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Asset pricing with liquidity risk ☆

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Abstract

This paper solves explicitly a simple equilibrium model with liquidity risk. In our liquidity-adjusted capital asset pricing model, a security's required return depends on its expected liquidity as well as on the covariances of its own return and liquidity with the market return and liquidity. In addition, a persistent negative shock to a security's liquidity results in low contemporaneous returns and high predicted future returns. The model provides a unified framework for understanding the various channels through which liquidity risk may affect asset prices. Our empirical results shed light on the total and relative economic significance of these channels and provide evidence of flight to liquidity.

JEL classification: G0; G1; G12

Keywords: Liquidity risk; Liquidity-adjusted CAPM; Flight to liquidity; Frictions; Transaction costs

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1. Introduction

Liquidity is risky and has commonalty: it varies over time both for individual stocks and for the market as a whole (Chordia et al., 2000; Hasbrouck and Seppi, 2001; Huberman and Halka, 1999). Liquidity risk is often noted in the financial press. For instance:

> The possibility that liquidity might disappear from a market, and so not be available when it is needed, is a big source of risk to an investor.
> —The Economist, September 23, 1999

> ...there is also broad belief among users of financial liquidity—traders, investors and central bankers—that the principal challenge is not the average level of financial liquidity... but its variability and uncertainty....
> —Persaud (2003)

This paper presents a simple theoretical model that helps explain how asset prices are affected by liquidity risk and commonality in liquidity. The model provides a unified theoretical framework that can explain the empirical findings that return sensitivity to market liquidity is priced (Pastor and Stambaugh, 2003), that average liquidity is priced (Amihud and Mendelson, 1986), and that liquidity comoves with returns and predicts future returns (Amihud, 2002; Chordia et al., 2001a; Jones, 2001; Bekaert et al., 2003).

In our model, risk-averse agents in an overlapping generations economy trade securities whose liquidity varies randomly over time. We solve the model explicitly and derive a liquidity-adjusted capital asset pricing model (CAPM). Our model of liquidity risk complements the existing theoretical literature on asset pricing with constant trading frictions (see, for instance, Amihud and Mendelson, 1986; Constantinides, 1986; Vayanos, 1998; Vayanos and Vila, 1999; Duffie et al., 2000, 2003; Huang, 2003; Gârleanu and Pedersen, 2004). In the liquidity-adjusted CAPM, the expected return of a security is increasing in its expected illiquidity and its "net beta," which is proportional to the covariance of its return, r^i, net of its exogenous[1] illiquidity costs, c^i, with the market portfolio's net return, $r^M - c^M$. The net beta can be decomposed into the standard market beta and three betas representing different forms of liquidity risk. These liquidity risks are associated with: (i) commonality in liquidity with the market liquidity, $\mathrm{cov}(c^i, c^M)$; (ii) return sensitivity to market liquidity, $\mathrm{cov}(r^i, c^M)$; and, (iii) liquidity sensitivity to market returns, $\mathrm{cov}(c^i, r^M)$.

We explore the cross-sectional predictions of the model using NYSE and AMEX stocks over the period 1963 to 1999. We use the illiquidity measure of Amihud (2002) to proxy for c^i. We find that the liquidity-adjusted CAPM fares better than the standard CAPM in terms of R^2 for cross-sectional returns and p-values in specification tests, even though both models employ exactly one degree of freedom.

[1]While research on endogenous time-variation in illiquidity is sparse, Eisfeldt (2004) presents a model in which real-sector liquidity fluctuates with productivity, Brunnermeier and Pedersen (2004b) show how predatory trading can lead to illiquidity when liquidity is most needed, and Brunnermeier and Pedersen (2004a) show how market liquidity varies with dealers' "funding liquidity."