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The pricing of liquidity risk on the Shanghai stock market

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ABSTRACT

This study investigates whether liquidity is a source of priced systematic risk in stock returns of the Shanghai stock market in China. It is found that the cross-sectional expected stock returns are related to the sensitivities of returns to fluctuations in aggregate market liquidity. This research contributes to the literature in two ways: First, in addition to conventional portfolio sorting of liquidity beta *quintiles*, the threshold estimates of portfolio regimes are examined, that is, portfolios are sorted by estimated liquidity betas; the usefulness of threshold portfolio sorting is confirmed, which further confirms that liquidity risk is substantially priced. Second, among four liquidity measures, the Pastor and Stambaugh (2003) and Amihud measures outperform others in identifying the liquidity risk premium. Moreover, evidence from quantile regression provides robust confirmation of the results.

1. Introduction

This study investigates whether market-wide liquidity is a source of priced systematic risk in stock returns of the Shanghai stock market in China. Four liquidity measures are employed, and under the methodological framework of Pastor and Stambaugh (2003), the empirical evidence indicates that the measures proposed by both Pastor and Stambaugh (2003) and Amihud (2002), as well as, the turnover ratio confirm the presence of a liquidity risk premium, while Spread is unable to identify the presence of risk premium. Moreover, using the threshold model of portfolio regimes, the Pastor and Stambaugh (2003) and Amihud measures provide robust empirical evidence to confirm the pricing of liquidity risk.

There are two types of empirical studies concerning asset pricing and liquidity.[1] The first strand emphasizes the correlation between liquidity levels and returns, and, specifically, the positive/negative correlation between them. Amihud and Mendelson (1986) pioneer this type of study by showing that liquidity is priced and found a *positive* return–illiquidity relationship. Amihud (2002) shows that there is a significant relation between liquidity and expected stock returns, and found a *negative* return–liquidity relation even in the presence of size, beta, and momentum. This strand is also known as the *liquidity premium theory*. Additional support has been provided by Datar et al. (1998), Chan and Faff (2005), Chung and Wei (2005), Limkriangkrai et al. (2008), and Lam and Tam (2011). At the market level, Gibson and Mougeot (2004) document a *negative* return–liquidity relation, consistent with the *liquidity premium theory*. Brennan and Subrahmanyam (1996) examine the liquidity premium and find a *positive* return–illiquidity relation even after taking price, size, and book-to-market factors (i.e., the Fama & French (1993) risk factors) into account. However, another perspective suggests that if liquidity varies systematically, securities with returns *positively* correlated with market liquidity should have high expected returns. Hence, contradictory results are found in Fama and French (1992), and Eleswarapu and Reinganum (1993).

Secondly, a related strand of literature considers the role of the market *liquidity risk* factor in determining equity returns. Pastor and Stambaugh (2003), Avramov and Chordia (2006), Naranyan and Zheng (2010) and Lin et al. (2011) present this perspective. Acharya

[1] Amihud et al. (2005) offer an excellent survey, indicating that both liquidity level and risk are priced.

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and Pedersen (2005) theoretically develop a model that leads to three different risk premia associated with changes in liquidity and find these *risk premia* to be highly significant for U.S. data.[2] Jones (2002) indicates that liquidity predicts future returns and liquidity shocks are *positively* correlated with return shocks. Recently, Lee (2011) has applied the approach of Avramov and Chordia (2006) to international asset pricing, and offers evidence that liquidity risks are priced independently of market risk in global financial markets. Lin et al. (2011) investigate corporate bonds and confirm a robust positive correlation between corporate bond returns and liquidity beta.

This paper focuses on the stock market in Shanghai and intends to investigate whether expected returns are related to systematic liquidity risk in returns, as opposed to the level of liquidity per se. There are several reasons for this focus on China: First, China is an important emerging economy, and with a fifth of the world's population, is becoming the world's second-largest economy. China's stock markets were initiated with the help of local government policy entrepreneurship. The markets in both Shanghai and Shenzhen grew rapidly, and by 2000, China had the second-largest capital market in Asia, after Japan, at least according to some measures. Currently, there are more than one thousand publicly traded firms in China, and their stock shares are listed on the Shanghai or Shenzhen Stock Exchange, but not both. Most of the public firms only issue domestic A-stock shares, and a small number of these firms issue both domestic A- and foreign B-stock shares. A-shares are the primary type of shares traded, which are denominated in Chinese RMB and available to Chinese citizens only. B-shares are denominated in foreign currency and were originally reserved for foreign investors, although Chinese citizens may now hold them as well. The attribute attracting investors and portfolio managers is that the companies publicly traded in China may offer a faster growth potential than those in developed countries. There is an increasing volume of literature focusing on the Chinese stock market.[3]

Furthermore, unlike developed markets, China's stock market is "thin", meaning that the supply of desirable shares is limited, and that, as a result, prices (especially for A-shares) have tended to be very high. At the market's peak in 2000, China's shares had a price/earnings ratio above 40.[4] The markets are also characterized by rapid turnover and relatively high volatility.[5] Thus, China is an ideal testing ground for the return–liquidity risk relationship because innovations in liquidity (illiquidity) should affect the expected returns of many listed firms.

Work on testing the relationship between cross-section stock returns and liquidity risk has mainly been limited to developed-country markets (the US, the UK, France, and Germany), which are price-driven markets. Testing this relationship in different market settings may provide different results or fresh insights. In light of this, the study's focus on the Chinese market is motivated by the fact that unlike developed-country markets, China is an order-driven market. Order-driven markets have substantially different market structures and their dynamic behavior is, as a result, different from the price-driven markets. To our knowledge, except for Naranyan and Zheng (2010), there are no studies that consider the role of the market liquidity risk factor on cross-sectional stock returns for order-driven markets. Naranyan and Zheng apply the approach of Avramov and Chordia (2006) to the Chinese stock market, and confirm the role of market liquidity risk in asset pricing. However, the pricing of the market liquidity risk in the Chinese market is still a puzzle.

The present research thus focuses on Shanghai's A-shares and adopts the approach of Pastor and Stambaugh (2003) to examine whether the cross-sectional difference in expected stock returns is related to the sensitivity of returns to fluctuations in market liquidity. The models considered are: (i) the CAPM, (ii) the Fama and French (1993) three factor model, and (iii) the Fama and French model augmented by momentum. The data set includes all of Shanghai's A-share listed firms over the period of January 2001 to February 2014.

According to the regression analysis, and in addition to conventional risk factors (market risk, HML, SMB and MOM), liquidity risk is computed with four liquidity measures: Amihud (2002), Pastor and Stambaugh (2003), bid–ask spread, and turnover ratio. Cross-sectional liquidity coefficients are then obtained from a firm-level time-series regression, while, all listed companies are sorted into several portfolios in terms of liquidity risk coefficients, or *betas*; moreover, the sorting of portfolios is based on estimating the thresholds of liquidity betas.

This article provides evidence for the pricing of market liquidity risk in the Chinese stock market. The study contributes to the literature in two ways: First, in addition to the conventional portfolio sorting of liquidity beta *quintiles*, the threshold estimates of portfolio regimes are examined, that is, portfolios are sorted by estimated liquidity betas; the process confirms the usefulness of threshold portfolio sorting, which further confirms that liquidity risk is substantially priced. Second, among the four liquidity measures, the Pastor and Stambaugh (2003) and Amihud measures outperform others in identifying the liquidity risk premium. Evidence from quantile regression provides robust confirmation of the results.

The remainder of the paper is organized as follows. Section 2 introduces the empirical methodology, including the asset pricing models and the measures of market liquidity and liquidity risk. Section 3 describes the data set and examines the empirical results under the framework of Pastor and Stambaugh (2003). Section 4 describes the threshold model of portfolio sorting and further checks empirical robustness. Section 5 concludes the paper.

[2] More evidence are found in, for example, Chordia et al. (2000, 2001), Huberman and Halka (2001), Pastor and Stambaugh (2003), Goyenko et al. (2009), Martínez et al. (2005), and Sadka (2006).

[3] He et al. (2013) have an excellent survey; see also Yao et al. (2014).

[4] In comparison, S&P500 price/earnings ratio has historically been between 15 and 25.

[5] Annual turnover is typically above the total market value in both Shanghai and Shenzen.