

**THE WALL STREET JOURNAL.**  
Small Business WSJ.com

Essential Tools  
Smart Reads  
Best Advice

Visit  
[WSJ.com/smallbusiness](http://WSJ.com/smallbusiness)  
today

Dow Jones Reprints: This copy is for your personal, non-commercial use only. To order presentation-ready copies for distribution to your colleagues, clients or customers, use the Order Reprints tool at the bottom of any article or visit [www.djreprints.com](http://www.djreprints.com)

[See a sample reprint in PDF format.](#)

[Order a reprint of this article now](#)

**THE WALL STREET JOURNAL.**  
WSJ.com

BOOKS | JANUARY 22, 2010

## The Minds Behind the Meltdown

*How a swashbuckling breed of mathematicians and computer scientists nearly destroyed Wall Street*

By SCOTT PATTERSON

*On Thursday, President Barack Obama proposed new rules to curb a number of Wall Street's risky—and highly profitable—trading activities. One target: The secretive trading operations within banks that use large doses of leverage, or borrowed money, to make huge bets on the market. Wall Street says the regulations are unnecessary, and since the financial crisis struck, most banks have cut back on these trading outfits. But when the downturn first hit in the summer of 2007, several of them were among the first to suffer, and collectively they lost billions over a matter of days.*

*In his new book, "The Quants," Wall Street Journal reporter Scott Patterson suggests how this new breed of mathematicians and computer scientists took over much of the financial system—and the damage they inflicted in the 2007 meltdown.*

At Morgan Stanley's investing powerhouse Process Driven Trading on Monday, Aug. 6, founder Peter Muller was AWOL, visiting a friend near Boston. Mike Reed and Amy Wong manned the helm, PDT veterans from the days when the group was nothing more than a thought experiment, its traders a small band of young math whizzes tinkering with computers like brainy teenagers in a cluttered garage.

On Wall Street, they were all known as "quants," traders and financial engineers who used brain-twisting math and superpowered computers to pluck billions in fleeting dollars out of the market. Instead of looking at individual companies and their performance, management and competitors, they use math formulas to make bets on which stocks were going up or down. By the early 2000s, such tech-savvy investors had come to dominate Wall Street, helped by theoretical breakthroughs in the application of mathematics to financial markets, advances that had earned their discoverers several shelves of Nobel Prizes.

PDT, one of the most secretive quant funds around, was now a global powerhouse, with offices in London and Tokyo and about \$6 billion in assets (the amount could change daily depending on how much money Morgan funneled its way). It was a well-oiled machine that did little but print money, day after day.

That week, however, PDT wouldn't print money—it would destroy it like an industrial shredder.

The unusual behavior of stocks that PDT tracked had begun sometime in mid-July and had gotten worse in the first days of August. The previous Friday, about half a dozen of the biggest gainers on the Nasdaq were stocks that PDT had sold short, expecting them to decline, and several of the biggest losers were stocks PDT had bought, expecting them to rise. It was Bizarro World for quants. Up was down, down was up. The models were operating in reverse.

The market moves PDT and other quant funds started to see early that week defied logic. The fine-tuned models, the bell curves and random walks, the calibrated correlations—all the math and science that had propelled the quants to the pinnacle of Wall Street—couldn't capture what was happening.

At the time, few quants realized what was happening, but over the next few days a theory would emerge: The U.S. housing market was unraveling, leading to big losses in the mortgage portfolios of banks and hedge funds. One or more of those hedge funds needed to raise cash quickly to make up for the losses, and needed to sell assets quickly to do so. And the easiest-to-sell assets of all were stocks, those held in portfolios highly similar to quant funds across Wall Street.

The result was a catastrophic domino effect. The rapid selling scrambled the models that quants used to buy and sell stocks, forcing them to unload their own holdings. By early August, the selling had taken on a life of its own, leading to billions in losses. The meltdown also revealed dangerous links in the financial system few had previously realized—that losses in the U.S. housing market could trigger losses in huge stock portfolios that had nothing to do with housing. It was utter chaos driven by pure fear. Nothing like it had ever been seen before. This wasn't supposed to happen!

The quants did their best to contain the damage, but they were like firefighters trying to douse a raging inferno with gasoline—the more they tried to fight the flames by selling, the worse the selling became. Quant funds everywhere were scrambling to figure out what was going on.

Tuesday, the downturn accelerated. Applied Quantitative Research, the Greenwich, Conn.-based quant fund giant run by former Goldman Sachs Group whiz Cliff Asness, booked rooms at the nearby Delamar on Greenwich Harbor, a luxury hotel, so they could be available around the clock for stressed-out, sleep-deprived quants.

Authorities, meanwhile, had little idea about the massive losses taking place across Wall Street. That Tuesday afternoon, the Federal Reserve said it had decided to leave short-term interest rates alone at 5.25%. Investors on Main Street had little idea that a historic blowup was occurring on Wall Street. AQR risk-management guru Aaron Brown had to laugh watching commentators on CNBC discuss in bewilderment the strange moves stocks were making, with no idea about what was behind the volatility. Truth was, Mr. Brown realized, the quants themselves were still trying to figure it out.

Mr. Brown, who had joined AQR earlier that year, had been trying to get up to speed on the fund's systems to help manage its risk. He'd decided to stay in the office that Tuesday night and sleep on a small couch near his desk. He wasn't the only one. Near midnight, he stepped out of his office, eyes bloodshot from peering at numbers on a computer screen for the past 20 hours. The office was buzzing with activity, dozens of haggard quants chugging coffee, iPods plugged into their ears as they punched frantically on keyboards, unwinding the fund's positions in markets around the globe. It was a strange sight. The office was nearly as busy as it was during the day, but it was pitch black outside.

The carnage revealed a dangerous lack of transparency in the market. No one knew which fund was behind the meltdown. Nervous managers traded rumors by email and phone in a frantic hunt for patient zero, the sickly hedge fund that had triggered the contagion. Many were fingering Goldman Sachs's Global Alpha, the quant fund founded by Mr. Asness in the 1990s that had grown to massive proportions. But no one knew for sure.

At PDT on Tuesday, Mr. Muller kept ringing up managers, trying to gauge who was selling and who wasn't. But few were talking. In ways, Mr. Muller thought, it was like poker. No one knew who was holding what. Some might be bluffing, putting on a brave face while massively dumping positions. Some might be holding out, hoping to ride through the storm. And the decision facing Mr. Muller was the same one he confronted all the time at the poker table, but on a much larger order of magnitude: whether to throw in more chips and hope for the best or to fold his hand and walk away.

As conditions spun out of control, Mr. Muller was updating Morgan's top brass. He wanted to know how much damage was acceptable. But his chiefs wouldn't give him a number. They didn't understand all of the nuts and bolts of how PDT worked. Mr. Muller had kept its positions and strategy so secret over the years that few people in the firm had any inkling about how PDT made money. They knew it was profitable almost all the time. That was all that mattered.

That meant it was Mr. Muller's call. By Wednesday morning, he'd already decided. It was time to sell.

Walking downtown on Broadway that morning to Morgan Stanley's office through thick, sweaty crowds, Mr. Muller was growing impatient. Traffic in midtown Manhattan was jammed up like he'd never seen before. People swarmed the sidewalks, not just the usual tourists but businessmen in suits, nearly everyone jabbering frantically on their cell phones.

He'd just left his spacious apartment, located at the southwest corner of Central Park and 14 blocks north of Morgan's headquarters. There was no time to waste. The market would be opening soon. And he was worried the meltdown would continue.

Even nature seemed to be conspiring against him. Earlier that morning, a tornado had struck the city, hitting land shortly before the morning commute in New York City began in earnest. As quickly as the storm had rushed in, it cleared away, swirling into the Atlantic.

At Morgan's headquarters, Mr. Muller flew into the trading room. He flicked on his rank of computers with access to data on nearly every tradable security in the world. After a quick check of the market action, he checked PDT's internal gauge of gains and losses.

It was bad. This was the most brutal market Mr. Muller had ever seen. The U.S. housing market was melting down, causing huge losses at banks and hedge funds around the world. Stock markets were in turmoil. Panic was spreading. The entire system started to seize up as the delicate, finely wrought creations of the quants spun out of control.

PDT executed Mr. Muller's command that morning, dumping positions aggressively. And it kept getting killed. Every other quant fund was selling in a panicked rush for the exits. That Wednesday, what had started as a series of bizarre, unexplainable glitches in quant models turned into a catastrophic meltdown the likes of which had never been seen before in the history of financial markets. Nearly every single quantitative strategy, thought to be the most sophisticated investing ideas in the world, was shredded to pieces, leading to billions in losses. It was deleveraging gone supernova.

Oddly, the Bizarro World of quant trading largely masked the losses to the outside world at first. Since the stocks they'd shorted were rising rapidly, leading to the appearance of gains on the broader market, that balanced out the diving stocks the quants had expected to rise. Monday, the Dow industrials actually gained 287 points. It gained 36 more points Tuesday, and another 154 points Wednesday.

Everyday investors had no insight into the carnage taking place beneath the surface, the billions in hedge fund money evaporating. Of course, there was plenty of evidence that something was seriously amiss. Heavily shorted stocks were zooming higher for no logical reason. Vonage Holdings, a telecom stock that had dropped 85% in the previous year, shot up 10% in a single day on zero news. Online retailer Overstock.com; Taser International, maker of stun guns; the home building giant Beazer Homes USA; and Krispy Kreme Doughnuts—all favorites among short sellers—rose sharply even as the rest of the market tanked.

From a fundamentals perspective, it made no sense. In an economic downturn, risky stocks such as Taser and Krispy Kreme would surely suffer. Beazer was obviously on the ropes due to the housing downturn. But a vicious market-wide short squeeze was causing the stocks to surge.

The huge gains in those shorted stocks created an optical illusion: the market seemed to be rising, even as its pillars were crumbling beneath it.

There was a deceptive lull soon after lunchtime. But as the closing bell neared in the afternoon, the carnage resumed. Mom-and-pop investors watching the market make wild swings wondered what was going on. They had no way of knowing about the massive computer power and decades of quant strategies that were behind the chaos making a hash of their 401(k)s and mutual funds.

A source of the extreme damage Wednesday and the following day was the absence of some high-frequency statistical arbitrage traders, firms that use high-powered computers to trade rapidly in and out of stocks and can act as liquidity providers for the market.

As investors tried to unload their positions, the high-frequency funds weren't there to buy them—they were selling, too. The result was a black hole of no liquidity whatsoever. Prices collapsed. By the end of the day on Wednesday, PDT had lost nearly \$300 million—just that day. PDT, it seemed, was going up in smoke. Other funds were seeing even bigger losses. Goldman's Global Alpha was down nearly 16% for the month, a loss of about \$1.5 billion. AQR had lost about \$500 million that Wednesday alone, its biggest one-day loss ever. It was the fastest money meltdown Mr. Asness had ever seen. He was well aware that if it continued for much longer, AQR would be roadkill.

And there was nothing he could do to stop it. Or so it seemed.

**Write to** Scott Patterson at [scott.patterson@wsj.com](mailto:scott.patterson@wsj.com)

Copyright 2009 Dow Jones & Company, Inc. All Rights Reserved

This copy is for your personal, non-commercial use only. Distribution and use of this material are governed by our [Subscriber Agreement](#) and by copyright law. For non-personal use or to order multiple copies, please contact Dow Jones Reprints at 1-800-843-0008 or visit [www.djreprints.com](http://www.djreprints.com)

**Search Book Reviews**