman (2008).

Our first measure of asset liquidity assigns a liquidity score of one to cash and equivalents and a score of zero to all other assets of the firm. Formally, our first *Weighted Asset Liquidity* (*WAL*) measure for firm i in year t is given by

$$\text{WAL-1}_{i,t} = \frac{\text{Cash \& Equivalents}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 1 + \frac{\text{Other Assets}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 0.$$

Thus, effectively, *WAL-1* is just the proportion of cash and equivalents to the firm's lagged total assets. Clearly, this measure leaves out a lot of information about the liquidity of the other assets, as it presumes that all assets other than cash and equivalents are perfectly illiquid. Nevertheless, this measure is useful because it best captures the parameter α in our model.

While cash and equivalents are perfectly liquid, non-cash current assets (CA) are semi-liquid. That is, they can be converted to cash relatively quickly and at a low cost. Thus, for our second measure of asset liquidity we assign a liquidity score of one-half to non-cash current assets. Our second *WAL* measure is,

$$\text{WAL-2}_{i,t} = \frac{\text{Cash \& Equivalents}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 1 + \frac{\text{Non Cash CA}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 0.5 + \frac{\text{Other Assets}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 0.$$

Non-current assets can broadly be divided into tangible and intangible assets with tangible assets such as property, plant, and equipment being more liquid than intangible assets such as growth opportunities and goodwill. Following this logic we calculate our third measure by assigning a liquidity score of one for cash, three-quarters for non-cash current assets, one half for tangible fixed assets, and zero for the rest. We calculate tangible fixed assets as the difference between the book value of total assets and the sum of current assets, and book value of goodwill and intangibles.[5] This gives rise to our third *WAL* measure,

$$\begin{aligned}\text{WAL-3}_{i,t} = {} & \frac{\text{Cash \& Equivalents}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 1 + \frac{\text{Non Cash CA}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 0.75 \\ & + \frac{\text{Tangible Fixed Assets}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 0.5 + \frac{\text{Other Assets}_{i,t}}{\text{Total Assets}_{i,t-1}} \times 0.\end{aligned}$$

We construct our fourth and final measure of asset liquidity based on market values, to capture the liquidity of both assets-in-place and growth options. We construct the *Market Weighted Asset Liquidity* measure (MWAL), by assigning a liquidity score of one to cash and equivalents, three-quarters to non-cash current assets, one half to tangible fixed assets, and zero to the rest. We calculate tangible fixed assets as the difference between the book value of total assets and the sum of current assets and goodwill. We normalize this weighted score by the lagged market value of total assets to obtain:

$$\begin{aligned}\text{MWAL}_{i,t} = {} & \frac{\text{Cash \& Equivalents}_{i,t}}{\text{Market Assets}_{i,t-1}} \times 1 + \frac{\text{Non Cash CA}_{i,t}}{\text{Market Assets}_{i,t-1}} \times 0.75 \\ & + \frac{\text{Tangible Fixed Assets}_{i,t}}{\text{Market Assets}_{i,t-1}} \times 0.5 + \frac{\text{Other Assets}_{i,t}}{\text{Market Assets}_{i,t-1}} \times 0.\end{aligned}$$

[5] We obtain book values of goodwill and intangibles from Data204 and Data33 in Compustat.

Note that *MWAL* assigns a liquidity score of zero to growth options. Since we normalize the measure by the market value of assets – which is likely to include growth options – ceteris paribus, *MWAL* will be lower for firms with a higher proportion of growth options.

We use additional independent variables to account for firm and market characteristics that are likely to affect stock liquidity. We control for firm size, which is an important determinant of stock liquidity using the log of the market capitalization of the firm's equity, *Log(Mkt. Cap.)*. We also control for the extent of growth opportunities using the ratio of market value of equity to the book value of equity, *Market to Book*, and using the ratio of capital expenditures to total assets, *Capital Expenditure*. We also control for firm performance using return on assets, *ROA*– which is the ratio of operating income to lagged value of total assets– and using the annual buy and hold abnormal return during the previous year, *BHAR*. We measure abnormal return as the difference between the return on the firm's stock and the return on the value weighted portfolio of all stocks traded in the NYSE, Amex, and Nasdaq. Firms with more transparent earnings and firms with better disclosure policies are also likely to be associated with higher stock liquidity (Diamond and Verrecchia (1991), Bhattacharya, Desai, and Venkataraman (2007)). In most of our specifications we employ firm fixed effects and this is likely to control for most of the time invariant variation across firms in disclosure policies. In addition, we also control for the quality of a firm's earnings using the level of discretionary accruals normalized by lagged value of total assets. We calculate this measure following the procedure outlined in Jones (1991) modified by including controls for earnings performance as proposed in Kothari, Leone, and Wasley (2005).[6] Finally, we control for stock return volatility, *Volatility*. We measure stock volatility as the standard deviation of monthly stock returns during the sixty months preceding the current year.

We also use the control variables to test our predictions on how the relation between asset liquidity and stock liquidity is likely to vary in the cross-section. For example, we use *Market to Book* and *Capital Expenditures* to identify firms with growth opportunities and test *Prediction 2*. Another important variable that plays a role in our analysis is the likelihood that the firm goes bankrupt. We proxy for this using a modified version of the Merton-KMV expected default probability as outlined in Bharath and Shumway (2008). We use this along with firm size and the presence of credit ratings as a proxy for firm financial constraints to test *Prediction 4*.

Table I presents summary statistics for the key variables in our sample. To reduce the

[6] The reported results used the signed discretionary accruals. The results are similar when using the absolute value of the discretionary accruals instead (not reported).

effects of outliers, all our variables are winsorized at the 1% level. The median value of *Illiq* in our sample is 0.307. Average Roll's estimate of the half spread is about 1% implying an average relative spread during the entire sample period of approximately 2%. Consistent with this, the average effective half spread as estimated from the TAQ data, *Spread* in our sample is about 0.9%. Recall that this measure is estimated only during the sub-period 1994-2006. The average probability of zero-return in the sample is 17.8%.

The mean value of *WAL-1* is 0.143. That is, for firms in our sample book value of cash constitutes about 14% of the value of previous year's total assets. Note that the maximum value of all four of our weighted asset liquidity measures is greater than one because we normalize the weighted liquidity score by lagged total assets and not contemporaneous total assets. We normalize by lagged total assets to avoid spurious correlation between contemporaneous total assets and stock liquidity. The average market capitalization of equity in our sample is $1449.8 million, whereas the median is $125.7 million. Since market capitalization is highly skewed, we use the logarithm of market capitalization in all our analysis. The average market to book ratio of equity in our sample of 2.45 is comparable to other studies. The average expected default probability of our sample firms is 6% while the 90^{th} percentile is 21.3% (Not reported in the table). This ensures that there is sufficient variation in default probability in our sample. Firms in our sample have an average return on assets of 12.2%, and experience an average annual buy and hold abnormal return of 4.6%. The average abnormal return is positive because our sample requirements of minimum book value of total assets of $5 million, and availability of more than two years of data tilts our sample towards the better performing firms. This is unlikely to bias our results because one of the reasons for stipulating minimum size requirements is to ensure that the very small firms do not drive our results. About 19% of firms in our sample have short term credit rating from S&P.

[Table I goes here]

Table II presents the correlations among the key variables in our analysis. As expected, the four measures of stock liquidity are highly correlated with each other. Among the measures of asset liquidity, the three book value based measures are also highly correlated. The market value based measure is less correlated with the book value based measures. That is because a large fraction of the variation in the market value based measure is from changes in the market to book ratio. This is evident from the fact that the correlation between *MWAL* and *Market to Book* is -.417. We believe this is also the reason why *MWAL* is unconditionally positively correlated with the measures of stock illiquidity. As we see, in our multivariate regressions, once we control for firm fixed effects and the market to book ratio, *MWAL* is negatively correlated with the measures of stock illiquidity.[7] Among the book value based asset liquidity measures, while *WAL-1* is uniformly negatively correlated with the four measures of stock illiquidity, the pattern with the other two measures of asset liquidity is mixed. Note that these are both time series and cross-sectional correlations. In our tests we try to separately estimate the time series and cross-sectional correlations after controlling for known determinants of stock liquidity and find that all three measures of asset liquidity are uniformly negatively correlated with the stock illiquidity measures. Many of our control variables are also significantly correlated with the stock illiquidity measures, justifying the need to include them in the regressions.

[Table II goes here]

5 Empirical Results

5.1 The Basic Effect

We begin our empirical analysis by testing whether on average there is a positive or negative relation between asset liquidity and stock liquidity. Recall that *Prediction 1* indicates that this relation is ambiguous: more cash on the balance sheet both reduces uncertainty regarding assets-in-place, and increases the uncertainty regarding future investments. To find out which effect dominates, we estimate panel models with both firm fixed effects and time effects as follows:

$$Y_{i,t} = \alpha + \beta \times X_{i,t} + \gamma \times \text{Controls}_{i,t} + \mu_i + \mu_t + \epsilon_{i,t}. \qquad (9)$$

Here $Y_{i,t}$ is one of the four measures of stock liquidity for firm i during year t, $X_{i,t}$ is one of the four asset liquidity measures, μ_i are firm fixed-effects, and μ_t are year dummies. The control variables are *Log(Mkt. Cap.)*, *Capital Expenditure*, *Market to Book*, *ROA*, *BHAR*, *Volatility*, and *Discretionary Accruals*. We use robust standard errors clustered at the firm level.[8]

The use of firm fixed effects ensures that the model in (9) examines how changes in asset

[7] Since a lot of variation in our market value measure is driven by changes in market value of equity, we put more weight on the results with our book value measures.

[8] Since stock liquidity is correlated across stocks at a point in time, in alternate empirical specifications, we repeat our tests clustering standard errors at the year level and obtain results similar to the ones reported. Alternatively, we also tried clustering standard errors both at the firm and year level, but given the large number of fixed effects in our specifications, the estimates failed to converge.

liquidity over time at the firm level are associated with changes in stock liquidity. Table III reports the results of tests of *Prediction 1* with the sixteen different combinations of measures of stock liquidity and asset liquidity. Since all four measures of stock liquidity are, in fact measures of stock illiquidity, the sign of the relationship between asset and stock liquidity is opposite to the sign of the coefficient.

In Panel A the dependent variable is either *Illiq* or *s*. Columns (1) - (4) have *Illiq* as the dependent variable and correspond to the four different measures of asset liquidity: *WAL-1*, *WAL-2*, *WAL-3*, and *MWAL*. The coefficients on *all* four different measures are significant and have the expected negative sign. Furthermore, the results are economically significant. For example, for a firm with a median level of stock liquidity, a one standard deviation increase in *WAL-1* reduces *Illiq* by 15%. Similarly, one standard deviation increase in *MWAL* reduces *Illiq* by 11.5% for a firm with a median level of stock illiquidity. Note that the R^2 in all our regressions are high because of the use of firm fixed effects.

All our control variables are significant and have coefficients along expected lines: Smaller firms and firms with high market to book ratios have less liquid stock. Additionally, firms that do not undertake large capital expenditure, firms with low levels of profitability and abnormal stock returns have illiquid stocks.

In Columns (5)-(8) we repeat our estimation with Roll's measure as the dependent variable and obtain results consistent with those in the earlier columns. Here again we find that an increase in the proportion of liquid assets in the firm's balance sheet increase stock liquidity. The results are also economically significant. For example, the estimate in Column (5) indicates that for a firm with median level of stock liquidity, a one standard deviation increase in *WAL-1* improves liquidity by 10%, while the estimate in Column (8) indicates that a one standard deviation increase in *MWAL* improves liquidity by 12.2%. In Panel B we repeat the estimation using the *Spread* and *Zero Ret* as the dependent variables. The results are similar to the ones in the previous panel.

The results in Table III provide strong support for a positive average relation between asset liquidity and stock liquidity. This indicates that in our sample the effect of higher cash balance in increasing the liquidity of assets-in-place outweighs its effect in reducing the liquidity of future assets. The negative coefficient on *WAL-1* in all our specifications indicates that the observed *WAL-1* in our sample is higher than $\widehat{\alpha}$.

[Table III goes here]

Since we employ firm fixed effects in all our specifications, the correlations that we document are between time series changes in asset liquidity and stock liquidity. Does the same relation between asset liquidity and stock liquidity hold also in the cross-section? To answer this question, in Table IV, we employ the Fama-Macbeth approach. We conduct annual cross-sectional regressions of stock liquidity on measures of asset liquidity and the full set of control variables, and report the average coefficients along with the standard errors. Since stock liquidity is quite persistent, we adjust for autocorrelation by correcting the reported standard errors. To do this, we follow Fama and French (2002) and Cooper, Gulen, and Schill (2008), and multiply the standard errors of the average parameters by $\sqrt{\frac{1+\rho}{1-\rho}}$, where ρ is the first-order autocorrelation in yearly parameter estimates. To conserve space we suppress the coefficients of the control variables other than *Log(Market Cap)*. The results in Panel A and B of Table IV largely confirm the positive correlation between asset liquidity and stock liquidity in the cross-section. We find that thirteen of the sixteen coefficients are negative and statistically significant. The coefficient estimates are in some cases larger than the ones in Table III.

[Table IV goes here]

In summary, asset liquidity and stock liquidity are positively correlated both across time and in the cross-section. The magnitude of the effect is also large. Since asset liquidity and stock liquidity are likely to be endogenous, one concern with our estimates is of omitted variable bias. Say firms with growth opportunities may have high asset liquidity and stock liquidity. If we do not adequately control for growth opportunities, our estimates are likely to be biased. To see if our results are robust to partially controlling for endogeneity, we employ the linear Generalized Method of Moments (GMM) estimator proposed by Arellano and Bond (1991). This procedure uses lagged values to instrument for asset liquidity and estimates the regression using the GMM procedure. We find that our results are robust to using this procedure. This indicates that the positive correlation between asset liquidity and stock liquidity is not driven by omitted variables bias.

5.2 Growth Opportunities and the Relation Between Asset Liquidity and Stock Liquidity

Having established a positive average relation between asset liquidity and stock liquidity, we turn now to test *Prediction 2* that predicts that the positive relation between asset liquidity and stock liquidity will be weaker for firms with more growth opportunities. Our empirical approach will utilize cross-sectional variations in the extent of growth opportunities to test this prediction.

In Panel A of Table V we use firm capital expenditure to identify firms with growth opportunities. Firms with high capital expenditure are likely to have more growth opportunities as compared to firms with low capital expenditure. We divide our sample into firms with above and below median capital expenditure each year and repeat our tests in the two sub-samples. To conserve space, we only report the results for Amihud's stock illiquidity measure. Similar results are obtain for the other three stock liquidity measures. While our specification is similar to the one we employ in Table III, we suppress the coefficients on the control variables other than *Log(Market Cap)* to conserve space.

Note that one way to test *Prediction 2* would be to repeat the estimation of (9) after including an interaction term between the measures of asset liquidity and a dummy variable *High Cap. Ex.*, that identifies firms with high capital expenditure. *Prediction 2* would imply a positive coefficient on the interaction term indicating a smaller effect of asset liquidity on stock liquidity for firms with high capital expenditure. Instead of employing such a procedure, we repeat the estimation of (9) on two sub-samples of firms with high and low capital expenditure and test to see if the coefficient on the asset liquidity measure is different across the two sub-samples. Our methodology is a more general way of estimating interaction effects because in our procedure, we do not constrain the coefficients on the control variables to be the same for firms with high and low capital expenditures. Thus our procedure is equivalent to estimating the interaction effect after including a full set of interaction terms between all the control variables and *High Cap. Ex.* We employ this procedure for its generality.

The results in Column (1) and (2) indicate that *WAL-1* has a greater effect on stock liquidity for firms with below median capital expenditure (-.289) in comparison to firms with above median capital expenditure (-.192). The row titled Δ *Coef* shows that the coefficients across the two sub-samples are significantly different from each other. Qualitatively similar differences obtain from comparing Columns (3) to (4), (5) to (6) and (7) to (8).

In Panel B of Table V we repeat the analysis using the firm's market to book ratio to proxy for the extent of growth opportunities. Firms with a high market to took ratios (above median) are likely to have more growth opportunities. Following *Prediction 2*, we expect asset liquidity to have a less positive effect on stock liquidity for such firms. Consistent with our prediction, the results in Column (1) and (2) of Panel B shows that *WAL-1* has a greater impact on stock liquidity for firms with low market to book ratios. From Δ *Coef.* we find that the coefficients are significantly different from each other across the two sub-samples. In Columns (3)-(8) we repeat our estimates successively with *WAL-2*, *WAL-3*, and *MWAL*. All the results, except for those with *MWAL*, show a significantly stronger effect of asset liquidity on stock liquidity for firms with low market to book ratio.

We now proceed to tests of *Prediction 3*. To recall, *Prediction 3* suggests that the improvement in stock liquidity following firm financing should be greater if the firm retains a larger fraction of the issue proceeds as cash. To test the prediction, we focus on seasoned equity offerings (SEOs), and relate the stock liquidity in the post issue period to the fraction of issue proceeds that the firm retains as cash.

We first identify a sample of SEOs from SDC with issue date during the period 1970-2006 and that have non-missing and positive values for number of primary shares offered, issue proceeds, and issue price. We also confine the sample to SEOs with a minimum size of $10 million. We combine the SEO data with CRSP and COMPUSTAT to obtain stock price information during the pre- and post-issue period and firm financial data. This procedure results in a sample of 5756 SEOs.

The summary statistics for the key variables for this SEO sample is provided in Panel A of Table VI. The average size of the issue in our sample is $117.8 million and this constitutes about 31% of the book value of total assets as of the end of the previous year. This indicates that the average SEO is large in comparison to firm size. We use daily stock return data to calculate *Illiq* during the pre- and post-issue period. $Illiq_{-30,0}$ ($Illiq_{-60,0}$) is Amihud's illiquidity measure estimated during the thirty days (sixty days) prior to the SEO while $Illiq_{15,45}$ ($Illiq_{15,75}$) represents a similar measure estimated during the thirty days (sixty days) following the SEO. In calculating the illiquidity measures, we ignore the fifteen day period immediately following the SEO so as to ensure that our measures are not contaminated by abnormal trading immediately following the SEO. As can be seen, stock liquidity significantly improves after the SEO. This can be seen by noting that in Panel A $Illiq_{15,45}$ and $Illiq_{15,75}$ are smaller in comparison to $Illiq_{-30,0}$ and $Illiq_{-60,0}$ respectively. This result is consistent with the finding in Masulis, Eckbo, and Norli (2000) and it offers preliminary evidence consistent with *Prediction 3*. *Fraction Retained* is the ratio of the difference in cash balance between the end of the financial year immediately following and immediately before the SEO to the total SEO proceeds. We use this as a measure of the amount of the SEO proceeds that the firm retains as cash by the end of the year. We find that firms on average retain about 42% of the SEO proceeds as cash by the end of the year of the SEO. We now proceed to tests that relate the stock liquidity in the post-issue period to the fraction of the SEO proceeds that the firm retains as cash.

We use a model similar to (9) to estimate how the liquidity in the post-SEO period is related to the fraction of the SEO proceeds that the firm retains as cash. Since our analysis here is cross-sectional, we do not employ firm fixed effects in this estimation. Our main dependent variable for this analysis is either $Illiq_{15,45}$ or $Illiq_{15,75}$, while the main independent variable is *Fraction Retained*. *Prediction 3* implies that the stock liquidity during the post-issue period will be positively related to *Fraction Retained*. Note that in relating stock liquidity in the immediate post-issue period to the fraction of cash retained – which is only known in the future – we implicitly assume that the market will rationally anticipate the amount of cash the firm is going to retain and react accordingly. We control this regression for the stock liquidity in the pre-issue period, *Market to Book*, *Log(Mkt. Cap)*, and *ROA*.

In Column (1) of Panel B we have $Illiq_{15,45}$ as the dependent variable and our results show that the stock liquidity in the post-issue period is positively related to the fraction of the issue proceeds that the firm retains as cash. In Column (2) we repeat our estimation with $Illiq_{15,75}$ as our dependent variable and obtain similar results. In Column (3) we repeat our estimation after dropping the SEOs that happen within a period of two months before the year end. We do this to avoid any overlap between the time period used to calculate the post-issue illiquidity measures and the date we use to calculate the cash balance. This test is consistent with the notion that stock liquidity in the post-issue period reacts to the amount of cash that the firm is *expected* to retain by the end of the year.

The results in all the specifications show that the stock liquidity in the post issue period depends on the fraction of the issue proceeds that the firm retains as cash. In Column (4) we repeat our estimation after including an interaction term *Fraction Retained* × *Proceeds*/TA_{t-1} to see if the stock liquidity in the post-issue period is higher for firms that conduct a larger SEO in comparison to firm size and that retain a larger fraction of the issue. The results indicate that it is indeed the case. Note that in these regressions, we do control for the size of the SEO.

[Table VI goes here]

5.3 Financing Constraints and the Relation Between Asset Liquidity and Stock Liquidity

In this section we perform tests of *Prediction 4* which suggests that the relation between asset liquidity and stock liquidity should be stronger for firms that face external finance constraints. We use three proxies to identify firms that face financial constraints. Our first proxy for financial constraints is firm size. Based on prior literature, we expect smaller firms to face greater constraints in raising external finance as compared to larger firms. In

Panel A of Table VII, we classify firms with below and above median book value of total assets and repeat our estimation of (9) in the two sub-samples. Our results indicate that an increase in asset liquidity has a much greater effect on stock liquidity for firms with below median size in comparison to firms with above median size. For example, from Columns (1) and (2) one can see that the effect of asset liquidity on stock liquidity is stronger by a factor of more than eight for small firms. Similar results hold for the other asset liquidity measures.

In Panel B of Table VII we use the presence of credit ratings as a measure of firm financial constraints. Firms with credit ratings are likely to be more transparent and have more options when it comes to raising external finance. Such firms are hence likely to face lower financial constraints as compared to firms without credit ratings. The results in Columns (1) and (2) indicate that, consistent with our prediction, an increase in *WAL-1* has more than twice the effect on stock liquidity for firms without credit rating in comparison to firms with credit rating (-.082 in comparison to -.225). In Columns (3) and (4) we repeat our estimates using *WAL-2*, in Columns (5) and (6) we use *WAL-3* and obtain similar results. While our results with *MWAL* do indicate a stronger effect for non-rated firms, we find that the coefficients are not significantly different.

Finally in Panel C we measure the extent of financial distress in a firm and classify firms in financial distress as facing greater constraints in raising external finance. We use the Merton-KMV measure of the expected default likelihood as a proxy for financial distress. We estimate this measure using a methodology similar to that in Bharath and Shumway (2008). We distinguish between firms whose expected default probability is above and below the sample median. The results in Columns (1) and (2) of Panel C show that *WAL-1* has almost twice the effect on stock liquidity for firms with high default probability in comparison to firms with low default probability (-.285 in comparison to -.157). We also find that the coefficients are statistically different from each other. In Columns (3)-(8) we repeat our estimates successively using *WAL-2*, *WAL-3*, and *MWAL* and find that in all cases asset liquidity improves stock liquidity more for firms that are closer to default.

[Table VII goes here]

5.4 Additional Tests

In this section we do additional tests that help further establish how managerial actions that transform the liquidity of a firm's assets can affect stock liquidity.

Research on corporate governance shows that the stock market puts a lower valuation on corporate cash holdings of poorly governed firms because the managers of such firms are more likely to waste some of the cash in perquisite consumption (Dittmar and Mahrt-Smith, 2007). Such perquisite consumption should also weaken the relation between asset liquidity and stock liquidity for such firms. This is because outside investors only expect to receive a fraction of the cash on the firm's balance sheet as dividends. Following this logic, we expect the relation between asset liquidity and stock liquidity to be weaker for firms with poor corporate governance. To test this prediction we use the index of anti-takeover charter provisions developed in Gompers, Ishii, and Metrik (2002) and classify firms into those with above and below median level of take over protection and repeat the estimation of (9) in the two subsamples. The results in Table VIII show that consistent with our conjecture, asset liquidity has almost twice the effect on stock liquidity for the firms in the *Low G-Index* subsample as compared to the firms in the *High G-Index* subsample. These tests not only offer support for our theory but also offer additional support to the contention that managers of poorly governed firms are more likely to spend a part of the firm's cash holding in wasteful expenditure.

In our final set of tests, we estimate the value implications of the relation between asset liquidity and stock liquidity that we uncover. Our results so far show that an increase in asset liquidity is accompanied by an improvement in stock liquidity. Prior research in market microstructure shows that an increase in stock liquidity may increase firm value either by reducing the cost of capital () or by reducing dead weight costs of raising external finance (). If the improvements in stock liquidity that result from an increase in asset liquidity lead to higher firm value, then that would predict that asset liquidity should be more valuable for firms with an illiquid stock. To test this prediction we use the methodology in Faulkender and Wang (2006) and estimate the value of corporate cash holdings for firms with more and less liquid stock. In brief, their methodology involves regressing annual size and book to market adjusted abnormal stock returns on changes in cash balance and a set of control variables. The control variables include the initial cash balance, $Cash_{t-1}$, *Leverage*, *R&D*, and changes in *Non Cash Assets*, *Profits*, *Dividends*, *Interest*. In Column (1) of Table IX we repeat the estimation of Faulkender and Wang (2006) for comparison. The coefficient on Δ *Cash* is an estimate of the value of the marginal dollar of cash. The results in Column (1) shows that in our sample a dollar of cash is worth fifty-two cents for the average firm. This estimate is lower than seventy-five cents estimated by Faulkender and Wang (2006). In Columns (2) & (3) we divide our sample into firms with above and below median stock liquidity – as measured by *Illiq* – and repeat the estimation in the two subsamples. Faulkender and Wang (2006) show that cash is more valuable for smaller firms that may face greater external financial constraints. Since smaller firms are also likely to have illiquid stock, we need to control for firm size in our estimation. We do this by dividing our sample into market capitalization deciles and identifying high and low liquidity firms within the declines. Our results in Column (1) & (2) of Table IX shows that consistent with our conjecture an additional dollar of cash is more valuable for firms with less liquid stock. The row titled Δ *Coef.* indicates that a dollar of cash is worth ten cents more for firms with below median stock liquidity. In Columns (4) and (5) we further control for access to external finance, by limiting our sample to firms without long term bond rating. Our results again show that cash is more valuable for firms with below median stock liquidity.

6 Conclusion

Liquidity of an asset refers to the cost and time associated with converting the asset into cash. Classical theories from market microstructure highlight that stock liquidity should be driven by the extent of valuation uncertainty and asymmetric information associated with the firm's assets. In this paper we identify managerial investment decisions as a fundamental driver of uncertainty and asymmetric information and link it to stock liquidity. To do that we highlight that the liquidity of real assets of a firm should be reflected in the liquidity of claims to the cash flows generated from these assets. We formalize this link in a model which generates predictions on the relation between asset liquidity and stock liquidity and how the relation will vary with firm growth opportunities and external financial constraints.

Our empirical analysis confirms our model predictions. We establish an economically significant, positive relationship between the liquidity of the firm's assets and the liquidity of its stock. We further show that the link is weaker for firms with higher growth opportunities (higher market to book ratio and capital expenditure firms, as well as for SEOs in which the firm retains a smaller portion of the issue proceeds as cash) and stronger for financially constrained firms (smaller firms, firms with no credit rating, and financially distressed firms). We further show that the relation between asset liquidity and stock liquidity is weaker in poorly governed firms – consistent with the managers wasting part of the cash in such firms – and that cash is more valuable for firms with less liquid stock.

Our analysis uncovers a hitherto unexplored but important determinant of stock liquidity namely the liquidity of the real assets. In the process, we link managerial investment decisions to stock liquidity. Our analysis linking corporate finance decisions to stock liquidity and asset pricing has further potential implications, the empirical study of which is beyond the scope of this paper. One example is the commonality in stock liquidity. We show that the relation between asset liquidity and stock liquidity depends strongly on investment opportunities. Such opportunities co-vary at the industry, economy and global level. This suggests that stock liquidity may have a common component not only at the market level, but also at the industry and global level. Another example of an implication is the long-term stock under-performance after firm financing. The improvement in stock liquidity following such financing – as highlighted by our results– is likely to reduce the liquidity risk premium for the stock which in turn is likely to reflect as under-performance based on the ex ante risk characteristics.

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7 Appendix I

Proof of Proposition 1: Recall that λ is a measure of stock illiquidity. Thus, $\frac{\partial \lambda}{\partial \alpha} \leq 0$ means that higher asset liquidity is associated with higher stock liquidity. Differentiating (7) with respect to α we have:

$$\frac{\partial \lambda}{\partial \alpha} = \frac{1}{2\sigma_u} \cdot \frac{\partial \sigma_0^2}{\partial \alpha}. \tag{10}$$

Since $\sigma_u > 0$, $\frac{\partial \lambda}{\partial \alpha} \leq 0$ is equivalent to $\frac{\partial \sigma_0^2}{\partial \alpha} \leq 0$. Differentiating (6) with respect to α we obtain:

$$\frac{\partial \sigma_0^2}{\partial \alpha} = -2(1-\alpha)\sigma_x^2 + 2\alpha k^2 h(\gamma^*)^2 \sigma_y^2. \tag{11}$$

Thus $\frac{\partial \sigma_0^2}{\partial \alpha} \geq 0$ iff

$$-2(1-\alpha)\sigma_x^2 + 2\alpha k^2 h(\gamma^*)^2 \sigma_y^2 \geq 0.$$

Using (4) this is equivalent to,

$$\alpha \leq \frac{\sigma_x^2}{\sigma_x^2 + k^2 h\left(h'^{-1}\left(\frac{1}{k}\right)\right)^2 \sigma_y^2} \equiv \hat{\alpha}.$$

QED.

Proof of Propoisition 2: Differentiating (11) with respect to k we obtain:

$$\frac{\partial}{\partial k}\frac{\partial \sigma_0^2}{\partial \alpha} = 4\alpha k^2 h(\gamma^*)^2 \sigma_y^2 + 2\alpha k^2 h'(\gamma^*)^2 \sigma_y^2 \frac{\partial \gamma^*}{\partial k} > 0,$$

where the inequality follows since the first term is positive, and the second term is positive for unconstrained firms (from (5)) and zero for constrained firms. Consequently, $\frac{\partial^2 \lambda}{\partial k \partial \alpha} > 0$. Since λ is a measure of stock illiquidity, this means that the relation between asset liquidity and stock liquidity is weaker (less positive or more negative) for firms with higher values of k (higher growth opportunities). QED.

Proof of Proposition 3: Since γ^* is higher for an unconstrained firm and since $h(\cdot)$ is increasing in γ the second term in (11) is larger for an unconstrained firm as opposed to a constrained firm. Hence $\frac{\partial \sigma_0^2}{\partial \alpha}$ is more negative for a constrained firm as compared to an unconstrained $\subset$firm. QED.

Appendix II: Description of Variables

Variable Name	Description
Illiq	Square Root of average annual Amihud (2002) Illiquidity measure. Amihud's measure is the ratio of the absolute daily stock return and the daily dollar volume. Data for this variable was obtained from Hasbrouck's website
s	Gibbs sampler estimate of Roll's (1984) implicit measure of trading costs. Data for this variable was also obtained from Hasbrouck's website
Zero Ret	Annual percentage of zero return days estimated from CRSP daily data
Spread	Average intra-day daily effective percentage bid-ask spread estimated from TAQ. The data on the effective spread was obtained from the web site of the University of Vanderbilt's Center for Research on Financial Markets and is available to us only for the sub-period 1994-2006.
WAL-1	Ratio of the of cash and cash equivalents to lagged value of total assets
WAL-2	Ratio of the sum of cash and one half times the value of non-cash current assets, to lagged value of total assets
WAL-3	Ratio of the sum of cash, 0.75 times the value of non-cash current assets and one half times the value of other tangible fixed assets, to lagged value of total assets
Log(Mkt. Cap)	Natural log of a firm's market value of equity (Data25*Data199)
Def. Prob.	Expected Default Probability estimated using the approach in Bharath and Shumway (2008)
Capital Expenditure	Ratio of a firm's capital expenditures (Data128) to lagged total assets (Data6). When Data128 is missing, this variable is set to zero
Rated	A dummy variable that identifies firms with non-missing S&P Long-term credit rating in Compustat
ROA	Ratio of earnings before depreciation, interest, and taxes over lagged value of total assets
BHAR	Buy-and-hold annual abnormal stock return. It is the difference between the annual return on the firm's stock to the return on the value weighted portfolio of all NYSE, Amex, and Nasdaq stocks.
Disc. Accruals	Measure of a firm's abnormal accruals originally proposed in Jones (1991) and modified to control for performance per Kothari et al. (2005)
Volatility	Standard deviation of a firm's stock returns over 60 months preceding the beginning of a current fiscal year.
Fraction Retained	Ratio of the change in cash balance between the year ending after the SEO to the year ending before the SEO deflated by the size of the SEO.
Proceeds	The ratio of the size of the SEO in $ million to lagged value of total assets.
$\text{Illiq}_{-30,0}$	Average *Illiq* over thirty trading days prior to the SEO.
$\text{Illiq}_{-60,0}$	Average *Illiq* over sixty trading days prior to the SEO.
$\text{Illiq}_{15,45}$	Average *Illiq* over the period of fifteen to forty-five trading days following the SEO.
$\text{Illiq}_{15,75}$	Average *Illiq* over the period of fifteen to seventy-five trading days following the SEO.

Table I: Summary Statistics

This table reports the summary statistics of the key variables used in our analysis. *Illiq* is the square root of average annual Amihud (2002) Illiquidity measure. *s* is the Gibbs sampler estimate of Roll's (1984) implicit measure of trading costs, *Zero Ret* is the annual percentage of zero return days estimated from CRSP daily data, *Spread* is the average intra-day daily effective percentage bid-ask spread estimated from TAQ. *Log(Mkt. Cap)* is the natural logarithm of a firm's market value of equity, *WAL-1* is the ratio of cash and cash equivalents to lagged value of total assets, *WAL-2* is the ratio of the sum of cash and one half times the value of non-cash current assets, to lagged value of total assets, *WAL-3* is the ratio of the sum of cash, 0.75 times the value of non-cash current assets and one half times the value of other tangible fixed assets, to lagged value of total assets. *Market to Book* is the ratio of market value of equity to book value of equity, *Def. Prob.* is the expected default probability as estimated using the approach in Bharath and Shumway (2008), *Capital Expenditure* is the ratio of a firm's capital expenditures (Data128) to lagged total assets. *ROA* is the ratio of earnings before depreciation, interest and taxes to lagged value of total assets, *BHAR* is the Buy-and-hold annual abnormal stock return calculated as the difference between stock return and the return on the value weighted portfolio of all NYSE, Amex, and Nasdaq stocks, *Rated* is a dummy variable that identifies firms with S&P Long-term credit rating, *Analysts* is the number of security analysts following the firm's stock, *Volatility* is the standard deviation of a firm's stock returns over sixty months preceding the beginning of a current fiscal year, *Disc. Accruals* is a measure of a firm's abnormal accruals originally proposed in Jones (1991) and modified to control for performance using the methodology of Kothari et al. (2005). The sample includes all firms with financial data in Compustat during the years 1964-2006. Effective Spread data is only for 1995-2006. All variables are winsorized at the first and the ninety-ninth percentile.

Variable	N	Mean	Min	Median	Max	Std. Dev.
Illiq	89158	0.612	0.011	0.307	4.155	0.786
s	89158	0.011	0.001	0.006	0.059	0.011
Spread	36881	0.009	0.000	0.007	0.043	0.009
Prop. Zero Ret.	89158	0.178	0.000	0.167	0.720	0.117
Mkt. Cap$_{t-1}$	89157	1449.777	0.364	125.706	596475.800	9400.595
WAL-1	77452	0.143	0.001	0.062	1.097	0.200
WAL-2	77452	0.350	0.005	0.326	1.290	0.228
WAL-3	77452	0.672	0.080	0.654	1.744	0.241
MWAL	76676	0.503	0.040	0.489	1.228	0.244
Market to Book$_{t-1}$	87316	2.453	-3.352	1.644	19.380	2.920
Def. Prob.	65130	0.061	0	0.000	1.000	0.150
Capital Expenditure	88174	0.083	-0.019	0.056	10.977	0.124
ROA	78520	0.122	-0.672	0.136	0.495	0.164
BHAR$_{t-1}$	85617	0.046	-1.171	0.014	1.796	0.493
Rated	89158	0.186	0	0	1	0.389
Log(Volatility)$_{t-1}$	78687	-3.558	-4.723	-3.566	-2.274	0.545
Disc. Accruals	76667	-0.056	-18.830	-0.042	12.406	0.379

Table II: Correlations

This table reports the summary statistics of the key variables used in our analysis. The sample includes all firms with financial data in Compustat during the years 1964-2006. Effective Spread data is only for 1995-2006. All variables are winsorized at the first and the ninety-ninth percentile. All variables are defined in the Appendix

	Illiq	s	Spread	Prop. Zero Ret.	WAL-1	WAL-2	WAL-3	MWAL	Log(Mkt. Cap)$_{t-1}$
Illiq	1.000								
s	0.813	1.000							
Spread	0.834	0.880	1.000						
Prop. Zero Ret.	0.500	0.556	0.632	1.000					
WAL-1	-0.082	0.020	-0.003	-0.155	1.000				
WAL-2	-0.022	0.070	0.078	-0.068	0.841	1.000			
WAL-3	-0.046	0.034	0.054	0.006	0.654	0.793	1.000		
MWAL	0.259	0.202	0.270	0.269	0.029	0.180	0.403	1.000	
Log(Mkt. Cap)$_{t-1}$	-0.123	-0.126	-0.160	-0.165	-0.024	-0.068	-0.041	-0.145	1.000
Market to Book$_{t-1}$	-0.176	-0.110	-0.153	-0.200	0.271	0.241	0.202	-0.417	0.185
Def. Prob.	0.316	0.304	0.268	0.098	-0.089	-0.118	-0.165	0.052	-0.061
Capital Expenditure	-0.042	-0.010	-0.000	0.020	-0.002	-0.053	0.262	0.054	-0.007
Not Rated	-0.322	-0.321	-0.414	-0.285	-0.215	-0.316	-0.239	-0.140	0.221
Analysts	-0.412	-0.365	-0.478	-0.352	-0.080	-0.171	-0.090	-0.245	0.413
ROA	-0.160	-0.225	-0.204	-0.067	-0.349	-0.187	-0.037	-0.006	0.094
BHAR$_{t-1}$	-0.197	-0.213	-0.215	-0.307	0.187	0.202	0.205	-0.129	0.019
Log(Volatility)$_{t-1}$	0.368	0.490	0.475	0.012	0.354	0.359	0.184	0.087	-0.147
Disc. Accruals	0.022	0.044	0.044	0.064	0.017	0.020	0.031	0.003	-0.014

	Market to Book_{t-1}	Def. Prob.	Capital Expenditure	Not Rated	Analysts	ROA	BHAR_{t-1}	Volatility_{t-1}
Market to Book_{t-1}	1.000							
Def. Prob.	-0.095	1.000						
Capital Expenditure	0.073	-0.102	1.000					
Not Rated	0.025	0.022	-0.026	1.000				
Analysts	0.171	-0.106	0.047	0.510	1.000			
ROA	-0.027	-0.182	0.197	0.135	0.196	1.000		
BHAR_{t-1}	0.192	-0.252	0.095	0.000	-0.026	0.111	1.000	
$\text{Log(Volatility)}_{t-1}$	0.039	0.334	-0.016	-0.340	-0.346	-0.360	0.078	1.000
Disc. Accruals	0.003	0.023	-0.004	-0.009	-0.007	-0.110	-0.026	0.018

Table III: Asset Liquidity and Stock Liquidity - Time Series Evidence

This table reports the results of the regression relating firm's asset liquidity to stock liquidity. Specifically, we estimate the panel OLS regression: $Y_{i,t} = \alpha + \beta X_{i,t} + \gamma Controls_{i,t} + \mu_i + \mu_t + \epsilon_{i,t}$, where $Y_{i,t}$ is a measure of stock liquidity for firm i during year t, $X_{i,t}$ is a measure of asset liquidity, μ_i are firm fixed-effects, and μ_t are year dummies. Y is *Illiq* in Columns (1)-(3) of Panel A, s in Columns (4)-(6) of Panel A, *Zero Ret* in Columns (1)-(3) of Panel B, and *Spread* in Columns (4)-(6) of Panel B. *Illiq* is the square root of average annual Amihud (2002) Illiquidity measure. s is the Gibbs sampler estimate of Roll's (1984) implicit measure of trading costs, *Zero Ret* is the annual percentage of zero return days estimated from CRSP daily data, *Spread* is the average intra-day daily effective percentage bid-ask spread estimated from TAQ. *WAL-1*, *WAL-2*, and *WAL-3* are measures of asset liquidity. *WAL-1* is the ratio of cash and cash equivalents to lagged value of total assets, *WAL-2* is the ratio of the sum of cash and one half times the value of non-cash current assets, to lagged value of total assets, *WAL-3* is the ratio of the sum of cash, 0.75 times the value of non-cash current assets and one half times the value of other tangible fixed assets, to lagged value of total assets. *Log(Mkt. Cap)* is the natural logarithm of a firm's market value of equity, *Disc. Accruals* is a measure of a firm's abnormal accruals originally proposed in Jones (1991) and modified to control for performance using the methodology of Kothari et al. (2005). *Market to Book* is the ratio of market value of equity to book value of equity, *Capital Expenditure* is the ratio of a firm's capital expenditures (Data128) to lagged total assets. *ROA* is the ratio of earnings before depreciation, interest and taxes to lagged value of total assets, *Volatility* is the standard deviation of a firm's stock returns over sixty months preceding the beginning of a current fiscal year, *BHAR* is the Buy-and-hold annual abnormal stock return calculated as the difference between stock return and the return on the value weighted portfolio of all NYSE, Amex, and Nasdaq stocks. The sample includes all firms with financial data in Compustat during the years 1964-2006. Effective Spread data is only for 1995-2006. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% ($***$), 5% ($**$) and 10% ($*$) levels.

Panel A: Illiq & Roll's Measure (s)

	Illiq				Roll's Measure (s)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.231 (.020)***				-.003 (.0003)***			
WAL-2		-.282 (.017)***				-.004 (.0002)***		
WAL-3			-.205 (.012)***				-.003 (.0002)***	
MWAL				-.145 (.021)***				-.003 (.0003)***
Log(Mkt. Cap)$_{t-1}$	-.208 (.006)***	-.212 (.006)***	-.213 (.006)***	-.224 (.007)***	-.002 (.00007)***	-.002 (.00007)***	-.002 (.00007)***	-.002 (.00008)***
Disc. Accruals$_t$	-.009 (.005)*	-.005 (.005)	-.004 (.005)	-.007 (.005)	-.0002 (.00007)***	-.0001 (.00007)**	-.0001 (.00007)*	-.0002 (.00007)**
Market-to-Book$_{t-1}$	.009 (.001)***	.010 (.001)***	.010 (.001)***	.006 (.001)***	.0001 (.00002)***	.0001 (.00002)***	.0001 (.00002)***	.00006 (.00002)***
Capital Expenditure$_t$	-.197 (.046)***	-.168 (.042)***	-.104 (.028)***	-.181 (.042)***	-.003 (.0007)***	-.003 (.0006)***	-.002 (.0004)***	-.003 (.0006)***
ROA$_t$	-.367 (.029)***	-.296 (.029)***	-.289 (.029)***	-.372 (.029)***	-.007 (.0004)***	-.006 (.0004)***	-.006 (.0004)***	-.007 (.0004)***
Volatility $_{t-1}$	.239 (.013)***	.236 (.013)***	.235 (.013)***	.232 (.013)***	.008 (.0002)***	.008 (.0002)***	.008 (.0002)***	.007 (.0002)***
BHAR $_{t-1}$	-.152 (.005)***	-.145 (.005)***	-.146 (.005)***	-.160 (.005)***	-.003 (.00008)***	-.003 (.00007)***	-.003 (.00007)***	-.003 (.00007)***
Obs.	66584	66584	66584	66584	66584	66584	66584	66584
R^2	.782	.783	.783	.781	.774	.775	.775	.774

Panel B: Effective Bid-Ask Spread and Prop. of Zero Return

	Effective Bid-Ask Spread (*Spread*)				Prop. of Zero Return (*Zero Ret*)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.002				-.022			
	(.0002)***				(.003)***			
WAL-2		-.002				-.037		
		(.0002)***				(.002)***		
WAL-3			-.001				-.034	
			(.0001)***				(.002)***	
MWAL				-.002				-.026
				(.0003)***				(.003)***
Log(Mkt. Cap)$_{t-1}$	-.002	-.002	-.002	-.002	-.028	-.028	-.029	-.031
	(.00006)***	(.00006)***	(.00006)***	(.00007)***	(.0008)***	(.0008)***	(.0008)***	(.0009)***
Disc. Accruals$_t$	-.00009	-.00007	-.00007	-.00007	-.002	-.002	-.001	-.002
	(.00005)*	(.00005)	(.00005)	(.00005)	(.0006)***	(.0006)***	(.0005)***	(.0006)***
Market-to-Book$_{t-1}$	.00006	.00006	.00006	.00003	.0008	.001	.001	.0004
	(1.00e-05)***	(1.00e-05)***	(1.00e-05)***	(1.00e-05)***	(.0002)***	(.0002)***	(.0002)***	(.0002)***
Capital Expenditure$_t$	-.001	-.0008	-.0005	-.0008	-.047	-.042	-.031	-.043
	(.0003)***	(.0003)***	(.0002)**	(.0003)***	(.009)***	(.009)***	(.006)***	(.009)***
ROA$_t$	-.004	-.003	-.003	-.004	-.096	-.086	-.081	-.095
	(.0003)***	(.0003)***	(.0003)***	(.0003)***	(.004)***	(.004)***	(.004)***	(.004)***
Volatility $_{t-1}$	.004	.004	.004	.004	.007	.006	.006	.005
	(.0002)***	(.0002)***	(.0002)***	(.0002)***	(.002)***	(.002)***	(.002)***	(.002)***
BHAR $_{t-1}$	-.001	-.001	-.001	-.001	-.026	-.025	-.024	-.027
	(.00005)***	(.00005)***	(.00005)***	(.00005)***	(.0006)***	(.0006)***	(.0006)***	(.0006)***
Obs.	27492	27492	27492	27492	66584	66584	66584	66584
R^2	.876	.877	.876	.876	.8	.801	.801	.8

Table IV: Asset Liquidity and Stock Liquidity - Cross-Sectional Evidence

This Table reports the results of Fama-Macbeth regressions relating firm's asset liquidity to stock liquidity. Specifically, we estimate annual OLS regression: $Y_{i,t} = \alpha + \beta X_{i,t} + \gamma Controls_{i,t} + \epsilon_{i,t}$, and report the average of the annual coefficients. $Y_{i,t}$ is a measure of stock liquidity for firm i during year t and $X_{i,t}$ is a measure of asset liquidity. Y is *Illiq* in Columns (1)-(3) of Panel A, s in Columns (4)-(6) of Panel A, *Zero Ret* in Columns (1)-(3) of Panel B, and *Spread* in Columns (4)-(6) of Panel B. The specification is similar to the ones in Panel A and B of Table III. We suppress the coefficients of the control variables to conserve space. To adjust for autocorrelation, we correct the reported standard errors of the average parameters by multiplying with $\sqrt{\frac{1+\rho}{1-\rho}}$, where ρ is the first-order autocorrelation in yearly parameter estimates. The sample includes all firms with financial data in Compustat during the years 1964-2006. Effective Spread data is only for 1995-2006. Asterisks denote statistical significance at the 1% ($***$), 5% ($**$) and 10% ($*$) levels.

Panel A: Illiq & Roll's Measure (s)

	Illiq				Roll's Measure (s)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.269 (.058)***				-.003 (.001)***			
WAL-2		-.321 (.098)***				-.0047 (.0014)***		
WAL-3			-.063 (.032)*				-.002 (.00067)***	
MWAL				-.033 (.033)				-.002 (.0008)***
Log(Mkt. Cap)$_{t-1}$	-.239 (.021)***	-.213 (.006)***	-.236 (.021)***	-.229 (.022)***	-.001 (.0002)***	-.001 (.0003)***	-.001 (.0003)***	-.001 (.0003)***
Obs.	43	43	43	43	43	43	43	43

Panel B: Effective Bid-Ask Spread and Prop. of Zero Return

	Effective Bid-Ask Spread (*Spread*)				Prop. of Zero Return (*Zero Ret*)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.031 (.0072)***				-.019 (.002)***			
WAL-2		-.004 (.0005)***				-.057 (.005)***		
WAL-3			-.0005 (.0003)				-.022 (.006)***	
MWAL				.00004 (.0003)				-.023 (.007)***
Log(Mkt. Cap)$_{t-1}$	-.002 (.0002)***	-.002 (.0002)***	-.002 (.0002)***	-.002 (.0001)***	-.031 (.003)***	-.032 (.004)***	-.030 (.004)***	-.032 (.004)***
Obs.	12	12	12	12	43	43	43	43

Table V: Asset Liquidity and Stock Liquidity - Panel A: High vs Low Capital Expenditure Firms

This table reports the results of the regression relating firm's asset liquidity to stock liquidity. Specifically, we estimate the panel OLS regression: $Y_{i,t} = \alpha + \beta X_{i,t} + \gamma Controls_{i,t} + \mu_i + \mu_t + \epsilon_{i,t}$, where $Y_{i,t}$ is a measure of stock liquidity for firm i during year t, $X_{i,t}$ is a measure of asset liquidity, μ_i are firm fixed-effects, and μ_t are year dummies. Y is *Illiq*. *Illiq* is the square root of average annual Amihud (2002) Illiquidity measure. *WAL-1*, *WAL-2*, *WAL-3*, and *MWAL* are measures of asset liquidity. *WAL-1* is the ratio of cash and cash equivalents to lagged value of total assets, *WAL-2* is the ratio of the sum of cash and one half times the value of non-cash current assets, to lagged value of total assets, *WAL-3* is the ratio of the sum of cash, 0.75 times the value of non-cash current assets and one half times the value of other tangible fixed assets, to lagged value of total assets. *Log(Mkt. Cap)* is the natural logarithm of a firm's market value of equity, *Disc. Accruals* is a measure of a firm's abnormal accruals originally proposed in Jones (1991) and modified to control for performance using the methodology of Kothari et al. (2005), *Market to Book* is the ratio of market value of equity to book value of equity, *Capital Expenditure* is the ratio of a firm's capital expenditures (Data128) to lagged total assets. *ROA* is the ratio of earnings before depreciation, interest and taxes to lagged value of total assets, *Volatility* is the standard deviation of a firm's stock returns over sixty months preceding the beginning of a current fiscal year, *BHAR* is the Buy-and-hold annual abnormal stock return calculated as the difference between stock return and the return on the value weighted portfolio of all NYSE, Amex, and Nasdaq stocks. Δ*Coef* represents the difference between the coefficients on *WAL-1*, *WAL-2*, *WAL-3* and *MWAL* across the high and low capital expenditure sub-samples. The sample includes all firms with financial data in Compustat during the years 1964-2006. All variables are winsorized at the first and the ninety-ninth percentile. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% ($***$), 5% ($**$) and 10% ($*$) levels.

	High Cap. Ex.	Low Cap. Ex.	High Cap. Ex.	Low Cap. Ex.	High Cap. Ex.	Low Cap. Ex.	High Cap. Ex.	Low Cap. Ex.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.192	-.289						
	(.020)***	(.032)***						
WAL-2			-.222	-.335				
			(.019)***	(.028)***				
WAL-3					-.158	-.239		
					(.014)***	(.021)***		
MWAL							-.081	-.226
							(.026)***	(.030)***
Log(Mkt. Cap)$_{t-1}$	-.166	-.253	-.169	-.258	-.170	-.261	-.174	-.281
	(.006)***	(.009)***	(.006)***	(.009)***	(.006)***	(.009)***	(.008)***	(.010)***
Obs.	37783	28801	37783	28801	37783	28801	37783	28801
R^2	.806	.806	.806	.807	.806	.807	.805	.806
Δ Coef	.097		.113		.081		.146	
	(.042)**		(.032)***		(.027)***		(.043)***	

Table V: Asset Liquidity and Stock Liquidity - Panel B: High vs Low Market to Book Firms

This panel reports the results of the regression relating firm's asset liquidity to stock liquidity with the sample split into firms with above and below median levels of market to book ratio. The dependent variable is *Illiq*. All variables are defined in Panel A. $\Delta Coef$ represents the difference between the coefficients on *WAL-1*, *WAL-2*, and *WAL-3*, across the high and low market to book ratio sub-samples. All variables are winsorized at the first and the ninety-ninth percentile. The sample includes all firms with financial data in Compustat during the years 1964-2006. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% ($***$), 5% ($**$) and 10% ($*$) levels.

	High Mkt-Book	Low Mkt-Book	High Mkt-Book	Low Mkt-Book	High Mkt-Book	Low Mkt-Book	High Mkt-Book	Low Mkt-Book
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.189	-.336						
	(.016)***	(.047)***						
WAL-2			-.219	-.378				
			(.015)***	(.040)***				
WAL-3					-.164	-.230		
					(.011)***	(.028)***		
MWAL							-.179	-.182
							(.025)***	(.029)***
Log(Mkt. Cap)$_{t-1}$	-.159	-.261	-.163	-.267	-.163	-.268	-.175	-.281
	(.006)***	(.009)***	(.006)***	(.009)***	(.006)***	(.009)***	(.007)***	(.010)***
Obs.	32519	34065	32519	34065	32519	34065	32519	34065
R^2	.803	.809	.804	.81	.804	.809	.802	.809
Δ Coef	.147		.159		.066		.003	
	(.054)***		(.046)***		(.044)***		(.041)	

Table VI: Proceeds Retained in SEOs and Stock Liquidity

Panel A reports summary statistics for the key variables that we use in the tests with the SEO sample. *Proceeds* is the total proceeds in the SEO, *Proceeds/TA* is the ratio of SEO proceeds to lagged book value of total assets. $Illiq_{i,j}$ is Amihud's illiquidity measure as estimated from day i to day j relative to the SEO date. *Fraction Retained* is the ratio of change in year-end cash balance around the SEO to the total SEO proceeds. All other variables are defined in Appendix. The sample includes all SEOs from SDC database floated during the years 1970-2006, with a minimum size of $10 million, by firms with financial data in Compustat.

Panel A: Summary Statistics

Variable	N	Mean	Min	Median	Max	Std. Dev.
Proceeds ($ Million)	5756	117.808	10.000	60.050	12126.000	259.520
Proceeds/TA_{t-1}	5540	0.311	0.001	0.135	101.534	1.857
$\mathrm{Illiq}_{-30,0}$	5756	0.176	0.012	0.102	1.452	0.228
$\mathrm{Illiq}_{15,45}$	5756	0.115	0.011	0.080	0.727	0.115
$\mathrm{Illiq}_{-60,0}$	5756	0.162	0.012	0.098	1.300	0.200
$\mathrm{Illiq}_{15,75}$	5756	0.121	0.011	0.082	0.760	0.123
Market Capitalization ($ Million)	5686	1722	2	519	386402	7638
Fraction Retained	5435	0.420	-2.613	0.180	6.205	1.039

Panel B: Proceeds Retained in SEOs and Stock Liquidity

This panel reports the results of the regression relating post-SEO stock liquidity to the fraction of SEO proceeds retained by the firm. The dependent variable is $Illiq_{15,45}$ in Column (1) and $Illiq_{15,75}$ in Columns (2)-(4). In Column (3) the sample is confined to SEOs that happen more than two months before the financial year end. All variables are defined in the Appendix. The sample includes all SEOs from SDC database for firms with financial data in Compustat during the years 1980-2006. The regression includes year fixed effects. All variables are winsorized at the first and the ninety-ninth percentile. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% (∗∗∗), 5% (∗∗) and 10% (∗) levels.

	$\text{Illiq}_{15,45}$	$\text{Illiq}_{15,75}$		
	(1)	(2)	(3)	(4)
Fraction Retained	-.002	-.003	-.002	-.017
	(.001)**	(.0009)***	(.001)**	(.002)***
Proceeds/TA_{t-1}				.001
				(.0005)**
$\text{Fraction Retained*Proceeds/TA}_{t-1}$				-.055
				(.006)***
				.011
				(.007)*
$\text{Illiq}_{-30,0}$	.325			
	(.006)***			
$\text{Illiq}_{-60,0}$		.451	.436	.438
		(.006)***	(.007)***	(.006)***
$\text{Mkt. To Book}_{t-1}$	-.0001	.00009	.00008	.0006
	(.0002)	(.0002)	(.0002)	(.0002)***
ROA	-.014	-.014	-.015	-.019
	(.003)***	(.003)***	(.003)***	(.003)***
$\text{Log(Mkt. Cap)}_{t-1}$	-.021	-.016	-.018	-.019
	(.0008)***	(.0008)***	(.001)***	(.0008)***
Obs.	4588	4588	3184	4588
R^2	.65	.728	.73	.733

Table VII: Asset Liquidity and Stock Liquidity Panel A: Small vs Large Firms

This table reports the results of the regression relating firm's asset liquidity to stock liquidity. Specifically, we estimate the panel OLS regression: $Y_{i,t} = \alpha + \beta X_{i,t} + \gamma Controls_{i,t} + \mu_i + \mu_t + \epsilon_{i,t}$, where $Y_{i,t}$ is a measure of stock liquidity for firm i during year t, $X_{i,t}$ is a measure of asset liquidity, μ_i are firm fixed-effects, and μ_t are year dummies. Y is *Illiq*. In Panel A we estimate the regression in sub-samples with above and below book value of total assets. *Illiq* is the square root of average annual Amihud (2002) Illiquidity measure. *WAL-1*, *WAL-2*, and *WAL-3* are measures of asset liquidity. *WAL-1* is the ratio of cash and cash equivalents to lagged value of total assets, *WAL-2* is the ratio of the sum of cash and one half times the value of non-cash current assets, to lagged value of total assets, *WAL-3* is the ratio of the sum of cash, 0.75 times the value of non-cash current assets and one half times the value of other tangible fixed assets, to lagged value of total assets. *Log(Mkt. Cap)* is the natural logarithm of a firm's market value of equity, *Disc. Accruals* is a measure of a firm's abnormal accruals originally proposed in Jones (1991) and modified to control for performance using the methodology of Kothari et al. (2005), *Market to Book* is the ratio of market value of equity to book value of equity, *Capital Expenditure* is the ratio of a firm's capital expenditures (Data128) to lagged total assets. *ROA* is the ratio of earnings before depreciation, interest and taxes to lagged value of total assets, *Volatility* is the standard deviation of a firm's stock returns over sixty months preceding the beginning of a current fiscal year, *BHAR* is the Buy-and-hold annual abnormal stock return calculated as the difference between stock return and the return on the value weighted portfolio of all NYSE, Amex, and Nasdaq stocks. $\Delta Coef$ represents the difference between the coefficients on *WAL-1*, *WAL-2*, and *WAL-3* across the high and low market capitalization sub-samples. The sample includes all firms with financial data in Compustat during the years 1964-2006. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% ($***$), 5% ($**$) and 10% ($*$) levels.

	Large	Small	Large	Small	Large	Small	Large	Small
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.043	-.333						
	(.007)***	(.030)***						
WAL-2			-.051	-.375				
			(.007)***	(.025)***				
WAL-3					-.035	-.273		
					(.005)***	(.019)***		
MWAL							-.031	-.394
							(.010)***	(.028)***
Log(Mkt. Cap)$_{t-1}$	-.048	-.405	-.049	-.409	-.049	-.411	-.051	-.467
	(.002)***	(.010)***	(.002)***	(.010)***	(.002)***	(.010)***	(.002)***	(.011)***
Obs.	34585	31999	34585	31999	34585	31999	34585	31999
R^2	.784	.756	.784	.757	.784	.756	.784	.758
Δ Coef	.290		.324		.238		.363	
	(.033)***		(.028)***		(.021)***		(.031)***	

Table VII: Asset Liquidity and Stock Liquidity Panel B: Rated vs Not Rated Firms

This panel reports the results of the regression relating firm's asset liquidity to stock liquidity with the sample split into firms with and without short term credit rating. The dependent variable is *Illiq*. All variables are defined in Panel A. $\Delta Coef$ represents the difference between the coefficients on *WAL-1*, *WAL-2*, and *WAL-3* across the rated and not-rated sub-samples. All variables are winsorized at the first and the ninety-ninth percentile. The sample includes all firms with financial data in Compustat during the years 1964-2006. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% (∗∗∗), 5% (∗∗) and 10% (∗) levels.

	Rated	Not Rated	Rated	Not Rated	Rated	Not Rated	Rated	Not Rated
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.082	-.225						
	(.022)***	(.022)***						
WAL-2			-.124	-.282				
			(.020)***	(.019)***				
WAL-3					-.090	-.214		
					(.014)***	(.014)***		
MWAL							-.216	-.244
							(.026)***	(.024)***
Log(Mkt. Cap)$_{t-1}$	-.082	-.259	-.084	-.263	-.084	-.264	-.101	-.292
	(.007)***	(.007)***	(.007)***	(.007)***	(.007)***	(.007)***	(.009)***	(.008)***
Obs.	13986	52598	13986	52598	13986	52598	13986	52598
R^2	.81	.781	.811	.782	.811	.782	.814	.781
Δ Coef	.143		.158		.125		.028	
	(.033)***		(.029)***		(.021)***		(.037)	

Table VII: Asset Liquidity and Stock Liquidity - Panel C: High vs Low Default Probability Firms

This panel reports the results of the regression relating firm's asset liquidity to stock liquidity with the sample split into firms with above and below median default probability. We measure default probability using Bharath and Shumway (2008) methodology. The dependent variable is *Illiq*. All variables are defined in Panel A. $\Delta Coef$ represents the difference between the coefficients on *WAL-1*, *WAL-2*, and *WAL-3* across the sub-samples with high- and low-default probabilities. The sample includes all firms with financial data in Compustat during the years 1970-2006. All variables are winsorized at the first and the ninety-ninth percentile. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% ($***$), 5% ($**$) and 10% ($*$) levels.

	High Default	Low Default	High Default	Low Default	High Default	Low Default	High Default	Low Default
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.285	-.157						
	(.040)***	(.020)***						
WAL-2			-.345	-.165				
			(.032)***	(.017)***				
WAL-3					-.228	-.114		
					(.024)***	(.011)***		
MWAL							-.289	-.035
							(.033)***	(.020)*
Log(Mkt. Cap)$_{t-1}$	-.280	-.114	-.285	-.118	-.285	-.119	-.313	-.117
	(.009)***	(.006)***	(.009)***	(.006)***	(.009)***	(.006)***	(.011)***	(.006)***
Obs.	24114	25963	24114	25963	24114	25963	24114	25963
R^2	.797	.852	.798	.853	.798	.852	.798	.851
Δ Coef	-.128		-.180		-.114		-.254	
	(.05)***		(.04)***		(.029)***		(.044)***	

Table VIII: Asset Liquidity and Stock Liquidity - High vs Low G-Index Firms

This panel reports the results of the regression relating firm's asset liquidity to stock liquidity with the sample split into firms with above and below median Gompers-Ishii-Metrick index of takeover protection. The dependent variable is *Illiq*. All variables are defined in Panel A. $\Delta Coef$ represents the difference between the coefficients on *WAL-1*, *WAL-2*, and *WAL-3* across the sub-samples with high- and low-G-Index. The sample includes all firms with financial data in Compustat during the years 1970-2006. All variables are winsorized at the first and the ninety-ninth percentile. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% (∗∗∗), 5% (∗∗) and 10% (∗) levels.

	High G-Index	Low G-Index	High G-Index	Low G-Index	High G-Index	Low G-Index	High G-Index	Low G-Index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
WAL-1	-.029	-.060						
	(.017)*	(.017)***						
WAL-2			-.043	-.091	-.020	-.058		
			(.015)***	(.017)***	(.008)**	(.012)***		
WAL-3					-.020	-.058		
					(.008)**	(.012)***		
MWAL							-.019	-.143
							(.018)	(.026)***
Log(Mkt. Cap)$_{t-1}$	-.054	-.064	-.055	-.065	-.055	-.066	-.056	-.081
	(.006)***	(.007)***	(.006)***	(.007)***	(.006)***	(.007)***	(.007)***	(.009)***
Obs.	13554	15580	13554	15580	13554	15580	13554	15580
R^2	.872	.798	.872	.799	.872	.799	.872	.801
Δ Coef	.032		.048		.037		.124	
	(.02)		(.023)**		(.014)**		(.032)***	

Table IX: Asset Liquidity, Stock Liquidity and the Value of Cash

This panel reports the results of the regression relating the abnormal stock return on a firm's stock to changes in cash balance. The dependent variable is *Abnormal*, the size and book to market adjusted abnormal stock return. All variables are defined in Appendix II. $\Delta Coef$ represents the difference between the coefficients on Δ *Cash* across the sub-samples with high- and low-stock liquidity. The sample includes all firms with financial data in Compustat during the years 1970-2006. All variables are winsorized at the first and the ninety-ninth percentile. The standard errors are clustered at individual firm level. Asterisks denote statistical significance at the 1% ($***$), 5% ($**$) and 10% ($*$) levels.

	Size and Book to Market Adjusted Annual Return				
	All Firms	Low $Illiq_{t-1}$	High $Illiq_{t-1}$	Unrated Low $Illiq_{t-1}$	Unrated High $Illiq_{t-1}$
	(1)	(2)	(3)	(4)	(5)
Δ Cash	.521	.415	.524	.453	.527
	(.020)***	(.023)***	(.029)***	(.027)***	(.033)***
$Cash_{t-1}$	.140	.109	.158	.128	.139
	(.009)***	(.010)***	(.016)***	(.012)***	(.018)***
Δ Non Cash Assets	.136	.119	.125	.137	.155
	(.006)***	(.006)***	(.009)***	(.008)***	(.011)***
Δ Profits	.886	.701	1.011	.694	.971
	(.021)***	(.023)***	(.034)***	(.026)***	(.037)***
Leverage	-.332	-.276	-.391	-.293	-.449
	(.010)***	(.013)***	(.019)***	(.015)***	(.022)***
R & D	.178	.001	.701	.086	.641
	(.037)***	(.044)	(.077)***	(.048)*	(.081)***
Δ Dividends	4.019	4.080	3.213	4.234	3.806
	(.302)***	(.340)***	(.556)***	(.384)***	(.615)***
Δ Interest	-1.946	-1.629	-1.935	-1.676	-2.070
	(.099)***	(.111)***	(.175)***	(.125)***	(.198)***
Const.	.088	.132	.230	.049	.245
	(.013)***	(.015)***	(.023)***	(.015)***	(.023)***
Obs.	72932	44898	28034	34397	22064
R^2	.175	.161	.191	.17	.196
Δ Coef		.109		.074	
		(.035)***		(.041)*	