Particle physics helps combat securities fraud

Markets expert Joost Pennings hopes to be able to identify fraudulent transactions on futures markets using technology from the particle physics laboratory CERN in Geneva. This might make it possible to prevent stock market crashes and fraud.

TEXT KENNETH VAN ZIJL **PHOTO** BLOOMBERG / GETTY IMAGES

'They did wonder what on earth an economist from Wageningen was doing among all those physicists and Nobel Prize winners at CERN,' says Joost Pennings, professor of Marketing at Wageningen. CERN is the centre in Europe for fundamental research on elementary particles. During a guided tour with an acquaintance who works at the site of the particle accelerator in Geneva, Pennings had a brainwave: he saw a similarity between the billions of collisions between elementary particles over ultrashort timespans and the millions of transactions that take place on the stock exchange in hundredths of a second.

'The people at CERN told me that most collisions go perfectly. Only if a collision is imperfect, or if a particle moves abnormally, does it throw up new insights. On the stock exchange, if the bid price and the offer price are the same, you have a transaction – in CERN terms, a perfect collision. If that is not the case, something is up. I suddenly saw an analogy with the data we had just received.'

Pennings won a data set with transaction data from the Chicago Mercantile Exchange Group (CMG), the largest stock market in the world for futures trading. CMG had run a competition for the data. Universities could submit plans outlining what they wanted to study using the data from the 'Limited Order Book'. 'I think our reputation was the decisive factor. Not many people know this, but Wageningen is a world leader in research on commodities future markets.'

USING TRANSACTION DATA

Pennings and his Wageningen colleagues want to study whether it is possible to use data from the Limited Order Book to find out whether transactions have taken place

that broke the rules. Agri-business traders buy and sell grain or potatoes, for instance, on the futures market in order to cover themselves for the consequences of price fluctuations. 'Sometimes the price goes up and down in nanoseconds. Nowadays many transactions are generated by algorithms,' says Pennings.

One of the problems in analysing the Limited Order Book is that economists do not have the tools to analyse this big data, which can amount to thousands of terabytes. So Pennings wants to make use of ROOT, a CERN program which is capable of storing and analysing the gigantic quantities of data generated by the millions of elementary particle collisions in fractions of milli-

> **'We are going to store and analyse the transaction data'**

A trader on the Chicago Board Options Exchange, November 2017

seconds. It then converts them into graphics which reveal any deviations in the collisions or movements. 'Together with the people from CERN, we are going to store and analyse the big data on transactions in ROOT. The question is whether we shall find deviations that way.'

SPOOF INTEREST IN BUYING

One of the anticipated anomalies appears when a trader uses algorithms to put a series of buying orders on the market at just below than the market price. This creates the impression that there is a lot of interest in buying. Other traders notice that and buy the forward contract, thus pushing up the price. This 'spoofing algorithm', as it is called, then cancels the buying orders and

sells the trader's own contracts at a profit. All this happens in nanoseconds. In 2010, spoofing led to a flash crash in which one trillion dollars' worth of stock exchange value evaporated on the Chicago Mercantile Exchange in a matter of seconds.

'The buying and selling of commodities on the futures market should always be based on correct information. That is a fixed rule of the game. In spoofing, the information is false because the buyer has no intention of actually buying. That is not allowed.' Pennings wants to use ROOT not only to track down spoofing, but also in the end to be able to say how much risk there is that spoofing is about to occur, based on monitored market transactions. A forecast based on analysis of big data can be wrong too, of course. 'That is

why it is ultimately up to the law courts or the financial market authority to determine whether there is any question of spoofing.' Pennings has just embarked on a three-year research project, and cannot yet say what the data will reveal. He now has stock exchange data from 2015 at his disposal. Maybe that was a very virtuous year in which no one behaved badly. Pennings laughs: 'There is never a dull year on the stock exchange, never. You see, we are going to go ahead with CERN and we don't know exactly where we'll end up. There is a chance that it leads to something relevant to society. The only thing we know for sure is that it's going to be very interesting.' ■

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