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Do liquidity measures measure liquidity?☆

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ABSTRACT

Given the key role of liquidity in finance research, identifying high quality proxies based on daily (as opposed to intraday) data would permit liquidity to be studied over relatively long timeframes and across many countries. Using new measures and widely employed measures in the literature, we run horseraces of annual and monthly estimates of each measure against liquidity benchmarks. Our benchmarks are effective spread, realized spread, and price impact based on both Trade and Quote (TAQ) and Rule 605 data. We find that the new effective/realized spread measures win the majority of horseraces, while the Amihud [2002. Illiquidity and stock returns: cross-section and time-series effects. Journal of Financial Markets 5, 31–56] measure does well measuring price impact.

1. Introduction

The role of liquidity in empirical finance has grown rapidly over the past five years influencing conclusions in asset pricing, market efficiency, and corporate finance. A number of studies have proposed liquidity measures derived from daily return and volume data as proxies for investors' liquidity and transaction costs. These studies usually test whether security returns are related to these liquidity measures but rarely test whether the measures are related to actual transaction costs. The assumption that the available liquidity proxies capture the transaction costs of market participants is often not tested because of the limited availability of actual trading costs. In the US markets transaction data are only available since 1983 and in many countries transaction data are not available at all. The consequences of not testing liquidity proxies on actual trading data is that there is little consensus on which measures are better and little evidence that any of the proposed measures are related to investor experience.

Further, while a handful of studies, Lesmond, Ogden, and Trzcinka (1999), Lesmond (2005), and Hasbrouck (2009), test whether some of the available liquidity proxies are related to liquidity benchmarks computed from transaction data, they construct the liquidity proxies on an annual or quarterly basis. Yet the vast majority of the literature using liquidity proxies employs them on *monthly* (or finer) data. Given the limited number of liquidity proxies previously tested, the limited set of liquidity benchmarks used in the literature, and the absence of monthly proxies, it is not surprising that there

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are conflicting views about which measure is better and that there is little assurance that these measures actually capture the transaction costs of market participants. In short, not much is known about whether transaction cost proxies measure what researchers claim they measure.

The purpose of this paper is to address this gap in the literature by providing a comprehensive study of liquidity measures. We run "horseraces" of all the widely used proxies for liquidity, plus three new proxies for effective and realized spread, and nine new proxies for price impact. We use multiple liquidity benchmarks, two high-frequency data sets (TAQ and Rule 605 data), multiple performance metrics, and a long sample period that includes the decimals regime.

We find a close association between many of the measures and actual transaction costs. Some measures are able to precisely estimate the magnitude of effective and realized spreads and many are highly correlated with both spreads and price impact. We can safely assert that the literature has generally not been mistaken in the assumption that liquidity proxies measure liquidity. The new measures we introduce in this paper consistently win a majority of the effective/realized spread horseraces. A measure commonly used in the literature, Pastor and Stambaugh's (2003) Gamma, is clearly dominated by other measures while the widely used Amihud (2002) measure is a good proxy for price impact.

The paper is organized as follows. Section 2 discusses the empirical design of the paper. In Section 3 we develop the high-frequency liquidity benchmarks used in the horserace and in Sections 4 and 5 we develop the low-frequency spread proxies and price impact proxies used in the horserace. Section 6 describes the data sets and methodology. Section 7 presents the horserace results. Section 8 concludes the paper.

2. Empirical design

Our basic hypothesis is that useful monthly and annual liquidity measures can be constructed from low-frequency (daily) stock returns and volume data, giving researchers an access to liquidity measures over a long price history and in many markets. The US daily stock returns and volume data are available from the Center for Research in Security Prices (CRSP) covering NYSE/AMEX firms from 1926 to the present and NASDAQ firms from 1983 to the present. A wide variety of vendors provide daily stock returns and volume data for international equity markets. For example, Thomson Financial's Datastream provides daily stock returns and volumes covering firms in more than 60 countries from 1994 to the present and daily stock returns for several developed markets going back to the early 1970s.

These tests should be of interest to a broad spectrum of empirical research in financial economics. In the asset pricing literature, Chordia, Roll, and Subrahmanyam (2000) show that various spread measures vary systematically. Goyenko (2006) shows that various spread measures are priced. Sadka (2006), Acharya and Pedersen (2005), Pastor and Stambaugh (2003), and Watanabe and Watanabe (2006) show that various price impact measures are priced. Fujimoto (2003), Korajczyk and Sadka (2008), Hasbrouck (2009), and others test the pricing of *both* spread and price impact measures in the US while Bekaert, Harvey, and Lundblad (2007) test the measures in emerging markets where liquidity concerns may be more pronounced. All of these studies use monthly liquidity estimates. Reliable *monthly* spread and price impact measures going back in time and/or across countries are needed to determine if these asset pricing relationships hold up. In the market efficiency literature, De Bondt and Thaler (1985), Jegadeesh and Titman (1993, 2001), Chan, Jegadeesh, and Lakonishok (1996), Rouwenhorst (1998), and many others have found *monthly* trading strategies that appear to generate significant abnormal returns. Yet, Chordia, Goyal, Sadka, Sadka, and Shivakumar (2008) show that one of the oldest trading strategies in the literature, the post earnings announcement drift, cannot produce returns greater than the Keim and Madhavan (1997) measures. Clearly liquidity measures over time and/or across countries are needed in order to determine if these trading strategies are truly profitable net of a relatively precise measure of cost of trading.

Finally there is a growing need in corporate finance research for useful monthly liquidity measures. Kalev, Pham, and Steen (2003), Dennis and Strickland (2003), Cao, Field, and Hanka (2004), Lipson and Mortal (2004a), Schrand and Verrecchia (2004), Lesmond, O'Connor, and Senbet (2008), and many others examine the impact of corporate finance events on stock liquidity. Helfin and Shaw (2000), Lipson and Mortal (2004b), Lerner and Schoar (2004), and many others examine the influence of liquidity on capital structure, security issuance form, and other corporate finance decisions. Liquidity measures over a longer period of time would expand the potential sample size of this literature. Liquidity measures across many additional countries would greatly extend the potential diversity of international corporate finance environments that this literature could analyze.

To determine which liquidity measures are best, we compare proxies calculated from low-frequency data to sophisticated benchmarks of liquidity calculated from two high-frequency data sets using time-series correlations, cross-sectional correlations, and prediction errors. Specifically, we compare spread proxies to effective and realized spreads and we compare price impact proxies to two price impact benchmarks. All four of these benchmarks are calculated using the NYSE's Trade and Quote (TAQ) data set from 1993 to 2005. Our monthly benchmarks are computed as monthly averages based on every trade and corresponding BBO[1] quote over the month and our annual benchmarks are computed as annual averages based on every trade and corresponding BBO quote over the year. We also compare spread proxies to the effective

[1] BBO means the best bid and offer. It is the highest bid and lowest ask available for a given stock at a moment in time.