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Pricing of liquidity risks: Evidence from multiple liquidity measures ☆

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ABSTRACT

We investigate the pricing implication of liquidity risks in the liquidity-adjusted capital asset pricing model of Acharya and Pedersen (2005), using multiple liquidity measures and their principal component. While we find that the empirical results are sensitive to the liquidity measure used in the test, we find strong evidence of pricing of liquidity risks when we estimate liquidity risks based on the first principal component across eight measures of liquidity, both in the cross-sectional and factor-model regressions. Our finding implies that the systematic component measured by each liquidity proxy is correlated across measures and the shocks to the systematic and common component of liquidity are an undiversifiable source of risk.

1. Introduction

Liquidity proxies measure systematic liquidity, but not without noise. Hence, the quality of liquidity proxies, or the extent to which it measures systematic components of liquidity, plays an important role in the research of asset pricing with liquidity risk. Furthermore, the systematic component of measured liquidity may be driven by either a systematic and common component that is simultaneously captured by different measures of liquidity, or a systematic but measure-specific component of liquidity. That is, each measure could be either a noisy proxy for the same dimension of liquidity or a proxy for the different dimension of liquidity. Given the limitation of a single liquidity measure, this paper investigates the pricing of liquidity risks by multiple measures of liquidity. Specifically, we test the liquidity-adjusted capital asset pricing model (LCAPM) of Acharya and Pedersen (2005) in the US stock market during 1962–2011, using eight different measures of liquidity. Employing multiple measures of liquidity enables us to examine whether the pricing of liquidity risks is specific to the measure used in the test. Moreover, based on multiple measures of liquidity, we can now investigate the pricing implication of liquidity risks when liquidity risks are estimated from a systematic and common component across different liquidity measures. To the best of our knowledge, this is the first study to investigate the pricing of multiple sources of systematic liquidity risks as specified in the LCAPM using multiple liquidity proxies as well as their principal component.

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We evaluate the LCAPM because it provides a unified framework to examine the effect of liquidity on asset returns by encompassing various channels in one model through which liquidity affects asset prices. Specifically, other than the covariance of stock return with market return in the traditional capital asset pricing model (CAPM), the LCAPM includes three additional covariances that are related to stock or market *liquidity*—covariance of stock liquidity with market liquidity, covariance of stock liquidity with market return, and the covariance of stock return with market liquidity. Most importantly, the LCAPM theoretically motivates that the pricing of liquidity risks is independent of the pricing of market risk, as specified in the traditional capital asset pricing model. Previous studies in asset pricing with liquidity mostly have focused on the pricing of liquidity as a stock characteristic (Amihud, 2002; Amihud and Mendelson, 1986; Brennan and Subrahmanyam, 1996) or as a covariance risk based on stock *return* and market *liquidity* (Korajczyk and Sadka, 2008; Liu, 2006; Pástor and Stambaugh, 2003; Sadka, 2006). In addition to these two sources of pricing of liquidity, the LCAPM proposes two more channels, which arise from the covariance of stock *liquidity* with market *liquidity* ("commonality in liquidity") and that of stock *liquidity* with market *return*. Although a group of research shows that shocks to liquidity are a systematic source of risk by presenting the existence of commonality in liquidity (Chordia et al., 2000; Hasbrouck and Seppi, 2001; Huberman and Halka, 2001; Karolyi et al., 2012), its pricing implication is first theoretically modeled in the LCAPM.[1]

Most of the aforementioned empirical studies employ one single liquidity measure. For example, Acharya and Pedersen (2005) borrow the measure from Amihud (2002), and Pástor and Stambaugh (2003), Liu (2006), and Sadka (2006) respectively propose new measures for their studies. Recently, Lee (2011) empirically tests the LCAPM on a global level using stocks from 50 countries, but he also uses only one liquidity measure. The limitation of using one single measure is clear, as shown by Hasbrouck (2005), and Goyenko et al. (2009), all of whom find that the quality of liquidity measures varies. More importantly, empirical results based on a single measure raise the issue of whether the results are driven by systematic but *measure-specific* components or by systematic and *common* components of measured liquidity. That is, if each measure evaluates different dimension of liquidity, the empirical results showing the significant pricing of liquidity risk may suggest the existence of multiple premia for each different aspect of measured liquidity. On the contrary, when each measure evaluates systematic and common component across measures, the significant pricing of liquidity may imply the existence of a single premium for common liquidity. We therefore ask the following important questions: Does the pricing of liquidity risks vary according to the measures used in the test? If so, why do some measures show supporting evidence of pricing of liquidity risks, while others do not? Is it because of the difference in each measure's level of goodness in capturing the systematic and common component, or is it because each measure proxies a different aspect of liquidity? Can we find evidence of the pricing of liquidity that is common across different measures?

Focusing on this issue, Korajczyk and Sadka (2008) find the existence of a common component across eight measures of liquidity in a principal component analysis (PCA) framework. They further show that this systematic common component is accompanied by a significant liquidity premium, while the measure-specific liquidity that is orthogonal to the common component is not. However, the channel of pricing of liquidity in their study is restricted only to the level of liquidity and the covariance of stock *return* with market *liquidity*, leaving room for further research on the pricing of commonality in liquidity and the covariance of stock liquidity with market return. That is, in addition to the test of the pricing implication of liquidity shown in Korajczyk and Sadka (2008), we also test in this paper whether the commonality in liquidity is related to stock returns in a way that stocks whose liquidity improves when the market liquidity dries up are traded at a premium, as modeled in the LCAPM. Moreover, the LCAPM shows that the covariance of stock liquidity (illiquidity) with market return are positively (negatively) related to stock returns, implying that stocks that are difficult to sell in a down market are traded at a discount.[2] This pricing implication is also motivated by Kyle and Xiong (2001), Morris and Shin (2004), and Brunnermeier and Pedersen (2009), who show that arbitrageurs demand compensation for bearing liquidity risk when they are forced to liquidate their positions facing large market declines. Overall, by testing the LCAPM using alternative measures of liquidity, our paper extends Korajczyk and Sadka (2008) to the pricing of multiple liquidity risks which are theoretically encompassed in an asset pricing model.

Given the limitation of each liquidity measure, we use eight different measures of liquidity and examine whether the empirical result of pricing of liquidity risks vary depending on the measure. Specifically, we use price impact measures introduced by Amihud (2002) and Pástor and Stambaugh (2003), zero-return based-measures by Lesmond et al. (1999) and Liu (2006), serial correlation-based measure of Roll (1984), price-based spread proxy of Corwin and Schultz (2012), and effective tick measure of Goyenko et al. (2009).[3] The correlations among liquidity measures range from −0.23 to 0.87 and are positive and highly significant in the Pearson correlation tests in most cases. In addition, time-series plots of shocks in market-wide liquidity show that the anecdotal events of dried-up liquidity are jointly and successfully indicated by different measures. However, our cross-sectional regression tests indeed show that the empirical results provide only weak evidence of pricing of liquidity and are rather sensitive to the liquidity measure used in the test. All these imply that our liquidity proxies measure the systematic and common component of liquidity, but not without negligible level of noises. Hence, we extract systematic and common aspects of liquidity across different measures by principal components analysis to investigate whether liquidity risks based on this systematic and common component of liquidity are priced in the US market. Consistent with Korajczyk and Sadka (2008), we find

[1] Bekaert et al. (2007) empirically test pricing of multiple liquidity risks. However, the pricing implication of these liquidity risks is theoretically modeled by Acharya and Pedersen (2005).

[2] "Whenever the market turns against you, you take the biggest losses in illiquid securities," says Richard Bookstaber, former head of risk management at Salomon Bros. "Because there are so few buyers, you're forced to sell at a discount that is both huge and highly unpredictable" (p.49, Fortune, November26, 2007; recited from Lee (2011)).

[3] We focus on the liquidity measures based on return and trading volume since they are popular, easy to compute, and provide longer time-series. By the same reason, we exclude measures based on intra-daily data (such as TAQ database).