Practical Applications of

Financial Disruption: *An Interview with Didier Sornette*

Practical Applications
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Overview

The history of the financial markets is punctuated with extreme events: Consider the Dutch tulip bubble in the 17th century and the recent global financial crisis. **Didier Sornette**, Professor and Chair of Entrepreneurial Risks at **ETH Zurich (the Swiss Federal Institute of Technology)**, has devoted more than two decades to studying bubbles and crashes. Sornette will be presenting at the 2016 **Global Derivatives** in Budapest. In a pre-conference interview with **Institutional Investor Journals**, he discussed **the Financial Crisis Observatory (FCO)**, a project that analyzes a vast array of asset classes, searching for evidence of bubbles or crashes in the early stages of their formation.

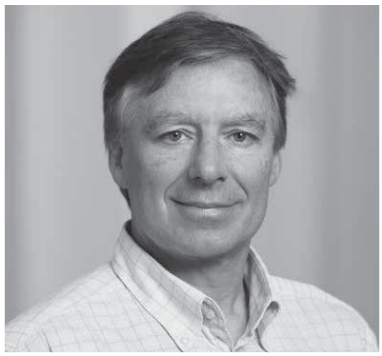
Practical Applications

- **Extreme phenomena exist.** The idea that steady and significant economic growth can be achieved with low volatility and little risk is a myth perpetuated by a misunderstanding of basic economic data.
- **Bubbles have a positive side.** In spite of their initial destructive nature, bubbles may drive massive investment in infrastructure and help to develop a cohort of highly skilled employees, with benefits that are realized over the long term.
- **FCO Cockpit shows promising results.** Real-time testing has demonstrated that there is predictability in the markets and that it is possible to identify turning points in financial regimes.

Questions And Answers

Your research on bubbles and crashes dates back to the mid-1990s and includes your book, *Why Stock Markets Crash: Critical Events in Complex Financial Systems*. What drew you to these topics and what are your main observations on such phenomena?

Sornette: My philosophy is that in order to learn about a system, it is good to look at it out of equilibrium, particularly when it is in an extreme state. Many of the systems we observe seem to be in balance most of the time, but underneath are tremendous conflicting forces that essentially cancel each other out. Extreme events provide a fantastic opportunity to decipher the forces that are hiding the true nature of the system from the investigator.



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Didier is Professor and Chair of Entrepreneurial Risks in the Department of Management, Technology and Economics at **ETH Zurich (the Swiss Federal Institute of Technology)**, a Professor of Finance at the **Swiss Finance Institute**, and an Associate Member of the Departments of Physics and Earth Sciences at ETH Zurich.

He uses rigorous data-driven mathematical statistical analysis combined with nonlinear multi-variable dynamical models, including positive and negative feedbacks to study the predictability and control of crises and extreme events in complex systems. This methodology has applications to financial bubbles and crashes, earthquake physics and geophysics, the dynamics of success on social networks, and the complex-system approach to medicine (immune systems and epilepsy, for example)—all leading toward the diagnostics of systemic instabilities.

Didier has authored numerous papers and articles on the topics of bubbles, crashes, financial markets, and analytical methodologies. In 2003, he published ***Why Stock Markets Crash: Critical Events in Complex Financial Systems*** (Princeton University Press, 2009).

In 2008, he launched the **Financial Crisis Observatory (FCO)**, at ETH Zurich to test the hypotheses that financial bubbles can be diagnosed in real time and that their termination can be predicted probabilistically.

Key Definition

Financial Crisis Observatory (FCO) at ETH Zürich

The Financial Crisis Observatory (FCO) is an experiment that presents novel financial bubble indicators, with the goal of helping to develop a science and culture of crisis risk monitoring. The FCO generates a series of positive and negative bubble risk maps that are recalculated and upgraded daily and made available through a public website.

Some bubbles are quite beneficial in the longer term:

✓ The dot-com bubble.

✓ Railroads in the US and UK in the mid to late 1800s.

Early in our research, we saw parallels between the rupture of a financial system and a rupture of a material engineering structure. Specifically, we found that the mathematical language developed for predicting the failure of key engineering structures like the Ariane space rocket turned out to be very flexible and convenient to apply to financial bubbles. Naturally the systems for analysis become more complicated when you dive into the specifics of the financial markets.

How has studying the numerous dramatic events around the world over the past few decades guided your work up to the most recent financial crisis?

Sornette: One of our group's most important conceptual breakthroughs has been to understand why the global financial crisis occurred and how it is tied to the evolution of the previous decades. In general, the financial markets and national economies are continuously punctuated by phases of overheating. This leads to innovation and progressive phases of engineering and product development, but often the system overreaches, and then there is a correction.

At the end of the Second World War, the level of technological advancement due to the war effort had spillovers with extraordinarily good consequences in terms of productivity growth for the next 30 years, a period known as "Les Trentes Glorieuses." Then a significant change took place. After three decades of real growth in capacity and output, the economy shifted to another regime. Starting around 1980, this period can be described as the "illusion of the perpetual money machine."

During much of this period before the crisis of 2007–2008, GDP appeared to be predictable, and we generally saw mild volatility, decreasing unemployment and low inflation. However, while people were toasting the Great Moderation, they were forgetting to look at other signatures: the global crash of '87, another break in 1991–1992, and a larger disruption with the dot-com crash in 2000–2001. These bubbles were acting as the canary in the financial coal mine, telling us that this growth was not obtained from real productivity and would not be sustainable. In spite of beliefs to the contrary, the events of 2007 to 2008 are not a surprise. In fact, the global financial crisis can be seen as the culmination of 30 years of relying on indebtedness, credit creation and financialization, not real value and productivity gains.

Is this similar to Schumpeter's waves of creation and destruction?

Sornette: For the general bubble and correction cycle, very much so. For the excesses of the thirty years ending with the great recession, absolutely not. Some bubbles are quite beneficial in the longer term. The dot-com bubble generated a lot of hype, and investors lost a great deal of money, but it also produced a massive amount of human capital, well educated and experienced young people who were relatively cheap to employ and ready to develop the next boom that we see in Google, Facebook and Amazon. Such social or tech bubbles create opportunities because they result in creation of excess capacity. Once it is installed, it will be reused and enables the next wave of creation. The history of railroads in the US and the UK in the mid to late 1800s is a similar situation. It is an extreme version of **Schumpeter**—bubbles and crashes can have benefits, but it may take several decades to obtain the return on the investment. In contrast, the bubbles associated with the Great Moderation were purely destructive for society and only served a minority.

FCO Cockpit—offers fresh bubble indictors for major markets.

—40-50 assets for the public to watch and experiment on.

What is the Financial Crisis Observatory and the FCO Cockpit?

Sornette: We want to get as close to scientific experimentation in finance as possible. So we came up with a methodology for the FCO, where we were watching for the most evident bubbles, documenting the cases, putting the written work aside for six months, sealed and encrypted, and publishing the public key immediately. That way, six months later, everyone would be able to check the document and see how accurate it was.

We ran the experiment for two years and then moved on to actual trading through an **Interactive Brokers** account with about $100,000 CHF. Here we tested it in real time and introduced the operational aspects: risks, transaction costs, slippage—all of the practical details. We ran the investment experiment for one year as an academic project, and it did very well. This confirmed to us that there is predictability in the markets and that it is possible to create diagnostics that watch for turning points successfully.

Since then we have been publishing the ***FCO Cockpit***, offering fresh bubble indictors for the major markets, showing 40-50 assets for the public to watch and experiment on. In our own research, we are observing 25,000 assets every day, so there is more in the works for the future, including publication of an index for investors.

You will present at the Global Derivatives Trading & Risk Management on "Diagnostic and Forecasting of Future Bubbles, Crashes, and Crises." What are the key takeaways?

Sornette: We will run the Cockpit and present a state of the world: "Where are the bubbles and the opportunities?" We will also highlight the point that extreme phenomena are complex and deeply connected with policy, regulation, politics, beliefs and culture.

This field is dominated by financial mathematics and engineering, and yet we do not have many relevant models for bubbles and crashes. There is enormous work to be done and I am happy to offer an approach to the challenge in a solid, axiomatic way.

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