Making the most of third-party transaction analysis: the why, when, what and how?

How can independent third-party transaction cost analysis be used alongside other data streams to offer a complete view of algorithmic trading performance?

*Robert Kay**

Algorithmic capabilities are now well established as an important and rapidly growing part of institutional trading. They offer an apparently low cost way for buy-side clients to complete both straightforward and more complex trades without requiring the same level of support from personnel employed by executing brokers. The combination of low cost and 'high tech' has created an appeal that has overcome concerns about whether the algorithms deliver 'good execution' or even whether they deliver the results that they claim. This did not matter when utilisation was limited. However, with greater usage should come greater scrutiny and only independent research can realistically provide the comfort that market participants need.

Why independent measurement?

The goal of algorithmic trading is to achieve a specific execution result through application of technology rather than reliance on human skills. Because the goal is specific and established in advance, some of the more naive providers and users of algorithms believe that evaluation of results is straightforward and independent assessment unnecessary. For these individuals, sophisticated analysis is rendered superfluous by the

*Robert Kay, managing director, GSCS Information Services

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belief that all the algorithms that produce the results are essentially indistinguishable.

Those who think about the subject more deeply however, whether on the buy-side or the sell-side, know that in fact all algorithms are different. By understanding just 'how different', as well as the financial impact that the differences have on trading results, it is possible to make a strong case in support of independent measurement of the performance of algorithms, of the kind provided by GSCS Information Services to its clients within its *itero* service.

In this, independent providers are simply following the approach adopted in most other areas of financial services, most obviously measurement of investment performance. It is recognised that the combination of performance and marketing is what enables investment managers to be successful. Such is the importance of performance measurement to continued success, that usually at least two institutions provide measures to the ultimate clients. First, the investment managers themselves assess their own investment performance. Second, an independent entity, usually a custodian or fund accountant, provides an objective third-party assessment. The ultimate clients rely on the latter as reflecting the true value of their portfolio and the fairest way to compare performance across different managers.

Similarly, when it comes to execution, whether algorithmic trading, program trading, direct market access or voice trading between buy-side and sell-side individuals, performance allied to commission levels is what determines success. In execution, performance is now becoming the most critical component of where orders flow, as transparency reduces the relevance of research and other qualitative factors in the execution decision. As the importance of performance grows so does the value of and need for independent assessment as a supplement to, and validation of, the information that the

individual executing broker may provide.

There are two particular values of an independent assessment. The first is the fact that it is genuinely independent. While most brokers provide accurate comparisons with different performance benchmarks, it is clear that some do not provide any analysis at all, while others use their own benchmarks, which may or may not exactly match the managers or those used by other brokers. An independent provider can offer a comprehensive service and has no interest in under or overstating execution results. The second value is that in terms of approach to measuring execution results (benchmark definition, market data sources, etc.) and reporting layout, style and analytical approach, an independent provider can offer consistency as well as a focus on accuracy and peer group comparison. This makes analysis both easier for the manager and fair, since comparisons across brokers have been generated consistently.

Just as managers would like clients to rely on their valuations, so brokers would like managers to rely on their presentation of execution results from algorithmic trading. Just as managers are frustrated by independent analysis of performance which does not match their own, so brokers are concerned that independent review of algorithmic trading will suggest that results do not match expectations for technical reasons which independent analysis does not account for. It is of course quite reasonable to raise these kinds of concerns. However, in the long run none of them will prevail for the simple reason that evaluation of execution performance generally and algorithmic trading in particular, is too important to be left to parties who have clear conflicts of interest and economic incentives to produce the 'right result'.

When and what to measure?

Algorithms, unlike simple trades, have two features that a buy-side trader is interested in. The first is the outcome in terms of the execu-

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Table 1: Multi benchmark report – by trading strategy

Trade date from: 10/1/04 to 31/12/04
Currency: Euros

Country	# Trades	Value	Av value /trade	Res comm	Res comm %	Ex value 1 Int VWAP
Algo Interval	179	85,376,572	476,964	51,225	0.06	8,962
Algo Close	97	42,378,578	436,892	25,427	0.06	n/a
Algo Arrival	550	254,886,258	463,430	152,932	0.06	n/a
Direct market	118	18,952,489	160,614	5,685	0.03	-4,189
Program	3,141	720,723,360	360,362	1,191,851	0.05	-39,992
Voice trading	15,486	3,679,374,675	237,594	4,985,592	0.14	481,283
Totals	19,571	4,801,691,932		6,177,443	0.13	441,291

tion price achieved on actual transactions. The second is the way in which the algorithm achieves the intended outcome.

Measuring the outcome on individual trades is no more or less complex for algorithmic trades than for any other kind. By definition measurement can only take place after the client has used the algorithm to execute one, or preferably a series of trades with the broker. What is different, however, is that in the case of algorithmic trades the intended outcome is known in advance and hence the relevant benchmark cannot be a source of disagreement. For example, if the target on some trades is to achieve 'interval VWAP' while on others 'Arrival Price' is the benchmark, then the analysis can easily be tailored within the GSCS *itero* service database to distinguish between the different types of trade and to use a different benchmark for each. Obviously in these situations the notion of a 'single right benchmark' for all trades makes no sense, as brokers and managers would undoubtedly agree. Table 1 shows the kind of report that GSCS produces for clients based on different benchmarks for different execution strategies.

The second measure is arguably more important as well as being much more sensitive. To what extent do clients want, or does their business merit, involvement with how each algorithm actually works. Most providers of algorithmic trading offer a series of more or less standard algorithmic outcomes: VWAP (Volume-Weighted Average Price within some period); TWAP (Time-Weighted Average Price, again within some agreed period);

EV 1 %	Ex value 2 Arrival Time Price	EV 2 %	Ex value 3 TD Close	EV 3 %	Ex value 4 Av VWAP	EV 4 %
0.01	n/a		n/a		n/a	
	n/a		1,031	0.02	n/a	
	525,001	0.21	n/a		n/a	
-0.02	17,531	0.09	-20,757	-0.11	6,364	0.03
-0.01	2,543,719	0.35	-958,197	-0.13	-50,159	-0.01
0.01	-4,110,460	-0.11	3,297,812	0.09	660,769	0.02
0.01	-1,566,741	-0.03	2,339,615	0.05	610,610	0.01

Arrival Time Price and Closing Price. However, quite clearly the algorithms do not operate in exactly the same way. Indeed, the brokers offering algorithms emphasise the superiority of their particular algorithms. This superiority is based on the amount of money spent and the proven results achieved within the firm when it has used the algorithms in supporting proprietary trading. Superiority is usually stated in terms of consistency in achieving the desired outcome. From a client perspective it is reasonable to believe that the algorithms used by each broker will be similar structurally; for example, they will break down large orders into a series of much smaller trades to be executed electronically. However, at the detail level (e.g., how many smaller orders of what minimum/maximum size, traded at what precise frequency) they will operate differently.

Brokers do not want to give away the intellectual property contained within their specific algorithm but need to be able to justify why they are able to achieve superior performance. This offers the opportunity for brokers to make the maximum use of independent cost analysis consultants like GSCS. Actual trades, non-client specific of course, can be provided to an independent service together with the precise nature of how the algorithm should have operated (i.e., exactly what partial fills were completed at what times to achieve the outcome). This data can be easily verified by GSCS to confirm what the prices were when each particular 'partial fill' was completed. The independent 'imprimatur' can then be offered to the broker,

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Table 2: Trade breakdown

Summary

	Av price	£6.3852
09:40 to 11:20	Adj VWAP	£6.3848
09:40 to 11:20	Std VWAP	£6.3861

Detail time of trade	*Traded price*	*Shares traded*	*Cost (£)*	*Detail time of trade*	*Traded price*	*Shares traded*	*Cost (£)*
9:40:14	638.50	20,000	127,700.00	10:27:48	638.50	18,750	119,718.75
9:42:13	638.00	19,000	121,220.00	10:30:01	638.50	18,750	119,718.75
9:43:25	638.00	21,000	133,980.00	10:33:15	638.00	28,540	182,085.20
9:46:02	637.50	21,000	133,875.00	10:38:04	638.50	42,140	269,063.90
9:50:45	638.00	38,400	244,992.00	10:39:56	638.50	43,120	275,321.20
9:51:56	638.50	19,700	125,784.50	10:44:17	638.00	23,450	149,611.00
9:54:46	638.50	21,300	136,000.50	10:45:57	638.50	21,670	138,362.95
9:58:34	638.00	33,500	213,730.00	10:48:02	638.50	22,340	142,640.90
10:00:03	638.50	32,600	208,151.00	10:49:45	638.00	21,900	139,722.00
10:01:58	638.50	19,000	121,315.00	10:52:45	638.50	18,750	119,718.75
10:03:56	639.00	18,650	119,173.50	10:56:58	639.00	28,950	184,990.50
10:06:45	639.50	19,600	125,342.00	10:57:34	638.50	33,250	212,301.25
10:08:34	639.50	19,600	125,342.00	11:00:01	638.00	21,760	138,828.80
10:10:00	639.50	21,400	136,853.00	11:01:23	638.50	18,500	118,122.50
10:12:54	640.00	17,600	112,640.00	11:05:14	639.00	25,600	163,584.00
10:13:34	639.50	19,200	122,784.00	11:08:14	638.50	28,600	182,611.00
10:16:45	639.00	19,800	126,522.00	11:12:14	638.00	29,540	188,465.20
10:17:43	639.00	17,500	111,825.00	11:13:29	638.13	19,740	125,966.86
10:20:23	639.50	15,460	98,866.70	11:16:04	638.00	18,560	118,412.80
10:21:56	639.00	23,450	149,845.50	11:17:45	638.18	17,540	111,936.77
10:26:00	638.50	41,200	263,062.00	11:19:57	638.15	19,590	125,013.59

establishing that not only does the algorithm produce the intended outcome, but does so using the methodology that the broker says it is using. This analysis and imprimatur can be made available before any trades are completed for a specific client. An example of the kind of reporting is shown in Table 2. It remains in the brokers hands whether, or to what extent, they share the precise details of the function of the algorithm with clients as a means of either winning new business or retaining existing clients in the face of competition. Independent verification can be applied to different algorithmic outcomes and across an array of different 'real life' situations, without causing any concern about client confidentiality.

In conclusion therefore, both the actual outcome of algorithmic trading and the basis on which it is conducted can be measured – the former only after the event, but the latter in advance of any actual trading with a specific client. Any client, who is approached by a broker offering algorithms, who is unwilling to be independently assessed, should be naturally suspicious and predisposed not to consider them as a suitable counterparty.

How to measure?

Unfortunately, in spite of the common terminology used by providers not even the four 'standard' outcomes noted above can be defined to a universally agreed standard. For example, Bloomberg allows dozens of different ways to calculate the VWAP, depending on what trades might be excluded from the calculation. In highly liquid securities the exclusions may make only marginal difference to the VWAP calculation, but in some cases the changes made deliver a noticeably different result.

Similarly, when assessing the Arrival Time price should it be the bid, ask or mid price and should that determination depend on whether the trade is a buy or a sell, and whether or not the market in the security is rising or falling. Should any attempt be made to take account of the volume being traded at or around the Arrival Time, or should the last tick be the price chosen. All this assumes there are no errors in any of the data from market data vendors or exchange feeds.

The important point for buy-side traders to bear in mind is that the proponents of algorithmic trading make the case that a particular result is 'assured' to within a very small error tolerance. It is suggested that this result will be achieved without the buy-side trader having to spend time and effort 'monitoring' the progress of the transaction. Rather they can leave it to the algorithm to deliver the chosen result. However, if the chosen result is not defined with sufficient precision, almost any outcome can be justified as having met the objective of using an algorithm. This is clearly unsatisfactory.

However, while there may be differences in the definitions of the benchmarks being targeted and in the way the programs actually operate, from a client perspective the important question is the extent to which this may make a difference to the outcome (i.e,. the actual price achieved on the trade). As well as considering the difference on any particular trade,

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clients will also want to assess the extent to which 'outperformance' by an algorithm is consistent or simply reflects the specifics of an individual trade.

In terms of impact on performance, most firms engaged in the business accept that differences in definitions can be meaningful in terms of outcomes. Data from within the GSCS universe, which covers millions of trades in thousands of different equity securities, suggests that the bid/offer spread is seldom less than 15 bps, and in some countries (not merely emerging markets) more than 50 bps. Clearly defining the price target in precise terms is critical when measuring Arrival Time or Closing Price targets. Similarly, while minor changes to VWAP definitions may make only a few basis points difference across daily VWAP data, the impact on VWAP during particular intervals of time may be much more substantial. Again the GSCS universe of data confirms that variations of up to 50 bps should not be regarded as uncommon, even though overall the figure is lower.

In the context of commission savings of 10 bps or less for algorithmic trading, the potential loss of value caused by the application of an inappropriate 'benchmark' is clearly significant. To embark on algorithmic trading without having a plan and process to effectively monitor the outcome is potentially costly to the buy-side firm.

What is important within any measurement system is consistency in approach across all brokers, an ability to 'tailor' analysis of the trades to suit the particular circumstances of the client and an interactive approach to the subject which allows for assessment methodologies to be tried and adjusted as and when necessary. An ability to compare algorithmic trading outcomes against those achieved by other managers using the same brokers and algorithms is an added bonus. Only independent analysis can offer the possibility of achieving these diverse but critical objectives.

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