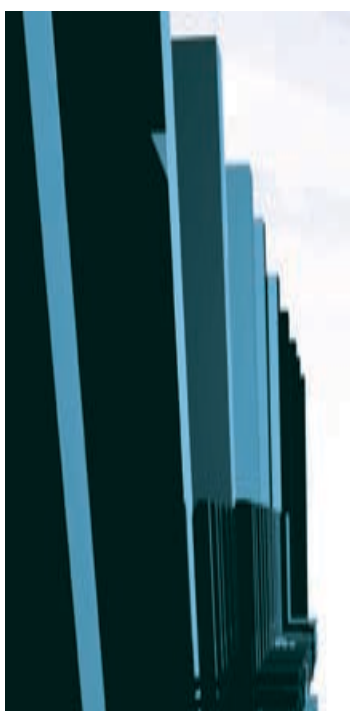


Best Execution Compliance Automation



MiFID requires investment firms to be able to demonstrate that they have secured the best possible execution for their clients, taking into account the various characteristics of the trades involved. In this article, **Mark Yeandle**, Senior Consultant at Z/Yen, reviews the development and testing of Z/Yen's risk/reward prediction software that offers a 'sifting engine' designed to help firms automate the best execution compliance function

The European Union implements the Markets in Financial Instruments Directive (MiFID) on 1 November 2007. Article 21 of MiFID, *Obligation To Execute Orders On Terms Most Favourable To The Client*, which relates to 'best execution', states:

Member States shall require that investment firms take all reasonable steps to obtain, when executing orders, the best possible result for their clients taking into account price, costs, speed, likelihood of execution and settlement, size, nature or any other consideration relevant to the execution of the order... Member States shall require investment firms to monitor the effectiveness of their order execution arrangements and execution policy in order to identify and, where appropriate, correct any deficiencies.

In the US, a similar set of regulations from the Securities and Exchange Commission, RegNMS, takes effect in 2006 and also requires that investment firms are able to demonstrate best execution. The Financial Services Authority advises:

*Firms will need to consider how they will monitor execution performance by the venues included in their policy, and their processes for determining which execution venues to use. They will need to consider the extent to which their existing trading strategies enable them to deliver on these obligations. This could have systems impacts for some firms and generate wider demand for data relating to executions (FSA, *Planning for MiFID*, November 2005, p 12).*

Most brokers rely on traditional management oversight of the trading process or customer feedback to control execution quality – but traditional oversight cannot cope with today's volumes and clients tend to feed back selectively. Many brokers contrast prices obtained in a sample of trades (one per cent may be typical according to the British Bankers' Association) with the published bid-offer spreads available at the time – but then complain that the bid-offer spreads are only a good comparison for very small trades.

What is missing is the ability to show that a specific trade was executed at a reasonable price, taking into account the various characteristics of the trade. In order to comply with MiFID, the only effective method of monitoring thousands, or hundreds of thousands, of trades per week is to have an automated process identifying a sensible set of anomalous trades for individual examination. Basically, firms need a 'sifting engine' that puts forward trades that must be examined – 'best execution compliance automation'.

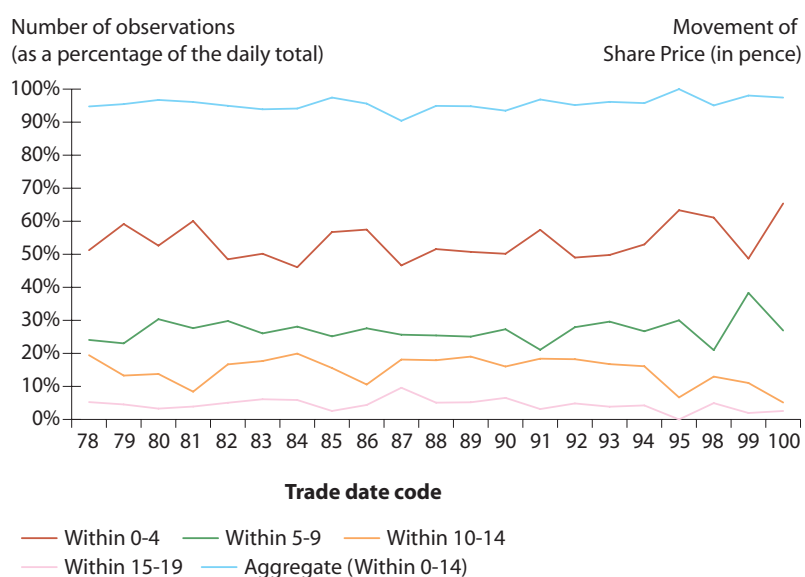
In 2004, Z/Yen undertook an informal trial of its PropheZy risk/reward prediction software on bid-offer spreads for the small-cap trades of a broker. PropheZy is a commercial application of a Support Vector Machine (SVM). This trial indicated that PropheZy might be good at identifying trading anomalies for compliance purposes.

Best Execution Compliance Automation (BECA) Project

In 2005, Sun Microsystems and the London Stock Exchange, with the cooperation of four brokers, sponsored a detailed, formal trial of PropheZy using three months of 2004 data, comprising over 190,000 trades with a value of over £54bn, in order to predict a fourth month. The project objective was to see if PropheZy could predict a number of trade characteristics, in particular the likely price range of a trade (specifically, one of 20 price bands on a logarithmic scale). Other characteristics that were tested for predictability included the counterparty to the trade and the share itself (given all the other characteristics).

The project demonstrated that the PropheZy system successfully predicted price movement bands. For instance, by setting the level of acceptable accuracy at 'within 0 to 4 bands' out of 20 (ie one quarter of the logarithmic scale, see Chart 1), PropheZy was able to predict over 50 per cent of the trades' price bands acceptably. Using these predictions, it was possible to set a level for best execution outliers or anomalies using price band prediction differences.

Chart 1 – Broker B, differences between actual and predicted values (by day)



An outlier, or anomalous trade, was defined as a trade where the predicted price movement differs from the actual price movement by more than 15 bands out of 20 – either a very high price movement was predicted but a low price movement was observed, or a very low price movement was predicted but a high price movement was observed.

Table 1 below indicates that when using the SVM as an initial filter (First Filter), on average seven per cent of non-SETS trades were defined as outliers. Seven per cent is still too many outliers for a detailed manual investigation. A second filter is therefore needed. A trade is unlikely to fail best execution if it was conducted at the best prevailing price (or better), though there are some arguments that very large trades might be capable of exceptional improvement under certain conditions. When excluding trades outside the bid/offer spread (Second Filter) is combined with the first filter, the number of outliers that are outside the bid/offer spread is approximately 1 per cent.

The research team also examined how well the SVM could predict the magnitude of a single share's price movement. By plotting the actual share price movement since the last trade against the SVM predicted price movement band, it is evident that the SVM does achieve reasonable predictions of price movement and, ultimately, responds well to changes in the market. In Chart 2, the three outliers for the share are plotted in green. It is interesting to note that in all three cases the SVM presages major changes, but for this broker they had not occurred at that point.

An inspection of the anomalous trades with the participating brokers was undertaken and it was agreed that the system was providing trades worthy of investigation. Participant feedback included the following:

"... This system highlighted anomalous trades and, if we had been using it, we would certainly have investigated any of these trades that were outside the Bid/Offer spread".

"... This system would be a great way of seeing a small number of 'odd looking' trades that we could check – the fact that the same principles could be applied to fixed income and other instruments makes it particularly interesting".

Table 1 – The number of outliers by broker

Broker	Number of December trades	Number of outliers	% outliers	Number of trades outside bid/offer	% outliers outside bid/offer	Number of trades outside bid/offer	% outliers outside bid/offer
		First Filter		Second Filter		Combined Filters	
A	2,232	109	4.88%	56	2.51%	1	0.04%
B	6,530	312	4.78%	2,879	44.09%	124	1.90%
C	294	6	2.04%	11	3.74%	1	0.34%
D	28,623	2,220	7.76%	2,621	9.16%	277	0.97%
Overall	37,679	2,647	7.03%	5,567	14.77%	403	1.07%

"... An extremely interesting and innovative approach – the trades that were highlighted would certainly have been investigated. Whilst there was no real pattern or similarity in the outliers, they were all things that should have been looked at".

"... I was fascinated to see the selection of trades that this system identified – there were good reasons why all of them traded at the prices shown but they were just the sort of trades that we should have been looking at".

Moving Towards A Compliance Workstation

PropheZy is a statistical and information technology approach, with applications in numerous areas that Z/Yen terms dynamic anomaly and pattern response. Anomaly detection using PropheZy has wide applicability in a number of trading markets beyond equities, including foreign exchange, fixed income and commodities. In addition, the sifting approach to identify anomalous trades could be expanded from just price to cost, speed, venue, order fulfilment, client instructions and size.

The project was not, however, just a statistical exercise. During the course of the project, the team provided a prototype 'Compliance Workstation'. This Compliance Workstation combined tools (PropheZy, VizZy, FractalIntel- ligence and Decisionality) within an Excel framework that provided the ability to:

- construct predictive tests on any trade characteristic in order to spot anomalies;
- spot anomalies using cluster analysis;
- display the results visually, specifically showing predicted versus actual differences in three dimensions (Diagram 1);
- provide a 'drill down' tool for a compliance officer to relate any of the analyses to specific trades (Diagram 2);
- track the investigation process, providing an 'audit trail' of compliance officers' work.

Next Steps

The BECA project is exciting because it demonstrates that the automated sifting of trades can identify anomalies, thus reducing the costs of complying with MiFID, while simultaneously increasing the effectiveness of the compliance function. The Compliance Workstation is available to firms for purchase in order to help comply with MiFID. The BECA project could be extended, with some further testing, to buy-side (asset managers and investment managers) compliance and other markets. The BECA project also provides an opportunity for exchanges that wish to provide a centralised compliance service for their members.

For further information on this project please contact either Michael Mainelli (michael_mainelli@zyen.com) or Mark Yeandle (mark_yeandle@zyen.com) on +44 207-562-9562. ■

Chart 2 – Movement of share price (in pence) and predicted price movement band for a single share

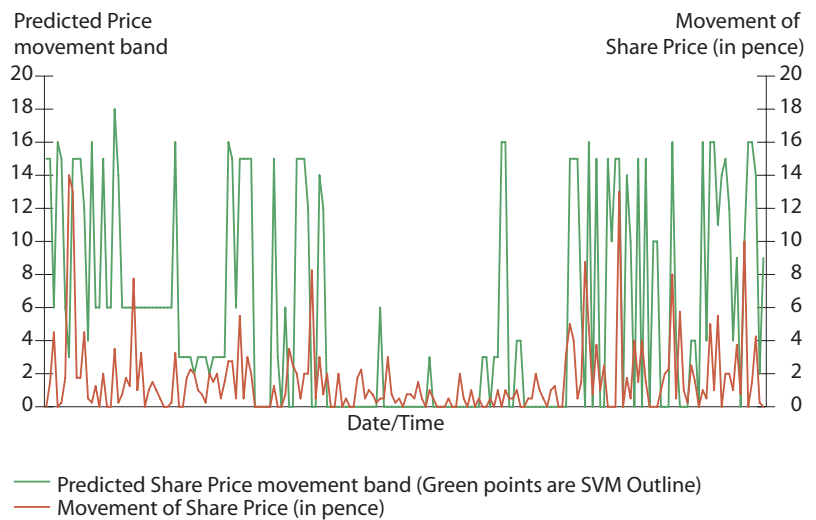


Diagram 1: Contrasting a sub-set of actual versus predicted trade price bands

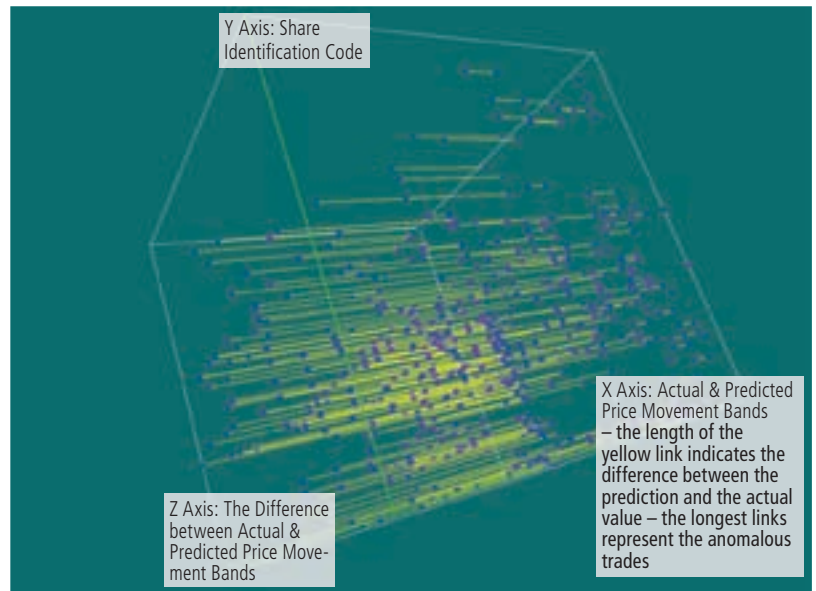


Diagram 2: Drilling down to investigate specific anomalous trades

