Inside Wall Street's Black Hole
by Michael Lewis  March 2008 Issue

For years, investors have relied on a complex formula to manage risk. But what happens if the Black-Scholes model is wrong—and we're in bigger trouble than ever?

The striking thing about the seemingly endless collapse of the subprime-mortgage market is how egalitarian it has been. It's nearly impossible to draw a demographic line between the victims and the perps. Millions of ordinary people ignorant of high finance have lost billions of dollars, but so have the biggest names on Wall Street, and both groups made exactly the same bet: that real estate values would never fall. Stan O'Neal, the former C.E.O. of Merrill Lynch, was fired for the same reason the lower-middle-class family in the suburban wasteland between Los Angeles and San Diego may have lost its surprisingly nice home. Both underestimated the likelihood of an unlikely event: a financial panic. In retrospect, the small army of Wall Street traders who lost tens of billions of dollars in subprime-mortgage investments looks as naive and foolish as the man on the street. But there's another way of viewing this crisis. The man on the street, for the first time, acted on the same foolish principles that have guided the behavior of sophisticated Wall Street traders for the past few decades.

If you had to pick a moment when those principles first appeared a bit shaky, you could do worse than the 1987 stock market crash. Black Monday was the first of a breed: a panic that suggested disastrous economic and social consequences but in the end had no serious effects at all. The bursting of the internet bubble, the Asian currency crisis, the Russian government bond default that triggered the failure of the hedge fund Long-Term Capital Management—all
of these extreme events seemed, in the heat of the moment, to have the power to change the world as we know it. None of them, it turned out, was that big of a deal for the U.S. economy or for ordinary citizens. But the 1987 crash marked the beginning of something else too—a collapse brought about not by real or even perceived economic problems but by the new complexity of financial markets.

A new strategy known as portfolio insurance, invented by a pair of finance professors at the University of California at Berkeley, had been taken up in a big way by supposedly savvy investors. Portfolio insurance evolved from the most influential idea on Wall Street, an options-pricing model called Black-Scholes. The model is based on the assumption that a trader can suck all the risk out of the market by taking a short position and increasing that position as the market falls, thus protecting against losses, no matter how steep. Nearly every employee stock-ownership plan uses Black-Scholes as its guiding principle. A pension-fund manager sitting on billions of U.S. equities and fearful of a crash needn't call a Wall Street broker and buy a put option—an option to sell at a set price, limiting potential losses—on the S&P 500. Managers can create put options for themselves, cheaply, by shorting the S&P as it falls, and thus, in theory, be free of all market risk.

Good theory. The glitch was discovered only after the fact: When a market is crashing and no one is willing to buy, it's impossible to sell short. If too many investors are trying to unload stocks as a market falls, they create the very disaster they are seeking to avoid. Their desire to sell drives the market lower, triggering an even greater desire to sell and, ultimately, sending the market into a bottomless free fall. That's what happened on October 19, 1987, when the sweet logic of Black-Scholes was shown to be irrelevant in the real world of crashes and panics. Even the biggest portfolio insurance firm, Leland O'Brien Rubinstein Associates (co-founded and run by the same finance professors who invented portfolio insurance), tried to sell as the market crashed and couldn't.

Oddly, this failure of financial theory didn't lead Wall Street to question Black-Scholes in general. "If you try to attack it," says one longtime trader of abstruse financial options, "you're making a case for your own unintelligence." The math was too advanced, the theorists too smart; the debate, for anyone without a degree in mathematics, was bound to end badly. But after the crash of 1987, individual traders at big Wall Street firms who sold financial-disaster insurance must have smelled a rat. Across markets—in stocks, currencies, and bonds—the price of insuring yourself against financial disaster rose. This rise in prices and the break with Black-Scholes reflected two new beliefs: one, that huge price jumps were more probable and likely to be more extreme than the Black-Scholes model assumed; and two, that you can't manufacture an option on the stock market by selling and buying the market itself, because that market will never allow it. When you most need to sell—or to buy—is exactly when everyone else is selling or buying, in effect canceling out any advantage you once might have had.

"No one believes the original assumptions anymore," says John Seo, who co-manages Fermat Capital, a $2 billion-plus hedge fund that invests in catastrophe bonds—essentially bonds with put options that are triggered by such natural catastrophes as hurricanes and earthquakes. "It's hard to believe that anyone—yes, including me—even believed it. It's like trying to replicate a fire-insurance policy by dynamically increasing or decreasing your coverage as fire conditions wax and wane. One day, bam, your house is on fire, and you call for more coverage?"

THE PROBLEM

This is interesting: The very theory underlying all insurance against financial panic falls apart in the face of an actual
panic. A few smart traders may have abandoned the theory, but the market itself hasn't; in fact, its influence has mushroomed in the most fantastic ways. At the end of 2006, according to the Bank for International Settlements, there were $415 trillion in derivatives—that is, $415 trillion in securities for which there is no completely satisfactory pricing model. Added to this are trillions more in exchange-traded options, employee stock options, mortgage bonds, and God knows what else—most of which, presumably, are still priced using some version of Black-Scholes. Investors need to believe that there's a rational price for what they buy, even if it requires a leap of faith. "The model created markets," Seo says. "Markets follow models. So these markets spring up, and the people in them figure out that, at least for some of it, Black-Scholes doesn't work. For certain kinds of risk—the risk of rare, extreme events—the model is not just wrong. It's very wrong. But the only reason these markets sprang up in the first place was the supposition that Black-Scholes could price these things fairly."

Black-Scholes didn't work; trillions of dollars' worth of securities may have been priced without regard to the possibility of crashes and panics. But until very recently, no one has bitched and moaned about this problem too loudly. Lay folk might harbor private misgivings about the clergy, but as lay folk, they are reluctant to express them. Now, however, as the subprime market unravels, the beginnings of a revolt against the church seem to be taking shape.

One of the revolt's leaders is Nassim Nicholas Taleb, the bestselling author of The Black Swan and Fooled by Randomness and a former trader of currency options for a big French bank. Taleb can precisely date the origin of his own personal gripe with Black-Scholes: September 22, 1985. On that day, central bankers from Japan, France, Germany, Britain, and the United States announced their intention to torpedo the U.S. dollar—to reduce its value in relation to the other countries' currencies. Every day, Taleb received a list of his trading positions from his firm and a matrix describing his risks. The matrix told him how much money he stood to make or lose, given various currency fluctuations. That September 22, when the central bankers announced their plan to lower the dollar's value, he made money but didn't know it. "I didn't know what my position was," he says, "because the movement was outside the matrix they'd given me." The French bank's risk-analysis program assumed that a currency crash of this magnitude would occur once in several million years and therefore wasn't worth considering.

Taleb made a killing that day, but it wasn't thanks to a grand plan and it wasn't happy money. "People in dark suits started coming from Paris," he says. "They said that the only way I could have made that much was to have taken far too much risk." But he hadn't. They had simply failed to account for the true nature of risk in financial markets. "Then I started looking at the history of markets," he says. "And I saw that these sorts of things happened all the time." Taleb became obsessed with the way prices in the options market, based on the famous Black-Scholes model, underestimated the risk of extreme and rare events. He set up his trading to profit from such events by buying up disaster insurance that would, according to Black-Scholes, be considered overpriced. When October 19, 1987, arrived, he was prepared. "Ninety-seven percent of all the returns I ever made as a trader, I made on that day," he says.

THE SOLUTION

In the past two years, Taleb has co-authored a pair of papers that have appeared in the sort of academic journals that originally published the Black-Scholes model. He and his co-author attack the model head-on in its own language (math), and as much as call for a retraction of the Nobel Prize awarded to Myron Scholes and Robert Merton for their work in creating the model. "This is what I'm saying to Merton and Scholes," Taleb says. "You guys are just parasites. You're not bringing anything useful to the market. You are lecturing birds on how to fly. You're watching them fly. And
then you're taking credit for it.”

He's saying more than that, actually. He's saying that the academics, in lecturing the birds, have made flying more difficult. Like John Seo—like a lot of traders who both understand the math of Black-Scholes and the reality of the marketplace—Taleb believes that the model has a pernicious effect: By leading investors to think they understand complicated financial risk when they actually do not, and by mispricing that risk, Black-Scholes encourages them to take more chances than they rationally should. The big Wall Street firms, oddly enough, are the most foolish in this regard. In a post-Black-Scholes world, these companies, more than anyone else, would be compelled to reduce their exposure to financial catastrophe and to raise the prices at which they sell financial insurance to others. Indeed, if no one has made too much of a stink about mispriced risk until now, it may be because the chief victims have been the big Wall Street firms that typically wind up with it. "The main reason there isn't a fundamental public outcry against Black-Scholes," says Seo, "is that the main losers from its mispricing are broker-dealers." The crashes happened, yet only Wall Street traders—rather than living and breathing human beings with whom the world could empathize—suffered.

The collapse of the subprime-mortgage bond market is different from the general run of modern financial panics in this respect: It involves millions of blissfully oblivious people who have never heard of the Black-Scholes options-pricing model. Nevertheless, it was Black-Scholes that gave them—and the rest of the financial system—the excuse to risk the roof over their head. They were followed by the mortgage brokers who lent them money and the banks that funded the brokers. Black-Scholes is no longer just a model; it has evolved into a climate of opinion about a certain kind of financial risk. It wasn't only big Wall Street firms, but a lot of small real estate speculators—otherwise known as homeowners—who, in effect, sold put options too cheaply against the risk of extreme, rare events. That many of these people literally live inside the investment that they've speculated on sharpens the pain but fails to drive home the point. Financial panics have become almost commonplace; events that are meant to occur once in a millennium now seem to occur every few years. Could this be because the financial system was built on an idea that badly underestimates the risk of catastrophes—and so conspires with human nature to create them?