



# **Funding Liquidity Risk: Definition and Measurement**

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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*

$$Outflows_t \leq Inflows_t + Stock\ Money_t$$

- The net liquidity demand

$$\begin{aligned} NLD_t &= Outflows_t - Inflows_t^{due} - M_t \\ &\leq p_t^D L_{new,t}^D + p_t^{IB} L_{new,t}^{IB} + p_t^A A_{sold,t} + p_t^{CB} CB_{new,t} \end{aligned}$$

- 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

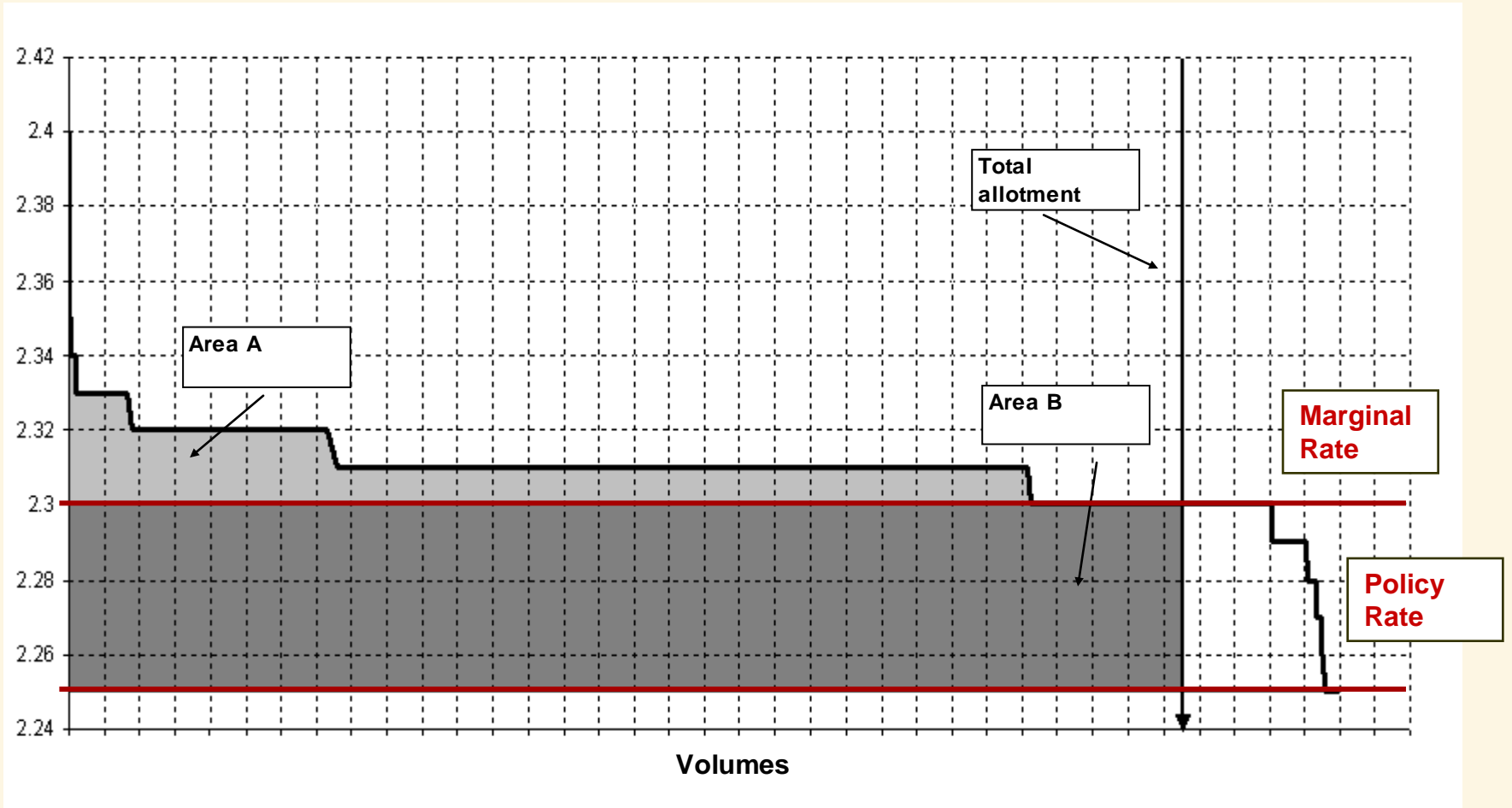


## MROs in the Eurosystem (until Oct 2008)

- 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

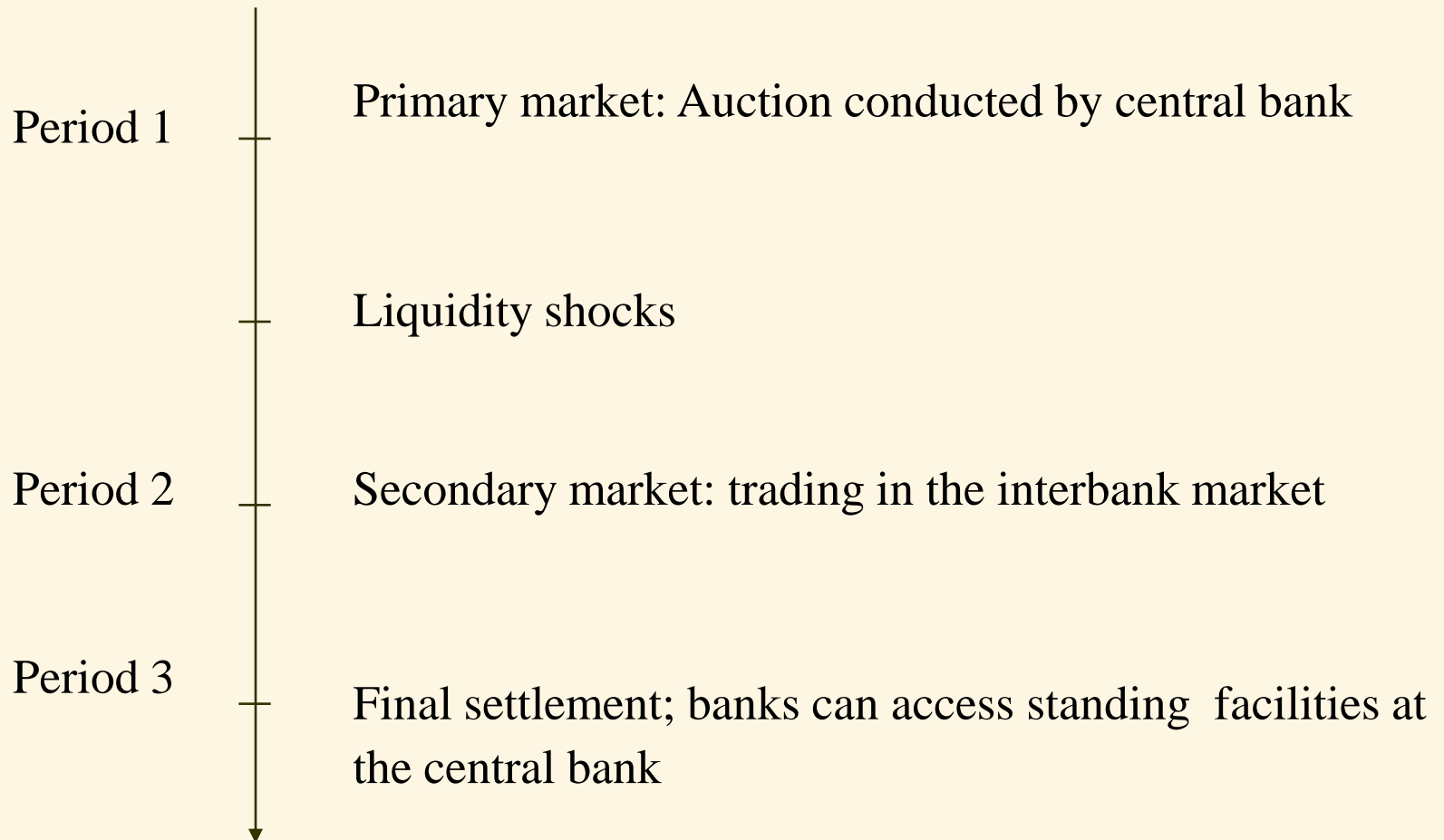


# Our measure





## Funding liquidity risk and bidding behaviour – a stylised time line





## Funding liquidity risk and bidding behaviour

- Assume only interbank markets and central bank 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):

$$AB_{b,i,t} = \frac{(bid\_rate - policy\_rate)_{b,i,t} * volume_{b,i,t}}{total\_allotment_t}$$

- 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)

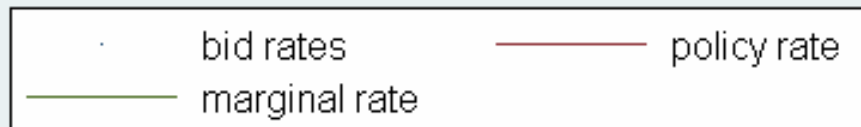
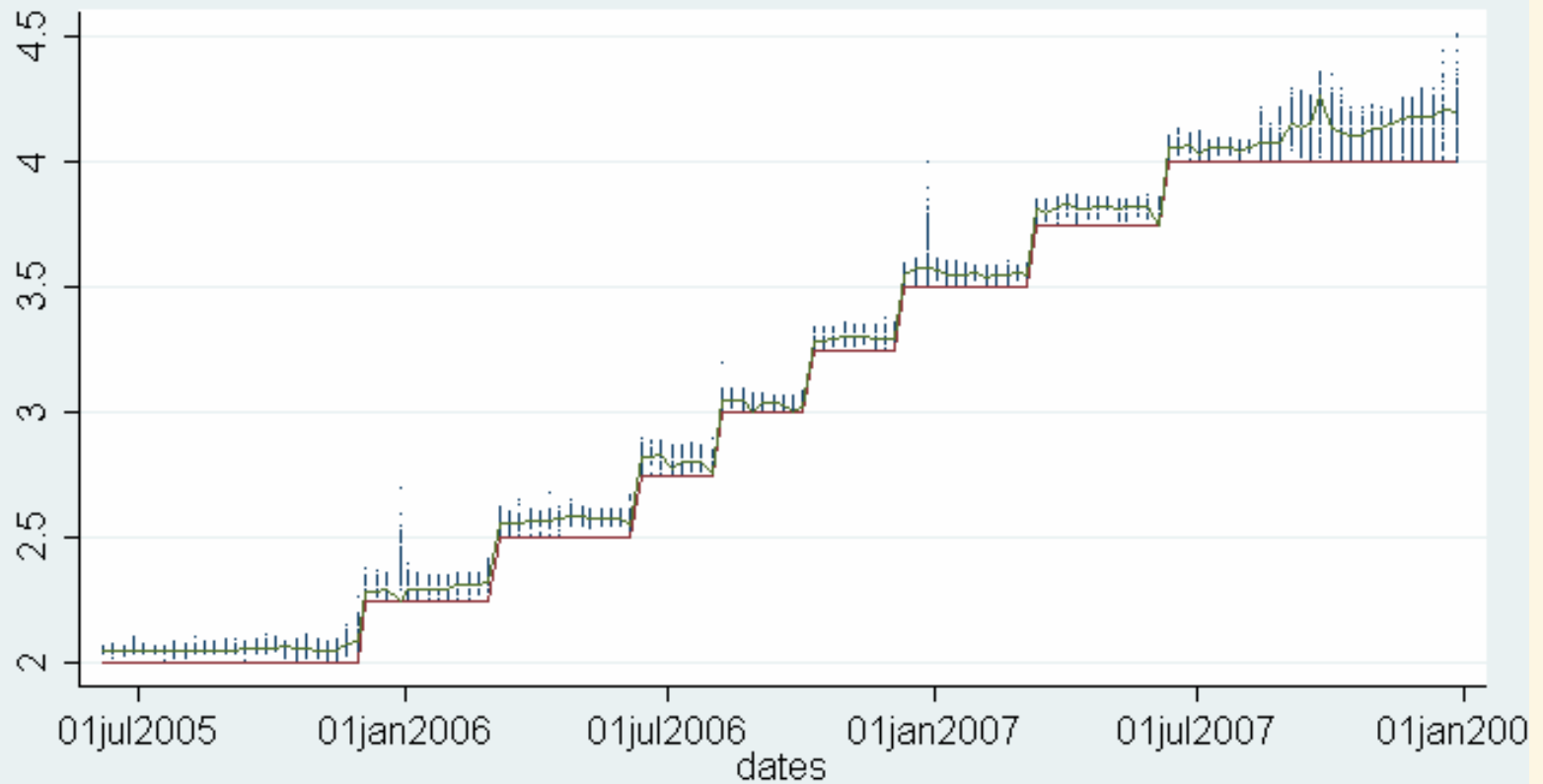


## Data

- 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)

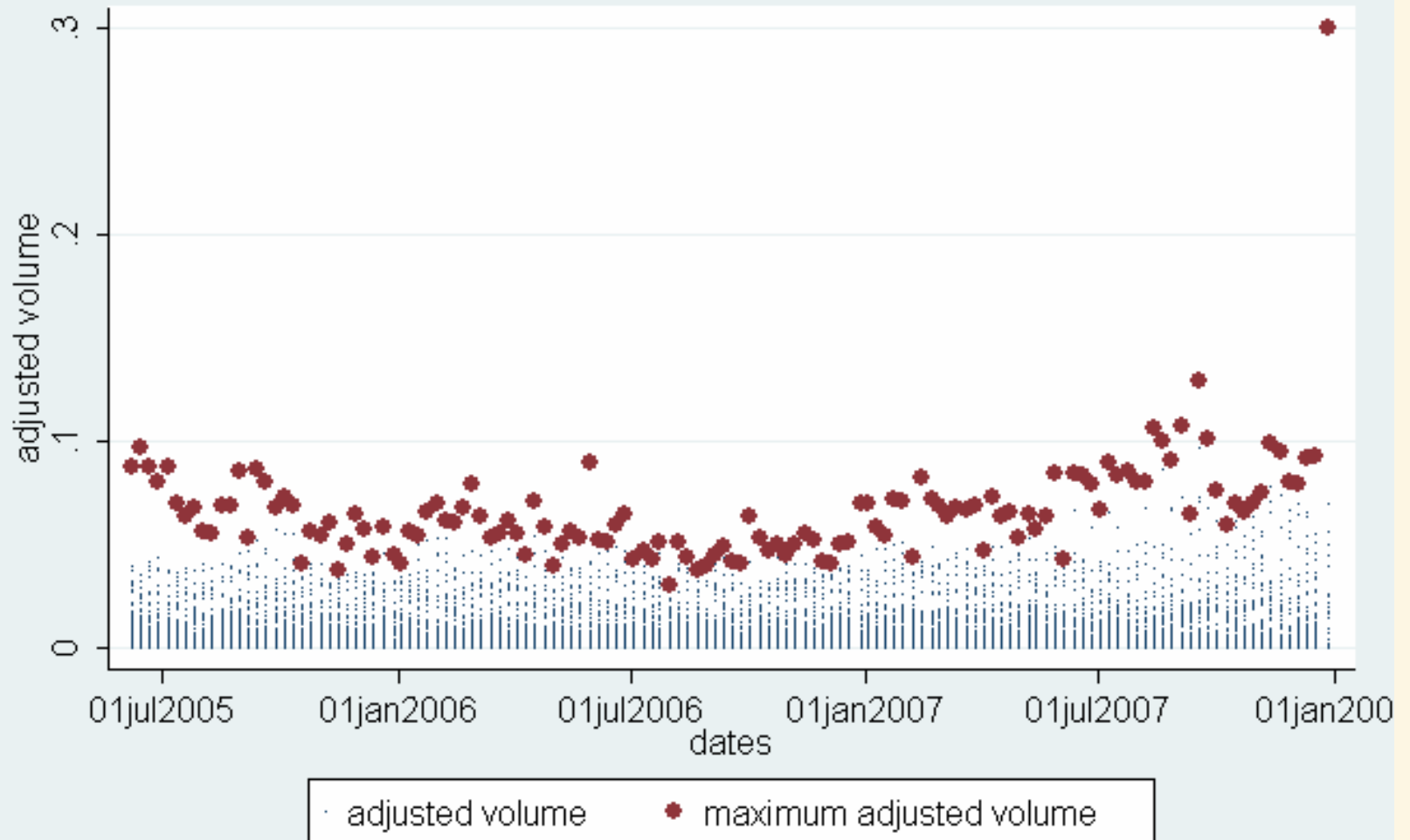


### Distribution of bid rates



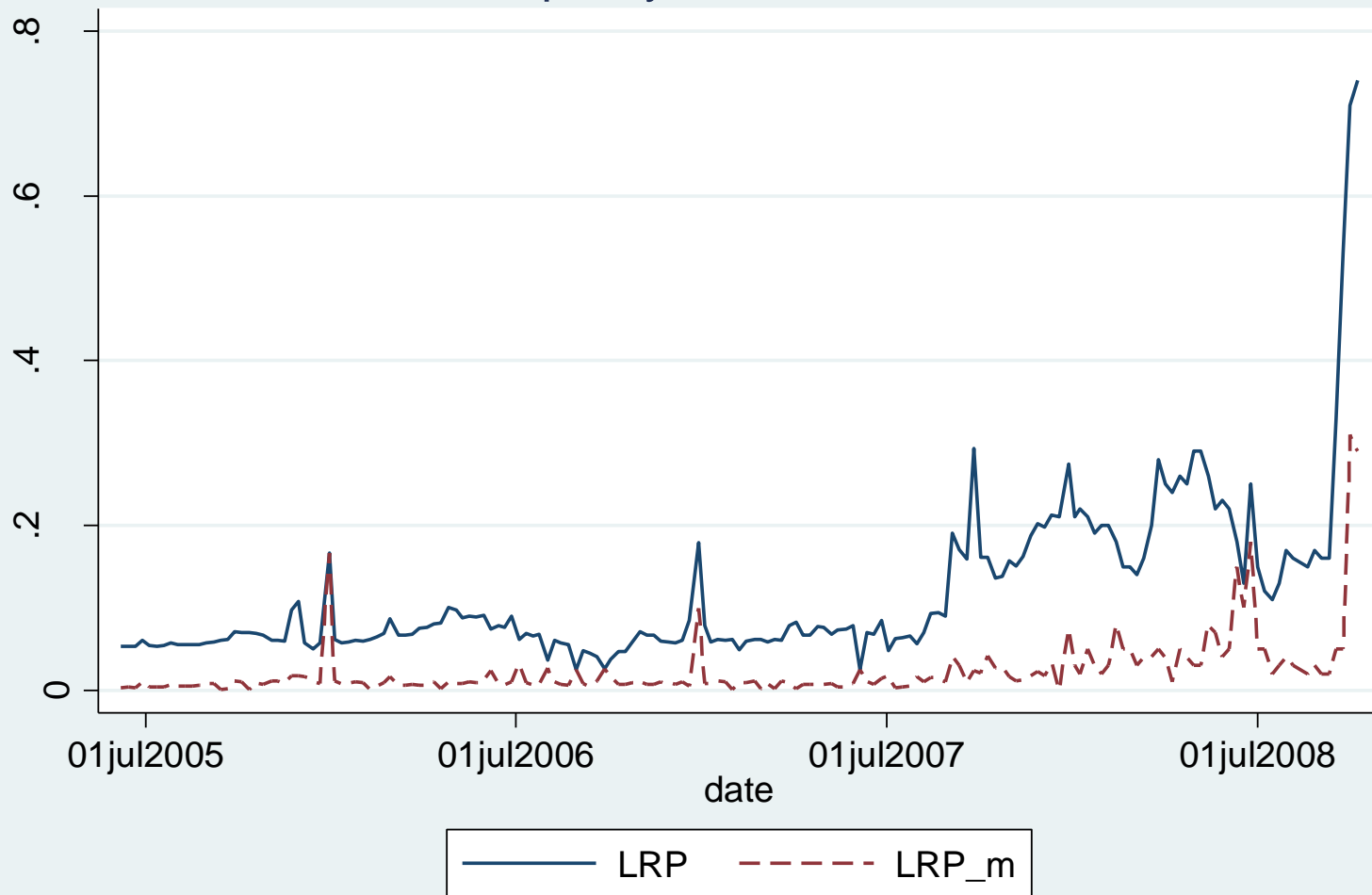


## Distribution of adjusted bid volumes



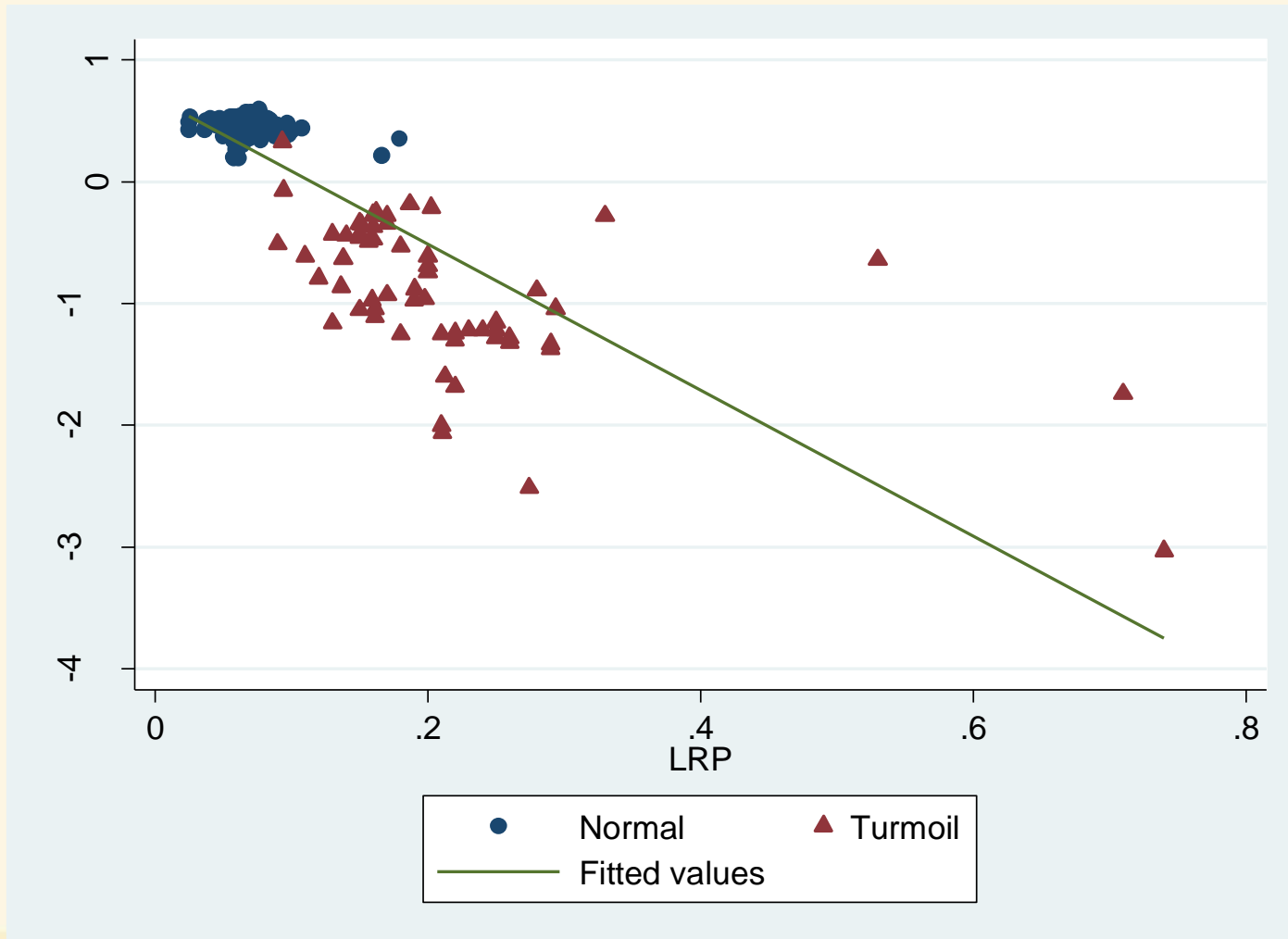


## Liquidity risk measures





# 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