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Informed Trading *Vol.* 1

Toward Informed Equity Trading

We are pleased to introduce a new digest called *Informed Trading*, a vehicle for us to share our insights into equity trading with our user community. This series of market commentary pieces will highlight the underlying inputs and models driving Instinet's trading solutions. We will cover topics ranging from volume profile estimation to market impact models to advanced microstructure research. *Informed Trading, Vol. 1* previews some of the topics covered in this series.

Introduction: Unrelenting Market Evolution

Throughout the history of stock trading, regulation and technology have always driven the evolution of equity markets. Regulators pushed for level playing fields, and technology advancement gave competitive edges for those who innovate. This is true even in the current century in which the automation of trading and communication, coupled with regulatory changes in response to such advancement, has considerably altered the ways stocks are traded.

Focusing on the US market as an example, after the implementation of Reg. NMS and the proliferation of electronic trading by the late 2000s, we could have easily envisaged that equity trading had already become so mature as to leave little room for innovation. In reality, however, the equity trading space has continued to undergo remarkable changes. In the past few years:

- new dark pools have emerged, and some of them, most notably IEX, offer fierce competition to well-established incumbents [1], [2]
- fundamental market microstructure, such as minimum price variation and exchange pricing models, has come under regulatory review [3]–[6]
- exchanges have continued to create exotic order types, adding more complexity to trading [7], [8]

These changes have spurred greater interest in equity market microstructure among investors. In response, Instinet has increased and refined its focus on scientific analyses of trading data. We apply the outcomes to our trading algorithms, empowering our clients to make more informed decisions.

The goal of the *Informed Trading* series is to highlight our most salient findings and their applications to Instinet's trading products. *Volume 1* presents a preview of topics covered in forthcoming issues.[1]

Volume 2: The Three Pillars of Trading

In *Informed Trading, Vol. 2*, we will discuss the intraday profiles of volume, volatility, and bid-ask spreads used by the *Execution Experts*® platform. Most traders would agree that these are the three most essential quantities influencing trading decisions. In large part, the real-time values of volume, volatility, and bid-ask spreads determine the speed, risk, and market impact of an intraday order execution. Therefore, estimating or forecasting how these quantities might change within the trading day provides a foundation for designing all trading algorithms.

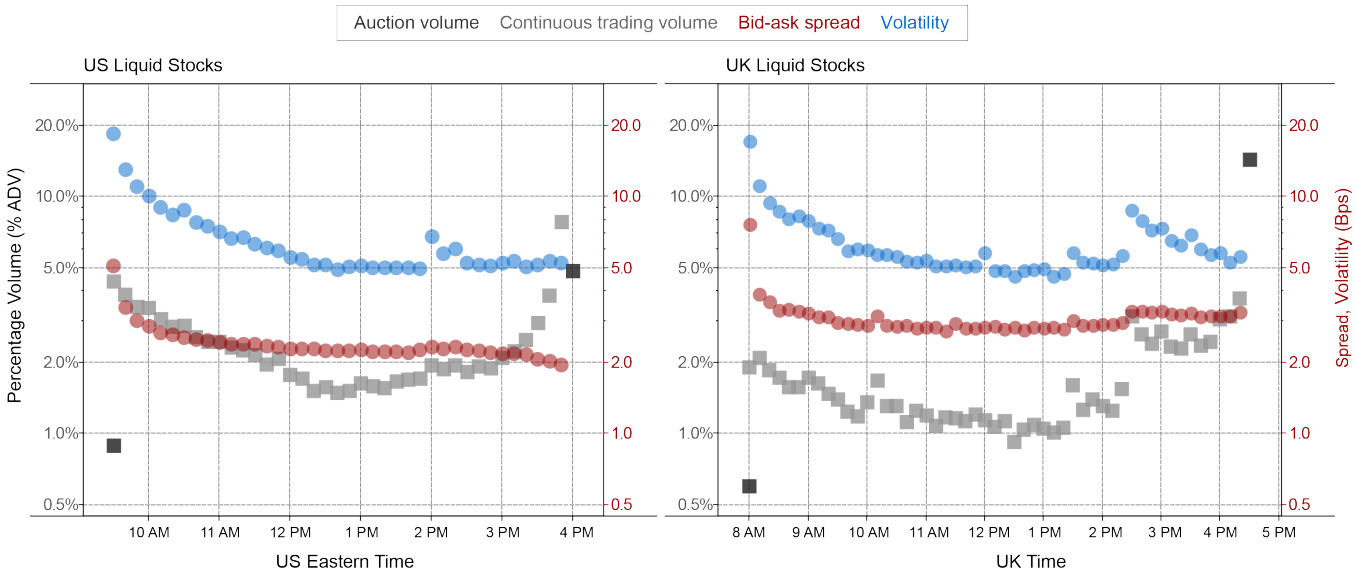
As a preview, Figure 1 presents some of the profiles for the US and UK markets, aggregated over the most liquid stocks in each market. As seen in the figure, the three profiles largely tally with one another; however, there are a few important distinctions. In the US market, for example, the volume increases steeply towards the market close, whereas the spread narrows concurrently, and volatility stays mostly unchanged. In addition, we can see a spike in the UK volume profile around 2:30 PM local time, which coincides with the opening of the US market and the related increase in UK trading.

Of greater interest to trading is the variation of these profiles over different market segments, as well as across days. Instinet updates these data on a daily basis, so our algorithms stay informed of the latest profiles of individual stocks. We will discuss how they affect trading behaviors in *Volume 2*, scheduled for July.

[1] *Publication dates and the order of topics may be subject to change.*

Figure 1. Intraday Volume, Volatility, and Spread Profiles

Intraday profiles of volume, volatility and spread for US and UK markets, aggregated over the most liquid stocks in each market. Volume profiles are displayed as the percentage volume in 10-minute buckets; opening and closing auctions are shown separately in black; UK mid-day auction volume is included in the continuous trading volume. Volatility is based on one-minute price returns and displayed in basis points. Spread, displayed in basis points, is the bid-ask spreads as a fraction to the mid-price.



Source: Instinet

Volume 3: Liquidity, Tick Size, and Trading Characteristics

With the tick pilot program scheduled to start in October 2016, the US market is set to change the universal one-cent tick schedule for the first time in more than a decade, experimenting with one of the most well-known features of the US equity market [9], [10]. In *Vol. 3*, scheduled for September, we will discuss the diverse trading characteristics of stocks and the influence of the stocks' liquidity and tick size.

Two stocks similar in company size and liquidity can trade in quite different ways, and they may exhibit very different volatility, bid-ask spreads, queue lengths, trade/quote frequency, and dark pool market share, among others. In recent years, a growing amount of academic literature has revealed that tick size has considerable effects on stocks' trading characteristics [11]–[13]. In particular, as tick size sets the base consideration for high-frequency market makers, liquidity provision characteristics are remarkably different for varied tick sizes.

Obviously, understanding a stock's trading characteristics is an important first step to tailoring trading tactics based on the stock type, which controls the cost of trading. It is crucial that we not only design algorithms cognizant of this knowledge, but also prepare ourselves for the tick pilot experiment.

Volume 4: Venue Toxicity

The proliferation of alternative trading venues, particularly in the US and Europe, has spurred a great deal of interest among investors about the nature of liquidity provided at various venues. Thus, there have been many studies in the trading industry focused on '*venue toxicity,*' which show the quality of passive fills at each venue. Although there is not necessarily a single definition of toxicity, we refer to the level of adverse selection as a venue's toxicity. Analyzing venues' toxicity helps us effectively strategize our trading destination selection.

In *Vol. 4*, scheduled for Fall 2016, we will compare adverse selection across various trading venues, including the regulated exchanges and dark pools. Toxicity generally varies significantly between venues, but we will show that the toxicity level strongly depends on the exchange's fee structure. We will discuss key factors determining adverse selection, and how we take advantage of this information to optimize our algorithms' destination selection.

Volume 5: Dark Pool Liquidity Profiles

To strategize our order routing even more effectively, we will analyze the *liquidity profile* of dark pools: what types of stocks are preferentially traded, how much adverse selection we incur, and how this may change in response to market volume and volatility.

As a preview, Figure 2 shows the historical ATS market share from May 2014 through Feb 2016. As various dark pools compete for liquidity, some have risen in the ranking while others have fallen. We keep a close eye on which dark pools have more liquidity and how this depends on the stock type. In addition to the toxicity analyses, dark pool liquidity profiles allow us to find the best liquidity for our customer orders.

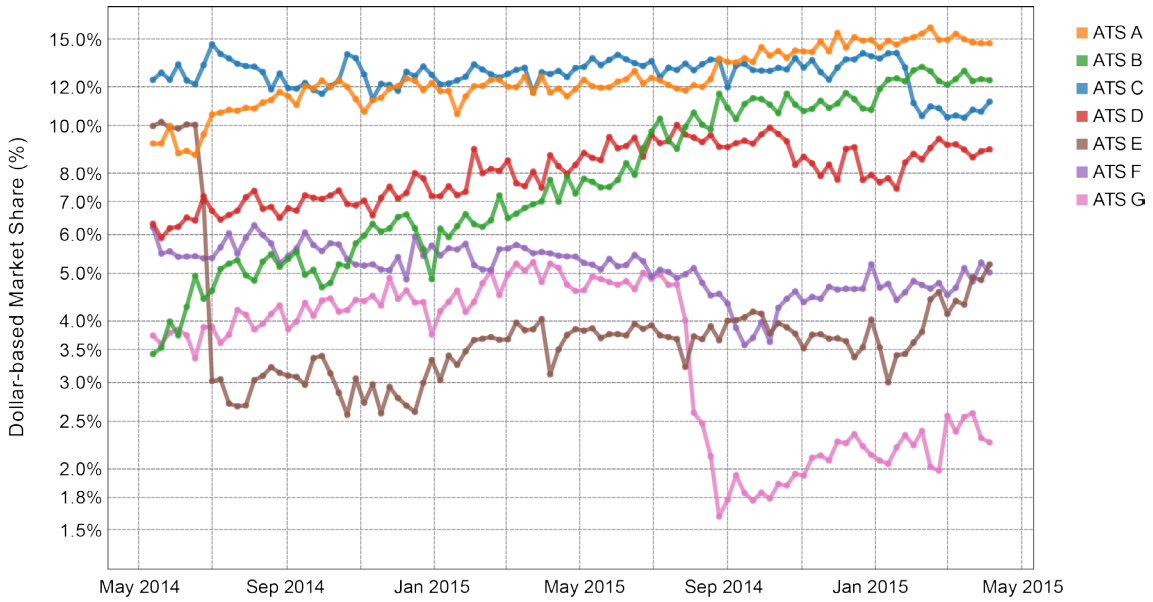
Volume 6: Price Innovation and New Quote Persistency

From the start of an order execution until its termination, a trading algorithm makes numerous decisions in response to market fluctuations and trader input. One of the most common decisions arises when the market price changes, and the algorithm has to decide whether to revise the limit price of its posted shares. On one hand, we want to chase the new market price immediately to secure a better position in the queue. On the other, we fear being gamed and adversely selected, so we hesitate to join the new quote.

We will focus on one of our original methodologies informing liquidity provision tactics. The method is based on the *price persistency* of a new quote, or the probability that the newly set price will persist for a certain time. We developed a model to predict the price persistency based on the new quote's properties, the exchange, and the stock's trading characteristics. Our trading algorithms compute the price persistency as soon as a new NBBO appears and decide whether to go after it.

Figure 2. ATS Market Share since May 2014

Dollar volume-based ATS market share calculated weekly from May 2014 to Feb 2016. Volume data obtained from FINRA's ATS Transparency Data website.



Source: FINRA, Instinet

Summary and Future Topics

In spite of its apparent maturity, the environment surrounding equity trading continues to evolve. We think that scientific data analyses are essential to understand the inner workings of trading and keep up with the latest developments in this increasingly electronic market. The outcomes of our market research provide essential information for our trading algorithms.

In addition to the topics previewed in this volume, we will discuss other research conducted at Instinet in future issues. The topics to be covered include trading triggers and intelligent posting, auction analyses and prediction, market impact estimation via our proprietary, global 'Metric' model, and a novel methodology for volume prediction. Through our *Informed Trading* series, we are committed to delivering valuable insights into equity trading and helping our clients make informed decisions.

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