Diversification of Stock Exchange Trading Platforms

Takeshi Inoue

I. Competition among exchanges intensifies

In Europe and the US, the rapid development of computers and information/ communications technology has laid the groundwork for the emergence of a varied mix of transaction services, including ECN (Electronic Communication Networks) and MTF (Multilateral Trading Facility), and this process has increasingly intensified the competition between markets to capture securities trading orders.

The demand for these types of services continues to grow in step with the increase in trust funds, pension funds, hedge funds, and other institutional investors that need to execute a large volume of orders as a part of their daily operations. Because many of these institutional investors trade with a high degree of frequency and have a strong need to make passive orders with their index-linked investments, they have a very keen interest in not only the fundamental investment value of securities but also in market liquidity and execution costs -- the impact that its own orders have on the price of a security.

Within this environment, securities exchanges in Europe and the US have continuously experimented with a variety of reforms aimed at attracting transactions to their own markets, including providing more diverse ways to order and trade and increasing the speed at which transactions are executed.

This report takes a broad look at those reforms related to the diversification of exchange-trading methods that securities exchanges in Europe and the US have been pursuing in recent years.

II. Diversification of trading platforms

1. Types of trading platforms and their characteristics

Trading systems on an organized stock exchange can be classified, based on differences in the process by which the price is determined (price discovery), as either order driven or quote driven.

Under order-driven trading, both sell orders and buy orders are gathered together in a ledger, known as the limit order book," and these sell and buy orders, coded with a price and a volume, are matched up with each other in accordance with a given set of rules[1] to create trades. In contrast, under quote-driven trading, a securities trader known as a market maker announces a selling and buying price for a security, and investors enter into a transaction with that trader based on that price.[2]

Another way to classify trading systems is by how the order is processed, and these can be classified as either continuous trading, in which each order is processed immediately, or call market trading, in which the orders are pooled and batch processed at a predetermined interval. The primary trading technologies used at most exchanges during normal trading hours are either order-driven trading with continuous order processing (known as continuous auction trading) or quote-driven trading with continuous processing (known as the market maker system).

The continuous auction method is an efficient mechanism that provides numerous opportunities to execute trades, narrow spreads, and low costs. This method does have some drawbacks, however, in that because it directly matches sell orders with buy orders, when the market develops a substantial imbalance of supply-demand, prices can become extremely volatile and there can be a dramatic decline in opportunities to execute trades in stocks with low liquidity. Furthermore, because of the high degree of market transparency, large-lot trades have a greater market impact.

Under the market maker system, since the market maker always has indicated a quoted price at which he is obligated to buy and a price at which he is obligated to sell, transactions are immediate, and since a market maker who is thoroughly knowledgeable in the stock participates in its price formation, there is less price volatility. There are also problems with this method, however: transaction costs are

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1 These are normally processed in order according to price and time priority. In other words, from among the buy orders bidding the highest price and the sell orders asking the lowest, trades are matched and executed starting with the first ones received.

2 The order-driven system is translated into Japanese as *chuumon kudou houshiki*, and the quote-driven system as *kehai kudou houshiki*.

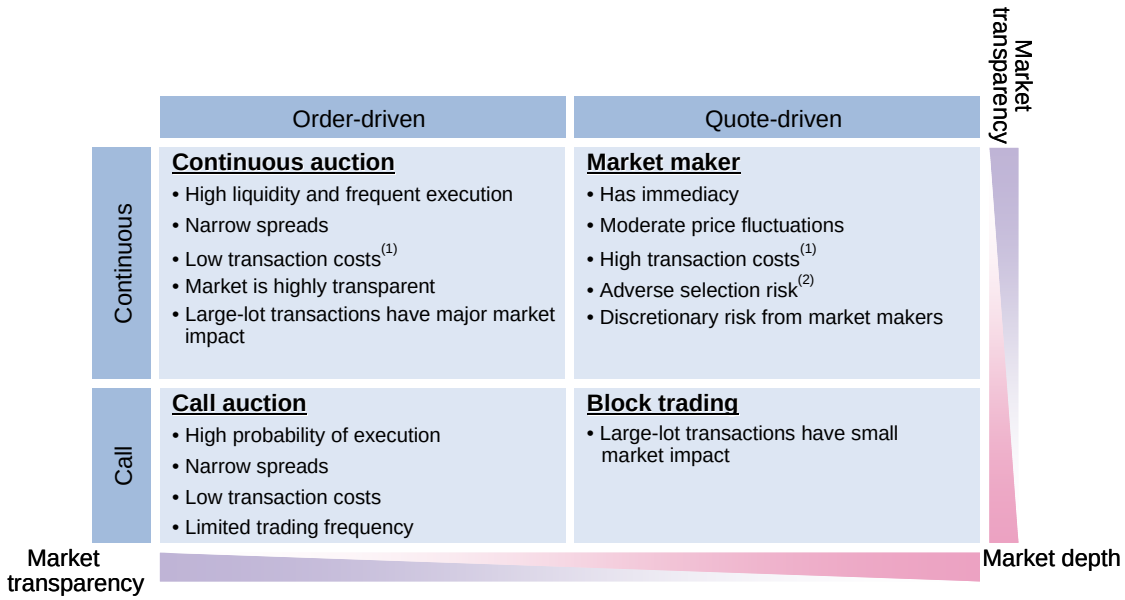
higher owing to personnel and other administrative costs as well as to the need for the market maker to cover his risk with the buy-sell spread; the quoted prices tend to be disadvantageous to the customer, depending on the competition that exists among market makers; and when a major imbalance in market supply-demand arises, there is a risk of the market maker leaving the market.

Based on these differences, it is generally thought that order-driven trading works best for reasonably liquid stocks and the market maker system works best for stocks with low-liquidity.

Under continuous auction trading, it is normally the case that a call auction is used at both the opening and closing of normal trading hours. In a call auction, the probability of an execution is high because orders are accumulated over a set period of time, and since price formation reflects a large amount of information and the judgment of many investors, spreads are smaller. In other words, this method makes it possible to raise the probability of executing a trade and lower the transaction cost, based on the lower transaction frequency.

In addition to these, other trading systems, mostly used to execute large orders, include block trades and cross trades. Under these systems, a trade is executed at a predetermined price within a specified period of time. Both systems could be considered close to quote-driven trading, and also similar to the call market, which batch processes at a predetermined time.

Figure 1 Various trading systems



Notes: 1) Administrative costs, including personnel costs per trade.
2) When there are large market fluctuations, there is a risk that the market maker will either widen spreads to avoid the risk of asymmetric information or stop quoting prices.

Source: Nomura Institute of Capital Markets Research

2. Moves toward diversifying trading platforms

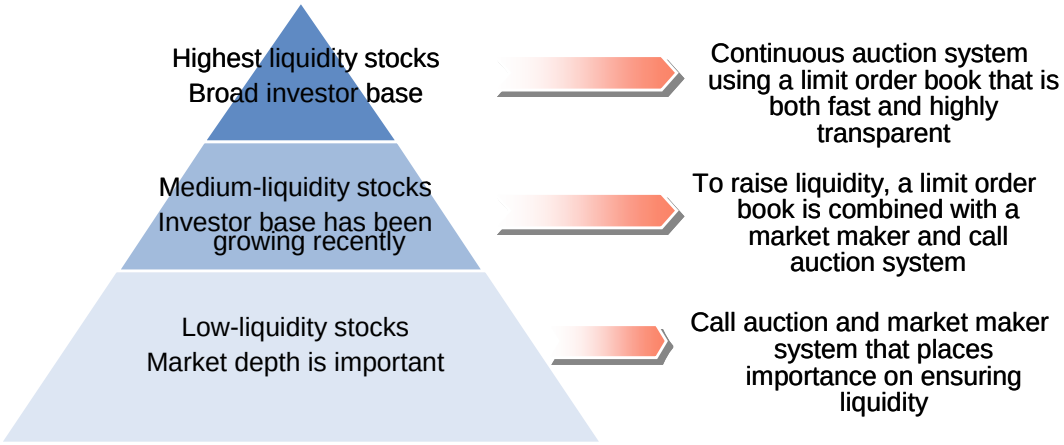
In the past, it was possible to compare the trading systems used by each of the markets, noting that markets in the UK and US used quote-driven trading, while markets on the European continent, in Asia, and elsewhere employed order-driven trading. In recent years, however, there has been a growing trend, primarily in securities exchanges in Europe and the US, to use both methods, thereby making it impossible to classify methodology in this way.

In markets in the UK and US, both oriented toward the market maker system, there has been a pronounced trend toward the use of electronic, order-driven trading capable of quickly processing a large volume of orders for highly liquid stocks frequently traded by institutional investors. Meanwhile, markets on the European continent, where trading of mid-range to low-liquidity stocks is not that active, are experimenting with the introduction of trading platforms that incorporate elements of the market maker system. Even more recently, it has not only become difficult to distinguish market based on their use of quote-driven versus market-maker systems, a growing number of exchanges are using a new hybrid trading system that incorporates features of both.

Likely reasons behind this development are the growth in stock markets and the intensifying competition between exchanges. As the base of listed companies and investors has become increasingly broad, it has also become possible to divide markets into several stock categories based on differences in share liquidity and their primary investors. Within this context, exchanges are implementing the optimal trading system for each grouping of stock, thereby making it possible to further increase the liquidity of the market overall, compared with using a single trading system for all transactions.

Meanwhile, new market entrants such as ECN and Crossing Network are targeting specific niches (including the most liquid group of stocks and transactions by institutional investors) and developing leading-edge trading systems and services, and this has enabled them to capture market share (of trading orders) from the exchanges. It has now become necessary for the exchanges, in order to keep from losing even more transactions, to fight back by upgrading their trading technology and offering a more complete set of services.

Figure 2 Trading method and market segmentation



Source: Nomura Institute of Capital Markets Research

III. The introduction of hybrid systems

1. SETSmm at the London Stock Exchange

Two different approaches to introducing a hybrid trading system have been observed, one that adds a market maker to an order-driven system, and the other that adds auction elements to a quote-driven system.

The former is primarily seen in the European stock exchanges, where a system of continuous auctioning during normal trading hours combined with a call auction at market open and market close has added to it a market maker that is obliged to provide liquidity to the market by continuously submitting both buy and sell orders. This system, implemented in order to compensate for the weaknesses of order-driven trading, which does not function well with low-liquidity stocks, is primarily targeted at stocks with mid-level liquidity that are experiencing a gradual increase in their investor base.

A classic example of this is the SETS Market Maker (SETSmm) system at the London Stock Exchange (LSE). Although SETSmm is an order-driven trading system that uses a limit order book, a market maker with the obligation of supplying market liquidity by regularly submitting both buy and sell orders has been assigned to every stock.

The LSE originally used a quote-driven trading system known as Stock Exchange Automated Quotation (SEAQ) for all trades on the exchange, but since the introduction in 1997 of the Stock Exchange Trading Service (SETS), an order-driven trading system that uses a limit order book, trading in high-liquidity stocks has gravitated to order-driven trading. SETS was apparently introduced in response to complaints that the quotes posted by market makers did not reflect the market reality and to demands for a more efficient trading system for high-liquidity stocks. Accordingly, in this vein, the reforms implemented by the LSE can be viewed as adding order-driven technology to a quote-driven system.

The SETSmm hybrid trading system was introduced in November 2003 as the successor to SEAQ Cross, a cross trading system that used a limit order book within the SEAQ framework for trading stocks of relatively high liquidity. Since then, this trading system has grown to encompass primarily stocks of mid-range liquidity. In 2005, roughly another 360 stocks began trading on SETSmm, including FTSE small- and mid-cap stocks as well as constituents of the AIM 50 index, bringing the total to 577 stocks as of December 16, 2005.

Market makers on the SETSmm are exchange-designated broker/dealers (specialists) who are obligated to adhere to maximum buy-sell spreads and minimum trading order volumes.[3] Additionally, orders submitted by market makers based on their obligation to supply liquidity are committed principal orders that cannot be canceled, and the name of the person submitting the order is displayed in the limit order book (Figure 3).

Figure 3 Screen shot from SETSmm

Source: Compiled by Nomura Institute of Capital Markets Research, based on LSE materials.

2. The liquidity provider system in continental exchanges

Although the hybrid trading system used in Euronext, the Deutsche Borse, and other exchanges on the European continent is the same as the LSE's SETSmm in the sense that it is an order-driven system to which a liquidity providing market maker is added, it is also quite different in that the issuer of the stock determines who the market maker will be.

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3 SETSmm has four platforms, STMM for mid-cap stocks, SSMM for all stocks but mid-caps, SSMU for receivables on goods, and ETF, and the maximum spreads and minimum trading volumes required of the market maker are set for each. In the STMM, for example, the maximum spread is either 5% of the closing price of the previous day or the larger of either 10% of the closing price of the previous day or 3 pence, while the minimum size order is one-fourth of the normal market size (NMS). The NMS, an index that is calculated quarterly by the exchange in order to show the liquidity of each stock, is used to determine the minimum trading unit required of the market maker. The formula for calculating NMS = (Total trading value for past 12 months) / (number of business days x the closing price of the previous month) x 2.5%.

On the Deutsche Borse and Euronext, listed stocks are assessed periodically according to liquidity indices[4] set by the exchanges, and if a stock does not meet certain standards, it is placed in a category of stock that are only traded via a call auction once or twice a day. Nevertheless, at the option of the issuer, the system allows for even a low-liquidity stock to be traded continuously if a liquidity-supplying market maker[5] is used.

As on the LSE, the market maker must have a designation from the respective exchange and is therefore obligated to adhere to certain standards in terms of buy-sell spreads, minimum order sizes, and rate of participation in transactions.[6] Market makers are also evaluated periodically for their performance in supplying liquidity, and if they fall below a given grade without subsequent improvement, they can lose their exchange designation.

One distinguishing feature of the hybrid system as used on the European continent is that the market maker signs an agreement with the issuer concerning the supply of liquidity and earns commissions from the issuer.[7] The exchange has absolutely no involvement in this agreement, which is treated as a contract between only the issuer and the market maker. The terms of the agreement need only satisfy the minimum obligations of the market maker as established by the exchange. It is thus possible, for example, for the parties to agree upon higher commissions based upon meeting more strict liquidity supply hurdles.

Since the market maker working within a hybrid system must also compete with limit orders, it is difficult to recover costs through spreads in the same manner as in a straight market maker system. On the other hand, the risks remain large because of the trading obligations. Because of this, some sort of incentive is required. The exchange does not charge the market maker any commissions for orders related to market-making activity, but beyond that does not offer the market maker any incentives.

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4 On the Deutsche Borse, the indicator used to evaluate the liquidity of listed stocks is the XLM (Xetra Liquidity Measure). Stocks that have either an XLM evaluated quarterly that fails to meet a certain standard or an average daily trading value that falls below an average for the quarter of 2.5 million euros are given a liquidity category of B, designated as stocks to be traded once a day through a call auction, and excluded from the major indices. In Euronext, the established standard is a trading turnover of at least 2500x per year.

5 This is called a designated sponsor on the Deutsche Borse and a liquidity provider on Euronext.

6 On the Deutsche Borse, the maximum spread (between 2% and 10%) and the minimum order volume (between 5000 and 20,000 shares) are determined by the stock's liquidity and share price. Furthermore, a minimum transaction participation rate (50% for continuous trading and 80-90% for call auction trading) is also specified. Euronext also sets its maximum spread (4-5%) and minimum order volume (3000-10,000 euros) according to the stock's liquidity.

7 On both the Deutsche Borse and Euronext, the market maker earns commissions from the issuer of 15,000 to 20,000 euros annually.

The fundamental concept underlying this system is that the issuer should have responsibility for ensuring the liquidity of its stock. This is because the exchanges, which are now for-profit corporations, would have trouble justifying from a business perspective the additional cost of providing incentives for low-liquidity stocks, which are not very profitable to begin with.

It appears that market makers are providing market-making services aimed at earning direct economic profit by attracting off-market transactions as well as business from issuers, separate and apart from the commissions paid by issuers.

3. A shift toward hybrid trading in the US

A classic example of the shift from a quote-driven to a hybrid system is SuperMontage, the new system introduced by NASDAQ in 2004. In addition to quotes from market makers, the new system also includes quotes and order information from ECN, other exchanges, and even regular brokers and dealers, providing an integrated display similar to the limit order book in an order-driven system. This could be viewed as a transition to a de facto order-driven system that still retains the features of a market maker system. New order handling rules implemented in 1997 as a response to suspicions of collusion among market makers at NASDAQ led to market makers routing all customer orders that were more favorable than their own quotes to ECN, causing a substantial reduction in NASDAQ's share of trading in NASDAQ-listed stocks.[8] SuperMontage was introduced to make price formation and trading of highly liquid stocks on NASDAQ as efficient as that of ECN and other order-driven systems. Furthermore, since 2004 NASDAQ has had call auction trading, which is normally used for the opening and closing on an order-driven system.

Meanwhile, the New York Stock Exchange (NYSE), which has elements of quote-driven trading through the use of specialists as go-betweens, introduced NYSE Direct+, a system that automatically executes small orders at the optimal price, and plans to expand functionality of that system moving forward by abolishing limits on order volume, offering opportunities to improve prices, and increasing the number of order types.

[8] A paper by Professors Christy (Vanderbilt University) and Shultz (Ohio State University) published in 1994 found that in most cases, the spread on the market maker's best quote is not the tick size of $1/8 but rather $1/4, and this generated suspicion that market makers colluded to ensure that odd-numbered quotes (3/8 and 5/8) were not submitted. For details, see Sadakazu Osaki, Kabushiki *Shijo kan Kyousou* (Competition between stock markets) Diamond Publishing, 2000.

IV. Status of the major exchanges

We looked above at the reforms recently implemented at the major exchanges in Europe and the US. Figure 4, a look at the differences in trading systems used by the world's major exchanges, shows that a variety of trading technologies have been introduced in Europe and the US, where competition among the exchanges has been heating up. This stands in contrast with the Asia-Pacific region, where there has not been much in the way of competition between exchanges thus far and where nearly every exchange uses an order-driven system exclusively.[9]

Figure 5 shows the relationship between trading methods and market segmentation at the major exchanges. For years now, the exchanges have used market segmentation either to expand their base of listed companies without harming the quality image of their blue-chip companies, or to raise investor awareness of lower-tier companies and improve the liquidity of the overall market.

In the process of diversifying trading platforms over the last few years, in some cases trading systems were tied to the existing market segments and in others the market was newly segmented based on differences in trading systems.

For example, it is possible to categorize stocks trading on the LSE as either UK-listed stocks, international listed stocks, or AIM (alternative investment market) stocks,[10] based on their national origin and listing regime, but apart from this stocks can be assigned to a total of eight market segments based on differences in trading systems and differences in the stock's national origin.[11] Accordingly, AIM stocks are

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9 The Korea Exchange (KRX) introduced a liquidity provider system from January 2, 2006. Under this system, which borrows from the systems used on the European exchanges, the issuers and the securities companies sign a liquidity provision agreement. When the spread between buy orders and sell orders in the limit order book exceeds 3% during normal trading hours, the liquidity provider is obligated to issue within 5 minutes a certain volume of orders for both buy and sell.

10 With the segmenting of the market in 1995, this market was overseen by the LSE, which used a registration with relaxed standards rather than a formal listing subject to review by the UK Listing Authority, the body charged with reviewing listings in the UK.

11 The eight market segments are (1) SETS (Stock Exchange Trading Service), using the continuous auction method; (2) SETSmm (SETS Market Maker), using a hybrid system that combines a market maker with a continuous auction; (3) SEAQ (Stock Exchange Automated Quotations), using a market maker system; (4) SEATSPlus (Stock Exchange Alternative Trading System), using a hybrid system that uses a market maker in parallel with a continuous auction; (5) EUROSETS, which is for Dutch stocks on a continuous auction system; (6) IOB (International Order Book), using either a continuous auction or thrice daily call auctions to trade depositary receipts on foreign shares; (7) IBB (International Bulletin Board), using either a hybrid system like that of SETSmm or a thrice daily call auction to trade foreign shares; and (8) IRS (International Retails Service), using a market maker system to trade major European and US stocks.

traded across multiple segments, depending on which of eight categories of trading systems applies.

Figure 4 Trading methods on the major stock exchanges

	Name of exchange	Trading method	Market maker
North America	New York Stock Exchange	Hybrid (2)	Yes
	NASDAQ Stock Market	Hybrid (3)	Yes
	Archipelago Exchange	Hybrid	Yes
	Toronto Stock Exchange	Hybrid	Yes
Europe	London Stock Exchange	Order-driven/hybrid/quote-driven	Yes
	Euronext	Hybrid/quote-driven	Yes
	Deutsche Borse	Hybrid	Yes
	Borsa Italiana	Order-driven/hybrid	Yes
	SWX Swiss Exchange	Order-driven/hybrid	Yes
	OMX		
	Copenhagen Stock Exchange (Denmark)	Order-driven/hybrid	Yes
	Stockholm Stock Exchange (Sweden)	Hybrid	Yes
	Helsinki Stock Exchange (Finland)	Hybrid	Yes
	Tallinn Stock Exchange (Estonia)	Hybrid	Yes
	Riga Stock Exchange (Latvia)	Hybrid	Yes
	Vilnius Stock Exchange (Lithuania)	Order-driven	Yes
Asia	Tokyo Stock Exchange	Order-driven	
	Osaka Stock Exchange	Order-driven	
	JASDAQ Securities Exchange	Order-driven/quote-driven	Yes
	Australian Stock Exchange	Order-driven	
	Hong Kong Exchanges and Clearing	Order-driven/hybrid	Yes
	Korea Exchange	Order-driven/hybrid	Yes
	Singapore Exchange	Order-driven	
	Taiwan Stock Exchange	Order-driven	

Notes: 1) Hybrid denotes a combination of a limit order book with a market maker.
2) The NYSE uses a specialist to manage the limit order book. For small-lot orders, NYSE Direct+ automatically executes the best quote.
3) NASDAQ provides an integrated display of quotes from the market maker, ECN, and exchanges. For market opening and market close, a call auction is used.

Source: Nomura Institute of Capital Markets Research

Figure 5 Market segmentation and trading systems at the major exchanges

	Limit order book only	Uses multiple platforms and/or hybrid system
Market segmentation	Hong Kong Stock Exchange (2) Singapore Stock Exchange Tokyo Stock Exchange Osaka Stock Exchange	NASDAQ (3) Archipelago Exchange Toronto stock exchange London Stock Exchange Euronext (4) Deutsche Borse (5) Italy Stock Exchange Swiss Stock Exchange OMX (except Riga Stock Exchange) Korea Stock Exchange
Does not segment market	Australia Stock Exchange Taiwan Stock Exchange	New York Stock Exchange(6) JASDAQ Stock Exchange

Notes:
1) Market segmentation here refers both to traditional segmentation based on a stock's market cap and number of investors as well segmentation based on liquidity aimed at applying different trading systems.
2) The Pilot Program trading US equities and ETF uses a market maker.
3) Quotes from the market maker, the ECN, and the exchange are integrated into a single display. A call auction is used at market opening and market close.
4) No market maker is assigned to the stocks comprising the Euronext 100 index.
5) There is no need for a market maker for high-liquidity stocks.
6) A specialist manages the limit order book, and also supplies liquidity in response to continuous pricing conditions.

Source: Nomura Institute of Capital Markets Research

V. Status in Japan

In Japan, most exchanges have established multiple market segments, but none of the exchanges employ different trading systems for different segments. Even in the JASDAQ, Japan's only securities exchange using the market maker system, there has been no policy up until recently of tying market segments to the trading system.[12]

In Japan, competition between markets has begun to emerge over startup companies and small and midsize companies. This competition has tended to emphasize listing standards, the simplicity of listing procedures, and share price trends following listing. Nevertheless, it seems fairly certain that indicators of market liquidity such as trading volume, bid/offer spreads, and share price volatility are

12 A system was implemented in 2004 that required use of a market maker for the first year of listing when trading newly listed shares with less than 600 shareholders. This change came close to compelling the use of a market maker system for trading shares considered to have low liquidity. Nevertheless, 600 shareholders at the time of the IPO is not that high of a hurdle to meet, and it is conceivable that the market could be segmented by liquidity and tied to trading systems by raising the hurdle or by applying the standards to existing listed companies.

critical factors to the further development of markets away from a focus on individual investors to a broader investor base that includes institutional investors.

Also conceivable, as is the case in exchanges in Europe and the US, is that Japanese markets will use different trading systems for each market segment and otherwise implement trading mechanisms that are optimized to the stocks' characteristics with the aim of increasing market liquidity.