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Measuring market liquidity in US fixed income markets: A new synthetic indicator☆

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ABSTRACT

We propose a new synthetic liquidity indicator that summarizes the information of a broad set of market liquidity measures for both sovereign and corporate fixed income markets in the US. Our index is based on seventeen liquidity measures that cover the main dimensions of market liquidity. The methodology to compute the index consists of two steps. First, we carry out a transformation of the individual liquidity measures based on that of Holló et al. (2012) for the CISS—Composite Indicator of Systemic Stress—and second, we weight the transformed variables using a principal component analysis. The indicator shows that liquidity in US fixed income markets has been impaired after the global financial crisis mainly as a result of weaker liquidity conditions in US Treasury markets, whereas those in the corporate debt market remained stable.

1. Introduction

The concept of liquidity is broad and complex. This has been acknowledged by many researchers in the field. For example, Shin (2005) states that liquidity defies a simple definition and Tirole (2011) explains why liquidity cannot easily be apprehended through a single statistic. Hence, in this paper we focus only on a particular type of liquidity—i.e. market liquidity—and we use a composite indicator that captures various dimensions of liquidity. Market liquidity may be defined as the easiness with which market participants can buy or sell an asset in a market without affecting its price (Elliot, 2015). The definition of market liquidity differs from that of monetary liquidity, related to central banks' monetary aggregates, or from funding liquidity, which is the ability to obtain funding for a position in a risky asset (Brunnermeier and Pedersen, 2009).

In recent years, episodes of financial market strains and heightened volatility have been increasingly associated with discussions of the degree of liquidity in specific market segments. This was the case with the so-called "taper tantrum" in the second quarter of 2013 and the October 2014 "flash crash" in US Treasury markets.[1] Overall, market liquidity has been receiving a growing attention, given its apparent decline in some markets (IMF, 2015; Fender and Lewrick, 2015) and the possibility that impaired liquidity may have been one of the main drivers of these volatility spikes (Adrian et al., 2015).[2] Recently, a report published by the US Office of Financial Research (Office of Financial Research, 2015) showed that liquidity has been declining in a number of US markets in recent years, including the most liquid ones. The report suggested that this decline may amplify shocks in financial markets and impair financial stability. Its assessment was rather timely: Actual market developments around the report's publication in mid-December 2015—when turmoil hit US high-yield bond markets and three investment funds suspended redemptions—were linked to liquidity strains in certain segments of US corporate bond markets.

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[1] Ben Bernanke suggested in mid-2013 that the Federal Reserve might slow down the pace of bond purchases as the outlook for the US economy was improving and these comments led to instability in bond markets ("taper tantrum"). The "flash crash" event refers to the abnormal behaviour of prices and volatility of Treasuries in October 15, 2014 (Bouveret et al., 2015).

[2] Adrian et al. (2015b) develop a liquidity risk measure. Specifically, they define liquidity risk as the risk that market liquidity may get impaired in the future. They show that their liquidity risk measure and a particular volatility indicator go hand in hand with US Treasuries and equities.

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Measuring market liquidity is not an easy task, as its definition embodies several dimensions. In particular, Sarr and Lybek (2002) summarize the five characteristics that characterize market liquidity, namely tightness, immediacy, depth, breadth and resilience. The concept of tightness refers to transaction costs, which are supposed to be low in liquid markets, whereas immediacy characterizes those markets where trades are executed quickly and in an orderly manner. Depth is linked to the number of orders, while breadth allows orders to flow with a minimal impact in prices, even if they are large. Finally, in a resilient market, prices are able to move rapidly to new equilibrium levels; hence, resilience is closely related to market efficiency (Bernstein, 1987).

Given the heterogeneity of the characteristics behind the definition of market liquidity, there is a large number of indicators that have been proposed to monitor its various aspects. Some of them relate to plain transaction costs ("bid-ask" spreads), while others comprise more sophisticated measures that consider volume and price sensitivities of financial assets.[3] The result is a plethora of indicators that usually gives different signals and does not allow for an unequivocal assessment of how liquidity conditions are evolving.

In addition, none of these single indicators can simultaneously capture all dimensions of market liquidity (Amihud and Mendelson, 1991). In this paper, we propose a synthetic liquidity index to overcome this problem. Although the literature of composite indicators has been traditionally devoted to evaluate financial stress—see Kliesen et al. (2012) for a recent survey on these indicators—, we use this framework to construct a liquidity index based on individual liquidity indicators. Previous literature on this type of liquidity indexes is scarce. As far as we know, only Adrian et al. (2015a) also calculate a liquidity composite indicator for US fixed income markets. Our proposed indicator is robust to the different scales of the individual indexes and encompasses all liquidity characteristics. Nevertheless, as liquidity is an unobservable variable, there is no reliable benchmark to assess liquidity conditions, which constitutes one of the main challenges to construct such an index.

Our index is based on liquidity indicators for two main fixed-income markets. Namely, the US Treasury market (i.e. the segment with maturities close to 10 years) and the US corporate bond market for both investment grade and high yield (IG and HY respectively onwards). Our choice for these markets is motivated by the fact that they have been at the centre of recent discussions in both academia and the financial industry on the significance of strains in market liquidity. Moreover, the outstanding amount of these debt securities (USD 20.8 trillion) represents a substantial share of the whole U.S fixed income markets (52% of total in the second quarter of 2015).[4]

The main contribution of this paper to the literature is twofold. First, to the best of our knowledge, it is the first empirical application that employs the methodology of particular financial stress indices to develop a liquidity index that encompasses both government and corporate debt securities. Second, the proposed index combines the main aspects related to market liquidity, so that the specific liquidity characteristic that drives liquidity conditions in both markets can be identified.

The remainder of the paper is structured as follows. First, Section 2 describes the selection of liquidity indicators which we use to construct the synthetic indicator and reports some initial findings. Section 3 covers the methodology underlying the composite liquidity index. Section 4 discloses the evolution of the proposed index during the last 10 years. Finally, Section 5 concludes.

2. Market liquidity indicators

2.1. Selection of market liquidity indicators

Among the variety of liquidity metrics that are available, we have chosen seven to construct a synthetic index. We use these indicators for three markets, namely the US Treasury market and the US corporate IG and HY markets. All in all, we compute seventeen liquidity indicators in total for these markets, as some indicators are not available.[5] Our selection allows capturing the five main characteristics of market liquidity, that is, tightness, immediacy, depth, breadth and resilience. Table 1 provides further details on the individual indicators and their respective data sources. We calculate the seventeen measures on a weekly basis. The sample period runs from July 20, 2005 to October 21, 2015, so that the sample size is $T = 537$.

First, we use bid-ask spreads to capture tightness.[6] The bid-ask spread is the difference between offer and bid prices of a security and is interpreted as a proxy of the explicit cost of executing a trade in the market. The lower the spread, the easier to trade a security (buy at a low ask and sell at a high bid price), and the better the liquidity conditions. In this paper, we estimate bid-ask spreads by means of the methodology proposed by Corwin and Schultz (2012).[7] We use this estimator, as it is easy to compute and because we lack reliable data on intraday spreads.

Second, we use the daily range to measure immediacy. The daily range is the difference between the higher and lower price of a security during a trading day. When immediacy is poor, trades become harder to implement or may lead to huge price movements once executed. Therefore, large swings of the daily range suggest a weak immediacy. We transform the daily range to a weekly frequency using end of period data.

Then, we employ two volume-based measures to analyze depth in fixed income markets. First, we use the trading volume, which is the amount of traded securities. In our dataset, volumes are denominated in dollars. Second, depth is also measured by the turnover rate, defined as the trading volume over the size of the market (measured by debt outstanding). The turnover rate indicates the number of times that an asset changes hands during a period. Thus, a low turnover means that only a small portion of this market is traded every time, which would indicate a low level of market liquidity.

Regarding breadth, we compute two price impact ratios to analyze if trading activity has a minimal effect on prices. First, we calculate the indicator proposed by Amihud (2002), which is the absolute return over volume. Second, we compute the Hui and Heubel (1984) liquidity index. This last index measures the variation between the highest and lowest daily price during a certain period of time against the turnover. In both cases, an increase of the

[3] Gabrielsen et al. (2011) provide a survey of liquidity measures, where the advantages and disadvantages of each indicator are detailed.

[4] We obtain the data of the outstanding amount of fixed income markets from the US Securities Industry and Financial Markets Association (SIFMA).

[5] Specifically, we compute seven individual indicators for Treasury debt and five measures for each segment of the corporate bond market (IG and HY). The lack of market information prevent us from calculating the bid-ask spreads and the daily range for corporate debt.

[6] It is generally acknowledged that the bid-ask spread is a direct and potentially important indicator of liquidity, but at the same time it does not fully capture other important aspects of liquidity such as market depth and resilience. See Bao et al. (2011) for a discussion. We overcome this shortcoming by adding specific indicators for depth and resilience.

[7] In Corwin and Schultz (2012), the key assumption is that high prices are often buyer-initiated trades while low prices are more seller-initiated-trades. So the ratio between daily high and low prices reflects both the intrinsic price variation as well as the difference between bid and ask orders (the bid-ask spread).