# Preface to the Focus Theme Section: 'Financial Market Engineering'

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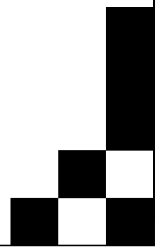

Tremendous changes are occurring in financial markets and trading organizations as a result of technology developments. These advances in IT have created significant opportunities for economies of scale, reduced transaction costs, and enhanced trading liquidity. New market systems also create major risks for exchanges and their operators stemming as a result of competitive forces unleashed by open, global markets and real-time access. For instance, in the foreign exchange market, sophisticated traders found technological loopholes to exploit the available pricing systems in the market. Deutsche Bank, one of the largest participants in FX, found that it had to turn away 10% of its overall flows in 2005 after discovering such 'system arbitrage' taking place through its market systems. Other market technologies have simply fail the adoption test, and do not attract sufficient order flows to remain in operations. Optimark in the US and Jiway in Europe were major market systems launched in the late 1990s that failed.

Poorly designed trading venues create the risk of losses, of erosion of liquidity, and reduction in customers and 'market share'. Traditionally, trial-and-error has been the preferred, although hazardous, approach for designing trading venues. This special issue addresses the need for a more conscious design process. Financial Market Engineering is an engineering approach to market structure that is needed to help market operators exploit the opportunities for IT-enabled markets while minimizing the risk of failure.

As this focus theme section will explore, successful design of a trading venue requires that the trading rules (i.e., the 'microstructure'), the technical infrastructure, and the market's governance form come together to form a solution that leads to adoption and growth in volumes. Engineering questions to address for each of these three areas are:

- Microstructure – What auction or other negotiation protocol serves in the interest of participants? Which protocols are innovative and applicable?
- Infrastructure – How can the market protocols be implemented in a decentralized, highly scalable IT architecture? What technologies should be used? Which capacity and functionality demands have the highest priority?
- Business governance structure – Who controls the market as an organization, and enhances its


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financial performance? What are the promising revenue models? Which services should be offered to whom at what price?

Since the outcomes from configuring these three dimensions today are still imperfectly understood, designing markets remains a challenging task. The approach of market engineering proposes that the design of electronic markets be approached holistically. Holistically means that all areas of the design – the microstructure, the infrastructure as well as the business structure – are simultaneously considered. The configuration of these different dimensions of a market is guided by a structured engineering process. We suggest that market designers decompose the entire design task into smaller pieces, and then integrate the results into whole architectures that can be tested, with the best one being implemented.

As an emerging topic area, we welcomed submissions relating to all areas of engineering financial markets ranging from the trading rules, to the infrastructure, to business models, as well as methods, process models or tools that empirically test markets or trading designs. We are encouraging an integrated interdisciplinary view of market engineering that fosters the configuration of sustainable, customer-oriented electronic markets. The fields of microeconomics, behavioural economics, computer science, and information systems are all capable of contributing to the optimal design of markets.

The relevant topic areas for market engineering include:

- Best Execution – What do we want from our markets?
- Innovative Products, Trading Mechanisms, and Services for Electronic Markets;
- Performance of market platforms;
- Auction and matching techniques;
- Models, methods, and tools for financial market engineering; and
- Integrating mechanisms for multiple market modalities.

From this initial grounding, list of topics, and call for papers, we received interesting papers from which we selected the best four papers to showcase the topic and to suggest future research on market engineering.

The first paper, 'Volume Discovery: Leveraging liquidity in the depth of an order driven market.' presents ideas and a design for a 'volume discovery' market model to be used by institutional block traders. The model is promising and a 'test of concept' demonstration shows is a good fit with the market's needs. Ultimately, the market model for size discovery will be tested for its feasibility (will it be adopted) and desirability (will it improve market quality) in the harsh and unforgiving world of real markets. The design looks promising.

The second paper, 'The Sensitivity of Effective Spread Estimates to Trade–Quote Matching Algorithms' addresses an important topic in the area of execution quality and transaction costs at stock exchanges. The contribution aims at providing a so-called 'optimal matching algorithm' to match trades and quotes as to determine effective spreads. The methodology takes the quote dissemination methods used on the Nasdaq Stock Market as given. It then presents the basic idea of the optimal matching algorithm for identifying the quotes that were in force and went along with a particular trade at a particular time. The authors show that a 5-second quote-to-trade rule leads to biased results. The 'optimal matching algorithm' uses delays between 1 and 2 seconds – at the time the authors studied the problem. In the future, as delays and latencies are further reduced, practical results should be possible from a 0-second rule.

The third paper is 'Engineering Multi-Attribute Double Auctions for Financial Markets.' It addresses a very relevant topic, the application of multi-attribute continuous double auctions for financial markets. With little economic theory available for multi-attribute auctions, the authors attempt to fill this vacuum by providing an engineering solution. They suggest solutions for matching and arbitrating that generalize from price-only auctions and apply some basic bargaining theory. In the design, bidders (buyers) or offerers (sellers) submit sets of products and attribute ranges. Attributes are linked to each other in ways that are expressed by indifference curves. Once submissions are aggregated, the discrete bids and offers are matched according to utility proxies. The result is a workable solution that may not appeal to economists that prefer to see auction equilibria derived and compared for their welfare contribution. The design is open to experiments to evaluate its design and demonstrate that it generates economic benefits.

The fourth and final paper, 'Dynamics of Market Liquidity of Tunisian Stocks: An Analysis of Market Resiliency' deals with the analysis of market resiliency in the Tunisian Stock Market. Most market-related work focuses on spread tightness and depth as the two main dimensions of liquidity. Market resiliency is often left out for reasons of data availability and methodological concerns. The authors investigate the dynamic behaviour and particularly the market resiliency of frequently traded stocks on the Tunisian stock exchange (BVMT). They introduce a standard Vector-Auto-Regressive (VAR) model to study the dynamic interaction between liquidity and volatility. Resiliency is then more thoroughly analysed by means of the impulse response function of the estimated VAR model. The paper explains the determination of the liquidity variables bid-ask spread and depth in terms of mid-quote return volatility, and estimates the VAR model for the group of frequently and infrequently traded stocks. The estimations show a significant interaction between the liquidity dimensions and volatility.

Significantly, volatility increases subsequent depth of buying interest only for frequently traded stocks, which may explain how frequently traded stocks can better absorb shocks better than infrequently ones. Another result is that quantities around the bid-ask spread are positively correlated, so that market sizes to buy and sell trend together, which is important to traders with large orders to fill. Future work can address whether these are peculiarities of the Tunisian market.

Overall, the papers presented show that market design must be informed by the reference knowledge about trader preferences, technology and the dynamic behaviour of the market. Using the results such as those presented here will guide market developers and lead to markets capable of adding greater value to their traders and users. On the path toward 'optimal' markets, market engineering has a long way to go, but it has made a strong start.