



RESEARCH



Research by **Tobias Preis** crosses divides from physics to finance and aims to understand how we could prevent another stock market crash. Des Dearlove finds out how big data meets Big Brother

The digital treasure trove

Business is a magpie science. Business people are, after all, pragmatists and opportunists – they have to be. They are willing to pick up and polish a nugget of information or inspiration no matter what its source, so long as they believe it helps deliver a competitive advantage.

Over the last century, the world of business schools has been informed by sociologists, economists, psychologists, philosophers, anthropologists and many more. But physicists?

Dr Tobias Preis, Associate Professor of Behavioural Science & Finance at Warwick Business School, is a physicist by training. Along the way from physics to business school academic, in 2007 he also founded Artemis Capital Asset Management, a proprietary trading firm based in Germany. “During my PhD, I combined the study of physics with research into financial markets,” says Preis. “I was interested in the behaviour of financial systems and also had some

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background in computer science. My PhD gave me the chance to bring all these different disciplines together, to try and understand the vast amounts of data generated by the financial world. So everything I’m doing today is hugely interdisciplinary, involving large volumes of data.”

In the era of big data, Preis’s research looks at what he calls the “digital traces”, the digital detritus, the granules of information and insight we leave behind in our interactions with technology and the internet in particular. His research is probably best described as “computational social science”, an emerging interdisciplinary field which aims to exploit such data in order to better understand how our complex social world operates.

Positive traces

One intriguing source of information used by Preis’s research is Google Trends, which tracks people’s Google searches. The service is publicly available. Type in Christmas and you will see predictably yearly patterns for people’s searches (www.google.co.uk/trends/explore#q=christmas). “It’s a tool which provides you with information about human behaviour on a very large scale, describing behaviour across all the countries in which Google operates – over 200 worldwide,” says Preis. “With my collaborators, I became interested in whether we can use these digital online traces, which capture aggregated human activity, and in particular how we can use this information to improve our understanding of financial markets.”

Along the way, Preis and his colleagues, Helen Susannah Moat and Steven Bishop at UCL and H. Eugene Stanley at Boston University, uncovered an intriguing link. The Google Trends data allowed them to look at a national breakdown of what people search for online. They asked: do people from certain countries tend to look to the future – by keying in searches using next year’s date – more than others? “Some countries are more future-oriented than others. If you just calculate the sum of all searches for the next year, for example ‘2013’, versus all searches for the past year, for example ‘2011’, then you have a ratio which we call the Future Orientation Index,” explains Preis. “If we plot this index against the GDP per capita in all the countries we analysed, then we find a strong correlation between both quantities. This suggests a relationship between the ratio of future-oriented searches to past-oriented searches and the economic success of a country.”

The online search data throws up other extremely intriguing results. For example, Preis, Moat and colleagues have found that the more people search for “debt”, the more likely they are to have sold their shares at a lower price a week later. Similarly, in 2010 Preis and his colleagues showed that there is also a link between the number of internet searches for company names and transaction volumes of the corresponding stocks on a weekly time scale. If more people are Googling Apple, more traders are also likely to be trading in Apple stocks. “These new, big data resources, can provide new insights into human behaviour, in particular human decision making on

a large scale,” says Preis. “Google provides the possibility of looking at the early stages of collective decision making. Investors are not disconnected from the world, they’re Googling and using various platforms and services to collect information for their decisions.” In effect, these new sources of data can predict human behaviour. The events of the world are Googled before they happen. The next challenge for these researchers is to be able to identify key words and phrases at the time they are being used rather than historically.

The risks of diversification

Preis’s fascination with big data and financial markets also led to his involvement in a study of the US market index, the Dow Jones. His research analysed the daily closing prices of the 30 stocks forming the Dow Jones Industrial Average from March 15, 1939, to December 31, 2010. The results, published in *Scientific Reports*, shed light on why correlation risks in asset bundles were underestimated at the beginning of the recent financial crisis, and provide crucial information on the behaviour of markets in times of stress.

Preis and his academic colleagues discovered that a portfolio of shares, far from being diverse and spreading risk during a time of stock market slump, start behaving the same. This flies in the face of conventional wisdom. Traders are taught to diversify to spread their risk, but this general rule could have helped amplify the crashes, with Preis’s research finding that the correlation between stocks increases as the market slump heightens. Preis believes his findings

could help predict the breakdown in the ‘diversification effect’. In effect, this 72-year study of the Dow Jones could give traders an extra early warning sign in the fight to avoid the kind of stock market crash that struck the world economy in 2008.

“With a higher level of market stress, stocks tend to move closely together rather than behaving randomly, and this has major implications because these correlations are used to construct portfolios which seek to minimise risk,” Preis explains. “We could use the findings to help anticipate diversification breakdowns, which could guide the design of portfolios and contribute to the increased stability of the financial markets.”

“When financial markets are suffering significant losses, our findings could be used to anticipate the increasing lack of diversification in portfolios. This would enable a more accurate assessment of the risk of making losses.”

In collaboration with Moat, Preis has recently begun to investigate what secrets may be held in Wikipedia data. “We realised that Wikipedia data gives you clearer semantic definitions of what people have clicked on, in comparison to data on search terms such as ‘Apple’ which can have multiple meanings. It became clear to us that these data streams give us different perspectives on what people search for and what people find,” he says. There are, Preis anticipates, other digital treasure troves of data waiting to be discovered and analysed to better understand human behaviour and decision making. ■

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