Funding Liquidity Risk: Definition and Measurement

Mathias Drehmann       Kleopatra Nikolaou

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Contribution

- Provide a definition of funding liquidity and funding liquidity risk
- Develop a simple, yet intuitive funding liquidity measure
  - Persistence at low levels with occasional spikes
- Demonstrate relationship between funding liquidity risk and market liquidity empirically
  - Inverse relationship
Definitions

- *Funding liquidity is the ability to satisfy the demand for money with immediacy*
  - As solvency, funding liquidity is (essentially) point in time and a zero-one concept

- *Funding liquidity risk is the possibility that, over a specific horizon, a bank will be unable to meet the demand for money*
  - As other risks, funding liquidity risk is forward looking and measured over a specific horizon

- We focus on central bank money
Liquidity as a stock-flow concept

- A bank is liquid if Outflows are smaller than Inflows and the Stock of Money

\[ \text{Outflows}_t \leq \text{Inflows}_t + \text{Stock Money}_t \]

- The net liquidity demand

\[ \text{NLD}_t = \text{Outflows}_t - \text{Inflows}^{due}_t - M_t \]

\[ \leq p_t^D L^D_{new,t} + p_t^{IB} L^{IB}_{new,t} + p_t^A A_{sold,t} + p_t^{CB} CB_{new,t} \]

- Funding liquidity risk
  - Risk that Outflows larger than Inflows at some point in the future
  - Determined by two stochastic components:
    - The net liquidity demand
    - Prices of obtaining liquidity from different sources
MROs in the Eurosystem (until Oct 2008)

- Conducted weekly
- Provide liquidity against eligible collateral
- Benchmark allotment is provided by central bank and announced
- More than 6,000 banks are eligible
- Flexible rate tenders
  - Each bank submits bids schedule, i.e. up to 10 bids specifying volume and price
  - Auction is price-discriminating
  - Bids lower than the marginal rate are not satisfied and rationed at the marginal rate
Our measure

Note: Thick black line is the aggregate demand curve. LRP = \[\frac{(\text{Area A} + \text{Area B})}{\text{total allotment}}\], LRP_1 = \[\frac{\text{Area A}}{\text{total allotment}}\]
Funding liquidity risk and bidding behaviour – a stylised time line

- **Period 1**: Primary market: Auction conducted by central bank
- **Period 2**: Secondary market: trading in the interbank market
- **Period 3**: Final settlement; banks can access standing facilities at the central bank
Funding liquidity risk and bidding behaviour

- Assume only interbank markets and central bank provides the right amount of liquidity
- Frictionless interbank markets
  - Liquidity risk is zero
  - Banks bid at the policy rate (Ayuso and Repullo, 2003, Välimäki, 2002)
- Interbank market with frictions
  - Frictions such as asymmetric information, incomplete markets or market power key drivers for funding liquidity risk
  - Banks with higher funding liquidity risk bid more aggressively (Nyborg and Strebulaev, 2004, Välimäki, 2006)
Funding liquidity risk and bidding behaviour (II)

- Bids are only proxies
  - Banks do not bid full marginal valuation
  - Collateral effects
  - Winners curse
    - Bindseil et al (2008) show that this is not important for the euro area
    - Central bank supply not fully exogenous
- Bidding with all sources of liquidity
  - No theoretical model
  - Deposits react sluggishly
  - With frictions → downward spirals between funding and market liquidity risk possible
  → Higher bids reveal higher funding liquidity risk
Our measure

- The adjusted bid (AB):

\[ AB_{b,i,t} = \frac{(bid \_ rate - policy \_ rate)_{b,i,t} \times volume_{b,i,t}}{total \_ allotment_t} \]

- Liquidity risk proxy (LRP):

\[ LRP_t = \sum_{i=1}^{N} \sum_{b=1}^{B} AB_{i,t} \]

- Liquidity risk proxy based on bids above the marginal rate (LRP_M)
Data

- ECB internal
  - Bank bidding schedules from the ECB auctions
    - Bidder id, bid rate, bid volume, allotted volume
  - Data on weekly MROs
  - Sample from June 2005 to Dec 2007

- Public
  - Monetary policy rate (minimum bid rate)
  - Maintenance period
  - Marginal rate and weighted average bid rate (up to Oct 2008)
Distribution of adjusted bid volumes

- adjusted volume
- maximum adjusted volume
Funding liquidity risk and market liquidity
Conclusions

- Propose definitions of funding liquidity and funding liquidity risk
- Construct a measure of funding liquidity risk
- Find evidence of inverse relationship between funding liquidity risk and market liquidity