Market Microstructure

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Market microstructure is a branch of economics and finance concerned with the details of how exchange occurs in markets, most commonly financial markets. Market microstructure research typically examines the ways in which the working process of a market affects trading costs, prices, volume and trading behaviour.

- Garman (1976) used a collection of market agents to model both 'dealership' and 'auction' markets.
- Morse and Ushman (1983) examined the effect of information announcements on the bid/ask spreads. They found no significant changes in bid/ask spreads surrounding quarterly earnings announcements, but significant increases in the size of bid/ask spreads are found on the day of large price changes.
- Amihud, Mendelson and Murgia (1990) studied the impact of the stock market microstructure on return volatility and on the value discovery process in the Milan Stock Exchange; the primary trading mechanism employed by this exchange is a call market, which is usually preceded and followed by trading in a continuous market. They found that the opening transaction in the continuous market had the highest volatility, and that opening the market with the call transaction seemed to produce relatively lower volatility.
- Reinganum (1990) investigated the influence of market microstructure on liquidity premiums. Premiums of a competitive, multiple-dealership market (NASDAQ) were contrasted with those of a monopolistic, specialist system (NYSE). The NASDAQ appeared to have a liquidity advantage over the NYSE for small firms but not for large companies.
- In Bossaerts and Hillion (1991), four continental European currencies with respect to the French franc were examined, and the bid–ask spread in the spot and forward foreign exchange markets when some traders have superior information about government intervention was investigated. Larger

bid-ask spreads on Fridays were documented. Reliable evidence of asymmetric bid-ask spreads for all days of the week, albeit more pronounced on Fridays, were presented.

- Lease, Masulis and Page (1991) investigated the importance of bid-ask spread-induced biases on event date returns as exemplified by seasoned equity offerings by NYSE listed firms. They document significant negative return biases on the offering day. Buy-sell order flow imbalance was prominent around the offering and induces a relatively large spread bias.

- Allen and Gorton (1992) explain that buyers wish to avoid trading with informed investors, will usually be able to choose the time at which they trade, and so will tend to cluster. So when liquidity buyers are not clustering, purchases are more likely to be by an informed trader than sales so the price movement resulting from a purchase is larger than for a sale. As a result, profitable manipulation by uninformed investors may occur; and the authors present a model where the specialist takes account of the possibility of manipulation in equilibrium.

- Dubofsky (1992) proposed a market microstructure explanation of the positive abnormal returns found on ex-stock distribution days. The abnormal returns are argued to be the result of NYSE Rule 118 and AMEX Rule 132, which dictate how open limit orders to buy and sell stock are handled on ex-days.

- Loughran (1993) demonstrated that the relatively poor performance of small NASDAQ securities relative to the performance of similarly-sized NYSE securities during the 1973–1988 period was largely due to initial public offerings (IPOs), rather than market microstructure differences (on average, IPOs underperform during the six calendar years after going public).

- Huang and Stoll (1994) developed a two-equation econometric model of quote revisions and transaction returns and used it to identify the relative importance of different microstructure theories and to make predictions. Microstructure variables and lagged stock index futures returns had in-sample and out-of-sample predictive power based on data observed at five-minute intervals. The most striking microstructure implication of the model, confirmed by the empirical results, specified that the expected quote return is positively related to the deviation between the transaction price and the quote midpoint while the expected transaction return is negatively related to the same variable.

- Wang, *et al.* (1995) examined the Real Estate Investment Trust (REIT) market microstructure and its relationship to stock returns. When compared with the general stock market, REIT stocks tend to have a lower level of institutional investor participation and are followed by fewer security analysts. Also, REIT stocks that have a higher percentage of institu-

tional investors or are followed by more security analysts tend to perform better than other REIT stocks.

- Park (1995) examined the impact of bid-ask bounce on variations in stock returns following large price changes. By using the average of the bid-ask prices in the sample selection process, the previously reported price reversal on the day following the events (day +1) disappears. However, for a short-run period after day +1, systematic abnormal return patterns are still observed (but the profits from a contrarian investment strategy designed to exploit the patterns would not cover transaction costs).

- Maureen O'Hara wrote *Market Microstructure Theory* (O'Hara 1995), which provides a comprehensive guide to the theoretical work.

- Brennan and Subrahmanyam (1996) investigated the empirical relation between monthly stock returns and measures of illiquity obtained from intraday data. They found a significant return premium associated with both the fixed and variable elements of the cost of transacting. The relation between the premium and the variable cost was concave, which is consistent with clientele effects caused by small traders concentrating in the less liquid stocks. However, the relation between the premium and the estimated fixed cost component was convex.

- Campbell, Lo and Mackinlay (1996) contains a chapter on market microstructure which covers nonsynchronous trading, the bid-ask spread and modelling transactions data.

- Hasbrouck (1996) provided an overview of the various approaches to modelling microstructure time series.

- Spulber (1996) considers market microstructure and intermediation.

- Amihud, Mendelson and Lauterbach (1997) showed that improvements in market microstructure are valuable. Specifically, they found that stocks that were transferred to a more efficient trading method in the Tel Aviv Stock Exchange enjoyed significant and permanent price increases.

- Spulber (1999) wrote *Market Microstructure: Intermediaries and the Theory of the Firm*, which presents a theory of the firm based on its economic role as an intermediary between customers and suppliers. He applies the term 'market microstructure' generically to refer to the operation of markets for all types of goods and services.

- MacKinnon and Nemiroff (1999) examined the effect of the move to decimalization by the Toronto Stock Exchange and found an unambiguous gain to investors. Effective spreads decreased significantly, yet price impact was unaffected, thus reducing transaction costs, and there was an increase in trading activity.

- Madhavan (2000) reviewed the theoretical, empirical and experimental literature on market microstructure relating to (1) price formation, (2) market structure and design, (3) transparency and (4) applications to other areas of finance.

- Kauffman and Wang (2001) studied the dynamics of an instance of dynamic pricing—group-buying discounts—used by MobShop.com, whose products' selling prices drop as more buyers place their orders. They found a positive *participation externality effect*, a *price drop effect* and a significant *ending effect*.

- Muscarella and Piwowar (2001) studied a sample of Paris Bourse stocks that were transferred between call trading and continuous trading. They found that frequently-traded stocks that are transferred from call trading to continuous trading experience, on average, liquidity improvements that are positively associated with price appreciation; and infrequently-traded stocks that are transferred from continuous trading to call trading experience price and liquidity declines.

- Cheung and Chinn (2001) reported findings from a survey of United States foreign exchange traders. They found that (i) in recent years electronically-brokered transactions have risen substantially, mostly at the expense of traditional brokers; (ii) the market norm is an important determinant of interbank bid-ask spread and the most widely-cited reason for deviating from the conventional bid–ask spread is a thin/hectic market; (iii) half or more of market respondents believe that large players dominate in the dollar–pound and dollar–Swiss franc markets; and (iv) exchange rate predictability is viewed as fairly low (surprisingly, there is little variation in the proportion of traders who hold this view over the various horizons—from intraday to over six months).

- Hasbrouck (2002) provided an overview of econometric approaches to characterizing the random-walk component in single- and multiple-price settings.

- Larry Harris published *Trading and Exchanges: Market Microstructure for Practitioners* (Harris 2002), an excellent book about trading, the people who trade securities and contracts, the marketplaces where they trade and the rules that govern it.

- Dominguez (2003) explored whether aspects of market microstructure influence the effectiveness of central bank intervention. Her results indicated that some traders typically know that the Fed is intervening at least 1 hour prior to the Reuters' report that a central bank is intervening, and the effects of interventions generally persist, at least to the end of the day. There was evidence of mean reversion in returns subsequent to Fed interventions particularly in the USD–DEM market, suggesting some initial over-reaction by the market. Also, the evidence suggested that the timing

of intervention operations matters—interventions that occur during heavy trading volume, that are closely timed to scheduled macro announcements, and that are coordinated with another central bank are the most likely to have large effects.

- In an excellent review paper, Biais, Glosten and Spatt (2005) surveyed the literature analyzing the price formation and trading process, and the consequences of market organization for price discovery and welfare.

- Aït-Sahalia, Mykland and Zhang (2005) consider the question of how often to sample a continuous-time process in the presence of market microstructure noise, and their answer is: model the noise and sample as often as possible.

- Hansen and Lunde (2006) analyzed the properties of market microstructure noise and its influence on empirical measures of volatility, and examined a simple bias correction of the realized variance. An empirical analysis of the 30 stocks that comprise the Dow Jones Industrial Average revealed that market microstructure noise is (1) time-dependent and (2) correlated with increments in the efficient price. The results were established for both transaction data and quotation data and were found to hold for intraday returns that are based on both calendar-time sampling and tick-time sampling.

- Hasbrouck (2006) published *Empirical Market Microstructure: The Institutions, Economics, and Econometrics of Securities Trading*, the first integrated introduction to the most important models of empirical market microstructure.

References

AÏT-SAHALIA, Yacine, Per A. MYKLAND, and Lan ZHANG, 2005. How often to sample a continuous-time process in the presence of market microstructure noise. *Review of Financial Studies*, **18**(2), 351–416.

ALLEN, Franklin, and Gary GORTON, 1992. Stock price manipulation, market microstructure and asymmetric information. *European Economic Review*, **36**(2–3), 624–630.

AMIHUD, Yakov, Haim MENDELSON, and Beni LAUTERBACH, 1997. Market microstructure and securities values: Evidence from the Tel Aviv Stock Exchange. *Journal of Financial Economics*, **45**(3), 365–390.

AMIHUD, Yakov, Haim MENDELSON, and Maurizio MURGIA, 1990. Stock market microstructure and return volatility: Evidence from Italy. *Journal of Banking & Finance*, **14**(2–3), 423–440.

BIAIS, Bruno, Larry GLOSTEN, and Chester SPATT, 2005. Market microstructure: A survey of microfoundations, empirical results, and policy implications. *Journal of Financial Markets*, **8**(2), 217–264.

BOSSAERTS, Peter, and Pierre HILLION, 1991. Market microstructure effects of government intervention in the foreign exchange market. *The Review of Financial Studies*, **4**(3), 513–541.

BRENNAN, Michael J., and Avanidhar SUBRAHMANYAM, 1996. Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. *Journal of Financial Economics*, **41**(3), 441–464.

CAMPBELL, John Y., Andrew W. LO, and A. Craig MACKINLAY, 1996. *The Econometrics of Financial Markets*. Princeton, New Jersey: Princeton University Press.

CHEUNG, Yin-Wong, and Menzie David CHINN, 2001. Currency traders and exchange rate dynamics: A survey of the US market. *Journal of International Money and Finance*, **20**(4), 439–471.

DOMINGUEZ, Kathryn M. E., 2003. The market microstructure of central bank intervention. *Journal of International Economics*, **59**(1), 25–45.

DUBOFSKY, David A., 1992. A market microstructure explanation of ex-day abnormal returns. *Financial Management*, **21**(4), 32–43.

GARMAN, Mark B., 1976. Market microstructure. *Journal of Financial Economics*, **3**(3), 257–275.

HANSEN, Peter R., and Asger LUNDE, 2006. Realized variance and market microstructure noise. *Journal of Business & Economic Statistics*, **24**(2), 127–161.

HARRIS, Larry, 2002. *Trading and Exchanges: Market Microstructure for Practitioners*. Financial Management Association Survey and Synthesis Series. New York, USA: Oxford University Press.

HASBROUCK, Joel, 1996. Modeling market microstructure time series. *In*: G. S. MADDALA and C. R. RAO, eds. *Handbook of Statistics 14: Statistical Methods in Finance*. Amsterdam, The Netherlands: North-Holland, Chapter 22, pp. 647–692.

HASBROUCK, Joel, 2002. Stalking the "efficient price" in market microstructure specifications: An overview. *Journal of Financial Markets*, **5**(3), 329–339.

HASBROUCK, Joel, 2006. *Empirical Market Microstructure: The Institutions, Economics, and Econometrics of Securities Trading*. New York, USA: Oxford University Press.

HUANG, Roger D., and Hans R. STOLL, 1994. Market microstructure and stock return predictions. *The Review of Financial Studies*, **7**(1), 179–213.

KAUFFMAN, Robert J., and Bin WANG, 2001. New buyers' arrival under dynamic pricing market microstructure: The case of group-buying discounts on the internet. *Journal of Management Information Systems*, **18**(2), 157–188.

LEASE, Ronald C., Ronald W. MASULIS, and John R. PAGE, 1991. An investigation of market microstructure impacts on event study returns. *The Journal of Finance*, **46**(4), 1523–1536.

LOUGHRAN, Tim, 1993. NYSE vs NASDAQ returns: Market microstructure or the poor performance of initial public offerings? *Journal of Financial Economics*, **33**(2), 241–260.

MACKINNON, Greg, and Howard NEMIROFF, 1999. Liquidity and tick size: Does decimalization matter? *Journal of Financial Research*, **22**(3), 287–299.

MADHAVAN, Ananth, 2000. Market microstructure: A survey. *Journal of Financial Markets*, **3**(3), 205–258.

MORSE, Dale, and Neal USHMAN, 1983. The effect of information announcements on the market microstructure. *The Accounting Review*, **58**(2), 247–258.

MUSCARELLA, Chris J., and Michael S. PIWOWAR, 2001. Market microstructure and securities values: Evidence from the Paris Bourse. *Journal of Financial Markets*, **4**(3), 209–229.

O'HARA, Maureen, 1995. *Market Microstructure Theory*. Blackwell Publishing Ltd.

PARK, Jinwoo, 1995. A market microstructure explanation for predictable variations in stock returns following large price changes. *The Journal of Financial and Quantitative Analysis*, **30**(2), 241–256.

REINGANUM, Marc R., 1990. Market microstructure and asset pricing: An empirical investigation of NYSE and NASDAQ securities. *Journal of Financial Economics*, **28**(1–2), 127–147.

SPULBER, Daniel F., 1996. Market microstructure and intermediation. *The Journal of Economic Perspectives*, **10**(3), 135–152.

SPULBER, Daniel F., 1999. *Market Microstructure: Intermediaries and the Theory of the Firm*. Cambridge, UK: Cambridge University Press.

WANG, Ko, *et al.*, 1995. Market microstructure and real estate returns. *Real Estate Economics*, **23**(1), 85–100.