

Box 7

FUNDING LIQUIDITY, FUNDING LIQUIDITY RISK AND ITS INTERACTION WITH MARKET LIQUIDITY¹

The developments in the various segments of the euro money market since August 2007 are typical of a liquidity crisis and suggest the existence of a link between market liquidity and funding liquidity risks. Nevertheless, empirical evidence of this link is difficult to find, mainly due to the problem of measuring funding liquidity risk. This box discusses the notions of funding liquidity and funding liquidity risk, proposes a simple indicator for measuring funding liquidity risk and presents an empirical link between market and funding liquidity, based on evidence from recent data.

Funding liquidity and funding liquidity risk

Funding liquidity is defined as the *ability to settle obligations immediately when due*. Consequently, a bank is illiquid if it is unable to settle obligations on time. Given this definition, it can be said that *funding liquidity risk is driven by the possibility that, over a specific horizon, the bank will become unable to settle obligations when due*.

Funding liquidity is essentially a zero-one concept, i.e. a bank can either settle obligations, or it cannot.² *Funding liquidity risk*, on the other hand, can take on infinitely many values reflecting the magnitude of risk. Moreover, *funding liquidity* is a point-in-time concept, while *funding liquidity risk* is forward-looking. As long as the bank is not in an absorbing state, both liquidity and illiquidity are possible. The likelihood of either depends on the time horizon considered

1 This box is based on M. Drehmann and K. Nikolaou, "Funding liquidity risk: definitions and measurement", *ECB Working Paper*, forthcoming.

2 This is equivalent to the definition of solvency, where a bank is said to be solvent if the current value of its assets is higher than the value of its liabilities.

and on the nature of the funding position of the bank. In this respect, concerns about the future ability to settle obligations or to raise cash at short notice, i.e. future funding liquidity, will impact on current funding liquidity risk.

Considering the implementation of the aforementioned definitions, a more operational definition would be helpful. To this end, the definition of a settlement asset is narrowed down to central bank money, since in the vast majority of cases, the latter is one of the most important settlement assets from an aggregate point of view. Hence, the ability to settle is crucially linked to the ability to satisfy the demand for central bank money. Therefore, a more narrow definition of funding liquidity can be the *ability to settle obligations with central bank money immediately when due*.

A simple indicator of funding liquidity risk

In practice, a bank is able to satisfy the demand for central bank money, and is thus liquid, as long as outflows of central bank money are smaller than, or equal to, inflows at each point in time. However, the net amount of central bank money needed to remain liquid is uncertain from an ex-ante perspective and depends on the stochastic volume of liquidity required and the stochastic prices of acquiring it. Such uncertainties generate funding liquidity risk. The theoretical and empirical literature shows that higher funding liquidity risk implies a higher marginal valuation of liquidity, which – in turn – is linked to higher bids at central bank liquidity auctions. Although submitted bids may not perfectly reflect the marginal value for funding liquidity due to bid shading,³ they should provide an ordinal proxy indicator of funding liquidity risk.

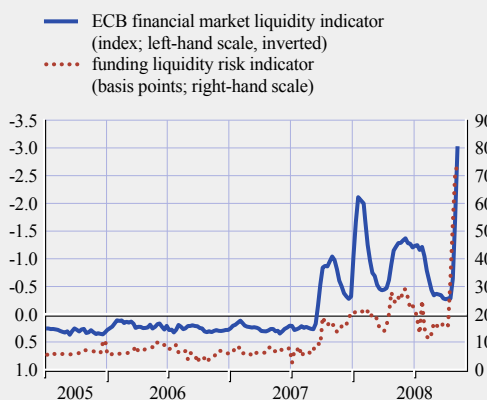
The proposed funding liquidity risk indicator takes into account information on both the price of liquidity (i.e. the bid rate minus the ECB policy rate) and the volume of liquidity obtained (i.e. the volume allotted), normalised by the total volume of liquidity provided, in order to maintain consistency across auctions of differing size. Summing up this information across bids and banks gives an aggregate proxy of funding liquidity risk (see Chart A), which equals the weighted average rate of successful bids minus the policy rate, i.e. variables routinely reported by the ECB when main refinancing operations are conducted through variable rate tenders.

Funding liquidity risk and market liquidity

Theoretical research has rationalised strong interactions between funding liquidity risk and market liquidity in periods of crisis.⁴ Shocks to funding liquidity can lead to asset sales

Chart A Funding liquidity risk and financial market liquidity indicators

(June 2005 – Oct. 2008)



Sources: ECB, Bank of England, Bloomberg, JPMorgan Chase & Co., Moody's KMV and ECB calculations.

Note: The proxy funding liquidity risk indicator equals the difference between the weighted average rate of successful bids in ECB main refinancing operations conducted through variable rate tenders and the ECB policy rate. For more details on the ECB financial market liquidity indicator, see Chart 3.1.

³ Bid shading refers to the practice of a bidder placing a bid that is below an estimated fair price.

⁴ See M. Brunnermeier and L. H. Pedersen, "Market liquidity and funding liquidity", *National Bureau of Economic Research Working Paper No 12939*, February 2007.

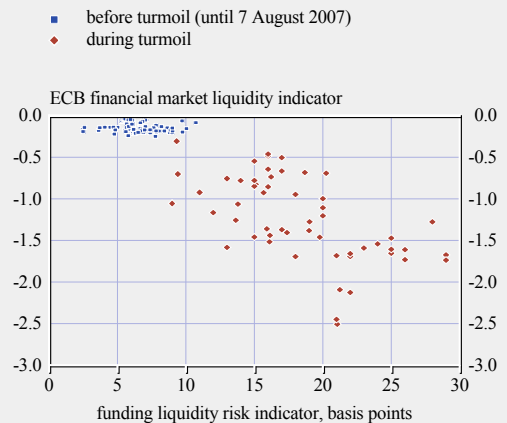
and may depress asset prices, with dire consequences for market liquidity. The loop is established when lower market liquidity leads to higher margin calls, which increase funding liquidity risk as outflows rise. A downward liquidity spiral begins, as a new round of asset sales begins so that banks can remain liquid.

Whilst the theoretical exposition is clear, and many observers consider it relevant to the recent turmoil, a lack of indicators of funding liquidity risk has delayed empirical validation. Using the suggested indicator, it is possible to empirically support these interactions by looking at the interrelationships between the proposed funding liquidity risk proxy indicator and the ECB's indicator of financial market liquidity.⁵

A scatter plot of the funding liquidity risk indicator and the ECB's financial market liquidity indicator is presented in Chart B. A clearly negative relationship can be seen, i.e. when market liquidity falls, funding liquidity risk increases. There was, however, no significant relationship between funding liquidity risk and market liquidity prior to the turmoil; it emerged only after the turmoil had unfolded. This is in keeping with the theory that such interactions emerge only when banks face funding constraints.

Chart B Relationship between funding liquidity risk and market liquidity

(June 2005 – Oct. 2008; index and basis points)



Sources: ECB, Bank of England, Bloomberg, JPMorgan Chase & Co., Moody's KMV and ECB calculations.

Notes: The proxy funding liquidity risk indicator equals the difference between the weighted average rate of successful bids in ECB main refinancing operations conducted through variable rate tenders and the ECB policy rate. For more details on the ECB financial market liquidity indicator, see Chart 3.1.

⁵ See Chart 3.1.