"Zero Intelligence" Trading Closely Mimics Stock Market

A model that assumes stock market traders have zero intelligence has been found to mimic the behavior of the London Stock Exchange very closely.

However, the surprising result does not mean traders are actually just buying and selling at random, say researchers. Instead, it suggests that the movement of markets depend less on the strategic behavior of traders and more on the structure and constraints of the trading system itself.

The research, led by J Doyne Farmer and his colleagues at the Santa Fe Institute, New Mexico, US, say the finding could be used to identify ways to lower volatility in the stock markets and reduce transaction costs, both of which would benefit small investors and perhaps bigger investors too.

A spokesperson for the London Stock Exchange says: "It's an interesting bit of work that mirrors things we're looking at ourselves."

Most models of financial markets start with the assumption that traders act rationally and have access to all the information they need. The models are then tweaked to take into account that these assumptions are not always entirely true.

But Farmer and his colleagues took a different approach. "We begin with random agents," he says. "The model was idealized, but nonetheless we still thought it might match some of the properties of real markets."

Buying and Selling

In the model, agents with zero intelligence place random orders to buy and sell stocks at a given price. If an order to sell is lower than the highest buy price in the system, the transaction will take place and the order will be removed - a market order. If the sell order is higher than the highest buy price, it will stay in the system until a matching buy order is found - a limit order. For example, if the highest order to buy a stock is \$10, limit orders to sell will be above \$10 and market orders to sell will be below \$10.

The team used the model to examine two important characteristics of financial markets. These were the spread - the price difference between the best buy and sell limit orders - and the price diffusion rate - a standard measure of risk that looks at how quickly the price changes and by how much.

The model was tested against London Stock Exchange data on 11 real stocks collected over 21 months - 6 million buy and sell orders. It predicted 96% of the spread variance and 76% of the variance in the price diffusion rate. The model also showed that increasing the number of market orders increased price volatility because there are then fewer limit orders to match up with each other.

Incentives and Charges

The observation could be useful in the real financial markets. "If it is considered socially desirable to lower volatility, this can be done by giving incentives for people who place limit orders, and charging the people who place market orders", Farmer says.

Some amount of volatility is important, because prices should reflect any new information, but many observers believe there is more volatility than there should be. "On one day the prices of US stock dropped 20% on no apparent news", says Farmer. "High volatility makes people jittery and sours the investment climate." It also creates a high spread, which can make it more expensive to trade in shares.