

Computer Based Statistics: Introduction in SAS

Franziska Peter

November 17, 2010

Definition

Hasbrouck (2000):

Market Microstructure is the study of the trading mechanism used for financial securities

Market Structure

- Limit Order Markets
- Floor Markets
- Dealer Markets
- Auctions and Clearing Mechanisms

Basic concepts of (empirical) financial market microstructure

Ask/ bid prices and depths provided by liquidity suppliers

- market makers (NYSE: specialist, NASDAQ: dealer)
- limit order traders (Xetra)

limit buy order: buy order with upper price limit and given buy volume

limit sell order: sell order with lower price limit and given sell volume

Non-executable limit orders (LO) constitute the limit order book

market order (MO): no price limit (but buy and sell volume)

Basic concepts of (empirical) financial market microstructure

(best) ask price (or offer price) depth at best ask price

(best) bid price depth at best bid price

→ best quotes

Inside spread or quoted spread: ask price - bid price

Spread: natural measure of liquidity and market quality and (implicit)
transaction costs (cost of round trip)

Basic concepts of (empirical) financial market microstructure

midprice or midquote or midpoint $(askprice + bidprice)/2$

relative (quoted) spread:

$$\left(\frac{\text{quoted spread}}{\text{midquote}} \cdot (100\%) \right)$$

Basic concepts of (empirical) financial market microstructure

Trades occur at the ask or bid → transaction price = bid price or ask price

or inside the quoted spread

or outside the quoted spread (if trading volume exceeds depth)

Three components which influence the spread

1. order processing costs (also opportunity costs of market making)
 2. inventory holding costs (of liquidity supply market maker holds suboptimal portfolio, risk aversion)
 3. adverse selection costs or asymmetric information costs (when some traders are better informed about true asset price than market maker)
- 3 types of costs incurred by market maker (liquidity supplier)
- spread has to compensate for them

Competition among liquidity suppliers reduces gains of liquidity supply in excess of these costs

Measures of market quality (execution quality)

quoted spread ask price - bid price

effective spread $2 \cdot (\text{execution price} - \text{midquote})$ for buy order

$2 \cdot (\text{midquote} - \text{execution price})$ for sell order

realized spread $2 \cdot (\text{execution price}(t) - \text{midquote}(t + x))$ for buy order

$2 \cdot (\text{midquote}(t + x) - \text{execution price}(t))$ for sell order

price impact $= (\text{effective spread} - \text{realized spread})/2$

$= \text{midquote}(t + x) - \text{midquote}(t)$ for buy order

$-\text{midquote}(t + x)$ for sell order

Very simple example of an order book

Time t

Bid	Bid volume	Ask	Ask volume
10.90	100	11.00	50
10.85	50	11.02	150
10.83	100	11.05	50
⋮	⋮	⋮	⋮

Very simple example of an order book

New limit buy order of 100 shares for at most 11.03.

What is the transaction price?

What does the order book look like now?

Time $t+\Delta$

Bid	Bid volume	Ask	Ask volume
10.90	100	11.02	100
10.85	50	11.05	50
10.83	100	11.06	50
⋮	⋮	⋮	⋮

Time $t+5$

Bid	Bid volume	Ask	Ask volume
10.90	100	11.02	50
10.85	50	11.05	50
10.83	100	11.06	50
⋮	⋮	⋮	⋮

Example

Calculate the quoted spread, the effective spread, the realized spread and the price impact.

$$ES = \begin{cases} 2 \cdot (price - midpoint) & \text{if buy} \\ 2 \cdot (midpoint - price) & \text{if sell} \end{cases}$$

$$RS = \begin{cases} 2 \cdot (price - midpoint5) & \text{if buy} \\ 2 \cdot (midpoint5 - price) & \text{if sell} \end{cases}$$

$$PI = (ES - RS)/2$$

Trade Classification

- compare transaction prices to midquotes
- compare transaction price to lagged transaction price