LIQUIDITY, THE VALUE OF THE FIRM, AND CORPORATE FINANCE*

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Until fairly recently, the theory of corporate finance has been based on the idea that a company’s market value is determined mainly by just two variables: the company’s expected after-tax operating cash flows or earnings, and the risk associated with producing them. While there is considerable disagreement about how to define and quantify this risk, the measures of risk that show up in most asset pricing and corporate finance valuation models reflect mainly the volatility of the operating cash flows.1 Consistent with this view of the market valuation process, the risks that get measured and managed in most corporate investment and financing decisions are those that stem mainly from the volatility of the firm’s cash flow or earnings stream.

In this article, we argue that there is another important factor affecting a company’s value: the liquidity (and what we later describe as the “liquidity risk”) of the company’s own securities, its debt as well as its equity. A company’s securities are liquid to the extent they can be traded quickly and at low cost. During the recent financial crisis, the shortage in funding and great uncertainty about asset values led to a dramatic reduction in the provision of liquidity services by market participants—that is, traders and dealers. The resulting changes in liquidity contributed to a sharp drop in securities prices, of all kinds of bonds and notes as well as stocks, and to an increase in the cost of capital.

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1 Or, in the case of the CAPM, the “co-variance” of their stock return (which presumably reflects their operating earnings as well) with the return on a broad market index like the S&P 500.
As discussed in this article, we now have considerable evidence that differences in liquidity can have major effects on the pricing of corporate stocks and bonds or, equivalently, on their required returns. Buying or selling imposes illiquidity “costs” on investors; and because investors demand compensation for bearing these costs, the required returns on a company’s debt and equity go up—and their prices go down as a result—when their liquidity falls. But the converse is also true: namely, increases in the liquidity of a company’s stock and bonds can reduce its cost of capital and increase its market value. And as we argue in these pages, the liquidity of a company’s securities can and should be managed by corporate policies and actions in a way that aims to maximize the total value of the firm. In what follows, we discuss what liquidity is, how it affects required returns, and how corporations should think about managing the liquidity of their financial claims to increase their market value.

Liquidity Costs: What Are They?

Before discussing how liquidity affects the value of financial assets, let’s begin by defining the costs investors incur when they trade less liquid securities. Stated as briefly as possible, liquidity costs are the costs associated with executing a transaction in the capital markets. These costs have two major components:

(1) First and most obvious are the direct trading costs, which consist of brokerage commissions, exchange fees, and taxes.

(2) Second, and potentially much larger, are price-impact costs, which reflect the price concession—a premium when buying and a discount when selling—that a buyer or seller must make to effect a trade. For example, suppose an investor receives new information that would lead to a rise in a stock’s price and so wants to buy a large quantity of the stock at the current price. In
that case, the seller would be better off holding onto the stock. For that reason, when market
makers or traders\(^2\) observe “buying pressure,” they will tend to sell the stock to the buyer only at a
higher price. And according to the same logic, they will interpret selling pressure as conveying
private negative information about the stock and will buy only at a discount. In both cases, traders
and market makers protect themselves by requiring price discounts or premiums that increase with
the quantity sold to or bought by them.

In such cases, moreover, the extent of the price impact—which is a liquidity cost from the
investor’s viewpoint—increases with the degree of information “asymmetry” between buyers and
sellers. The greater the potential disparity of information between the trading parties, the greater
the risk that that the party initiating the trade will take advantage of its counterparty, and the greater
the compensation required by the counterparty for doing the trade. In this fashion, greater
asymmetry of information results in a larger price impact and higher cost of trading.

The market-impact cost reflects not only asymmetric information but also the “inventory
risk” borne by market makers. When market makers buy a stock, they need to hold it in inventory
until buyers appear. During that period, they bear the risk that the price will fall by the time they
sell it. And if market makers make commitments, as some do, to sell more shares than they have in
inventory, they risk having to cover their positions by buying back the stock at a higher price.\(^3\)

The greater the asymmetric information and the inventory risk, the wider is the bid-ask
spread—the difference between the buying and selling prices posted by market makers. For
investors, the bid-ask spread represents the market impact of a small trade. But if investors deal in

\(^2\) Many traders in the market are market makers, whether formally or informally. They post bid and offer (or
ask) prices (buying and selling prices, respectively) and the quantities they are willing and ready to trade at
these prices. In so doing, they enable continuous trading and provide liquidity to the market.

\(^3\) Inventory risk, which results from the fluctuating market price, exists even if the counterparty has no
special information.
larger quantities, the price impact—the premium or discount needed to compensate market-makers for bearing the asymmetric information and inventory risks—becomes larger.

Finally, as one would expect, the riskier is a given stock, and thus the greater the level of uncertainty about its future value, the greater the price impact and inventory risk, and the higher the associated liquidity costs, tend to be.

The potential price-impact costs for a given stock or security can also be assessed by the depth of the market for the security. Market depth is often defined as the largest trade that can be effected without moving the market price beyond the currently quoted bid and offer prices. It can also be measured by the sum of the quantities offered by traders and market makers willing to trade at the posted bid or offer prices.4

Liquidity and Asset Prices: The Theory

In a paper published in the *Journal of Financial Economics* in 1986,5 we presented the first model that attempts to quantify the relationship between the liquidity and price of a financial asset. In our model, investors are assumed to maximize the expected present value of the cash flows generated by the securities in their portfolio, while taking into account differences in two main variables: (1) differences in liquidity costs among securities and (2) differences in their own time horizons. The basic insight of our model is that the expected, or required, return on a stock (or any financial asset) is an increasing function of its liquidity costs because all investors, regardless of their time horizon, require compensation for bearing these costs. At the same time, our model also

4 An additional source of illiquidity cost are search-and-delay costs, which are the opportunity costs of not trading when traders are searching for better prices than those quoted in the market or when they try to “work” an order to reduce its price impact.

5 Yakov Amihud and Haim Mendelson, 1986, “Asset Pricing and the Bid-Ask Spread,” *Journal of Financial Economics* 17, 223-249. Full citations of all studies mentioned in the text or notes can be found in the references section at the end.
predicts that this positive relationship between liquidity costs and expected returns will be “concave” rather than “linear”; that is to say, the additional return required for a given increase in liquidity costs should become progressively smaller for incrementally less liquid assets. The logic underlying this prediction is that less liquid assets tend to be held by investors with longer investment horizons; and because such investors effectively “amortize” their liquidity costs over a longer period, the liquidity costs per annum are lower, and the resulting marginal increase in required return is smaller, as one moves toward increasingly less liquid assets.

As a result of this so-called clientele effect whereby longer-term investors end up holding less liquid securities, the required returns on such securities and hence the corporate cost of capital —although higher than for more liquid securities—are lower than a “linear” relationship between liquidity and cost of capital would lead one to expect. (For a graphic illustration of this “concave” relationship, see Figure 1 below.) But our model also has a less comforting, and somewhat counterintuitive, implication. In the case of normally highly liquid assets, a sudden and unexpected decrease in liquidity could have much larger price effects precisely because such assets tend to be traded more frequently, and thus incur more trading and market-impact costs per annum.

In sum, our analysis suggests that while the return premium for illiquidity is small in the case of more liquid stocks (and bonds), changes in the liquidity of such stocks have larger effects on their values because they tend to be held by frequent traders who care more about liquidity.

Empirical Evidence on Liquidity and Value

Since the publication in 1986 of our model of this liquidity effect on asset pricing, a substantial body of empirical evidence has confirmed the effects of liquidity on the prices and expected returns of a variety of financial assets in many different markets, using a number of
different measures of liquidity and different estimation methods. In the case of stocks, bonds, and other financial instruments (including options, closed-end mutual funds, hedge fund investments, and equity-linked index bonds), researchers have consistently reached the same conclusion: the lower the liquidity of a security, the higher, after controlling for its risk and other relevant characteristics, its expected return and thus the lower its price.

In our 1986 study, we designed an empirical test of our predicted relationship between liquidity and asset returns using NYSE- and AMEX-listed stocks over the period 1960-1980. For each of the 21 years in our sample, we divided all stocks into seven groups based on their bid-ask spread, which was then the prevailing measure of liquidity costs. The first group consisted of one seventh of all the stocks in our sample with the lowest bid-ask spreads; the last group consisted of the seventh of the stocks with the largest spreads.

Our next step was to subdivide each of these seven groups into seven portfolios ranked by their beta coefficient, the CAPM-based measure of risk, giving us a total of 49 portfolios. Then, by comparing each of the seven portfolios with the same beta risk (while also making adjustments for firm size and “unsystematic” volatility), we found that the average portfolio returns were significantly higher for the groups of stocks with higher bid-ask spreads. And this positive relationship between average return and bid-ask spread turned out to be concave, as we thought it would.

To be more specific, the average monthly return $R_j$ on each portfolio $j$ was given by the equation:

$$ R_j = 0.0065 + 0.0010\beta_j + 0.0021\ln(S_j) , $$

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6 See Amihud and Mendelson (1986, 1989). The 1989 paper considers separately the effects of residual risk. Full citations for all studies cited in footnotes can be found in a reference section at the end of the article.

7 Our illiquidity measure was the bid-ask spread as a percentage of the stock’s price.
where $S_j$ was the average bid-ask spread of portfolio $j$ (as a percentage of stock price) and $\beta_j$ was the systematic risk of portfolio $j$. To illustrate our general finding, an increase in the bid-ask spread from 1% to 2% (as can be seen in Figure 1) was associated with an increase in the average monthly return of 0.15% ($= 0.0021 \cdot \ln(2)$), or 1.8% per annum. And to illustrate the “concavity” of the relationship (or the diminishing marginal effect of transaction costs for less liquid stocks), an increase in the spread from 2 to 3% was associated with a further increase in return of only 1% per annum.

**Figure 1: Relationship between illiquidity costs, as represented by the bid-ask spread as a percentage of stock price, and the excess monthly stock return.**

In later studies, other researchers confirmed our finding that lower liquidity is associated with higher expected returns while using a number of alternative measures of liquidity in different markets and time periods. For example, a 1996 study of the effect of liquidity costs on NYSE stock returns over the period 1984-1991 reported a strong positive relationship between average stock
returns and liquidity costs when measured in terms of both bid-ask spreads and price-impact costs.\(^8\) And two more recent studies\(^9\) reported a similarly positive relationship with average returns when measuring liquidity costs by stock turnover (the ratio of trading volume to number of shares outstanding) and dollar trading volume.

The studies discussed up to this point estimate the effects of liquidity on actual average stock returns, which are then viewed as a proxy for expected returns. And as already noted, the higher a stock’s expected return, the lower is its price or value for any given level of expected cash flow or earnings. Many corporate managers, however, are accustomed to thinking about cost of capital in terms of their company’s price/earnings (P/E) ratio, with a higher P/E ratio often interpreted as a lower cost of capital. According to our theory, the more liquid a company’s stock, the higher its P/E ratio should be for a given expected growth rate and level of risk. In a 2005 study of Swiss and U.S. Nasdaq stocks, Claudio Loderer and Lukas Roth found that companies with greater stock liquidity (as indicated by lower bid-ask spreads) had higher P/E ratios after controlling for differences in predicted growth (obtained from analysts’ forecasts), dividend payout, beta risk, and firm size.\(^{10}\) They estimated that the P/E ratio of the median Nasdaq stock represented a discount of about 30% relative to its hypothetical value in a trading regime with zero transaction costs.

**Evidence from Treasury Markets.** In a study published in 1991, we tested the liquidity effect on value in fixed-income markets by examining the differences between the yields on U.S.

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\(^8\) See Brennan and Subramanyam (1996). Their estimates of liquidity costs were obtained from a regression of each stock’s trade-by-trade price change as a function of the trade size and the bid-ask bounce. The slope of this regression represents the price-impact cost; an estimate of the price change that is independent of order size is taken as an estimate of the fixed liquidity costs.


\(^{10}\) Claudio Loderer and Lukas Roth (2005).
Treasury bills and notes with less than six months to maturity.\textsuperscript{11} For these maturities, both securities are discount instruments; and when their maturities are matched, they are identical except that the bills are much more liquid than the notes. The average bid-ask spread on the Treasury bills in our sample was 0.00775\% as compared to 0.0303\% (or roughly four times larger) for the notes. The brokerage fees were $12.5 to $25 per $1,000,000 value for bills and $78.125 per $1,000,000 for notes. And as further evidence of the bills’ greater liquidity, their average trade size was much larger than that of the notes.

Because notes are less liquid than bills with the same maturity, our theory predicts that the notes’ yields would be higher. We tested this liquidity effect using 37 randomly-selected days in 1987, matching notes with bills of roughly the same maturities. Confirming our prediction, the annual yield to maturity on the notes was 0.43\% higher than on bills with the same maturity.\textsuperscript{12} Other studies have reported a similar pattern in the yield differential between on-the-run bonds, which are the most recently issued of a given maturity class, and their less liquid off-the-run counterparts.\textsuperscript{13}

\textbf{Evidence from Corporate Bond Markets}. Corporate bonds have higher yields, on average, than similar-maturity government bonds. And among corporate bonds, lower-rated bonds have higher yields than higher-rated bonds. These yield differentials have traditionally been attributed solely to differences in the risk of default, which is of course higher for investment-grade corporate bonds and still higher for lower-rated corporate bonds. But according to our theory, if

\textsuperscript{11} Amihud and Mendelson 1991(a).
\textsuperscript{12} Kamara (1994), who obtained similar results, found that the note-bill yield differential holds after controlling for a number of additional security characteristics.
\textsuperscript{13} A number of studies document a lower yield to maturity for on-the-run bonds compared to their off-the-run counterparts (cf. Warga (1992), Krishnamurthy (2002)).
liquidity costs are higher for corporate and riskier bonds, part of these yield differentials is likely to be attributable to differences in liquidity.

A 2007 study published in the *Journal of Finance* found that the liquidity costs of corporate bonds are generally higher for lower-rated bonds; and that, after controlling for risk, issuer characteristics, and special features of the bonds, less liquid bonds have higher yield spreads over Treasury rates. The study also showed that changes over time in the liquidity costs of individual bonds lead to changes in the yields of those bonds.  

Another test case for the value of liquidity has been provided by the SEC’s Rule 144A, which allows for limited trading of bonds that cannot be traded in the public markets. Trading of these so-called Rule 144A bonds is restricted to “qualified” investors (generally institutional investors), which makes the bonds less liquid than otherwise comparable publicly traded corporate bonds. Supporting our prediction that less liquid securities would have higher required returns, a 2004 study reported that the yields on Rule 144A bonds were 0.49% higher, on average, than the yields on unrestricted, publicly traded bonds with similar characteristics. And consistent with our proposition of a concave relation between liquidity costs and yields, the yield differential attributable to liquidity costs was larger for investment-grade bonds, which are more liquid, than for non-investment-grade 144A bonds.

Effects of Liquidity Changes over Time

Liquidity not only varies across securities, but the liquidity of a given security—or of an entire market—can change over time. And just as liquidity affects asset prices across securities, changes in the liquidity of a security will result in changes in its value.

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A good example of the effect of market-wide liquidity changes over time was provided by the U.S. stock market crash of October 19, 1987. In a study published in 1990, we together with Robert Wood of the University of Memphis provided evidence that a significant part of the plunge in prices resulted from a sharp decline in overall market liquidity. In response to the drop in liquidity, investors reduced the price of securities, which in turn caused liquidity to fall further, thereby setting off a “vicious cycle” of illiquidity and plunging prices.

More specifically, we found that on “Black Monday,” the average dollar spread of S&P 500 stocks traded on the NYSE increased by 17 cents, or more than 63%, from its pre-crash level, with many spreads more than tripling in size—and the quoted depth also fell dramatically. A similar drop in liquidity was reported in London, where the bid-ask spread of the most liquid stocks increased from 1.2% prior to the crash to 3.4% on the crash day, and remained at about 3% through November 1987. Adding to the sense of panic and lack of liquidity, this plunge in liquidity followed a period when investors had come to believe the market could absorb ever larger order flows with small effects on prices.

Our study also showed that the stocks that fell the most on Black Monday were those whose liquidity declined the most, as measured by both the increase in the bid-ask spread and the decline in quoted depth. And providing further support for our theory of liquidity and value, those stocks that recovered the most by the end of October 1987 were those that experienced the largest restoration of liquidity (although the liquidity of the average stock remained below its pre-Crash level).

The price effects of market-wide liquidity shocks could also be seen in different parts of the credit market following the collapse of the U.S. subprime mortgage market in mid-2007. The poor performance of the underlying mortgages, and the general uncertainty and scarcity of information
about the values of structured securities that used them in part as collateral, led to the collapse of liquidity in the markets in which they were traded. When these securities were initially priced, investors assumed that they would be able to liquidate them at relatively low costs. But this became impossible when the crisis materialized. And as a result, the yields on these securities jumped and their prices dropped.

After market prices had fallen in almost all asset categories during the crisis of 2008, many traders and dealers became financially constrained as their margin requirements became binding. And the result was that the funding liquidity of many institutions was severely reduced as well. As a consequence, many were forced to liquidate their securities under stress, which led to large market impact costs. Such financial constraints also meant that dealers could not provide liquidity services, which was harmful to ordinary investors who needed to transact in the market and find counterparties for their trades. And as investors experienced a loss of liquidity, they priced securities lower, which in turn exacerbated the financial constraints of dealers and providers of liquidity, leading to a downward spiral in prices and liquidity.\footnote{Brunnermeier and Pedersen (2009) model this scenario and provide insight into why we observe that negative price shocks lead to decline in asset liquidity, which in turn further lower prices, and so forth. Acharya and Viswanathan (2011) propose another link between market-wide price shocks and illiquidity. When prices fall, the leverage of financial intermediaries rises and this induces them to take more risk in the hope of resurrecting their position, thus shifting more risk on debt holders. As these firms need to roll over their short term debt, they become capital constrained because lenders are reluctant to provide capital, knowing the risk-shifting propensity of the managers. These effects cause the financial intermediaries to become financially constrained and liquidate their financial positions at great cost.}

**Changes in the Liquidity of Corporate Securities**

Studies have also shown that when companies take actions designed to *increase* the liquidity of their own debt and equity securities, investors’ required returns fall and the market value of the firm increases. For example, the exchange listing of stocks that previously traded over
the counter has led to both lower bid–ask spreads and increases in stock price.\textsuperscript{17} Such studies have also reported that the price increases were negatively correlated with the changes in the bid-ask spread; that is, the larger the decline in the bid-ask spread, the greater the price increase.

Nevertheless, in such cases one can question whether the price increase after listing is really attributable to the increase in liquidity. Decisions by corporate managers to list their stock can be motivated by, and provide a signal to the market of, favorable private information about their companies’ prospects that is unrelated to liquidity. Thus the most reliable way to test the impact of liquidity changes on value is to find a “controlled experiment,” one where liquidity is enhanced as a result of independent, “third-party” decisions that are not influenced by the firm’s management.

Such a controlled experiment was provided by the Tel Aviv Stock Exchange during the period 1987-1994 when it moved small groups of stocks from a once-a-day call auction to a higher-frequency and more liquid trading regime. Periodic decisions to transfer stocks to the more liquid regime were made by the board of directors of the Tel Aviv Stock Exchange, not by the management of the firms involved. Once the decisions were made, they were announced publicly, and the stocks were transferred to the more liquid trading regime a few days later.

Our 1997 study with Beni Lauterbach of Bar Ilan University examined the price changes of the transferred stocks over the period starting five trading days before the transfer announcement and ending 30 days after the actual transfer. As shown in Figure 2, the stocks that were transferred to the more liquid trading regime enjoyed an increase in value of about 6% on average during this period. The message of this finding is that corporate management may find it worthwhile to invest in efforts to improve the liquidity of the company’s securities. Some ways to do that are discussed below.

\textsuperscript{17} Kadlec and McConnell (1994), Elyasiani et al. (2000) and Bollen and Whaley (2004) examine the effect of listing on stock liquidity and price.
Figure 2: Effect on Stock Prices of a More Liquid Trading Regime

Cumulative Average Abnormal Return (%)

“A” is the announcement day and “T” is the actual transfer day.

The Effect of Market-Wide Liquidity Shocks, Liquidity Risk, and the Liquidity Risk Premium

The well-known Capital Asset Pricing Model defines the systematic (or $\beta$) risk of a stock as the exposure of the stock’s returns to the market-wide return. As such, beta can be viewed as a measure of a stock’s sensitivity to “price shocks.”\(^{18}\) The findings of our study of the 1987 Crash suggest that stock prices respond to market-wide \textit{liquidity} shocks as well as to general market price shocks.

\(^{18}\) This $\beta$ risk is measured by the “co-variance” of the stock’s return with the return on a broad-based market index.
Using data for the NYSE over the period 1963-1996, a 2002 study by one of the present authors investigated whether and how market-wide liquidity affects both expected and realized stock returns. Market illiquidity (or market-wide liquidity costs) was measured by the daily average across all NYSE stocks of the ratio of absolute daily stock return to the daily dollar trading volume in the stock. This ratio is a proxy for price impact, the trading volume needed to move the stock price. The higher this ratio, the less liquid is the stock; and an increase in the average ratio for all NYSE stocks indicates a decrease in market-wide liquidity.

The study found that, in cases of illiquidity shocks—that is, when market liquidity falls unexpectedly—stock prices fall, implying an increase in future expected or required returns. And as if to confirm this implication, the study also found that the greater the current degree of market illiquidity, the higher is the actual average market return in the period that follows. We interpret these results as follows: When market liquidity falls, investors anticipate that liquidity costs will remain high for a while because of the persistence of illiquidity; and higher expected liquidity costs should cause expected returns to rise and stock prices to fall.

The impact of market-wide illiquidity shocks was also found to be greatest for small stocks, which are generally less liquid, implying that such stocks have greater exposure to liquidity shocks and hence higher “liquidity risk.” That is, when liquidity drops sharply enough, investors generally shift from less liquid to more liquid securities, which exacerbates the decline of small-company stock prices while cushioning the negative effect on large, highly liquid stocks. This is one example of the well-recognized phenomenon known as “flight to quality”—a phenomenon that is perhaps better interpreted as a “flight to liquidity.”

19 Amihud (2002).
20 An intuitive way to view this is by looking at bonds: a price decline means a rise in the yield to maturity. This is based on two assumptions: first, that companies’ future earnings are not strongly related to current stock liquidity—trading liquidity, not the corporate liquidity position; and second, that illiquidity shocks lead to a change in stock liquidity that persists some time into the future.
As this analysis suggests, then, a security’s sensitivity to liquidity shocks—or what might be referred to as its market (il)liquidity beta—can be expected to affect its expected return and its price. In support of this idea, two recent studies\textsuperscript{21} reported that stocks whose return is more sensitive to overall liquidity shocks have higher average returns than otherwise comparable stocks with less sensitivity to liquidity changes.

In addition, one of these studies\textsuperscript{22} has proposed a comprehensive liquidity-adjusted CAPM in which each stock has, in addition to its standard market beta, three liquidity betas: (1) one that reflects the sensitivity of the stock’s return to market-wide liquidity shocks; (2) a second that reflects the sensitivity of the stock’s liquidity to market-wide liquidity shocks; and (3) a third that reflects the sensitivity of the stock’s liquidity to the market return. The study shows that these three liquidity betas are all “priced” both individually and when put together. That is to say, increases in each of these three additional risk factors are associated with higher expected returns over time.

In sum, the price of a security, be it stock or bond, is affected both by the level of its liquidity and by its liquidity risk, as measured by its exposure to market-wide liquidity shocks and by the response of its own liquidity to the market return. This adds to the security’s systematic risk over and above the ordinary beta risk, which reflects sensitivity to the market return alone. For any given cash flow that the security is expected to generate, its price is higher when its liquidity costs and exposure to market-wide liquidity risk are lower.

A recent study by Acharya, Amihud, and Bharath (2011) shows that liquidity shocks do not always play important role in securities pricing. After examining the exposure of the U.S. corporate bond returns to liquidity shocks of stocks and treasury bonds during the period 1973-2007, the authors characterize their findings as evidence of “two regimes.” Under normal (or

\textsuperscript{21} Pastor and Stambaugh (2003) and Acharya and Pedersen (2005).
\textsuperscript{22} Acharya and Pedersen (2005).
“benign) economic conditions, liquidity shocks have mostly insignificant effect on bond prices. But undersufficiently adverse economic and financial conditions, a general increase in illiquidity produces significant but conflicting effects on bond prices. The prices of investment-grade bonds rise while prices of speculative grade (junk) bonds fall substantially (all relative to the market).23

3. Implications for Corporate Management

This effect of liquidity on investors’ required returns suggests that a company can reduce its cost of capital and increase its market value by increasing the liquidity of its stocks or bonds. We now suggest a number of ways that companies can seek to do this.24

Implications for Capital Structure

According to the Modigliani-Miller capital structure irrelevance proposition, in a world without transactions costs, taxes, information costs, or other “frictions,” a company’s capital structure should not affect the value of the firm. But when these assumptions are violated, capital structure matters. In particular, when information and transactions costs become high enough, a company’s capital structure will affect the liquidity of the firm’s stock and, as a consequence, its equity cost of capital. The higher a company’s leverage ratio, the greater is the risk of its equity—and, as a result, the greater is the sensitivity of the value of its equity to new or private information about the firm. With this greater sensitivity comes a greater potential for “informed” investors to

23 These effects, which are robust to controlling for other systematic risks (term yield risk and default risk), suggest the existence of time-varying liquidity risk of corporate bond returns that is conditional on episodes of flight to liquidity. A similar pattern is observed for stocks based on their book-to-market ratios, which is associated with economic performance. Here again, liquidity shocks play a special role in periods characterized by adverse economic conditions, with the effect of liquidity shocks being particularly negative for high book-to-market stocks, which are associated with distressed profitability.  

24 See also Amihud and Mendelson (1988, 1991) for earlier discussions of liquidity-enhancing corporate finance policies.
take advantage of market-makers and other “less-informed” investors. And the likely result of such information asymmetry, as we noted earlier, is wider bid-ask spreads and higher price-impact costs.

In this way, an increase in corporate leverage has the potential to cause a reduction in the liquidity of the company’s stock and, along with it, an increase in its cost of equity capital. To test this argument, a 2008 study by David Lesmond, Philip O’Connor, and Lemma Senbet examined the effect of major recapitalizations—some debt-increasing, others debt-reducing—on the liquidity costs of 276 public U.S. companies that executed such recaps during the period 1980-2006. In support of the authors’ hypothesis, the companies that carried out leverage-increasing recaps experienced an average increase of 1% in the bid-ask spreads of their stock in the following year, and the leverage-reducing companies saw a narrowing of their stocks’ bid-ask spreads by an average of 2%. The study’s findings were also interpreted as predicting a 30-basis point increase in the liquidity costs of the company’s equity for every 10% increase in its debt-to-assets ratio. In addition, the authors reported that the leverage-increasing companies experienced a decline in their number of shareholders (another factor known to affect liquidity), most notably in holdings by institutional investors, who typically prefer more liquid stocks.

What does this mean for corporate CFOs and treasurers? For companies that have (or are contemplating) more leveraged capital structures, management should weigh the costs associated with having less liquid stock against whatever tax and “control” benefits they derive from heavier leverage.

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25 And even though the value of a company’s debt is generally less sensitive than the value of its equity to the possibility of asymmetric information, the liquidity costs associated with debt could also rise with a significant increase in corporate leverage.

26 Liquidity costs are measured in a number of ways: price impact, bid-ask spread, an imputed cost estimated from the price change needed to effect a transaction and overcome the trading cost of the stock, and a measure of the probability of informed trading (reflecting asymmetric information). The pattern of change in other measures of liquidity costs was similar.

27 The effects of changes in capital structure were estimated after controlling for other variables that affect liquidity costs and institutional holdings, accounting for the endogeneity of some of these variables.
And to the extent that a company’s securities become more illiquid—debt as well as equity—when the firm has greater difficulty servicing its debt, illiquidity costs can be thought of as another form of “financial distress costs.”

Providing further evidence that liquidity plays a role in corporate capital structure decisions, a 2007 study by Marc Lipson and Sandra Mortal of U.S. companies that raised outside capital (debt or equity) in public markets during the period 1986-2004 found that the more liquid a company’s stock in any given year, the more likely the company was to raise equity rather than debt in the following year. Using five different measures of stock liquidity, Lipson and Mortal also reported that companies with more liquid stock tend to have lower levels of leverage (both in terms of book and market values), and that increases in stock liquidity in one year tend to be followed reductions in leverage in the next year. And providing still more evidence of this tendency of companies raising capital to choose more liquid securities—or, alternatively, for high leverage to reduce liquidity—a 2008 study by Sreedhar Bharath, Paolo Pasquariello and Guojun Wu found that corporate leverage ratios are an increasing function of a composite measure of stock illiquidity that combines the stock’s bid-ask spread, trading volume intensity, probability of informed trading, and the price impact of trades. The study also reported that increases in illiquidity were associated with contemporaneous increases in leverage.

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30 But if liquidity concerns can cause some companies to limit their use of debt, there are also major costs associated with raising equity instead, particularly for companies with no clear growth opportunities or other promising uses for the capital. As Stewart Myers and Nicklaus Majluf (1984) demonstrated in their much cited pecking order theory of corporate financing, companies that need outside capital tend to exhaust their debt capacity before issuing equity to avoid the price-impact costs typically associated with issuing seasoned equity. Such price-impact costs are the result of a “corporate” liquidity problem, if you will—of an information asymmetry between management and its investors (as opposed to the asymmetry between informed and less-informed investors discussed earlier).
31 After controlling for factors that affect stock liquidity and corporate leverage
Recent research also shows that companies choose to raise equity during periods of higher general stock market liquidity. In a 2004 study, Malcolm Baker and Jeremy Stein reported that the annual aggregate share of equity issues among all securities issues was higher in years with higher stock market liquidity, as measured by stock turnover. When reaching this conclusion, moreover, Baker and Stein reported that other factors widely believed to affect the timing of equity issuance, such as price run-ups in the market or the aggregate dividend/price ratio (a commonly used indicator of equity overpricing), had no significant effect on the equity share of new issues. Only market liquidity appeared to matter.

Finally, greater stock liquidity also appears to reduce another cost associated with issuing new stock. A 2005 study by Alexander Butler, Gustavo Grullon, and James Weston shows that the fees investment bankers charge on stock issues decrease with the liquidity of the stock.

In sum, companies that are concerned about the liquidity of their securities may want to consider limiting their leverage ratios. And we now have considerable evidence suggesting that companies can facilitate their access to the market for equity capital by increasing the liquidity of their stock. To this end, management may want to explore other means of increasing the liquidity of their company’s shares that we discuss below.

**Implications for Security Design**

The standard analysis of security design views it as concerned mainly with optimal contracting, improving incentives and resolving asymmetric information. However, consideration should also be given to the liquidity of the securities. For each of a company’s securities, the quantity outstanding and the float are matters that need to be considered.
This presents an interesting trade-off in security design. If a company issues more types of securities, it may be better able to cater to specific contracting needs and the preferences of different investor clienteles. But the downside of such complexity is that with more types of securities, the issue size of each security is smaller, which reduces liquidity. In other words, issuing multiple types of securities leads to a fragmentation of a company’s investor base, and this can reduce liquidity and value. Although the different securities are often justified in terms of their contracting features and appeal to specific investor groups (or “clienteles”), such customization also has the effect of reducing the float, and hence the liquidity, of each individual security.

In a 2003 paper on which we collaborated with Beni Lauterbach, we investigated the consequences of such fragmentation by studying publicly traded companies with deep-in-the-money warrants on the verge of expiration. In such cases, the warrant prices should trade much like the underlying stock. The issue of liquidity arises insofar as the float of each security is smaller than it would be if they were both consolidated into a single security. The hypothesis of our study was that the consolidation of the two securities that follows the expiration of the warrants would increase the liquidity and, hence, the value of the stock.

Consistent with our hypothesis, we found that, on the day the warrants expired, the prices of the stocks increased significantly. To proponents of market efficiency and the conventional (that is, liquidity-neutral) CAPM, this outcome is surprising because the exercise of the warrants was

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32 See a related analysis of liquidity-based security design by DeMarzo and Duffie (1999).
33 In addition, changes in the liquidity of any individual security affects the liquidity of the firm’s other securities, as shown by Amihud, Mendelson and Lauterbach (1997).
34 Amihud, Lauterbach, and Mendelson (2003).
35 The alternative possibility, of course, is that such consolidation would have no effect: Since the two securities are substantively identical, investors may regard them as a single security and consider the relevant float of the equity instruments to be the sum of the floats of the two securities. However, this ignores the costs of liquidity—that is, the costs of combining the two securities as well as the fact that the cost of trading $1 million in each of the two securities would be greater than the cost of trading $2 million in a single security (with a float equivalent to the sum of the floats of the two securities).
completely anticipated and assured (since they were deep in the money). What’s more, the fact that the size of the price increases of the individual stocks was positively related to the subsequent increase in their liquidity—when measured using either the stock’s trading volume (relative to the market volume) or the bid-ask spread (imputed from reversals in daily stock prices)—suggests a causal relationship between the changes in liquidity and price.36 Underscoring the beneficial effect of the increase in float, the study also found that larger percentage increases in the number of shares as a result of the warrant exercise were associated with larger increases in both the liquidity and prices of the shares.

The message from our study, then, is that the issuance of multiple securities—even those with highly correlated returns—leads to fragmentation of trading, which reduces liquidity and value. And thus while many companies may have good reasons for issuing multiple classes of stock or a number of series of bonds, corporate managers should keep in mind the negative effect of a fragmented capital structure on liquidity and the cost of capital.37

**Implications for Payout Policy: Dividends and Buybacks**

Dividends provide investors with cash, which is of course the ultimate liquid asset. In a world without liquidity costs, stockholders could replicate any cash flow stream they wanted by trading in the market, which would make dividends irrelevant. But when such trading is costly, this

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36 Evidence of the importance of fragmentation can also be seen in the case of Canada’s sovereign debt. In a press release in August of 1997, the government of Canada announced that “the weekly cycle of treasury bill auctions will be replaced by a two-week cycle” in order “to enhance the liquidity of the market for new issues.” The “backgrounder” explained that “The measures will increase the size of amounts auctioned at each treasury bill tender and the outstandings for each particular bill maturity relative to the current issuance pattern.” Thus, the consolidation of otherwise fragmented sovereign debt issues can enhance liquidity and reduce the government’s borrowing cost.

37 This analysis may explain, at least in part, the failure in 1988 of the transformation of the common stock of Sara Lee Corporation into three different securities: a bond, an unusual type of preferred stock and a long-term option on the company's stock at a set exercise price. See Norris (1988).
dividend irrelevance proposition no longer holds. The more costly it is to trade in a stock, the
greater the potential role of dividends in providing liquidity for the stock’s owners.

Thus it follows that dividend increases are likely to be most valuable for stocks with low
liquidity, where the alternative of generating cash flows by selling the stock is more costly.
Consistent with this prediction, a 2007 study by Suman Banerjee, Vladimir Gatchev, and Paul
Spindt found that the propensity of companies to pay cash dividends is significantly higher in cases
involving less liquid stock.

Of course, for many of the least liquid stocks—particularly those with low or negative free
cash flow, including small growth companies with large outside funding requirements—dividend
payments are likely to be out of the question. But for those firms with relatively illiquid stocks and
enough confidence in their future free cash flow to consider paying dividends, an increase in
investor liquidity could become a decisive factor. The study by Banerjee et al. just cited reported
that the stocks of companies that initiate dividends tend to be relatively illiquid \(^{38}\) and have high
liquidity risk at the time of initiation (after controlling for other factors that affect dividend
initiation). But after the companies start to pay dividends, the liquidity risk (as measured by the
liquidity beta) of their stocks falls significantly \(^{39}\).

Also consistent with this liquidity effect of dividends, a 2006 study involving one of the
present writers found that the stock price reaction to announcements of dividend increases was

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\(^{38}\) Banerjee et al. (2007) measured liquidity using the turnover or trading volume and illiquidity by the
average price impact on the company’s stock or the proportion of non-trading days.

\(^{39}\) The liquidity risk or liquidity beta—which, as already noted, is the sensitivity of the stock return to
market-wide liquidity shocks—is measured over three years before and after the dividend initiation. The
model estimates the return beta on the liquidity index of Pastor and Stambaugh (2003), which estimates
liquidity as the return reversal after high-volume days, and then averaged across stocks. The model controls
for the three Fama-French factors—excess market return, return on the high-minus-low book-to-market
firms, and the return on small-minus-big firms—as well as the return on winners-minus-losers.
positively related to the illiquidity of the stock. The market reaction was also more positive for stocks with smaller market capitalization, which tend to have higher liquidity costs.\textsuperscript{40}

Stock repurchase, the other main means for distributing cash to shareholders, also appears to affect liquidity, which in turn affects corporate decision-making. To the extent companies incur liquidity costs when buying back their own stock, stock repurchases are more costly to carry out when the firm’s shares are relatively illiquid. In addition, if a company is suspected of using private information about the firm’s prospects when deciding on the timing of a specific stock repurchase, the knowledge that a large trader with private information is in the market may well reduce the liquidity of the stock.\textsuperscript{41} For both of these reasons, stock repurchases are likely to be undertaken by companies with relatively liquid stock.

Consistent with this analysis, a 2008 study by Paul Brockman, John Howe, and Sandra Mortal reported that companies with more liquid stock tend to distribute more of their excess cash in the form of stock repurchases than dividends. The study also finds that both the likelihood of initiating share repurchases and the amount of stock repurchased are increasing functions of stock liquidity for both dividend payers and non-dividend payers, with both effects being generally stronger for dividend payers. Finally, the study confirms the earlier reported finding that dividend initiations are more likely, and dividend payouts higher, for companies with relatively illiquid stock (again, after controlling for other factors).

In general, then, both theory and evidence suggest that dividends are more likely to be initiated and increased in companies with less liquid shares. At the same time, the proportion of

\textsuperscript{40} See Amihud and Li (2006). Part of the result may be due to the fact that dividend increase announcements are more informative in companies with greater information asymmetry, which also tend to be less liquid and smaller firms. But Amihud and Li control at least partly for that in their analysis by using stock return volatility, which is a commonly used measure of information asymmetry, and the firm’s age, another measure of availability of information about the firm.

\textsuperscript{41} For evidence consistent with this effect, and an analysis of the association between stock liquidity and the choice between dividend and repurchase, see Barclay and Smith (1988).
total corporate distributions made through share buybacks is larger for companies with more liquid stock. With that in mind, the dramatic increase in overall stock market liquidity during the past 15 or 20 years has likely been a significant contributor to the relative decline in dividends and surge in stock buybacks during roughly the same period.\textsuperscript{42}

**Increasing the Company’s Investor Base**

The liquidity of a company’s stocks and bonds can be enhanced by increasing its investor base, especially by adding small individual investors who trade the stock without private information. Theory suggests that greater trading activity by such “less-informed” investors can have the beneficial effects of reducing the extent of asymmetric information in trading and increasing liquidity, as reflected in the reduction of bid-ask spreads and the price impact of trades. In this way, an increase in a company’s number of less-informed investors could lead to a higher stock price or P/E multiple.

To test this proposition, we conducted a study with Jun Uno of Waseda University of the liquidity and stock performance of 66 Japanese companies that, in the early 1990s, made their stock more accessible to small investors by reducing their minimum trading unit or lot size, which is the smallest number of units that can be traded on an exchange. In most cases, the minimum trading unit was reduced from 1,000 shares to 100 shares, cutting the value of the trading lot for the median stock in the sample from $24,000 to $2,400. When such changes were introduced, as our study reported, the number of investors in such companies increased by more than 200%, on average, resulting in an increase in stock liquidity and an average stock price increase of about 6%. Moreover, the increase in the stock prices was an increasing (and statistically significant) function of the percentage increase in the number of individual shareholders.

\textsuperscript{42} Fama and French (2001) point out a process of disappearing dividends beginning around 1980, a period that also experienced a rise in stock market liquidity. Boudoukh, Michaely, Richardson and Roberts (2007) note that stock repurchases peaked in the years 1998-2000, which were years of high stock market liquidity.
Stock splits are another way to increase the investor base and to attract small, typically “less-informed” investors. A 1996 study by Chris Muscarella and Michael Vetsuypens analyzed “solo splits” of ADRs—that is, splits of foreign stocks in the U.S. market but with no corresponding split in the underlying foreign stock. What makes the case of solo splits such a useful testing ground is that the foreign company’s management does not make the decision to split the ADR in the U.S. That decision is instead made by a U.S. market maker, which ensures that the decision to split the shares does not reflect any new information on the part of management about the company. Muscarella and Vetsuypens found that the price of the ADR increased upon the announcement of the split, consistent with the idea that stock splits are motivated primarily by a desire to increase liquidity. Indeed, they found that the proportion of small trades (up to $10,000) increased from 36% to 50% following the split, and that the volume of such smaller trades increased by 138%.

This is consistent with the finding of a 1997 article by Sandip Mukherji, Yong Kim and Michael Walker that stock splits led to an increase in the number of stockholders, both individual and institutional. And suggesting the causal relationship between liquidity and value that we have posited throughout this article, the average stock price reaction to the split announcements was positive and correlated with the increase in the number of stockholders in the year of the split.

Advertising is yet another way of increasing a company’s investor base and the liquidity of its stock. In addition to the obvious effect of greater investor exposure through investor relations, advertising the company’s products or services increases a company’s visibility, which in turn has the potential to attract smaller, less-informed investors and so improve the liquidity of its securities. In a 2004 study of the effect on liquidity of product advertising, Gustavo Grullon, George Kanatas, and James Weston found that companies that spent more on advertising had larger investor bases.
comprising institutional as well as individual investors. Moreover, the effect of advertising was larger on the company’s individual investors, the kind of investor whose presence would likely result in greater liquidity for the firm’s shares. Grullon et al. also reported that higher advertising spending was associated with lower bid-ask spreads and price-impact costs, while increasing quoted depth. This was true both across firms and for the same companies over time.

In sum, a company intent on increasing the liquidity of its stock should consider attempts to increase its investor base. Stock splits are one widely recognized means of accomplishing this goal, but an effective advertising policy can also help.

Companies can also increase liquidity by inducing more dealers to make a market in their securities, especially if they are thinly traded. In the Euronext, small companies with illiquid stock are allowed to hire designated market-makers that commit to provide liquidity in their stock. In his 2008 study of a number of Dutch companies, Albert Menkveld found that the introduction of such designated market-makers led to a decline in the bid-ask spread, and that this decline was larger when the number of market-makers hired was greater. For example, the spread declined from 2% for companies that hired one market-maker to 1% for firms hiring eight market-makers. The decline in the bid-ask spread was also associated with significant declines in stock price volatility. And in support of our general theory on the effect of liquidity on stock price, Menkveld found that adding a designated market-maker was associated with an average price increase of 4.6%.

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43 Specifically, a company with 1% greater level of advertising spending had 0.25% higher number of stockholders (after controlling for other factors that affect stock ownership, such as market capitalization, age, share price, volatility and profitability), with the increase being mostly among non-institutional investors. For a given firm over time, an increase in advertising spending of 1% was found to increase the company’s investor base by 0.07%.

44 For example, for the average company in their sample, their regression analysis suggest that an increase of 1% in advertising spending reduced the price impact by 0.08%. This model uses the same controls as the model for the number of shareholders described in the previous footnote.
Disclosure of Information and Analyst Following

In 1988 we published an article suggesting that companies could increase the liquidity and, as a result, the prices of their stocks by voluntarily providing more information.\(^4^5\) Academic research has since provided considerable empirical support for this proposition.

For example, a 1997 study by Christine Botosan reported that companies that disclose more information in corporate annual reports—such as background information, five- or ten-year summaries of historical results, and management projections and “discussion and analysis”—had a lower cost of equity capital.\(^4^6\) The reductions in cost of capital were greatest for companies with small analyst followings—that is, companies where asymmetric information problems are likely to be greatest and hence liquidity is likely to be lower.\(^4^7\)

A number of other studies in the accounting literature have provided evidence that increases in disclosure and transparency are associated with higher liquidity and lower cost of capital. For example, a 1993 study of the effects of supplemental disclosures of the present values of reserves by oil and gas production companies found that stock illiquidity, as measured by the bid-ask spread, declined significantly for companies that volunteered to provide these disclosures.\(^4^8\) Narrower bid-ask spreads also appear to have resulted from the SEC’s 1970 requirement that multi-business companies provide financial information on their business segments in their 10-K reports.\(^4^9\) And in a 2007 study, Mary Barth, Yaniv Konchitchki and Wayne Landsman report that companies that are assumed to have more transparent financial statements—as indicated by greater

\(^4^5\) This idea was modeled later by Diamond and Verrecchia (1991).
\(^4^6\) Botosan (1997), p. 344. In this study, the cost of equity capital was derived as the rate of return that equates current price to the discounted present value of future net earnings, book value and stock price.
\(^4^7\) According to Botosan (1997), p. 344, “among firms with low analyst following, the most forthcoming firms enjoy about a 9.7% reduction in its cost of equity capital relative to the least forthcoming firms.”
\(^4^8\) Raman and Tripathy (1993).
\(^4^9\) Greenstein and Sami (1994).
co-variation between their stock returns and both their reported earnings and industry-adjusted
year-to-year changes in those earnings—have a lower cost of capital.\textsuperscript{50}

Management forecasts are another form of voluntary disclosure with potentially positive
effects on liquidity. This idea is supported by a 1997 study that shows that, after the release of
management forecasts, bid-ask spreads fall significantly.\textsuperscript{51} But even if management is reluctant to
provide forecasts, other kinds of communication with analysts and buyside investors can also work
to reduce asymmetric information in trading and enhance stock liquidity. A 1995 study by Michael
Brennan and Avinidhar Subrahmanyam reported finding a positive relationship between the
number of analysts following a stock and its liquidity, as measured by both price impact and depth.
More recently, a 2003 study by Darren Roulstone confirmed this association between larger analyst
followings and greater liquidity, as indicated by lower bid-ask spreads and greater market depth.
And in a further analysis of individual companies in which the analyst following changes over time,
Roulstone reported that the greater analyst coverage \textit{precedes} the higher stock liquidity, suggesting
a causal relationship. At the same time, this study shows that greater dispersion of analyst forecasts
for a given company, which is assumed to reflect greater information asymmetry, is associated with
reduced liquidity.

In sum, studies suggest that the public information provided by equity analysts helps to
increase liquidity. It follows that companies can improve their liquidity by taking steps to increase
their analyst following and by providing credible and consistent information designed to reduce
information asymmetry and, to the extent possible, limit the dispersion among analyst forecasts.

But what can companies do if they \textit{lose} analysts coverage? A recent study by Balakrishnan,
Billing, Kelly, and Ljungqvist (2011) analyzes situations where brokerage firms closed their sell-

\textsuperscript{50} Mary Barth, Yaniv Konchitchki and Wayne Landsman (2007). Cost of capital is measured by average
returns after adjusting for the common risk factors of Fama and French.
\textsuperscript{51} Coller and Yohn (1997).
side research operations as a result of adverse changes in the economics of sell-side research, causing a widespread coverage terminations by analysts. Balakrishnan et al. show that, although loss of coverage led to a rise in information asymmetry and a drop in the liquidity of their stock, many companies made up for this loss by increasing their voluntary disclosure. In particular, they provided more timely and informative earnings guidance, which in turn led to increases in their liquidity.

**How Innovative Companies Enhance Liquidity**

Liquidity is likely to be more valuable for companies with growth opportunities that need to raise capital to fund them, particularly innovative firms that are financially constrained. Such companies can be expected to find ways to make their stock more liquid in order to reduce the cost of the capital they raise.

In a recent study, Dass, Nanda, and Xiao (2011) examined the stock liquidity of companies that are characterized by high levels of R&D and a larger number of patents/citations during the period 1990-2009. They find that such “innovative” firms were more likely to do seasoned equity offerings and that their stocks were significantly more liquid than those of otherwise comparable companies. All other things equal, for example, a 10% increase in a company’s R&D spending was associated with a 7.4% lower measure of illiquidity (using Amihud’s (2002) measure), 9.4% higher turnover, and a 10% lower bid-ask spread.52

But it is not innovation *per se* that drives liquidity, but rather the growth opportunities of these companies and their efforts to inform investors about their performance while taking other steps to make their stock more liquid. For example, Dass et al. (2011) report that innovative (but

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52 Similar results are obtained when using the number of patents or patent citations as an index of innovation.
financially constrained) companies provide more information to investors. For such companies, each 1% increase in the number of patents filed was associated with a 2.5% increase in the frequency of earnings guidance from the firm’s management. Such firms were also more likely to take actions that have been shown to increase liquidity such as splitting their stock, using the services of underwriters with stronger reputations, and encouraging the listing of options on their stocks. And, finally, the importance of liquidity for innovative companies was highlighted by the fact that when general market liquidity improved in 2001 as a result of decimalization, the increase in both values and liquidity during this period was largest for innovative companies—and there was a significant positive association between the two sets of changes.

The Effect of Increased Liquidity on Corporate Investment

If more effective disclosure reduces a company’s cost of equity by increasing the liquidity of its shares, is there evidence that this greater liquidity turn affects corporate behavior? We start by considering corporate investment policy. To the extent that increased stock liquidity reduces a company’s cost of equity, it is also likely to reduce the hurdle rate set by the company when evaluating new investment projects. This in turn is likely to lead to increased investment and, to the extent the returns are expected to exceed the cost of capital, an increase in corporate values.\(^5\)

A 2006 study examined the effect of increased stock liquidity on investment by studying the consequences of a stock’s addition to the S&P500 index during the period 1980-2000.\(^5\) Stock liquidity obviously significantly improves after the addition to the index. But the authors of the study also reported finding a significant increase in the capital expenditures of such companies

\(^{53}\) Myers (1977) points out that the firm value is the sum of the value of assets in place and the value of future investment opportunities. Then, the lower cost of capital does not only increase the discounted present value of the cash flow that the firm is generating but it also adds value from the additional investments that the firm had to forego before greater liquidity has lowered its cost of capital

\(^{54}\) Becker-Blease and Paul (2006)
The capital expenditures were calculated in excess of those of control (similar) firms that were not added to the index.
shares instead of attempting to bring about constructive change by engaging managements and boards. But in an article published in 1998, Ernst Maug suggested that a more liquid stock also increases the willingness of active investors to take large positions in companies and exercise a value-increasing discipline on management. And consistent with Maug’s argument, a number of studies in recent years have shown that activist hedge funds are more likely to acquire blocks (stakes of at least 5%) in companies with more liquid stock.

At the same time, another recent study explores the possibility that the line of causality goes the opposite way—namely, that improvements in corporate governance, which often include fuller and more effective disclosure, can increase liquidity. To test this hypothesis, the authors construct a governance index (Gov-Index) by combining the 24 corporate governance items provided by Institutional Shareholder Services. They then test whether changes in the bid ask spread of the firm’s stock are associated with changes in the firm’s Gov-Index, while controlling for other factors that affect stock liquidity. The study finds a strong association between better governance, as measured by increases in the GOV-Index, and increased stock liquidity, as reflected in significant declines in not only the stocks’ bid-ask spreads, but also their effective spreads and market impact costs.

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56 See Bhide (1993), which in turn draws on Jensen and Meckling (1976), which shows that higher ownership by managers of a company’s stock aligns their interests with those of shareholders and reduce the agency costs that result from managers-shareholders conflicts. And Jensen (1986) demonstrates the role of high leverage in forcing mature companies to pay out their excess free cash flow. Consistent with Bhide’s argument, a 2010 study by Bharath, Jayaraman and Nagar provides evidence on how exogenous increases in stock liquidity increase the probability of block holder exits, thereby reinforcing the positive association between block ownership and firm value. But complicating matters,

57 See Fos (2010) and Edmans, Fang and Zur (2011)


59 The source is ISS Corporate Governance: Best Practices User Guide and Glossary (2003). These items have to do with the quality of audit, charter provisions, managerial compensation, stock ownership and state of incorporation.
Recent studies also suggest that managerial compensation—both its structure and its incentive effect—may also be affected by the liquidity of a company’s stock. A study by Jayaraman and Milbourn (2011) reports evidence that greater stock liquidity is associated with a lower proportion of cash-based executive pay and greater pay-performance sensitivity. (These relations hold both cross-sectionally and over time.) The authors also suggest that executives are more willing to have a larger share of equity in their compensation when the firm’s equity is more liquid. For one thing, a more liquid stock enables managers to sell their positions at lower cost. But perhaps more important, the prices of more liquid stocks are likely to do a better job of reflecting (insiders’ view of) the value of the firm, and the contribution of managerial skill and effort to the firm’s success. The authors also attribute a significant part of the increase since the early 1990s in the equity-based share of managerial compensation to the general increase in the liquidity of the stock market during the same period. What’s more, the study reports that managerial pay tends to be more sensitive to corporate performance in companies with more liquid stock.

In this context, the authors also report that stock splits, which are expected to increase stock liquidity and make stock prices more informative, are associated with changes in managerial compensation. Indeed, the authors find that the median proportion of cash-based to total annual compensation takes a significant and permanent decline in the years following the stock split, while the pay-performance sensitivity of compensation rises during the post-split years.

Taken together, then, the findings of more recent studies suggest that greater stock liquidity is associated with more informative stock prices, more active governance by large investors, and greater use of incentive features in managerial compensation. All this may explain the findings of a study by Fang, Noe and Tice (2009), which reports that changes in liquidity are positively
associated with changes in corporate market-to-book ratios and operating performance, as measured by returns on assets (operating income after depreciation as a percentage of total assets (in book value).

4. Concluding Remarks

In this article, we explain how liquidity is determined and measured in the capital markets, how it affects asset prices, and how corporate managers can incorporate these relationships in their financial decision-making. We show that the required returns and values of financial assets depend on their liquidity (or marketability) as well as the business and financial risks of the companies that issue them. For both stocks and bonds, the higher the liquidity, the lower the required expected return (all other things equal) and the higher the value (or P/E ratio). This relationship between liquidity and expected return implies that corporate managers can increase the market value of their companies by adopting liquidity-increasing corporate financial policies, including lower leverage ratios, the substitution of dividends for stock repurchases, more effective disclosure, and increases in the investor base. Higher liquidity also is associated with better corporate governance and greater use of incentive-based managerial compensation packages. Perhaps as a result, corporate profitability tends to be high in companies with more liquid stock.

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References


Marc L. Lipson and Sandra Mortal, 2007, Capital structure decisions and equity market liquidity. Working paper, University of Virginia.


Stewart C Myers and Nicolas S. Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, Journal of Financial Economics, 13, 187-221.


