MARKET LIQUIDITY

This book presents the theory and evidence on the effect of market liquidity and liquidity risk on asset prices and on overall securities market performance. Illiquidity means incurring high transaction cost, which includes a large price impact when trading and facing a long time to unload a large position. Liquidity risk is higher if a security becomes more illiquid when it needs to be traded in the future, which will raise its trading cost. The analysis in this book shows that higher illiquidity and greater liquidity risk reduce securities prices and raise the expected return that investors require as compensation. Aggregate market liquidity is linked to funding liquidity, which affects the provision of liquidity services. When these become constrained, there is a liquidity crisis, which leads to downward price and liquidity spiral. Overall, this book demonstrates the important role of liquidity in asset pricing.

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Market Liquidity

Asset Pricing, Risk, and Crises

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Introduction and Overview of the Book

This book is about the pricing of *liquidity*. We present theory and evidence on how liquidity affects securities prices, why liquidity varies over time, how a drop in liquidity leads to a decline in prices, and why liquidity crises create liquidity spirals. The analysis has important implications for traders, risk managers, central bankers, performance evaluation, economic policy, regulation of financial markets, management of liquidity crises, and academic research.

Liquidity and its converse, illiquidity, are elusive concepts: You know it when you see it, but it is hard to define. A liquid security is characterized by the ability to buy or sell large amounts of it at low cost. A good example is U.S. Treasury bills, which can be sold in blocks of $20 million dollars instantaneously at the cost of a fraction of a basis point. On the other hand, trading an illiquid security is difficult, time-consuming, and/or costly. Illiquidity is observed when there is a large difference between the offered sale price and the bid (buying) price, if trading of a large quantity of a security moves its price by a lot, or when it takes a long time to unload a position. A recent example of this is collateralized debt obligations, which investment banks have not been able to unload at an acceptable price for a long time.

Liquidity risk is the risk that a security will be more illiquid when its owner needs to sell it in the future, and a *liquidity crisis* is a time when many securities become highly illiquid at the same time. Some liquidity crises are dramatic: investors have a hard time selling the equities they want when prices fall as they submit their sale orders; market makers who are supposed to provide liquidity take their phones off the hook; or currency traders say it will take twenty days to trade out of large positions instead of the usual two days.

Historically, financial economists used to ignore liquidity problems: The theory assumed "frictionless markets," which are perfectly liquid all of the time, and most academics considered this assumption to be innocuous. We believe otherwise. In this book, we argue that illiquidity is a central feature of the securities and financial markets. We present and review central research contributions on liquidity and its effect on asset prices made over the past twenty-five years. Recent events have borne out our thesis: the Global Financial Crisis of 2007–2009 illustrates all too dramatically the importance of liquidity and liquidity risk and their effects on securities prices and on the functioning of financial markets.

The recent crisis is just one of a series of liquidity crises in the history of finance. Traders, regulators, and other market participants have long recognized the central importance of liquidity in financial markets. Securities market regulations aim to enhance the liquidity of the markets as a central goal, and market practitioners know that the cost and time of implementing trades are important determinants of performance. Sophisticated financial institutions are already implementing some of the techniques presented in this book in their trading and pricing models, and their ability to manage liquidity risk in addition to market risk make the difference between success and failure, as pointed out by the Chairman of the Federal Reserve, Ben Bernanke:

> Some more-successful firms also consistently embedded market liquidity premiums in their pricing models and valuations. In contrast, less-successful firms did not develop adequate capacity to conduct independent valuations and did not take into account the greater liquidity risks posed by some classes of assets.[1]

Each of this book's three parts addresses a different facet of friction in financial markets: *liquidity*, *liquidity risk*, and *liquidity crises*. Each part starts with a brief overview that explains the theory and how to apply it, and the evidence that supports it. Each part then presents original articles in that research area and, for each article, gives a short summary of its essential ideas, findings, and later extensions.

Part I introduces the theory of why liquidity is priced and focuses on the effect of the *level* of liquidity on securities' required returns. Across securities, investors are willing to pay lower prices, or demand higher returns, for securities that are more costly to trade. This gives rise to a positive relation between securities' trading costs and expected returns, or a negative relation

[1] Bernanke at the Chicago Federal Reserve Annual Conference on Bank Structure and Competition, Chicago, Illinois, May 15, 2008.

between trading costs and prices (for any given cash flow that the security generates). As the liquidity of securities rises, so does their price.

Part II shows that over time, market liquidity shocks translate into shocks in market prices and vice versa. A rise in market illiquidity, which means a greater cost of trading, makes forward-looking investors require higher future yields on their investments for any given cash flows generated by these investments because they expect the illiquidity to persist for a while. This increase in the required return causes securities' prices to fall. The result is a negative relation between market illiquidity changes and changes in market price levels. Therefore, the effect of market liquidity shocks on securities market prices introduces additional risk to market returns beyond the risk that is associated with shocks to expectations about future cash flows.

Faced with the risk of such liquidity and price shocks, risk-averse investors prefer securities whose returns and trading costs are less sensitive to market-wide liquidity shocks and whose trading costs do not rise when market prices fall. In short, investors prefer securities with lower liquidity risk. The higher the *liquidity risk*, the higher the expected return required as compensation.

Part III discusses how *liquidity crises* arise as shocks are amplified many-fold through *liquidity spirals*. It describes how liquidity dries up when its providers – dealers, proprietary traders, and hedge funds – run out of capital and need to reduce their positions. A crash in market prices imposes greater constraints on the traders' resources (i.e., reduces their *funding liquidity*), and consequently traders are less able to provide liquidity to the market. As the ability to fund trading activity declines, so does market liquidity. This generates a vicious cycle that creates liquidity crises: a reduction in market liquidity pushes prices down and worsens the funding problems, which, in turn, reduces market liquidity and increases volatility as market conditions spiral downward.

The liquidity paradigm presented in this book should be viewed in contrast to the traditional economic paradigm. The traditional paradigm assumes that investors are able to trade without transaction costs (friction-less markets), asset prices depend only on their fundamentals (the Law of One Price), corporations' investment decisions are independent of how they finance themselves (the Modigliani-Miller proposition), and derivative prices can be determined using no-arbitrage pricing.

During the recent global financial crisis, these basic pillars of traditional finance and economics were fundamentally shaken as the importance of liquidity risk became more apparent than ever: The Law of One Price broke down in currency markets (the covered interest rate parity failed), credit

markets (a price gap opened between corporate bonds and credit default swaps), and other markets (documented by Garleanu and Pedersen 2011). Corporations strapped for cash felt the tightening of liquidity and had to change their investment policy, violating the Modigliani-Miller proposition (Ivashina and Scharfstein 2010). Funding problems in the financial sector and broader liquidity deterioration sent the economy into a severe recession, showing how financial liquidity shocks can affect the business cycle beyond the effect of real economic factors. Central banks scrambled to introduce unconventional forms of monetary policy to improve market and funding liquidity, such as the purchasing of bonds and liquidity facilities targeted at alleviating investors' funding frictions and margin requirements (Ashcraft, Garleanu, and Pedersen 2010).

Paradoxically, not only did financial frictions increase dramatically during the crisis, but policy makers attempted to improve the situation by introducing additional frictions such as short sale bans and transaction taxes, although such initiatives are not supported by the theory presented in this book.

Having seen how liquidity and transaction costs affect asset prices, what can finance professionals glean from the insights presented in this book? Portfolio managers can incorporate liquidity considerations into portfolio construction and management strategies. These strategies should consider the portfolio's current liquidity characteristics and its liquidity risk, just as they incorporate standard market risk into the analysis. The results reported in this book provide a rigorous approach that can be employed in both thinking about portfolio composition and implementing portfolio strategies through trades.

Traders in financial markets are probably aware of the importance of transaction costs. This book provides a structured approach for quantifying their effect and thinking about the implementation of trading strategies that take liquidity cost considerations into account. Strategies that produce paper profits may fail in implementation because liquidity costs offset potential gains that could have been earned had it been feasible to execute trades at observed market prices. Therefore, traders should perform an analysis of their own transaction costs, either in-house or through a professional transaction cost analysis provider.

The effect of liquidity on prices also presents opportunities for investors. Investors with long horizons or superior trading technology can earn the liquidity premium by buying illiquid securities. Further, since the liquidity premium varies over time, the returns to buying illiquid securities are

expected to be the highest after times of crises when capital pursuing such strategies is scarce.

Corporate financial managers should not take the liquidity of their company's publicly traded claims – stocks and bonds – as exogenously given. They can employ corporate policies that enhance the liquidity of their company's claims.[2] The evidence presented in this book shows that such policies can reduce the corporate cost of capital and raise the company's market value. Liquidity-enhancing policies include greater transparency and better information disclosure practices that reduce informational asymmetry and thus improve liquidity. Liquidity also increases when the company's investor base is broadened and there is greater dispersion of ownership among investors who are likely to trade the stock. Means to achieve that include improved investor relations, advertising, and facilitating trades in small stock units. Multiple types of securities lead to fragmentation of the company's investor base, which can reduce liquidity and value. Therefore, having fewer types of claims, each with a larger float, contributes to greater liquidity. Capital structure and leverage policies may also affect liquidity to the extent that they affect the liquidity of the company's stocks and bonds. Also, when deciding to distribute cash to shareholders, stock buybacks may be preferred only if they do not hamper stock liquidity.

Policy makers and regulators should incorporate liquidity considerations into policy decisions on financial markets. For example, regulations that increase disclosure and reduce information asymmetry – such as Regulation Fair Disclosure and mandating the prompt release of pertinent information, as well as the prohibition of insider trading – contribute to increase market liquidity. Major market reforms, such as the reduction in the minimum tick (price change) from \$1/8 to \$1/16 and finally to \$0.01 reduced the cost of trading for many stocks, especially the frequently traded stocks that constitute most of the value in the stock market. Also, while information technology can be a double-edged sword, it can often increase liquidity and reduce transaction costs: the dramatic increase in stock liquidity since the 1980s is no doubt due in large part to improvements in computing and communications technologies.

The implications for public policy go beyond financial market structure issues per se. For example, every few years, policy makers in the United States and Europe propose to impose a securities transaction tax. As of the

[2] An analysis of liquidity-enhancing corporate policies appears in Amihud and Mendelson (1988, 2012).

writing of this book, bills have been introduced in the U.S. Congress to place a tax of up 0.25% on the value of stock trades (and a lower rate on other financial instruments), and the European Commission has proposed a tax of up to 0.10% on trading in stocks, bonds, and financial derivatives. Such a tax naturally reduces market liquidity by increasing the cost of trading. Eventually, investors will reduce their valuation of stocks by the present value of the stream of taxes that they would have to pay. By the estimation method presented in Chapter 1 to gauge the effect of transaction costs on asset values, a tax of 0.25% on stock trading in the United States would lead to a reduction of about 10% in the values of stocks. Put differently, as Chapter 1 demonstrates, the tax will raise the required expected return on investment in companies' stocks. This means that the corporate cost of capital will rise and the hurdle rate for new investments will be higher. The result will be a reduction in real corporate investment. In this way, a liquidity-reducing securities transaction tax will have negative effects on the real economy.

Liquidity considerations also become important for central bankers during crises when financial stability is at risk, as Part III discusses. At such times, central bankers often seek to improve the funding in the financial system such that liquidity providers can continue to operate and market liquidity is restored.

In summary, this book is about the effects of liquidity and liquidity risk on financial markets. It presents and reviews central research in this area and demonstrates how the liquidity theory provides a unified explanation of asset price determination, market price dynamics, and severe market breakdowns such as the recent global financial crisis. Liquidity problems always lurk in the market, and this crisis highlights the importance of liquidity and the price investors are willing to pay for it in dire economic situations.