**Abstract**

This project investigates the ability of both CAPM as presented by Sharpe(1964)1 and Lintner(1965)2 and the liquidity factor as in Pastor and Stambaugh(2003)3 to explain the cross-section of portfolio returns. We use the same aggregate liquidity factor as Pastor and Stambaugh (2003) which is defined to be an average measure of individual portfolio measures estimated with monthly data. Over both our initial period (Jan-1968 to Aug-2008) and subsequent period (sep-2008 to Dec-2018), we also use innovations in liquidity and traded liquidity as additional factors. Over these periods we find that average return on our portfolios with high *sensitivities to liquidity exceeds that for portfolios with lower sensitivities.* We can then conclude, just as Pastor and Stambaugh did, that liquidity risk is in fact a priced factor.

**Key words:**

Asset Pricing; CAPM; Liquidity; Beta; Portfolio

**Introduction**

1. Clear description of the problem/research question

In economic and asset pricing theory it seems reasonable that investors require higher returns on investments that have higher risk. [Measured by either volatility, Glosten Jagannathan and Runkle (1993)4 or sensitivity to risk factors as presented by Chan, Karceski and Lakonishok (1988)5]. Hence, we set out to research the extent to which one factor in particular, market-wide liquidity, accounts for systematic variations in portfolio returns and the extent to which it can explain the cross-section of portfolio returns.

We study the relationship between our factor ([Factor Data](http://faculty.chicagobooth.edu/lubos.pastor/research/liq_data_1962_2013.txt)) and 25 portfolios for US stocks sorted by size and momentum ([Portfolio Data](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ftp/25_Portfolios_ME_Prior_12_2.zip)). This study investigates whether expected returns are related to systematic liquidity risk in returns, as opposed to the level of liquidity per se.

1. Which other alternative approaches are done in literature (Literature Review)

Ever since Fama & Macbeth and Black, Jensen& Scholes began forming portfolios of betas with the market the testing of asset pricing models has followed a simple loop:

1. Find a characteristic or factor that you think is associated with average returns. Sort stocks into portfolios based on the characteristic, and check that there is a difference in average returns between portfolios.

2. Calculate betas for these portfolios and assess whether or not the average return is accounted for by the spread in betas.

3. If not, you have an anomaly. Consider multiple betas.

Aside from the word done by Pastor and Stambaugh, this process has been repeated for a number of different factors as well as for different ways to measure the same factor. In particular, in this section we will consider the illiquidity factor proposed by Amihud (2002)6 as well as a third measure of liquidity proposed by Sadka (2006)7 Liquidity in itself is a broad factor that represents a range of characteristics such as trading costs, ease of sale, necessary price discounts to affect a quick transaction and price predictability (Bodie et al 2018)8 . Because of this, it is difficult to measure with a single statistic, so it isn’t surprising that popular measures of liquidity focus on the “price impact dimension”, i.e. the price a seller may have to accept to complete a large sale of an asset or equally, what premium a buyer needs to offer make a the purchase.

Amihud’s measure for illiquidity is defined to be

ILLIQ = Monthly average of daily []

It essentially measures the impact on prices that a dollar’s worth of transactions accounts for.

Acharya and Pedersen (2005)9 use Amihud’s illiquidity measure to assess how both average *level* of illiquidity and liquidity risk premium affect prices. Their work concluded that several liquidity / illiquidity betas were required to fully capture and explain the expected asset returns in addition to CAPM. The liquidity betas they ultimately decided were sufficient enough to explain returns were:

* The sensitivity of individual stock illiquidity to market illiquidity
* The sensitivity of stock returns to market illiquidity and
* The sensitivity of stock illiquidity to market return

The third liquidity measure is Sadka’s measure that uses “trade-by trade” data. This measure attempts to observe the part of price impact that is due to asymmetric information. This measure changes depending on the volume of “informationally motivated” trades.

Both Amihud and Sadka’s measure can be averaged across stocks or portfolios and used to devise a measure of market wide (il)liquidity that can be used to measure a liquidity beta for individual portfolios.

In more recent literature, however, the idea that liquidity is priced has been brought into question. Hou, Xue and Zhang (2017)10 argue that 95 of 102 documented liquidity – related measures are completely insignificant is portfolio construction is done by giving slightly smaller weights to microcaps. Furthermore Li, Novy-Marx, and Velikov (2017)11 argue that Pastor and Stambaugh’s liquidity factor is overly sensitive to construction of portfolios used and a value weighted structure statistically generates insignificant returns.

It is clear that the existence of a priced liquidity factor is an issue that is still to this day being argued and assessed and revised in real time.

Full references:

1. Sharpe, W.F. (1964) “Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk”. Journal of Finance, 19, 425-442.
2. John Lintner (1965) “The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets “. The Review of Economics and Statistics, Vol. 47, No. 1. pp. 13-37.
3. Pastor, Lubos (2003) and Robert F. Stambaugh. "[Liquidity Risk And Expected Stock Returns,](http://ideas.repec.org/a/ucp/jpolec/v111y2003i3p642-685.html)" Journal of Political Economy, v111(3,Jun), 642-685
4. Lawrence R. Glosten, Ravi Jagannathan, David E. Runkle (1993). “On the Relation between the Expected Value and the Volatility of the Nominal Excess Return on Stocks”. The Journal of Finance, Vol. 48, No. 5, pp. 1779-1801
5. Louis K. C. Chan & Jason Karceski & Josef Lakonishok, 1998. "The Risk and Return from Factors," The Journal of Financial and Quantitative Analysis, vol 33(2).
6. Amihud, Y. (2002) “Illiquidity and Stock Returns: Cross-Section and Time-Series Effects”. Journal of Financial Markets, 5, 31-56
7. Sadka, Ronnie. (2006). “Momentum and Post-Earnings-Announcement Drift Anomalies: The Role of Liquidity Risk”. Journal of Financial Economics. 80. 309-349
8. Bodie, Z., Kane, A. and Marcus, A., 2018. Investments. 11th ed. Ch.13.4 New York: McGraw-Hill Education.
9. V. V. Acharya and L. H. Pedersen, “Asset Pricing with Liquidity Risk,” Journal of Financial Economics 77 (2005), pp. 375–410.
10. Hou, Kewei and Xue, Chen and Zhang, Lu, Replicating Anomalies (October 2018). Review of Financial Studies, forthcoming; Fisher College of Business Working Paper No. 2017-03-010
11. Li, Hongtao, Robert Novy-Marx, and Mihail Velikov, 2017, Liquidity risk and asset pricing, Critical Finance Review, forthcoming.