

### Box 3

#### Bond market liquidity indicators – an overview

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**An accurate assessment of bond market liquidity conditions is a crucial input for financial stability risk analysis.** As commonly defined, “liquidity” measures how much trading volume a financial market can absorb for a given change in price or what the price impact of a given trade volume will be. More elusively, liquidity may indicate how well market prices revert to their fundamental values. Lower bond market liquidity could amplify market price swings, impair the conversion into cash, and thus create financial stability risks.

**This box briefly explains the approach taken in constructing liquidity indicators at the ECB and some conclusions that can be drawn from the data.** Conditions over the lifetime of the public sector purchase programme (PSPP) to date and developments in France are used as examples.

**The concept of liquidity implies a comparison of factual and counterfactual information, namely market pricing with and without a trade being executed.** Actual market prices, as opposed to mere quotes or indications, are generally only measurable by actual trading. The executable price for a given trade at a given time also depends not only on the trade details, but also on the particular customer and trading venue. In most bond markets, it is generally also impossible to observe every trade that is being conducted. Commercial data providers and trading platforms offer trading datasets that cover certain sub-segments of the total trade universe, with varying degrees of coverage and sample bias.

**The design choices for liquidity indicators reflect trade-offs between various fundamental limitations.** ECB staff utilise multiple data sources to produce a range of internal liquidity indicators, and comparisons across indicators provide insights into market developments. The asset purchase programme (APP) in particular provides some post-trade information that would not normally be available to a central bank. By executing market purchases on a daily basis, the ECB can collect information on quoting behaviour that is not visible from screen indications, such as the dispersion of firm offers, time to quote, probability of no quote responses, etc.

**Market liquidity indicators can be grouped into three categories according to the type of trade information on which they rely (pre-trade, post-trade and indirect).** Pre-trade indicators rely on information that is observable before a trade takes place. This could be indicative price quotes posted by traders, or the order book structures of public exchanges. These indicators are comparatively easy to produce but are reliable only to the extent that indications correlate with executable prices, and that order books reflect true trade interest. Post-trade indicators are based on actual transaction prices and volumes. While the price information is informative, observed volumes are usually incomplete. In addition, the observed trading activity may be – and to the extent that traders seek out pockets of liquidity will be – a biased sample of total market activity. Sample bias is most likely to be significant at higher observation frequencies because higher frequencies imply, *ceteris paribus*, a smaller trade sample. Indirect indicators rely on secondary features of liquid markets, such as the absence of near-arbitrage opportunities. Such indicators sidestep the observational problems of the other two categories, but the definition and quantification of suitable secondary features is non-trivial.

**Market liquidity has both microscopic and macroscopic aspects.** At a given time, dealers may quote very tight bid-offer spreads and the market may be able to absorb single trades with a very low price impact, implying high liquidity at the microscopic, single-trade level. However, correlated trades in related instruments may degrade pricing at a more macroscopic level in the sense that the overall market levels move away from fundamentals. Partly as a result of this, trading volumes can be poorly correlated with other liquidity indicators.

**This idea can be illustrated with developments in the French government bond market during the period between November 2016 and May 2017.** At the time, political risk factors were being cited by a number of market participants ahead of the two rounds of the French presidential election that took place in April and May 2017. **Chart A**, based on ECB data shows that, at a microscopic level, average indicative bid-offer spreads had widened in November but then corrected around the year-end, before widening again in the spring. The price dispersion seen in PSPP execution was elevated sometimes, but not in a way that is correlated with the overall bid-offer measure, possibly indicating sample bias due to the bond selection strategy of ECB portfolio managers. At a macroscopic level, the evolution of an indicator based on spline spreads would be consistent with illiquid conditions, even over the year-end. All three indicators show an improvement in market liquidity after the election.<sup>24</sup>

**Taking a longer-term perspective, Chart B shows how bid-offer measures in the government bond market have evolved since the early days of the PSPP.** What stands out is that for the two

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<sup>24</sup> Spline spreads are produced by first fitting a smooth discount curve to observed yields and then calculating the difference between the market price and the present value of each bond according to this curve (z-spreads). These spreads are therefore indicators of relative value between similar bonds after correcting for coupon effects.

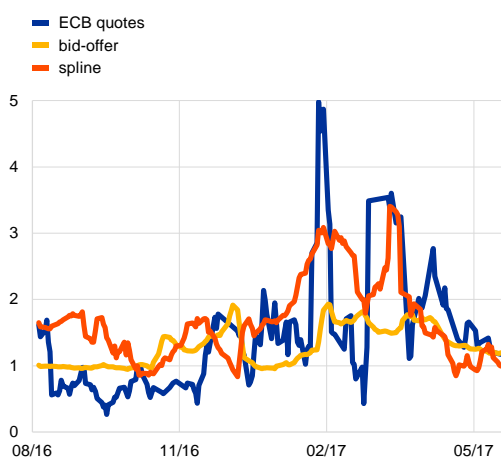
markets shown, liquidity diverged significantly over certain periods. Although there is no general trend for either market towards better or worse liquidity, investors' responses to market movements (e.g. the sharp yield rise in 2015 and the movements at the time of the French presidential elections this year) can have noticeable and diverging effects across different markets.

### Chart A

Bid-offer, spline spread and price dispersion measures of liquidity for the French market

#### Three indicators of liquidity for French government bonds of 4 to 7-year maturity

(1 Nov. 2016 = 1; five-business-day moving averages; higher values indicate lower liquidity)



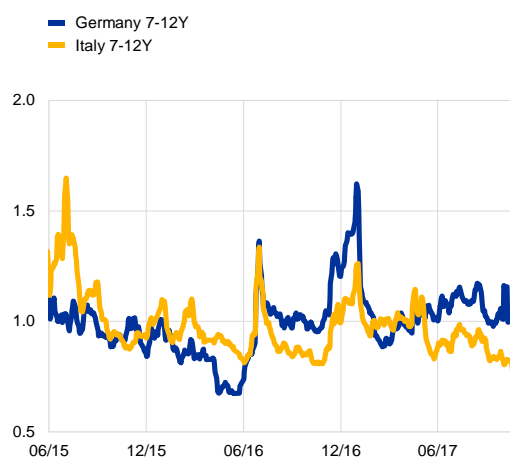
Sources: Bloomberg LP, ECB, MTS and ECB calculations.  
Notes: All indicators are indexed to 1 November 2016. "Bid-offer" refers to an average bid-offer spread (pre-trade indicator), while "spline" measures the sum of absolute spline spread values (indirect indicator). "ECB quotes" is an indicator based on the dispersion of price quotes received in PSPP execution (post-trade indicator).

### Chart B

Evolution of bid-offer measures over the last two years in Germany and Italy

#### Bid-offer-based liquidity indicator for the German and Italian government bonds of 7 to 12-year maturity

(average normalised to 1; five-business-day moving averages; higher values indicate lower liquidity)



Sources: Bloomberg LP and ECB calculations.  
Note: Bid-offer spreads are averaged across relevant bonds (pre-trade indicator).

**In conclusion, the joint analysis of multiple imperfect liquidity indicators provides a useful insight into how market conditions evolve.** Instead of focusing only on a single measure, a portfolio of quantitative indicators which can be monitored daily should be used.