

2 Euro area sovereign bond market liquidity since the start of the PSPP

Prepared by Linas Jurkšas, Daniel Kapp, Ken Nyholm and Julian Von Landesberger

The liquidity of euro area sovereign bond markets is important for the transmission of the ECB's monetary policy. In particular, a high degree of liquidity fosters the link between the ECB's monetary policy decisions, the yield curve, financial asset prices in general, and the overall cost and flow of finance in the economy. The liquidity of sovereign bond markets needs to be monitored more closely since the implementation of the ECB's public sector purchase programme (PSPP), under which a significant share of outstanding euro area sovereign bonds has been bought. Against this background, this box presents some of the market liquidity indicators that the ECB monitors regularly. Overall, the indicators suggest that liquidity conditions in sovereign bond markets have not deteriorated since the start of the PSPP (on 9 March 2015).

A liquid market is typically characterised as one in which the execution of a standard transaction has a limited impact on prices. In other words, a liquid market has “deep” order books, which are quickly replenished once a trade has been executed. As a result, price changes following a trade would be minimal and temporary. Naturally, if an executed trade is believed to provide new information about the fundamental value of the asset being traded, there would be a commensurate adjustment in ask and bid prices, but the order book around the new levels would still remain deep.

Market liquidity indicators commonly focus on one or more aspects of the cost of transactions, market depth and/or resiliency. The simplest indicator is the quoted bid-ask spread, which provides information on how costly a transaction can be expected to be. More informative indicators can be constructed by combining spread information with, for example, order book depth, which is a gauge for the volume of transactions that the market can absorb at a given point in time. Measures of market depth are typically based on information obtained from limit order books,¹⁰ which are the volume and price schedules available to traders. Resiliency is a function of market dynamics, such as how long it takes for order books to be refilled after a trade has been executed, i.e. it focuses on the time dimension of market liquidity.

In this box we analyse euro area sovereign bond market liquidity based on three indicators: the Amihud indicator, an order book liquidity indicator and an execution-based liquidity indicator. Although these three indicators are based on different sets of market data (respectively actual transactions executed in the market, limit order books and quotes), they mainly focus on the cost and depth dimensions of liquidity.

¹⁰ A limit order book is a trading system in which bids and asks submitted by market participants are stored in a queue and executed in a pre-defined sequence.

The Amihud indicator is widely used. It works by comparing absolute price changes with traded volumes.¹¹ It is defined for a given bond as the ratio between the absolute price change and the traded volume over a certain interval of time. A practical problem encountered when applying the Amihud indicator to government bonds is that most trades take place in the over-the-counter (OTC) market, therefore, price and volume data on transactions are difficult to obtain, especially on an intraday basis. Moreover, the indicator does not account for the fact that bond prices may, of course, change for reasons other than a lack of liquidity. To overcome these issues, for the variant considered in this box it is assumed that the daily traded volume (on which data are readily available) is spread evenly throughout the day, and the observed absolute price change is adjusted to eliminate the effect of the general market trend. As this indicator focuses on two dimensions of liquidity (i.e. cost and depth), it is often useful for determining which aspect is the driver of liquidity developments in particular time periods. The euro area aggregate indicator is calculated by first averaging the values of Amihud indicators for all PSPP-eligible sovereign bonds of a particular country and then weighting the composite country indicators by the respective GDP sizes.

The order book liquidity indicator is based on data on bid-ask spreads and quoted quantities obtained from limit order books. There is thus no need for data on actual transactions. However, this indicator is dependent on how representative the limit order book is of the market. It is calculated for a particular bond as the sum of the five best quotes on both the ask side and the bid side of the order book, divided by the sum of the corresponding quoted volumes. This is illustrated by the following equation:

$$\text{Order book illiquidity score}_{t,5\text{best}} = \frac{\text{SPREAD}_{t,5\text{best}}}{\text{QUANTITIES}_{t,5\text{best}}} = \frac{\frac{1}{5} \sum_{j=1}^5 P_{t,\text{Ask}(j)} - \frac{1}{5} \sum_{j=1}^5 P_{t,\text{Bid}(j)}}{\sum_{j=1}^5 Q_{t,\text{Ask}(j)} + \sum_{j=1}^5 Q_{t,\text{Bid}(j)}}$$

where “t” is the time at which the limit order book is “frozen” for calculation purposes, “P” is the price, and “Ask” and “Bid” indicate on which side of the order book the price is observed. The variable “Q” is the quantity that can be traded at a given quoted price and “j” denotes the order of priority of the offers in the limit order book (from the first to the fifth best ask and bid prices with the corresponding quantities). The indicator is calculated for the second-most recently issued ten-year sovereign bond of each country and the results are then weighted by the GDP sizes of the respective countries to obtain a euro area aggregate indicator.

The execution-based liquidity indicator uses information provided by quotes for transactions under the PSPP. When implementing PSPP trades in the OTC market, firm price and volume quotes are obtained from several counterparties. The differences between these quotes contain information on the degree of market liquidity. For a given bond, this indicator is defined as the spread between the two best quotes, divided by the duration of the bond. Only quotes that actually result in

¹¹ See Amihud Y., “Illiquidity and stock returns: cross-section and time-series effects”, *Journal of Financial Markets*, Vol. 5(1), pp. 31-56, 2002.

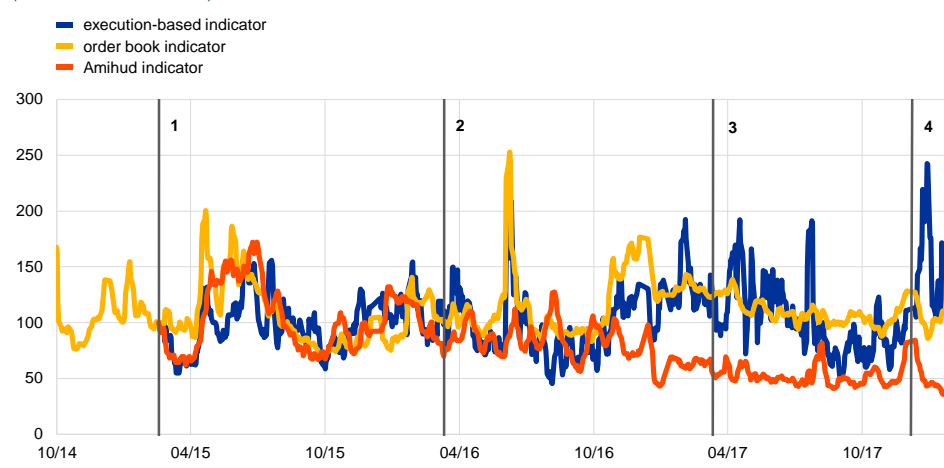
transactions are considered. A euro area-wide indicator is calculated as a volume-weighted average across all traded sovereign bonds.

These three indicators suggest that the liquidity situation in euro area sovereign bond markets has not deteriorated since the start of the PSPP (see Chart A). While all three indicators have displayed some volatility since the start of the PSPP, they have not recorded an upward trend, and the Amihud indicator has in fact tended to decline. This confirms that market liquidity has not deteriorated, despite the build-up of PSPP holdings over time. In the same vein, the indicators have not displayed a marked reaction to changes in the amount of monthly purchases under the PSPP, with only the execution-based indicator displaying increased volatility when the net monthly volume was reduced – especially following the reduction at the start of 2018.

Chart A

Sovereign bond market liquidity indicators since the start of the PSPP

(index: 100 = 9 March 2015)



Sources: Bloomberg, EuroMTS Ltd and ECB calculations.

Notes: The chart shows the five-day moving average of the indicators. An increase (decrease) in these indicators implies a deterioration (improvement) in the liquidity situation. They are normalised to 100 on 9 March 2015 when purchases under the PSPP began. The vertical lines denote the following volume changes of asset purchases under the PSPP: 1) the start of the programme, with a monthly pace of €60 billion (9 March 2015); 2) the increase in net monthly purchases to €80 billion (1 April 2016); 3) the decrease in net monthly purchases to €60 billion (3 April 2017); and 4) the decrease in net monthly purchases to €30 billion (2 January 2018). The latest observation is for 20 February 2018.

These indicators tend to spike around political and economic events

associated with an expected deterioration in market liquidity. For instance, spikes were observed during the “Bund tantrum” period (commencing on 29 April 2015) and in a period of heightened concern about a potential significant slowdown in China’s economic growth (in the first quarter of 2016). The UK referendum on European Union membership (23 June 2016) and the presidential elections in the United States (8 November 2016) and France (23 April 2017) were also marked by illiquidity spikes (see Chart A). Moreover, liquidity usually deteriorates during the summer and around the year-end. However, the spikes observed in the Amihud indicator around these periods are more muted than those seen in the order book indicator. Movements in the execution-based indicator

resemble those seen in the order book indicator, but appear to reflect relatively more noise. This may suggest that monitoring should focus on the order book indicator.¹²

¹² This could be justified for several reasons: first, the amount of submitted limit orders far exceeds the number of executed transactions in bond markets, enabling the order book indicator to react faster and more smoothly to market developments. Second, trade volume-based indicators may underestimate market depth since traded quantities are usually smaller than the maximum quantity that could have been traded at a particular price.