



# Earthquakes and aftershocks

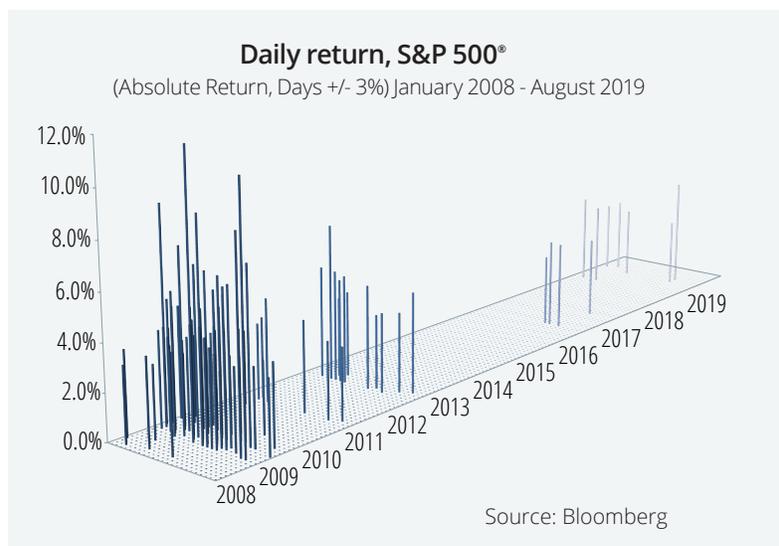
## A new visualization of market volatility



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- We present a new way to visualize stock market volatility that attempts to filter out noise and create a more intuitive view.
- The market’s “default setting” seems to be one of relative calm.
- But, extreme volatility events seem to cluster around each other at economic inflection points.
- We may therefore be on the cusp of another cluster of “seismic activity.” If so, newer investors will need a calm and experienced hand to help guide them through it.

If you’ve been in the market long enough, you probably recall an episode or two that fits the “earthquake model” well — long periods of relative calm, followed by clusters of high volatility. But rather than relying on intuition, misty memories and market folklore to represent this phenomenon, we tried to create a “topographical view” of the market by plotting each trading day over a given period on the same set of axis, then looking for periods of unusual volatility clustered together like clumps of trees in a mountain meadow. By itself, that visualization quickly becomes confusing for anything but the shortest periods of time. To create something more useful, we normalized prices by looking only at the absolute value of price changes, then plotting those data on the same set of axis.<sup>1</sup> Next, we sought to filter out some of the noise by considering any move in the market of less than



+/-3% to be immaterial and setting that day’s value to zero (after all, what we want to test is the tendency of extreme volatility events to cluster together, not run-of-the mill changes in price). Thus constrained,



we arrive at a “map” of the market that looks like the graph on the previous page, covering the roughly 10 years between the onset of the Great Recession and global financial crisis of 2008 and today.

A few interesting things jump out of the data. The first is the sheer number and magnitude of the volatility that accompanied the period 2008-09. Next, note the long period of relative calm between 2010 and 2012 (and the even more pronounced period of calm between 2012 and 2018), both of which illustrate the point that the market’s “default setting” is fairly tame. Finally, the very far end of our map shows the emergence of a few new clusters of “seismic activity” that could signal more volatility ahead — made particularly notable given that we seem to be

standing at a crossroads between continued economic expansion and cyclical contraction.

So what are the implications? First, the graph on the previous page suggests that extreme volatility events do indeed tend to cluster around one another. Next, we may be about to enter a period of heightened volatility — one that follows a long and happy period of relative calm that extends back many years. While that’s comforting, it also highlights that many younger investors who began their savings careers after the 2008 financial crisis might be about to wander into uncharted territory. They will undoubtedly need a steady, experienced hand to help guide them through the period of uncertainty that might lie ahead.

1 The intuition here is this: if we’re concerned about price volatility (and not price returns for their own sake), then a large positive move in price is just as relevant to us as a large negative move. Said differently, volatility is not directional — it’s just volatility.

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