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Home
World
Business
Markets
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Industries
Lex
Comment & analysis
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Columnists
Discussion & polls
Letters
Analysis
Comment
Technology
Management
Your money
Arts & Weekend
Sport
Jobs & classifieds
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The Long View: The end of normality

By Philip Coggan, Investment Editor
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The wild behaviour of markets and investors has attracted the interest of the finest academic minds. They are starting to tear up some of the standard "rules" that had been thought to apply to market movements.

Best known are the assaults on efficient market theory, which states that prices reflect all known information and are set by rational investors. The behavioural finance school has shown that investors have psychological biases that affect their ability to make decisions. Prices can thus depart from fundamentals.

The pattern of price movements is also unusual, as a soon-to-be-published book* by the mathematician Benoit Mandelbrot shows. The standard assumption is that financial markets resemble a "bell curve", or normal distribution. The curve fits some data quite well - the heights of American men, for example, or the results of coin-tossing sequences. But it does not fit the pattern of financial markets. Real trading has far more extreme events - "fat tails" in the jargon - than the bell curve would suggest.

Mandelbrot cites a Citibank study of the foreign exchange markets that saw a 7.9 per cent daily change in the dollar/yen rate, 10.7 times the standard deviation of the data. "Not if Citibank had been trading dollars and yen every day since the Big Bang 15bn years ago should it have happened - not once," he writes.

To use another example, the dollar fell substantially against the yen between 1986 and 2003, and nearly half that decline occurred on just 10 of the 4,695 trading days. In other words 46 per cent of the fall occurred in just 0.21 per cent of the trading time.

This is a problem for many financial models, which assume that markets operate on a bell curve basis. (The bell curve assumption makes the calculations much easier.) The result is that markets are far more risky than people think, as the founders of the US hedge fund Long-Term Capital Management found in 1998.

One of the wonderful things about the book is that the reader gets a clear picture of the history of financial theory before Mandelbrot proceeds to demolish it. This makes the first half of the book the best financial read since Nassim Nicholas Taleb's *Fooled by Randomness.*

If the standard assumptions are wrong, what is the right answer? Mandelbrot argues that financial markets display "fractal" patterns - geometric shapes in which a small part is a replica of the whole. An obvious example in nature is the cauliflower.

Furthermore, volatility tends to "cluster", rather like London buses, instead of being spread evenly throughout the data. The fractal structure means that a "power law" is in operation, creating a relationship between the size of the market movements and the frequency of their occurrence. Finally, and perhaps most controversially, markets have long-term "memory", so that each result is not independent of the last but in fact may be influenced by price movements a long time before.

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Regular patterns, long-term "waves" - these would appear to be evidence to justify technical analysis. Indeed, some chartists do cite fractal patterns as the basis of their work.

But Mandelbrot rejects their approaches. Talking of technical analysis, Mandelbrot says: "It beggars belief that vast sums can change hands on the basis of such financial astrology". The problem is that "the power of chance suffices to create spurious patterns and pseudo-cycles that, for all the world, appear predictable and bankable. Likewise, bubbles and crashes are inherent to markets. They are the inevitable consequence of the human need to find patterns in the pattern-less".

Although patterns do exist, they cannot be predicted, he writes. "I agree with the orthodox economists that stock prices are probably not predictable in any useful sense of the term."

Naturally, this leads to the question of whether Mandelbrot's insights are of any use. These issues were being discussed in the mid 1990s at conferences organised by the Swiss financier Richard Olsen (who features in the Mandelbrot book). But although many academics and finance professionals were aware of them, that did not prevent the dotcom bubble from developing and bursting.

Nevertheless, some researchers believe progress can be made. Didier Sornette's book**, decorated with fractal patterns, says the technique can be used to understand why crashes occur. Past analysis has focused on the imminent causes of the sell-off or on weaknesses in the structure of markets, such as the "portfolio insurance" trend of 1987. Investors had attempted to "insure" their portfolios by using the futures market. When the futures market fell, it drove down the cash market, causing further attempts to sell futures and so on.

But in fact Sornier, whose book is much harder going than Mandelbrot's, argues that a crash is inherent in the speculative bubble that precedes it, as traders interact to drive prices far higher than fundamentals. Such speculation leaves "fingerprints" in the market that may allow investors to predict future crashes. In particular, prices will obey a power law and show an increasing tendency to accelerate. (One could certainly see this in late 1999 and early 2000.) The immediate cause of the crash may thus be random; sooner or later, something will come along to send prices crashing.

Sornier claims to have predicted the Nasdaq crash of 2000 and the sharp 1999 equity market recovery in Japan, though not all his forecasts have proved accurate. For what it is worth, he foresees that the US equity market is in a period of stagnation that may last for up to a decade. He also predicts a "singularity" affecting the world economy and population (a super crash, perhaps) in 2050. Now that is a *really* long view.

** The Misbehavior of Markets: A Fractal View of Risk, Ruin and Reward, by Benoit Mandelbrot and Richard Hudson. To be published by Basic Books in August.*

*** Why Stock Markets Crash: Critical Events in Complex Financial Systems by Didier Sornette. Published by Princeton Paperbacks.*

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But the long view shows less regularity and a wider range of. behavior. This irregularity is also seen in how prices move together.Â normality measure displayed is the percent difference between normal and Barra Extreme. Risk estimates of 95% 1-day shortfall. Marginal contributions to shortfall admit to a simple and testable formulation.Â MCRs. The long view of history in BXR provides insight into extreme market dynamics, accounting for. volatility uncertainty, sudden spikes in correlation, frequent outliers, and asymmetry between. gains and losses. The normal Q-Q plot is an alternative graphical method of assessing normality to the histogram and is easier to use when there are small sample sizes. The scatter compares the data to a perfect normal distribution. The scatter should lie as close to the line as possible with no obvious pattern coming away from the line for the data to be considered normally distributed.Â curves moving away. from the line at the ends. Sample Quantiles 02468. Sample Quantiles 01234567.Â Any assessment should also include an evaluation of the normality of histograms or Q-Q plots and these are more appropriate for assessing normality in larger samples. Hypothesis test for a test of normality. Null hypothesis: The data is normally distributed. If p> 0.05, normality can be assumed. â€œNothing,â€ she chirped with a kiss to the end of his nose. He raised an eyebrow dubiously and it climbed higher as he watched her pull a length of thin red ribbon out of her pocket and loop it delicately around his neck. â€œNothing,â€ he repeated, eyes flicking from it to her, the corner of his mouth curling in amusement, â€œReally.â€Â Okay, so for any of you who read this that also have read/will read my long-fic "The Twilight Court", I want you to know that Yes, absolutely, that thing is still being worked on. I will finish it!Â â€œSuppose itâ€™s a good thing then that the end is nigh,â€ Rylen shot back with a wicked smile. â€œRedâ€™s a good color for you, Commander,â€ Barris put in, losing the fight on keeping his expression neutral. A boyish, much-too-wide smile snuck onto his face.