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BEWARE: DARK POOLS ARE ON THE MOVE SOARING through the changing global market structure

In the final scene of the classic movie *Animal House* (1978), as John Belushi and the Deltas reign chaos on the home coming parade, Kevin Bacon, amid a stampede of panicking parade goers, tries to tell the crowd to “remain calm – all is well.” We fear that many market participants are taking the recent UK Financial Services Authority (FSA) estimates that dark pools represent only 1.6% of total volume, and the recent estimates from the Tabb Group that 4% of executions are occurring in the dark, as indications that there is nothing to worry about regarding dark pools – all is well. The current belief is that the market is essentially unchanged and traders just have to focus on hitting the lit markets because they have the most market share. Bloomberg Tradebook, however, is finding that Europe’s market structure is again rapidly changing; dark pools are on the move. The changes to the pre-transparency rules are making smaller size orders eligible in dark pools. Although the FSA data suggests that at a composite level it appears that only a small percentage of stock is executed in the dark, we are finding that on a stock-by-stock basis, the story can be quite different. As much as 20% of the liquidity of our clients orders are being



Figure 1 – Venue Transparency on Tradebook’s GTTA<Go>

extracted from the dark (Figure 1) using our innovative technology in Smart Order Algorithmic Routing (SOAR) – dark aggregator.

You can monitor where your orders are getting

done on demand using the Global Tradebook Trade Analytic (GTTA<Go>).

Europe’s Dark Landscape
There are four types of dark pools in the European Market structure:

- Exchange integrated – these are exchanges or MTFs (LSE, Nasdaq OMX integrated book, Chi-X integrated book, BATS, Xetra, etc) that have lit or displayed orders with Icebergs or hidden order types;
- Exchange segregated – these are exchanges or MTFs that operate independent pools that do not have any lit components (Nasdaq OMX, Chi-X, BATS and Turquoise Dark Books)
- Block Trading – these are MTFs that seek to have block sized orders find and execute with each other;
- Broker Internalizers – these are broker books that pair contra customer orders

Asia's Dark Pools

Although there have been many announcements of alternative trading systems seeking to create dark pools, currently Asia's dark landscape is less mature - dominated mostly with private broker dark pools.

Dark Pools are a challenging and potentially dangerous place to play. High frequency traders, prop desks and predatory algorithms will use statistical trading techniques to detect the presence of large orders and use that information to their advantage. Dark pools, however, may have significant liquidity so they cannot be ignored. Successful dark interaction is not simply an issue of access and aggregation. Sophisticated algorithms that manage orders to efficiently find and extract

liquidity while doing it in a way that seeks to limit adverse price and information impact by proactively outsmarting the gamers.

Anti-gaming – It's Too Late

Some brokers will use post-trade statistical analysis to measure toxic activity in a dark pool. Mean reversion analysis takes a time and price stamp each instance that an order interacted with a dark pool. It then looks at the price of the stock at 1, 5, 10, 30-seconds and 1,5,10 minute intervals after the trade to see if there is a statistically significant pattern of price behavior. An example of such behavior would be if orders are sent to (or got an execution from) "dark pool A" and statistically, 1 minute later the stock consistently goes 10 basis points higher – this would suggest toxic or gaming behavior occurring in the "dark pool A." Although this analysis is extremely important, some brokers rely exclusively on this analysis to determine if they should continue their relationship with such a dark pool. The problem with using this analysis as the sole anti-gaming prevention technique is that it is reactive. The gaming

already occurred – the damage to the customer's orders was already done.

Outsmart the Gamers

To prevent your order from being "mugged", you have to take pro-active, preventative action to stop gaming before it starts. The post-trade mean-reversion analysis should be used to confirm that the proactive anti-gaming techniques are working, or that more analysis thought, and design needs to be done.

Being proactive in the dark space requires a certain methodology backed by sophisticated implementation algorithms that take into consideration, in part:

1. A true unconflicted business model
2. Techniques to finding hidden liquidity and statistics to create real time liquidity profiles, or Heat Maps
3. Real-time allocation/ranking of dark venues
4. Order Distribution and representation strategies
5. Price predictors
6. Ping detection

Institutional Investor broker league tables 2009. Bloomberg Tradebook:

#1 Global Equity Trading

#1 NYSE Equity Trading

#2 NASDAQ Equity Trading

Ranking is out of 2,000 brokers with best results vs. interval VWAP benchmark.

Figure 2

These six considerations are just some of the many complex issues that need to be explored for effective dark aggregation.

SOARing through Dark Pools

Bloomberg Tradebook has sophisticated and innovative smart algorithmic order routing (SOAR) that efficiently finds and extracts the markets unseen liquidity. We have been protecting our orders in both the dark and lit pools, and from potentially predatory high frequency traders in the U.S. equity market, for years. We adapted and customized many of these techniques for the global equity markets. These algorithms are, in part, a reason for Bloomberg Tradebook's top ranking in the November 2009 Institutional Investor best execution league tables (Figure 2).

It all begins with a business model that may result in higher costs to the broker, but is pro-client. You have to treat orders by balancing the needs of liquidity aggregation and order protection to seek the best possible average price on an order.

Business Model

Controlling the cost of execution directly impacts broker's profitability. An unconflicted business model would select dark venues based on the quality and quantity of liquidity they provide, rather than rebates or cost of trading. To increase broker profitability on the execution (commission less trading fees), many brokers (even those that provide agency-only execution) may

bias passive orders toward their own pool of liquidity and venues that offer high rebates or zero cost to post. If the broker selects venues based on cost and only represents the order in one venue, the buy side client may incur an opportunity cost - increased potential for an order to be traded around - liquidity missed - thus increasing the (potential) for inferior average prices and potential information leakage. Some (not all) brokers will search for additional liquidity in dark pools. When searching for liquidity, brokers may first search in venues with the lowest access fees rather than first going to venues where they have had success and large size executions.

Tradebook has comprehensive connectivity with all of the established exchange/MTF pools. The trade analytic **GTТА<Go>** (Figure 1), we show you where orders were executed. In addition to the exchange pools, we also have many relationships with our customers that have their own private dark pools. Tradebook is an anonymous trading platform. When we interact with our client's private dark pool, the GTТА trade analytic uses a mnemonic code to both show that the order was executed in the dark and also to preserve the liquidity-source client's anonymity.

Where's Wally?

One daunting challenge with dark pools is finding and extracting the liquidity. In some respects, finding dark liquidity is a little like the children's books by British illustrator Martin Handford - Where's Wally?

(This is known as "Where's Waldo" in North America). Because liquidity is fluid/transient we seek to create heat-maps of market liquidity. With the lit pools, we can look at the public trade history (the tape). With the dark pools, Tradebook looks at our execution history in the stock to answer the question, over the past 30-days and in real-time (over the last 10 seconds), what venue has the stock tended to trade in? This enables us to create an allocation table of the statistically most likely liquidity venues. We simultaneously represent orders in several of those dark pools at the same time and in a heat-map determined priority order and as executions occur, move orders around. Real-time success rates are given higher weights in the heat-map and will rebalance the dark pool rankings in real-time.

Protection

There are many predatory algorithms out there, but they really focus on two general categories: large order identification and momentum surfing. To outsmart these predatory algorithms, protection techniques need to focus on limiting information give-up AND momentum determination. Information leakage can be limited by order representation. The allocation table that is created from the heat-map creates an initial representation, and the subsequent rotation of, the orders in the dark. To seek to limit information give up and make detection more difficult, Tradebook uses many techniques including varying the order sizes in the pools and

explicit limits. Orders are disbursed into different pools, sometimes simultaneously, sometimes rotated. For example, on a buy order, we may divide the order into three dark pools at the same time; the limit may be the bid or the midpoint price of the stock. It all varies depending upon specific market conditions, success rates and other regulatory/operational considerations. Note, however, that strict limits are always used and overt re-pricing is used for modification in order for Tradebook to keep maximum control over the order. Many brokers will use non-aggressive limits with floating mid-point pegs so the order can float in the dark pool. That order representation strategy exposes the order to gaming – which we will soon highlight.

Since gamers use repeated small sized executions for “order anticipation” strategies, all passive and aggressive orders on Tradebook use a variety of minimum fill sizes to increase the cost of the information to a gamer and at the same time decrease our information leakage exposure by completing the order. In addition, a variety of time in force techniques are used (IOC, Synthetic IOCs, Day, 1 min, 2 min, etc) to avoid becoming a “sitting duck”.

Algorithms with Attitude

Order representation is one aspect of order protection. What you also want to try and do is beat the gamers at their own game. Algorithms need to have an attitude – know when to go on the offensive and start

taking liquidity from the very algorithms that are seeking to learn more about them and game them. To do this, you have to know when to be aggressive and Tradebook's Price Predictor Models (PPM) use a variety of inputs to determine and take advantage of short term price trends (for a more detailed description of the PPM, see [Research and Strategy](#) July, 2009. On the Bloomberg terminal, type DOCS R&S_JULY_09 <GO>)

Let's assume that you are a buyer of a stock. If the price predictor indicates that the odds are that prices may move higher, then the dark aggregator portion SOAR will move into an aggressive phase: Depending on the strength of conviction from the PPM, the algorithm will either improve the dark limits to the mid, or immediately cross the spread and seek to aggressively sweep dark liquidity. In this aggressive phase, if an entire order in a particular dark pool is fully executed, another order will be moved in using the same strict limit. If there is no subsequent execution, then limits are moved back to a passive stance and sizes are rebalanced. Conversely, if the PPM indicates that prices may fall, then sizes may be modified (reduced) still at the same limit in order to continue to take some liquidity, while new orders will be added in a ladder at lower prices or the bid will be pulled altogether.

Ping Detection and Toxicity

You also have to be proactive and try to determine if there is an algorithm out there hunting.

Similar to how sonar is used to find submarines, in electronic trading, algorithms will “ping” by sending thousands of small orders into the dark venues with limits at the mid or the contra side to try and determine if there is such a contra order out there.

In this case, protecting your order from information leakage also means that you also have to read your executions and surmise if someone is repeatedly “pinging”. If you are getting repeatedly pinged, many times it forewarns that someone may be sizing you up.

If your order is represented in the dark pool as a mid-point peg with a non-aggressive limit, your order is exposed. An algorithm that detects or thinks you may have size, can try and take the lit market higher (“walking you up”), hold it there and then sell those shares to you at the higher price in the dark pool. Then they would fade their bid and the market would fall back to the old level.

So, how do you prevent this from happening? Tradebook's use of strict limits means that any price change in the stock has to be analyzed by our dark algorithm. Tradebook has to send a cancel/replace or an order modification message to the dark pool. We determine when limits should be changed based on the analysis of the PPM. Predatory algorithms that seek to pull prices higher in order to “walk-up” the dark order's bid, typically this occurs only in that specific stock. Our PPM seeks to prevent Tradebook from chasing such

price changes because the PPM may see those stock specific price movements as anomalies – because they are not supported by corresponding price action in the sector or other the stocks in the peer group. In other words, the PPM will think that such price movements in that specific stock are probably unsustainable because they may statistically deviate from the price action of other stocks in sector or group.

At times, Tradebook will employ the use of other market center mid-point peg order types in order to capitalize on opportunities for price improvement. Rather than being walked-up, the mid-point peg with a strict limit enables the order to float lower if the market weakens.

The dark can be a dangerous place to play. With some of our clients, orders reaching 20% of liquidity being found in the dark, it cannot be ignored. Aggregating liquidity alone is inadequate. It is the responsibility of the broker to protect client orders. We believe that this can be achieved with the right business model, algorithms that seek to control the order and price predictors that game the gamers. Tradebook seeks to ensure that you get the liquidity while limiting information leakage and adverse price impact.

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