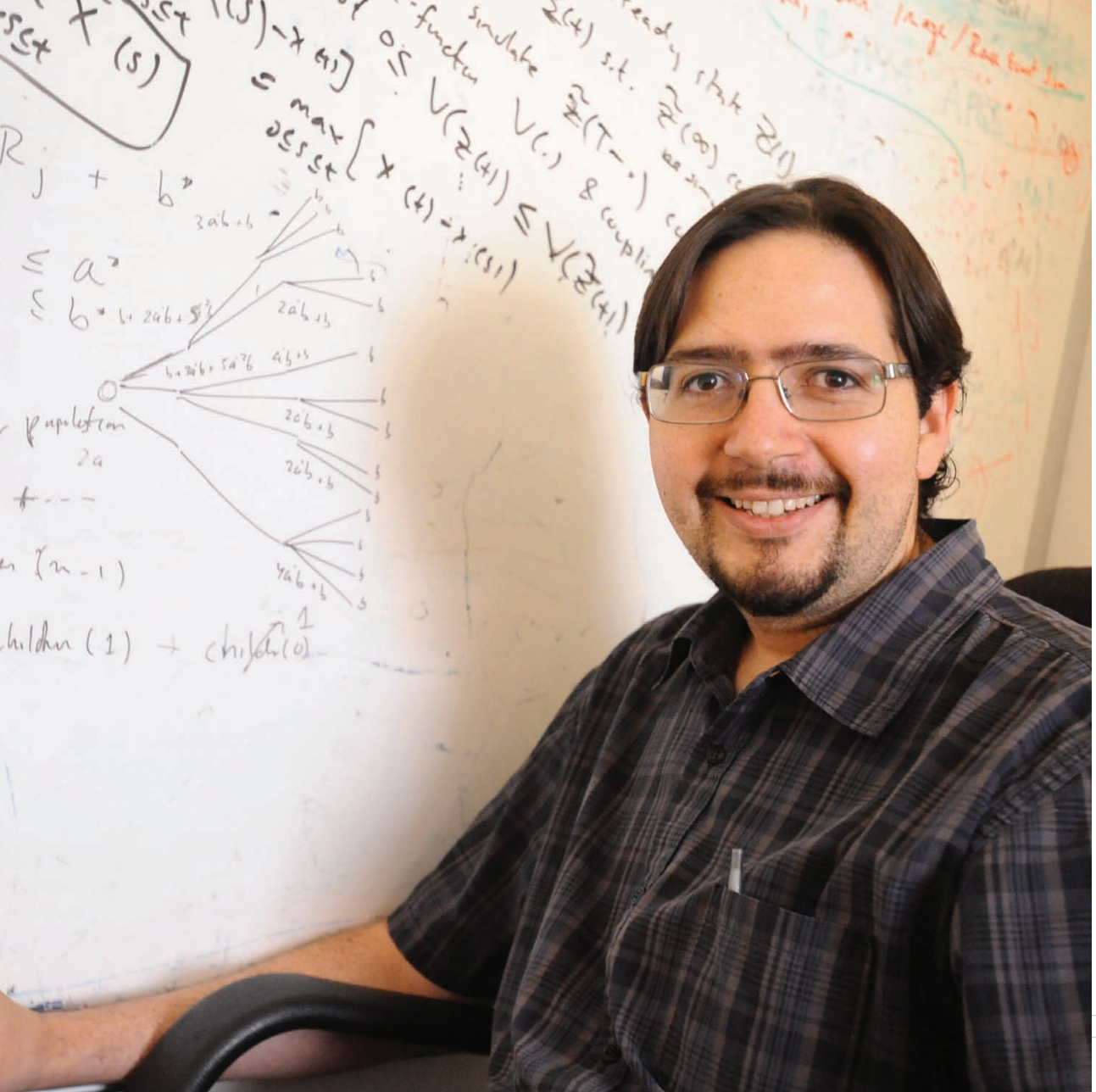

Understanding How Black Swans Evolve

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In early 2008, few investors saw the whirlwind coming. The financial crisis was what economists call a black swan, an earthshaking event so unlikely, no one anticipates or plans for it. Jose Blanchet would like to rectify this situation.

"I study black swan events by using probabilistic methods. That doesn't mean I predict them. Instead, I use computers to understand how they evolve," Blanchet said. His goal is to help investors see the warning signs of extreme events before they occur, while they still have time to respond.

Blanchet does this by building realistic computer models of portfolios. As they evolve, he shocks them with random events, such as bond defaults and bankruptcies. Ordinarily, the portfolio absorbs the hits. Rarely, very rarely, a combination of random shocks sends values crashing, just as cascading events did to real portfolios in 2008.

The shocks, Blanchet explained, must be truly random. "If you try to model a crisis that simulates these events, you could get it wrong and it will not reflect reality," he said.

"For example, suppose this is 2006 and you want to see what happens if lots of people default on their mortgages. Rather than start with a bankruptcy, we want to start with the events that cascade to create the bankruptcy. We let the probability model capture the events that occur naturally, even if they are rare."

"We look at extreme events in such contexts as queueing networks and risk management of financial and insurance portfolios. We want to understand what happens when there are huge backlogs or when companies post enormous losses. What are the consequences of that? What is the likelihood?"

Ordinarily, it would take a week or two to run enough simulations to generate a single black swan. That is far too slow to build a large enough database to study these events for similarities and differences.

To get around this problem, Blanchet devised algorithms that generate black swans rapidly. He then runs hundreds of simulations using a variety of portfolio models to see how they behave.

"We have a family of models that capture the features we want to study, and a computational tool that lets us observe these events as they unfold," said Blanchet. "It's like watching a crack in a dam. Most of the time, nothing happens. But sometimes it propagates and then the dam goes."

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