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# A Richter Scale for Markets

By **ERIC DASH**

It's tempting to pull out the old earthquake metaphor when talking about the latest financial crises. How else to describe the economic devastation — the tremors in the subprime mortgage market, the seismic collapse of [Lehman Brothers](#), and the aftershocks reverberating in Europe?

But some academics are now taking the metaphor seriously, pursuing a new approach to economics they call econophysics. The field represents a significant break from traditional economics, by studying financial earthquakes in much the same way geologists study those on terra firma. "New approaches are needed to address the fundamental and practical challenges of our financial, economic and social system," a group of econophysicists [wrote recently in an open letter to George Soros](#), the billionaire investor and philanthropist.

Macroeconomists construct elegant theories to inform their understanding of crises. Econophysicists view markets as far more messy and complex — so much so that the beauty and logic of economic theory is a poor substitute. Drawing on the tools of the natural sciences, they believe that by sorting through an enormous amount of data, they can work backward to find the underlying dynamics of economic earthquakes and figure out how to prepare for the next one.

Financial crises are difficult to predict, the econophysicists say, because markets are not, as some traditional economists believe, efficient, self-regulating and self-correcting. The periodic upheavals are the result of a cascade of events and feedback loops, much like the tectonic rumblings beneath the Earth's surface.

Scientists have found that earthquakes, natural and financial, share similar patterns.

Small, subtle market gyrations are such regular occurrences that they are barely noticed; extreme market shocks — the proverbial “Big One” — are very rare. So too with earthquakes, which also adhere to a statistical relationship known as a power law.

Economic earthquakes also trigger dangerous aftershocks. Just as 19th-century Japanese geophysicists discovered that aftershocks continue to reverberate well after a first major tremor hits, modern-day stock market seismologists have identified a similar pattern with financial crashes.

“If you analyze them, this earthquake law is obeyed perfectly,” notes H. Eugene Stanley, a [Boston University](#) physics professor who published a pioneering study of [financial markets in the scientific journal Nature](#). “A big shock causes smaller aftershocks, and then ones smaller and even smaller.”

Indeed, financial crises come in clusters. The currency crisis in Thailand during the late 1990s was followed by similar problems in Indonesia and South Korea. After Lehman Brothers faltered, [Washington Mutual](#), the Wachovia Corporation and scores of smaller banks toppled over like dominoes.

Some econophysicists, as well as economists and politicians, suggest that the ongoing turmoil in Europe was triggered by the lingering effects of the 2008 panic that started in the United States.

Financial earthquakes also radically reshape the environment. The sudden release of energy in the Earth’s crust creates seismic waves that can move mountains; financial crises can lead to the upheaval of regulations in place for years.

After the crash of 1929 and [the Great Depression](#), the [Glass-Steagall Act](#) was enacted to separate commercial banking from investment banking. Now, in the wake of the recent crisis, lawmakers have just completed the biggest overhaul of financial rules since the 1930s.

“Great earthquakes shape landscapes,” said Didier Sornette, a geophysics professor who now runs the [Financial Crisis Observatory in Zurich](#). “Great crashes shape regulation, the perception of risk, and the psychology of people.”

But as with earthquake science, our understanding of financial crises is primitive.

Seismologists, for example, can monitor the Earth's daily gyrations along the San Andreas Fault and know that the chance of a devastating earthquake — one larger than 6.7 on the Richter scale — over the next 30 years is greater than 99 percent. But they can't pinpoint exactly when or where one will hit, or how big it will be.

Economic earthquakes are even less predictable. One reason is that the real world is a complex system that is constantly adapting. Another reason is that while there are geological limits on the energy an earthquake can unleash, there are no constraints on prices.

"The physical world cannot surprise us massively," said [Nassim Taleb](#), author of "The Black Swan," a best-selling book about the influence of highly improbable events. "The financial world can."

So if financial crises are hard to predict, can anything be done to prevent the damage they cause? Lessons learned by earthquake scientists are instructive here as well.

After the Great Earthquake of 1906, architects and engineers greatly revamped San Francisco's building codes so the buildings would be able to withstand an even heftier blow. Likewise, the recently enacted regulatory reforms are aimed at strengthening the nation's financial architecture. The new rules are intended to act like shock absorbers to buttress the market's wild swings.

"We want to fortify structures so they don't collapse," said [Lawrence H. Summers](#), the president's chief economic adviser. Other administration officials suggest that the so-called systemic risk council of regulators can be on the lookout for early tremors in financial markets, just as seismologists do. "If you have better monitoring systems for earthquakes, you can take precautions and evacuate the population if a tsunami is about to occur," said Alan Krueger, the [Treasury Department's](#) chief economist.

Or prepare for the next eruption in the markets. The [Securities and Exchange Commission](#) recently asked a Princeton-trained nuclear physicist to lead its investigation into the causes of a "flash crash" in May, when the stock market plunged and then quickly rebounded, nonetheless stoking investor fears.

Still, no panacea for calming the volatile markets is in sight.

“We can have sound financial institutions but still have major financial earthquakes if the policies that governments pursue are fundamentally unbalanced,” said Lowell Bryan, a senior partner at McKinsey & Company. “Nobody seems quite interested in going through the pain.”