An edited version of this article was published in the *London Review of Books* of 25 January 2018. At the end of the following week, the processes discussed in the article began to go into reverse. Then, on 5 and 6 February, the reversal became dramatic, with a rise of the VIX to well over 30, accompanied by big overall fluctuations in international stock markets.

It's impossible to be certain how much of those fluctuations can be explained by the reversal of the feedback loop described in the article. Certainly, though, the 'short VIX' trade described in the article incurred huge losses. In particular, by the close of trading on 6 February, the XIV (the 'inverse' fund that facilitated betting that the VIX would continue to fall) had incurred losses of 92%. In response, Credit Suisse – whose product the XIV was – announced its termination. Investors in the XIV could redeem their units, but it appears that they could do so only at prices that for most of them imply almost complete loss of their capital.

I've subsequently come to realise that some of what's said in the article about the VIX is over-simplified, but rather than change it I have left the text as it was when submitted to the *LRB*.

Donald MacKenzie
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Aren't they scared?

The VIX, or Volatility Index, is Wall Street's fear gauge. I first started paying attention to it in the late 1990s. Back then, a level of around 20 seemed normal. If the VIX got to 30, that indicated serious market unease. Over 40 signalled a crisis. The highest the VIX ever got was during the 1987 stockmarket crash, when it reached 150. In the 2008 global banking crisis, the VIX peaked at just under 90.

The US economy has gradually recovered from the banking crisis, and coming US tax cuts will further boost corporate profitability. These effects, though, are now 'priced in': share prices have already risen to reflect them. The tax cuts aside, the political system remains largely paralysed. The Federal Reserve seems likely to continue raising interest rates, which usually isn't good news for the price of shares. Add in a President who is the very opposite of calm (and who is under FBI investigation), and you might expect the VIX to

be approaching the sweaty-palmed 30s. It isn't. As this issue of the *LRB* went to press, the VIX was 9.55 [update]. It's been low for many months, and shows no clear sign of increasing.

Donald Trump would no doubt attribute the fear gauge's low readings to investors' confidence in his leadership. But, as we Scots put it, I hae me doobts, and there's indeed another explanation. Whenever you measure something, you alter it: that, after all, is what Heisenberg's uncertainty principle is often taken to mean. In the everyday material world, you can usually set this aside: I don't worry about the effect of my speedometer on how fast my car's wheels turn or on how its engine runs. You can't ignore it, however, in economic life. As the economist Charles Goodhart argues, if a measurement device is widely used, it stops being a simple economic speedometer. In the financial markets, it becomes part of how traders think, and can begin to affect their actions deeply.

The VIX involves two iterations of this process. The first began in 1973, when the world's first organised options exchange was set up in Chicago, and when a hugely influential mathematical model of options prices was published by the economists Fischer Black, Myron Scholes and Robert C. Merton. An option gives its holder a right, but not an obligation. A 'put option', for example, is the right to sell an asset such as a block of shares at a pre-set price on, or up to, the date on which the option expires. A 'put' can thus function as a kind of insurance, limiting the losses that the owner of the asset can suffer.

A right of that kind is clearly valuable, but it's far from obvious how to measure an option's value. Making simplifying assumptions of the kind common in economics, Black, Scholes and Merton found an elegant way of doing just that. Their options model quickly stopped being just academic economics: options traders started to use it in Chicago's crowded trading pits. In so doing, they changed patterns of options prices (which originally corresponded only roughly to the postulates of Black and his colleagues), making those

patterns a much closer fit to the model. Timothy Mitchell of New York University elegantly summarises the generic process: 'The effectiveness of economics rests on what it does, not on what it says'.[1]

The process's second iteration also involved economists, at least initially. The crucial parameter in the Black-Scholes-Merton options model is the volatility of the underlying shares: the extent of the fluctuations of their price. One of the simplifying assumptions made by the model's authors was that the volatility of any given stock was constant, but traders could not bring themselves to believe that. Nor did Fischer Black or any other economist take that assumption literally. Both practitioners and economists realised, however, that you could use the options model backwards, so to speak: you could start with the market price of an option, and calculate the level of volatility of the underlying shares that was consistent with that price.

You therefore didn't need to run a public opinion poll to find out market practitioners' expectations about the volatility of share prices: you could infer those expectations from the prices of options. In the mid 1980s, the economists Menachem Brenner and Dan Galai started to lobby the US options exchanges to create a 'volatility index', based on options prices, that would measure stockmarket volatility in a way loosely analogous to – albeit mathematically far more sophisticated than – how the Dow Jones average or the Standard & Poor's 500 index summarises the market's overall level. By the early 1990s, the CBOE (the Chicago Board Options Exchange) was convinced, and it commissioned economist Robert Whaley to devise the best way of constructing a volatility index covering the ensemble of the stocks that make up the S&P 500 index.

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[1] Donald MacKenzie first wrote about these performative effects of economics in the *LRB*s of 13 April 2000 and 31 October 2002.

The exact way in which the VIX – the CBOE Volatility Index – is calculated has changed through time, and its values have also been worked out retrospectively for the second half of the 1980s. (There's no simple way of saying exactly what a given level of the VIX means. Perhaps you remember from secondary school how a 'standard deviation' measures the amount by which, in aggregate, a characteristic such as people's height varies from its average. The VIX is a sort of standard deviation, modified for the particularities of finance, and conceived of as measuring the variability of a single object – a price – that changes continually as time passes.) What matters, however, from my viewpoint is that the VIX did indeed begin as a gauge, as a measurement device: it was not intended to affect how options or shares were traded, and initially does not seem to have done so to any great extent. It was never literally a gauge of fear, because the volatility of a price includes its upward as well as its downward movements. But traders have always looked to the VIX primarily as a guide to the extent to which investors in the aggregate fear major price falls.

The fear gauge started to become an intrinsic part of finance's engine in 2004, when the Chicago Board Options Exchange began to turn the VIX from a measure of volatility into something you could actually trade. The CBOE did so by introducing futures contracts on the VIX, which allow traders to bet on or hedge themselves against coming rises or falls in the VIX's level. Those contracts, and the CBOE Futures Exchange on which they trade, are the pretty much exclusive domain of professional traders. In 2009-10, however, 'exchange traded funds' (ETFs) linked to the VIX were introduced. These ETFs are not futures contracts but shares that track the VIX, and they are easily accessible to amateur traders, although also widely used by professionals. The best known of the ETFs is the VXX, which the *Financial Times* reports to have been the fifth most heavily traded stock in the US in 2016. If the VXX isn't racy enough for you, there's also the UVXY, ranked number ten by trading

volume. Buying the UVXY is the equivalent of trading the VIX using not just your own savings but also borrowed money.

The most interesting of all these ETFs is the one that traders know by its ticker symbol as the XIV. It's got nothing to do with the number 14. The XIV is an 'inverse' ETF: buying the XIV is the equivalent of betting that volatility, as measured by the VIX, is going to continue to fall. By last April, the apparently utterly esoteric XIV had reached 34th in the ranking of US shares by trading volume, surpassing (as the *FT* noted) blue-chip corporations such as Chevron and Pfizer. It's not surprising that the XIV has been so successful. Buying the XIV is the most straightforward way for an amateur trader to bet that the VIX will fall, and, as the *FT* puts it, that bet 'has trounced the returns of pretty much everything since the [banking] crisis'. Five years ago, you could still buy a unit of the XIV for less than $20. This November, you could have sold that unit for nearly $110, a return on your money of nearly 500 percent. (For the first time, the pages of the *LRB* here need a standard disclaimer: neither the author nor the *LRB* offers financial advice. Consult a qualified professional!)

The 'short VIX' trade is professionals' term for the wager, made in recent years on a massive scale, that the VIX will go on falling. There are, of course, two parties to every trade, and the short VIX is no exception. The professional trading firms that accommodate the giant bet on a falling VIX have to trade in such a way that they don't lose money if the punters are right; so far, they usually have been right. The firms do that by entering into offsetting trades, which usually take the form – directly or indirectly – of trades on the CBOE in the options whose prices inform the calculation of the VIX. These trades increase the supply of these options, helping keep their prices, and thus the VIX, low. There's a feedback loop involved, and it seems to have been operating on an industrial scale: so far, quite

sufficient to keep the fear gauge seemingly stuck at the bottom of the scale, no matter what the antics of the occupant of the White House.

Although many people in the markets also suspect that a loop of this kind explains why the VIX remains low, I can't be entirely sure. Things like this typically become clear only in retrospect, and sometimes not even then. I can't even decide whether I am more worried by the 'loop' explanation being right or by it being wrong. If it's right, the danger comes from the fact that finance's feedback loops can suddenly fling themselves violently into reverse, and this can cause severe whiplash. That, for instance, was almost certainly an important element in the 1987 crash. Market participants employing 'portfolio insurance', an automatic hedging strategy based on the Black-Scholes-Merton model, needed quickly to sell large numbers of S&P 500 futures contracts, and that selling pressure fed through into the underlying stockmarket, exacerbating an already fragile mood and helping cause a fall of around a fifth in a single day – the worst single day ever in the history of share trading in the US.[2] If all those market participants, amateur and professional, who are betting on the VIX remaining low were suddenly to change their minds and to try simultaneously to liquidate their positions, a disruption on this scale can't be ruled out.

Perhaps those betting on a low level of the VIX are aware of the feedback loop, and know that the loop could suddenly go into reverse: in other words, they are consciously taking a substantial risk in trying to squeeze the final few dollars out of the best trade of the last five years. But maybe they don't see themselves as taking a big risk, and perhaps the loop isn't the explanation of the fear gauge's low readings. Maybe investors in the US simply aren't frightened. That would be worrying in quite a different way. It reminds me too much

[2] The 1987 crash was described by MacKenzie in the *LRB* of 4 August 2005.

of the widespread feeling, in the run up to the global banking crisis, that markets were enjoying a durable 'great moderation', free of boom and bust, bubbles and crashes. The time the rest of us should get scared is precisely when market participants aren't.

Bio

Donald MacKenzie's most recent book, *Chains of Finance: How Investment Management is Shaped*, written jointly with Diane-Laure Arjaliès, Philip Grant, Iain Hardie, and Ekaterina Svetlova, was published in June by Oxford University Press.