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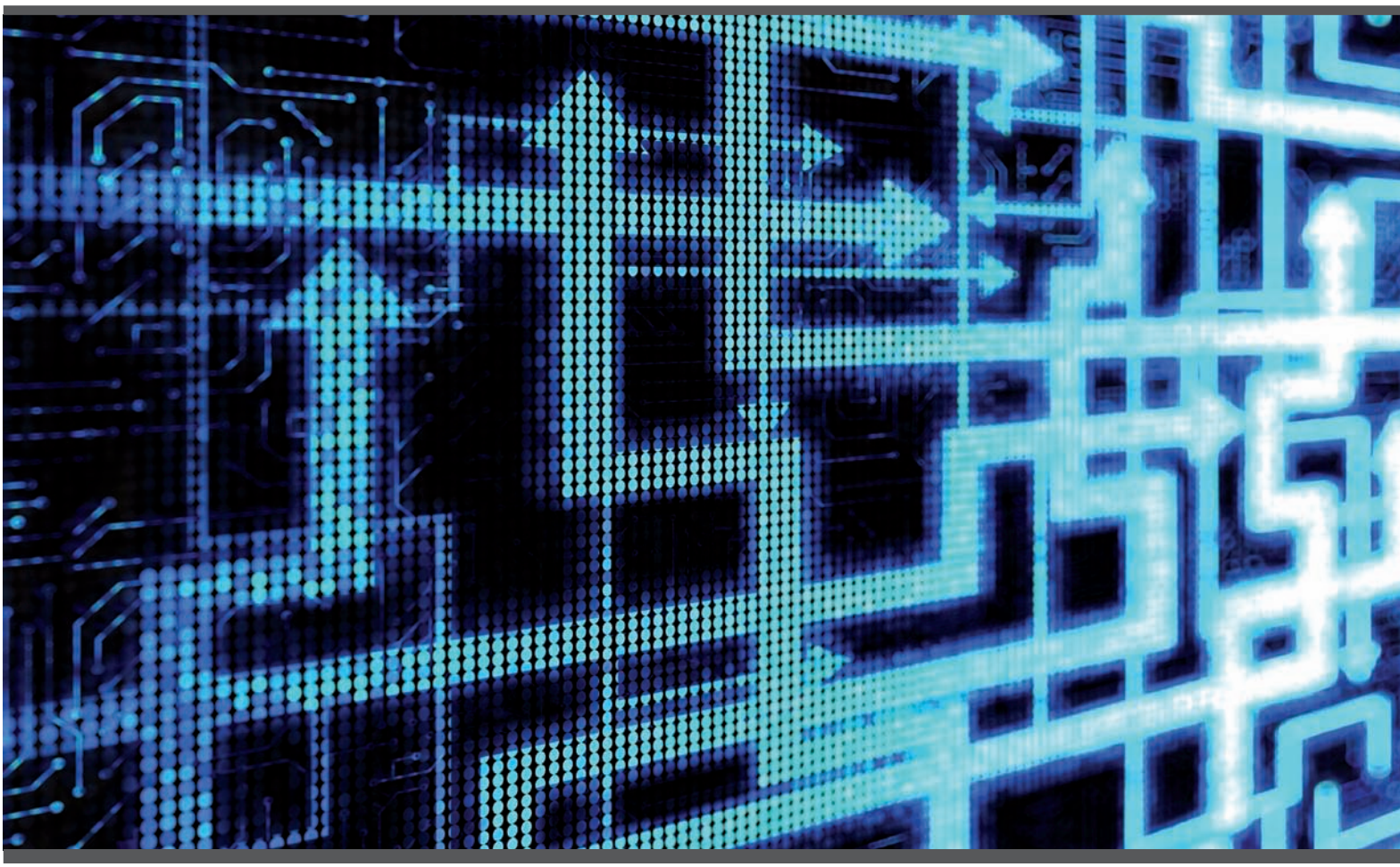
trading technologies for financial-market professionals

Best Execution

Special Report



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The Next of Best

What will best execution mean to you by this time next year? This month marks my one-year anniversary with *Waters* and in that relatively short amount of time the world of best ex has evolved—thanks to changes in regulation and market structure. While I came over from the retail, non-tech, banking side of the financial services industry, even I can recognize change when I see it.

To varying degrees, best execution has been the target of regulators—and savvy traders alike—on both sides of the Atlantic. In addition, Asian nations are grappling with the practice, most recently with India's regulatory body, the Securities and Exchange Board of India (SEBI), finally introducing smart order-routing to the marketplace, though the markets there are less fragmented.

Yet, inside this Special Report you will see that it is not just regulation that is driving best execution technology upgrades. As Sybase's Jeff Wootton points out in his Open Platform on page 4, this sea change is thanks more to market complexity and the emergence of ever-increasing numbers of venues for trading. Hardly a day goes by that I don't receive an announcement about this or that firm adding connectivity to some new exchange.

As a result, smart-order routing (SOR) technology has taken on greater importance at firms looking to gain an advantage over their competitors. In a matter of a year or two, smart order-routers have rapidly morphed from simple liquidity finders to become tools that can predict the probability of advantageous executions based on existing parameters and previous execution data, and adapt to changing market conditions.

I recently spoke with Thomas Chippas of Deutsche Bank; Ruth Colagiuri, then at Bank of America Merrill Lynch (BAML); and Jamil Nazarali at Knight Capital, each of whom is a major sell-side figurehead in the world of smart order-routing. They agree that putting a "Generation 2" or "Gen 2.1" tag on SORs is not appropriate, simply because this field of technology is improving so quickly (*see* Intelligent is the New Smart, Waters, *April 2010*).

It also must be noted that smart order-routing technology is just a piece of the best execution pie, as complex-event processing (CEP) has become a major buzzword throughout the industry. And finally, as Wootton points out in his Open Platform, as technology around best execution advances, so, too, will data requirements, which will create another headache–opportunity for advantageous trading shops.

As new geographies invest in routing technology; as rules geared toward best execution change; as new, sophisticated trading strategies take hold, firms on both the buy side and sell side will have to evolve with this market. So my asking, "What will best execution mean to you by this time next year?" isn't simply rhetorical. If you can't answer this question, then odds are that the market has already passed you by. ■

Anthony Malakian, News Editor

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Fidessa Releases US, Canada Fragmentation Tools

Steve Grob, Fidessa

In mid-September, trading technology and data vendor Fidessa launched its Fidessa Fragmentation Index (FFI) and Fragulator fragmentation analysis tools in the US and Canada, having launched European versions of both almost two years ago.

The FFI is a barometer of how fragmented trading is in stocks or indexes, and provides a score for how many venues a firm must visit to achieve best execution, while Fragulator allows users to perform detailed analysis of average trade sizes on different lit and dark categories or venues, or volume-weighted average price (VWAP) on different venues.

Combined, the tools provide investors with a fuller picture of liquidity fragmentation in stocks and indexes worldwide, with data updated at the end of each trading day, says Steve Grob, director of group strategy at Fidessa.

"The tricky bit is that the regulation differs between each market and zone—there are different opportunities and obstacles in each," Grob says. "So the idea of having one agreed lexicon to understand and make sense of it all was the key objective."

Regulatory changes and technological advances have resulted in new venues—each with new business models—challenging existing exchange monopolies and creating fragmentation of trading between different venues, which has prompted demand for a product that helps buy-side firms to achieve best execution, shows brokers how best to direct their smart order-routers, and enables high-frequency traders to spot opportunities and back-test strategies, Grob says.

While Fidessa has yet to roll out the products in Asia, Grob says the vendor will broaden its geographical coverage in the future, and may expand them to cover more asset classes, particularly in response to opportunities arising from regulatory reform—such as including data on exchange-traded funds, which are covered by the upcoming review of the Markets in Financial Instruments Directive (MiFID)—and possibly some basic transaction cost analysis tools.

Greg Chambers
Orc Software

Orc Software Debuts Access to Singapore Mercantile Exchange

The Singapore Mercantile Exchange (SMX) is granting access to its exchange through Orc Software's Orc Trading family of platforms, vendor officials announced.

"With growing numbers of Orc customers looking to trade onto Asian markets, Orc is experiencing an increasing demand for high-speed market connectivity within the region," says Greg Chambers, president of Orc Software, Asia-Pacific.

"Our recent addition of the SMX marketplace to our existing stable of connectivity is a further demonstration of Orc's commitment to facilitating our customers' trading needs in this respect."

SMX, a multi-product commodity and currency derivatives exchange, began live trading Aug. 31. Orc Trading services include Orc Trading for Algorithmic Trading, Orc Trading for Arbitrage, Orc Trading for Market Making, Orc Trading for Risk Management and Orc Trading for Volatility Trading.

Orc Software offers connections to several exchanges in Asia, including Hong Kong, Korea and Japan. The vendor is seeing high demand for trading capabilities in Asian markets and is therefore offering more connectivity to meet those needs, according to Orc officials.

India Regulator Gives SOR the Green Light

The Securities and Exchange Board of India (SEBI), which is the nation's capital markets regulator, has officially introduced smart order-routing to the Indian marketplace. Before the decision, stocks were listed on both the National Stock Exchange (NSE) and Bombay Stock Exchange (BSE). Investors trading electronically will now be able to find the best price on a trade made.

According to *The Hindu Business Line*, this change could result in the NSE losing some of its dominant market share as the BSE will be able to be more competitive on pricing.

Bats to Roll Out Parallel Smart Routing

Equities and options exchange operator Bats Global Markets plans to introduce three new smart-routing strategies that will complement its existing Cycle routing strategy available on Bats' various global markets.

In early September, Bats brought its Parallel D routing strategy into production, followed by Parallel 2D and Parallel T strategies in the subsequent weeks.

The new strategies aim to improve on the Cycle routing strategy, which serially routes entire orders to different market centers. "The order is only away at one market center at a time," says Chris Isaacson, COO of Bats Exchange. "It's very fast, but you are not accessing all the market at once."

The new Parallel D strategy will slice up an order and use direct market feeds to help calculate a routing plan and then route multiple orders to their destinations in parallel. "The pieces always sum up to the size of the original order," says Isaacson. "We use depth-of-book quotes and a proprietary scoring mechanism to determine how to oversize the order."

If, during the process, an order comes back unfilled or partially filled, the router will snap the quote again, repeating the process.

Where Parallel D exhausts all the liquidity, including hidden liquidity, at a specific price level before moving to the next price level, Parallel 2D will look at the depth-of-book quotes and send out orders in parallel at different price points. "It's more aggressive with the price, but hopefully with the benefit of a faster execution," says Isaacson.

Chris Isaacson, Bats Exchange

Parallel T is a strategy for Regulation NMS in the US. "It will just route to the protected top of the order book for only the size that's being displayed—it will never be oversized," says Isaacson.

Progress Brings SOR to India

After the recent decision by the Securities and Exchange Board of India (SEBI) to allow smart order-routing (SOR) to investors, Progress Software announced that it has launched its SOR accelerator in India.

According to the vendor, the Progress Apama SOR Accelerator allows traders to create proprietary order-routing strategies "that intelligently select execution venues from among the many exchanges, multi-lateral trading facilities (MTFs) and dark liquidity pools." Progress also claims that the product helps both buy- and sell-side firms to navigate India's regulatory structure. "SEBI's much-needed and eagerly awaited decision on allowing smart order-routing for every class of investors on the stock exchanges will lead to greater efficiency in the Indian markets. Smart order-routing will lead to the increased automation and wider adoption of sophisticated order routing technology in Indian capital markets to bring them in line with global markets. We aim to support the overall Indian capital market and the various trading entities in effectively implementing SEBI's decision with the introduction of the Progress Apama Smart Order Router (SOR) Accelerator," says Kaushal Mashruwala, vice president of Progress Software, in a statement.

Deutsche Bank Firms FX Options Pricing

Deutsche Bank has launched the latest release of its Autobahn FX dealer-to-client trading and data display terminal, including the addition of firm bid-and-offer quote data for foreign exchange options, which will allow the bank's clients to ensure that they are viewing tradable, as opposed to indicative, pricing.

Although clients were previously able to view real-time streaming foreign exchange options data, the latest release of Autobahn FX allows users to transact directly against real-time bid-and-offer quote data displayed via the terminal for a wide range of foreign exchange options.

In addition, the bank has also introduced a range of new order management features as part of its Automated Tool for Orders Management (ATOM) module, which allows users to input order execution parameters in addition to simple buy-and-sell order data, to provide more control over how orders are managed.

Best Ex Demands Real-Time Market Analysis

The principle of best execution has long been a tenet of the client–broker relationship, but its real meaning has evolved along with the markets and market regulations, expanding beyond the notion of obtaining the best price. It now encompasses achieving the best overall outcome for the client, considering such factors as price, speed of execution, likelihood of execution, and transaction cost. By Jeff Wootton

Not only have the markets evolved in recent years, but so too has the regulatory environment, particularly in Europe. While in the US, the Securities and Exchange Commission (SEC) still defines best execution as something measured on an aggregate level, in Europe the European Union—through the Markets in Financial Instruments Directive (MiFID)—has directed that firms must be able to demonstrate that best execution policies were followed at the individual order level.

Yet it's not the regulatory environment that has driven the interest in best execution practices and technology, but rather market complexity. With the liquidity pool for many securities fragmented across different venues, and with only part of the market liquidity visible at any one time, the ability to truly achieve the "best" results has become more challenging. Brokers have therefore invested heavily in smart order-routing (SOR) technology in an effort to deliver superior results to their customers, complete with choices of different routing strategies depending on the client's priorities. And the adoption of SOR technology is not limited to brokers—a growing number of buy-side firms are choosing to invest in their own order-routing technology.

Not So Smart

In the past, so-called smart order-routers were criticized for not being very smart. They used relatively simple and static rules for routing individual orders to a particular venue. Strategies have become much more sophisticated, however, and advancements in technology have enabled these complex strategies to be implemented more easily and in ways that they can quickly adapt to the ever-changing market landscape. The current state-of-the-art in order-routing technology doesn't just route orders, but rather manages them, deciding where to send orders, what type of order to send, and when to cancel an order. It includes strategies that make use of dark pools as well as consider hidden liquidity in visible pools. It may also take into account both historical and real-time data around the behavior of specific venues including latency, replenishment rates and other factors. And finally, an order-router should be adaptive, continuously adjusting the strategy to reflect current market conditions and observed results.

This sophistication requires data—lots of data—and the ability to analyze that data, in real-time, in order to consider many different facets of the market, in terms of current conditions, recent behavior, and historical norms. Complex event processing (CEP) technology is designed to analyze streaming event data in real time, and is often being used both within the implementation of SOR systems as well as to monitor such systems to ensure they are achieving the desired results.

To be clear, CEP is not smart order-routing technology. It is technology that helps pull together and make sense of fast-moving data from many different sources. So it is a natural enabler for today's SOR strategies that rely so heavily on many different pieces of information to make a "smart" decision. While the order-routing strategies themselves can be implemented directly on the CEP engine—and some smaller firms are doing this, driven primarily by the desire for agility—most larger brokers as well as execution management system (EMS) providers implement their order routing strategies directly in Java or C++. But these strategies still need access to market information beyond who has the best price. Where is the liquidity? What's the behavior being exhibited by the dark pools? What is the refresh rate on the visible pools? How does execution latency compare across venues? So even in cases where the strategies themselves are "hand coded," they may rely on a CEP engine to gather and interpret raw data from many different sources in order to know what's going on in the market right now and how that may compare to historical patterns.

The markets show no sign of getting simpler. Despite predictions of consolidation they remain fragmented. And while trade volume may not be growing significantly, the noise continues to grow exponentially. This points to a continued investment in making smart order-routing smarter, and that increased intelligence will be dependent on more data, from more sources, and, perhaps most importantly, the ability to extract insight from the noise. ■

Jeff Wootton is senior director of product management at Sybase.

Playing the Generation Game

While first-generation smart order-routing tools had their place in the global financial markets, it was clear that they were poorly equipped to cope with fragmented liquidity and a number of new challenges facing market participants. Now, second- and third-generation, genuinely "smart" routing tools are available to brokers and modest numbers of buy-side firms, as they look to manage the variables underpinning their best-execution mandates.

Q What are the variables that need to be considered when providing clients with a service that qualifies as meeting best-execution criteria? What role does technology play in supporting such variables?

Jeff Wootton, senior director, product management, Sybase: It clearly goes beyond best price to include things like speed of execution, likelihood of execution, and transaction costs. But while those are the primary measures to be balanced, there are many other data points that can be used in a strategy that seeks to achieve best execution. Best execution criteria may examine current and historical latency statistics for each venue, typical refresh rates for a given security on each venue, trading patterns in dark pools that can be used to estimate liquidity within the pool, and may also factor in transaction costs, which can be dynamic and include rebates based on current order flow and thresholds. Clearly, this means a lot of data that needs to be collected and analyzed at very high speeds. This demands technology that is capable of consolidating live data from many sources, analyzing that data in real time, and then feeding it into the routing algorithm that will direct the order.

Oliver Sung, head of execution consulting, Bank of America Merrill Lynch: First and foremost is understanding the client's trading objectives, which include benchmark selection, alpha expectation and alpha half life. Then there are many stock-specific criteria involved in proper strategy selection, including order size, the stock's volume and volatility patterns and variability, and trade frequency—to name a few. This is all part of the execution consulting process, whether pre-, intra- or post-trade, and has been successful in yielding the best execution methodology—whether via sales trader, or electronically, directed by the client—and specific trading strategy. Technology is essential to provide both historical and real-time data to monitor variable performance to yield the best trading strategy as well as make immediate changes when market situations dictate.

Kevin Chapman, managing director, Allianz Global Investors Capital: The main things we use for determining best execution for clients are market impact versus an expected impact model, and also versus volume-weighted average price (VWAP)—versus where volumes are trading. All of this has to do with liquid orders versus illiquid orders. Obviously, technology is very important for what we do in terms of capturing accurate time stamps from an order management system (OMS), but it's also important that our third-party provider is capturing market data accurately. So a consolidated tape is very important when determining whether or not you can really call something best execution. We need to ensure that the provider we are using is capturing the correct data from the market feeds they get.

Kevin Chapman
Allianz Global Investors Capital

> "Where people have gotten hurt with fragmentation and speed of the market is instances where algorithms are creating opportunities for high-frequency traders to take advantage of orders in the market."
> **Kevin Chapman, managing director, Allianz Global Investors Capital**

Sang Lee, managing partner, Aite Group: There are many variables that could be considered by broker-dealers when providing services to meet what clients would consider "best execution." Unfortunately, most of these variables are driven by the needs and ultimate goals of the clients themselves, typically. The definition of best execution would also depend on the type of products, as obligations would certainly vary depending on exchange-traded versus over-the-counter (OTC) at the highest level. In the less liquid and more opaque OTC markets, best execution is often associated with having the ability to source

multiple prices per transaction at its most basic level. On the exchange-traded side, we encounter many more variables, including price, speed, anonymity, likelihood of execution, and so on.

Key considerations for providing clients with services that qualify as meeting best-execution criteria are the ability to document the process as well as access to client-accepted benchmarks to prove best execution. Technology would obviously play a very important role in this regard, whether through sophisticated liquidity management tools or real-time audit trail capabilities.

Q Has the market witnessed the emergence of new or more important criteria and challenges that need to be considered and managed as part of a best execution service? If so, what are they?

Oliver Sung
Bank of America Merrill Lynch

Sung: Finding and accessing liquidity with minimal market impact is still the goal. However, with continuously evolving technology and market structure, ever-decreasing trade size and increased fragmentation, the requirements for providing best execution—now more than ever—rely on technology, innovation and implementation for both electronic trading as well as traditional high-touch trading. The speed of the markets requires a trading platform that can consume vast amounts of market data and act on this information. Anti-gaming technology is also extremely important in minimizing information leakage and market impact.

Wootton: The big shift in the past few years is moving from the first generation of smart order-routing (SOR) technology that went from static preference rules to take into account current market prices. This shift reflected the fragmentation in the markets, but was soon criticized as being not very smart. The current generation of order-routing systems are far more sophisticated, taking into account many more data points, going beyond best price as well as implementing adaptive techniques that adjust to current market conditions.

Lee: The biggest challenge to managing best execution under today's market structure is navigating through the multitude of potential execution venues. In particular, as the proportion of liquidity being provided by dark pools continues to increase, it has become very important for firms to be able to provide real-time information on overall performance metrics of these dark venues to help buy-side traders optimize their trading decisions. Especially in today's microsecond trading environment, sophisticated liquidity-sourcing tools are becoming vital for all major market participants.

> **Technology is essential to provide both historical and real-time data to monitor variable performance to yield the best trading strategy as well as make immediate changes when market situations dictate.**
> **Oliver Sung, head of execution consulting, Bank of America Merrill Lynch**

Chapman: The variables are the same, but obviously regulation and potential changes to regulation will perhaps tweak things a little bit. Some of this has to do with trade reporting and other issues. An example would be, if I trade a block with somebody that doesn't necessarily have to be reported right away and it fits in with the market price, but my volume is an entire day's volume that gets reported end-of-day or the next day. That's not necessarily going to reflect best execution because my trade relative to a sample for the market isn't a fair comparison. So I think it's extremely important that trades are reported to a consolidated tape as quickly as possible, and that proper comparisons are being made.

Q What role do multilateral trading facilities (MTFs) and dark pools play when it comes to providing brokers with additional liquidity pools when looking to move large block orders? Are there still misconceptions in the market—especially from the perspective of the institutional investor—when it comes to using non-lit liquidity?

Sung: MTFs and dark pools are a valuable tool to find liquidity that would have previously been kept upstairs and away from the exchanges. As these venues mature, we have seen institutional investors embrace the liquidity and nuances of these venues.

Lee: The emergence of MTFs has provided brokers with alternative venues for executions, but as average trade size across all lit venues has continued to decrease, they do not provide the best means to complete large block orders. For the most part, dark pools have become an accepted part of the institutional traders' execution tools driven by the market reality of lit markets not being able to adequately support large order sizes. Of course, not all dark pools are created equal. While all of the dark pools could theoretically argue that they provide a certain level of anonymity, the level of anonymity varies widely depending on whether or not these venues utilize immediate-or-cancel (IOC) and indication-of-interest (IOI). And most of the broker-owned internalization pools exhibit similar levels of average trade size as the lit markets—i.e., sub-250 shares per trade. On the other hand, you have dark venues that specialize

in blocks, such as the Liquidnets and Pipelines of the world. There is a certain level of misunderstanding on the part of the buy-side traders in terms of the differences that might exist in the dark pool market. It should be the obligation of each buy-side firm to understand the differences that exist across the dark pool market to ensure that their trading goals are met properly.

Wootton: Many markets are now very fragmented and MTFs, alternative trading systems (ATSs) and dark pools simply can't be ignored—they represent too much of the market. So it's not just that they provide additional liquidity; they are in fact a significant part of the market in many cases.

> **Brokers that have a large electronic execution business are likely to continue to invest in improving the algorithms and the technologies that feed and run them in an effort to build in more intelligence, producing superior results.**
> **Jeff Wootton, senior director, product management, Sybase**

Chapman: MTFs and dark pools are extremely useful for sourcing what I would call sensitive liquidity—larger orders you don't want to expose to the conventional market because of market impact. Typically, when you start going out loud in lit markets, they are going to start moving. It is the same situation it has always been in that you are trying not to expose yourself by giving out information. Where people have gotten hurt with fragmentation and speed of the market are instances where algorithms are creating opportunities for high-frequency traders to take advantage of orders in the market. So it's still extremely helpful to be able to find another similarly sized order without having to go to the marketplace. Investors are definitely used to the idea of dark pools now. They are more used to what the different trading facilities are trying to accomplish, and what the advantages of using the different facilities are.

Q Do smart order-routing tools provide brokers with the ability to differentiate themselves from one another when it comes to best execution? If so, what are the attributes of the ideal SOR tool?

Sung: Yes. The speed of the markets demand that SOR tools be able to read vast amounts of market data as well as process this data and make decisions about when to access liquidity. With SOR tools measuring latency in milliseconds and sub-milliseconds, a SOR that takes just a few milliseconds is at a distinct disadvantage. Also, the ability of the SOR to learn from a combination of historical and real-time market data, to react to ever-changing conditions, can differentiate one SOR from another.

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Wootton: Trading is increasingly automated, and most institutional clients use transaction cost analysis (TCA) to measure the performance of their broker. So it would seem clear that firms having SOR technology that can deliver consistently superior results will have a competitive advantage. Brokers that have a large electronic execution business are likely to continue to invest in improving the algorithms and the technologies that feed and run them in an effort to build in more intelligence, producing superior results.

Lee: SOR is the core component of a broker's liquidity-management platform. As the market has evolved, especially in the US, it has become very tough for brokers to differentiate themselves from one another based on SOR. However, in new markets, such as Europe and Asia-Pacific, the adoption of SOR will continue to increase and brokers with sophisticated and fast SOR capabilities will move ahead. Generally speaking, a few of the attributes of an ideal SOR would include connectivity to all major liquidity sources; management of different order types, fees, and rebates; understanding changing market microstructure; and maintaining efficient order routing schema.

Chapman: I think SOR is definitely a plus, but maybe less valuable than it used to be because more people are using SOR—the more that happens, the more it becomes commoditized. But it is still extremely useful to find where the flow is and where the liquidity resides, and to really target the market venue where you are getting the best experience and the most liquidity. The SORs that are learning as they go to shut off certain venues that don't provide liquidity and concentrate orders in the venues where they are finding liquidity is extremely valuable. It is similar to what we do as traders—trying to find the most liquidity with the least amount of market impact.

Q To what extent has market and liquidity fragmentation affected the ability to adhere to best execution mandates? How do brokers and buy-side firms address this issue through the use of technology?

Wootton: It's really market fragmentation that has driven the investment in, and evolution of, SOR technology. With a single liquidity pool you don't need SOR—you already know where to send the order. But that's not the reality of the markets today, and since brokers have an obligation to deliver best execution,

it is a requirement that they trade on the venues that will give them the best results. For buy-side firms it is a bit different, since there isn't an obligation to do it—they can always rely on their brokers to manage the order routing for them. But for some, albeit a relatively small number, of buy-side firms, they see value in taking control themselves.

Sang Lee
Aite Group

Lee: Market and liquidity fragmentation has essentially forced both brokers and buy-side firms to leverage technology in order to adhere to best execution mandates. As stated earlier, in today's microsecond trading environment, keeping up with best execution mandates via manual trading would be incredibly tough to maintain, not only in terms of actual trading decisions themselves but also documenting for the sake of meeting compliance obligations. As a result, the usage of OMSs, execution management systems (EMSs), and real-time compliance engines has become an integral part of market participants' trading infrastructure.

Chapman: It is much easier when you have one location to get best execution. It's similar to shopping for a new TV. If there's just one store selling the model you want, getting the best price is easy because there's only one option. But in a fragmented market you have to shop around. Up to a point, it was useful to have a fragmented market with lots of liquidity and high-frequency trading adding liquidity by going across different markets using latency arbitrage and so forth. But now we have reached that liquidity peak, and it is really an issue now where we are going to see a consolidation of venues and smart order-routers. We'll further consolidate our flow to where the liquidity is and shut down the other venues. If volumes continue to stay low like we have seen this summer, there will have to be a consolidation among venues.

Sung: Market fragmentation requires brokers to invest in SOR technology that combines these various pools of liquidity into a central pool of liquidity and then accesses these different pools in the fastest and most efficient manner possible. The buy-side firms can rely on the investment that the sell-side firms have made in this technology to minimize the impact of fragmented liquidity.

> An ideal SOR would include connectivity to all major liquidity sources; management of different order types, fees and rebates; understanding changing market microstructure; and maintaining efficient order routing schema.
> **Sang Lee, managing partner, Aite Group**

Q How effective are transaction-cost analysis (TCA) tools in providing firms with close-to-real-time analysis of their executions?

Wootton: Traditional TCA tools are still focused on aggregate post-trade measurement, but we are definitely seeing TCA techniques being applied in real-time, both to monitor performance of executing and routing algorithms as they work an order, as well as to provide closed-loop feedback into algorithms that are designed to be adaptive. In this case the algorithm adjusts, based on what's working and what isn't. We are seeing this more in regards to execution algorithms than routing algorithms so far—but there is no reason the same techniques couldn't be used to enhance the routing algorithms.

Lee: While TCA tools continue to provide an important service to all market participants, these are still predominately leveraged for post-trade analysis, which is often used for broker rankings and commission management. TCA tools also play a role in evaluating buy-side traders' performance as well as a component of compliance checks to ensure that the firm is making smart trading decisions in line with their best execution guidelines. In terms of the TCA tools' overall impact on the real-time side, it continues to be minor.

Chapman: TCA is very useful, but before we had these tools the traders were paying attention to the order and getting updates regularly from brokers, and they knew whether or not they were getting good executions. It is much easier now with TCA pulling in live-time fills. It is extremely useful in being able to make decisions around whether to be more aggressive or hold off, or if you need to have a conversation with your portfolio manager and adjust your strategy. You can do all that faster by realizing how the stock is reacting to your orders in the market faster.

Sung: Prior to the trade, TCA yields information for educated electronic strategy selection and impact cost estimates. During the trade, real-time TCA analyzes executions versus client-specified benchmarks. Differentiated TCA shows the rationale for any material deviations from expected impact and points to potentially more efficient trading strategies or parameters. Overall, effective TCA from both a pre- and intra-trade perspective allows buy-side traders to give extra focus to their most difficult trades without losing execution effectiveness. ■

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