There's money to be made by applying the laws of physics to the free markets. And trillion-dollar risks involved.

Inventing Money

BY NICHOLAS DUNBAR

245 pages, John Wiley & Sons, $30

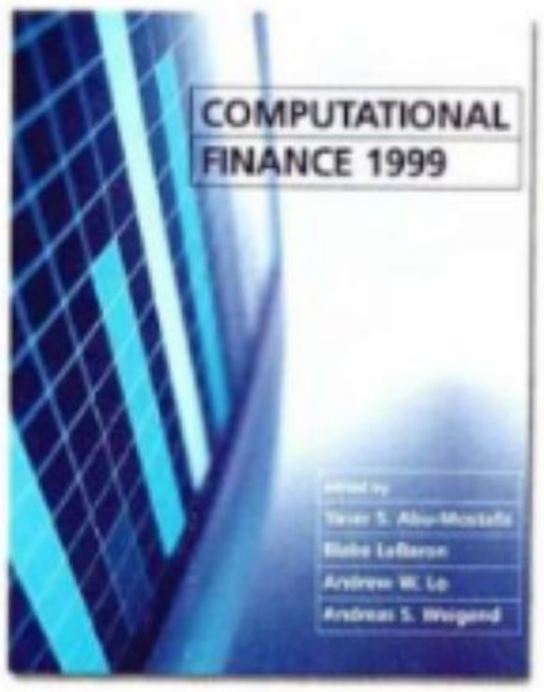
Computational Finance 1999

EDITED BY YASER S. ABU-MOSTAFA, BLAKE LEBARON, ANDREW LO, AND ANDREAS S. WEIGEND

650 pages, MIT Press, $40

IN 1998 the global economy came closer than most people could have understood to being toppled by a single firm: Long-Term Capital Management. Though LTCM actually had a mere $4.7 billion in equity, by the end of 1997 it had constructed $129 billion's worth of assets and $124.5 billion in liabilities. These figures were minor next to the leverage achieved in LTCM's derivatives positions: $1.3 *trillion*—equal to the U.S. government's annual budget.

LTCM's collapse caused Federal Reserve chairman Alan Greenspan to cut interest rates twice. He testified before Congress, which couldn't comprehend why the Fed had helped rally a consortium of the world's biggest investment banks to bail out a hedge fund's clients to the tune of $3.5 billion. Single mothers were being thrown off welfare, fumed Democratic congressmen, while the Fed rescued these fat cats. Republicans railed about government intervention in free markets. Though Mr. Greenspan's gnomic wisdom was deferred to as usual, the president of the New York Fed fared less well at his side: as he tried to explain the Fed's actions and the intricacies of LTCM's arbitrage engines, the congressmen accused him of patronizing them.



Now Nicholas Dunbar, in *Inventing Money: The Story of Long-Term Capital Management and the Legends Behind It*, gives general readers as good an explanation as we'll get of how the fund leveraged its way into becoming a market-distorting singularity. Still, reading this book, you may feel almost as puzzled as those congressmen. Mr. Dunbar does as fine a job as any writer could. But the array of financial techniques—some of the simplest are caps and swaptions, repos and reverse repos, delta and gamma hedging, interest-rate swaps, and Monte Carlo risk simulation—will boggle the minds of those of us who struggle to balance our checkbooks. It's like trying to get your brain around theoretical physics.

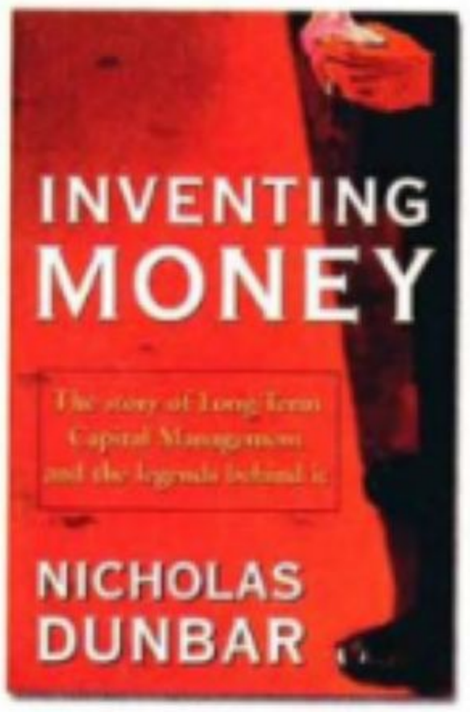
In fact, that is precisely what's involved. This relates to another singular aspect of LTCM: the people who ran it.

John Meriwether founded LTCM after building the bond arbitrage department at Salomon Brothers, the most profitable investment banking firm of the '80s. Michael Lewis, the author of the best-seller *The New New Thing*, established himself with *Liar's Poker*, which described what it was like to work at Salomon. In a famous scene from that book, Salomon chairman John Gutfreund comes by Mr. Meriwether's desk to propose a hand of liar's poker, which involves guessing the serial numbers on dollar bills and much bluffing, for high stakes. To wit: "One hand, $1 million, no tears."

According to Mr. Lewis, Mr. Meriwether replied: "No, John, if we're going to play for those kind of numbers, I'd rather play for real money. $10 million, no tears."

Mr. Gutfreund supposedly walked away.

If you're a reserved character (as Mr. Meriwether reportedly is) surrounded by Salomon's cowboy culture (in which the sobriquet "a big swinging dick" was, by Mr. Lewis's account, a macho trader's term of approval), then raising the ante in this fashion was an effective way to fend off such knuckleheads. But the incident also demonstrated Mr. Meriwether's willingness to make larger bets than most people would *think* of making, based on his intellectual assessment of the odds. Until he joined Salomon Brothers in the mid-'70s, bond trading resembled a kind of glorified day trading. Mr. Meriwether applied academic financial theories to find vast profits in bond arbitrage. This required trades in billion-dollar chunks, since one had to buy and sell $1 million blocks of U.S. Treasury bonds just to eke out $500 to $1,000. In the '80s, when the rest of Wall Street began hiring people who could convert abstract math, economic theory, and computer processing power into profit and made them backroom "quants"—quantitative analysts—Mr. Meriwether put the most promising brains out on the trading floor. In 1994, when he founded LTCM, that fund's principals included members of Salomon Brother's bond-trading department, physicists, two Nobel laureates in economics, and



SHELF LIFE

My Generation: Fifty Years of Sex, Drugs, Rock, Revolution, Glamour, Greed, Valor, Faith, and Silicon Chips, by Michael Gross (Cliff Street Books, $25)

The generation of Americans born in the two decades after World War II has consistently been at the forefront of dramatic social change. As the first wave of baby boomers nears retirement age, a new book by Michael Gross, a frequent contributor to *New York* and *GQ* magazines, examines their experience through the eyes of 19 individuals as diverse as real estate tycoon Donald Trump, porn star Nina Hartley, hip-hop maven Russell Simmons, software designer Tim Scully, and archconservative Barbara Ledeen.

Mr. Gross has distilled what must have amounted to hundreds of hours of interviews into a wide-ranging work about what it was like to grow up in the face of Vietnam, the sexual revolution, television, and computer chips. Each chapter looks at a stage of baby boomers' lives, from childhood to maturity, lingering for a few pages on one person and then jumping to the next. Though it could have devolved into a mere collection of life stories, *My Generation* draws on subjects' anecdotes and experiences like a palette with which to paint a broader picture. While no book can perfectly hold up a mirror to society, by focusing on the personal, Mr. Gross offers detailed insight into the history, challenges, and dilemmas of a generation.

Miss Wyoming, by Douglas Coupland (Pantheon, $23)

At once a commentary on American society and a postmodern love story, *Miss Wyoming* is the tale of two Hollywood B-listers who find each other in the shadows of the media spotlight. This latest work by Douglas Coupland, the author of such zeitgeist-capturing novels as *Generation X* and *Microserfs*, trots out the now all-too-familiar mélange of hip pop-culture references and eccentric characters. While Mr. Coupland pioneered this style, it is now so widely used that it has lost much of its effectiveness as a literary device.

Miss Wyoming follows Susan Colgate, a washed-up beauty queen and sitcom star, and John Johnson, a failing movie producer, both of whom have tried and failed to give up the Hollywood lifestyle. The instant attraction between the two is a pretense to backtrack into their pasts, as events in their histories reverberate into the present. Mr. Coupland employs this elliptical structure effectively, drawing us in as each succeeding chapter makes the present both clearer and more intriguing. His technical skill, however, cannot compensate for his use of the inescapable pop-culture leitmotif of the unfulfilled lives of Hollywood entertainers. Why read about fictional such lives in this book when you can get the real thing in *People* magazine?

—*Peter Rojas*

a former vice chairman of the Federal Reserve Board.

So LTCM represents the march of cutting-edge theory out of universities and into the markets, where the new ideas were commoditized as financial products. One of the hedge fund's two Nobelists, Robert Merton, envisioned the process in exactly these terms, calling it the "financial innovation spiral." It was "a philosophy of money machines," writes Mr. Dunbar in *Inventing Money*. "The inefficiencies, frictions, and irrational sentiments that pulled prices out of line and made arbitrage possible were constantly ironed out with each turn...Taking your profits, you then built new machines with the next generation of financial tools."

Mr. Dunbar's achievement is presenting LTCM in this context, without resorting to vague journalistic boilerplate like "highly complex financial models." As he shows, many of the developments arose out of ideas imported from physics, starting with a 1900 paper by Louis Bachelier, who was the first to analyze the mathematics of the Brownian motion of particles. Idiosyncratically, Mr. Bachelier studied not the jiggling of dust motes, but share prices on the Paris Bourse: statisticians' techniques showed both taking the same "random walk" from wherever one started tracking them.

Stephen Ross applied quantum mechanics to the behavior of stocks.

Thence, *Inventing Money* traces the derivatives revolution that took off in the '60s with the emergence of the Black-Scholes option-pricing model. Economist Fischer Black, calculating how a stock warrant's discount rate varied with time and stock price, found that the result resembled a well-known heat-transfer equation. Myron Scholes—who later shared the 1998 Nobel Prize in economics with Mr. Merton and was also an LTCM principal—helped Mr. Black develop a startlingly accurate option-pricing model. Mr. Merton assembled that model's final pieces and showed how investors, by owning stock in correct proportions to options they'd sold, could hedge against market movements—and, conversely, how options might be sold and a mirroring portfolio created with the underlying stock and cash. In the '70s, the finance theorist Stephen Ross applied physicist Richard Feynman's "sum over paths" quantum mechanics methods to the behavior of stocks.

The arguments for options and other derivatives—customized financial instruments whose value is derived from an underlying index, currency, stock, bond, or commodity—became compelling. With the hedging that derivatives allowed, pension and mutual funds might insure portfolios worth billions of dollars against market declines. The proportions of the stocks in those portfolios would need to change continually to immunize investors against the risks of selling options and shifting market conditions. The new computers, however, could crunch the necessary numbers thousands of times daily, churning out Buy and Sell orders.

For Mr. Meriwether and his adepts, such risk-management

technologies seemed to enable risk-free arbitrage profits. *Inventing Money* reports that Mr. Merton's autobiography for the Nobel Foundation portrayed his association with LTCM as the climax of his career. By December 1997, Mr. Dunbar notes, LTCM's capital balance was so big that—since returns are figured as earnings divided by capital—the fund couldn't show the net returns of previous years. LTCM confronted the unwelcome prospect of growing into an investment bank, with the hordes of employees, shareholders, and regulators that entailed. Alternatively, Mr. Scholes's and Mr. Merton's theories indicated that LTCM's risk-management technologies might be refined toward some ideal point of, as Mr. Dunbar writes, "zero capital and infinite leverage." Mr. Meriwether again assessed the probabilities and made an astounding bet. He returned $2.7 billion to LTCM investors *against their wishes*.

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But in August 1998, the Russian government defaulted on its loans, devaluing the ruble. At investment banks and funds, risk-management programs indicated that acceptable levels of uncertainty had been breached; traders reduced exposure, cutting even profitable positions. The flawed assumption underlying the Black-Scholes model—that there would always be continuous, frictionless markets—was revealed. Liquidity vanished. LTCM, with its reduced capital, found that everything previously working for it was now turned against it.

Financial Luddites have moralized gleefully. Still, in reality, almost nobody settles for less knowledge and power. *Computational Finance 1999*, edited by Yaser S. Abu-Mostafa, Blake LeBaron, Andrew Lo, and Andreas S. Weigend, is a collection of papers on the growing arsenal of technologies—like data mining, genetic algorithms, bootstrapping, and neural networks—that are being applied in the financial realm. In light of LTCM's extraordinary story, one essay, "Technical Trading Creates a Prisoner's Dilemma," is provocative. Its authors believe that, while individual traders will not resist the advantages conferred by technical forecasting techniques, those techniques' widespread adoption heightens volatility and ultimately diminishes traders' wealth. "Technical trading might be inevitable," they conclude, "yet traders would end up better off if it were possible to prevent it."

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