

Finance's Quant(um) Mechanics

One of the earliest “alternative” science careers, quantitative finance is now deeply embedded in the world’s finance industry

SAY YOU’RE A PHYSICIST WITH A STRONG MATHEMATICAL background, eager for intellectual stimulation and pining for some challenging problems to solve. You could seek a faculty gig and spend the next couple of decades developing a theory of everything. Or you could become a “quant” (short for “quantitative analyst”) and use advanced mathematics to help move mountains—of cash—through the world’s financial systems.

For anyone with a choice, Wall Street might not seem like an obvious employment destination at a time when the industry is crashing and burning. But quantitative analysis has a long history as an “alternative” career for scientists. In the past couple of decades, quants, in fact, have made themselves essential to the success—or failure—of financial-sector companies. It follows that despite the mortgage meltdown and the resulting credit calamity, exciting opportunities still exist for scientists with serious quantitative chops to work in finance—albeit, experts say, to a somewhat lesser extent in the near term. As scientific historian George Dyson says, in this time of crisis “we need more scientists in the banking system, not less.”



Fast turnaround. David Armet likes the fast-paced problem solving.

What quants do

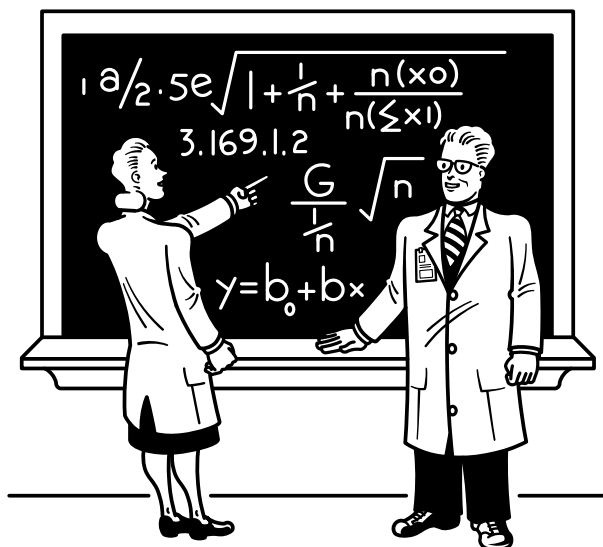
The sexiest quant careers, says Mark Joshi, a professor of actuarial studies at the University of Melbourne in Australia, are in derivatives pricing and statistical arbitrage—buying and selling to take advantage of market inefficiencies. Other quants perform portfolio analysis, and still others assess the models built by other quants. Wherever there’s a need for serious quantitative analysis in the financial industry—and that’s pretty much everywhere—you’ll find a quant.

Quants engage in a common activity: creating a wide variety of mathematical methods and applying them, via computer algorithms, to the solution of a particular financial problem. “If you look at the behavior of financial markets and try to describe that behavior using math, you very quickly end up in things like stochastic processes,” says Leif Andersen, a managing director and senior trading strategist at Bank of America based in Charlotte, North Carolina, with more than 10 years’ experience as a quant. Andersen, who has a master’s degree in mechanical engineering, another in electrical engineering, an MBA, and a Ph.D. in mathematical sciences, leads a team of 20 quants in the bank’s investment business. Andersen’s team works in a wide range of markets, including commodities, interest rates, and credit, computing prices and devising hedging strategies for the bank’s activities in capital markets. “When we have a good understanding of the markets and have a model for it, we try to use the model for certain applications like pricing instruments in the market, and that requires computer algorithms,” Andersen says. “So you have a mathematical model which you implement on the computer. That’s pretty much the exercise.”

Quant qualifications

Bank of America employs several thousand quantitative analysts, says Sam Murray, global executive quantitative recruiter for the company. About a third of the bank’s quants have Ph.D.s. Murray’s typical hire comes straight from academia with a master’s degree or a Ph.D. in physics, mathematics, statistics, or a related field. “People who come from a theoretical physics background do quite well with this,” Andersen says. “The problems we face are very similar to the problems they face.”

One unique aspect of the quant field is that work experience is sometimes considered a liability. Jim Varriale, publisher of QUANTster.com, a job Web site for quants, says that “the most sought-after quants are the fresh-out Ph.D.s in physics, math, and computer science” with no formal background in finance. “Companies want to train them themselves,” he says. “I don’t want to hire people with a financial background—they come with preconceived notions about how markets behave,” asserts Pierre P. Villeneuve, managing director of Mapleridge Capital Corp. in Toronto, Canada. “We would have to unbrainwash



Does G stand for force due to gravity or greenbacks?

them, and that's a lot of work." Villeneuve says he prefers to "hire raw scientists to bring quant skills and the strong intuition to marry the science with the business."

Another route into the field is a master's degree program in quantitative finance. Several such programs have sprung up recently. Many students already have advanced education in a scientific discipline when they enter the programs.

Quant communication

Hiring managers in quantitative finance may not seek financial experience, but they do look for the same "soft skills" sought by hiring managers in almost every industry—especially communication skills. "You have to be able to translate business problems into 'quantspeak' that teams of quants can work on," says Ivan Marcotte, senior vice president and global portfolio strategies executive at Bank of America and a 20-year-veteran quant. "You have to then take those results and translate them back into 'businessspeak' so that the business leaders know how to use the results and the efforts of our quantitative associates to get the most lift for our company."

Christine Jerritts, 31, senior mathematician at Quantitative Equity Strategies, a quant research and service company in Highlands Ranch, Colorado—and, incidentally, a race car driver for Team QuantSPEED in Denver—agrees. "Translation is number one," she says.

Complexity, with less waiting

Quantitative analysis, practitioners say, provides many of the advantages of scientific work with fewer disadvantages. "The complexity is as rich as in physics," Andersen says, "and you have a lot of people using your stuff all the time, which is very gratifying, particularly for people like myself coming out of an engineering background." Also, "you have a certain amount of instant gratification in this line of work," he continues, "where in many other fields, it takes you 15 years to get involved in some project with 15 co-collaborators." David Armet, 26, who works in quantitative and algorithmic trading on the currency desk at a global investment bank in London,

describes his work as "reactionary." He loves his job partly, he says, because of the very fast turnaround in solving a problem.

The field also pays well, especially in good times. Rita Raz, president of Analytic Recruiting Inc. in New York City and a quant recruiter for 29 years, says that an entry-level quant with a doctorate can expect a base salary of at least \$80,000 to \$90,000 and a signing bonus that's just as large. After 5 years in the field, Raz says, quants can expect to earn about \$130,000 in base salary and much larger bonuses—as much as 300% of the base salary in a successful year.

Finance's quantitative future

In science, there's commonly a gap between the short-term demand for employees and the needs perceived by high-minded experts. Everyone agrees that we need more researchers to solve many of the world's problems, but that rarely translates directly into jobs. Such a gap exists right now in quantitative finance. The recent financial crisis—which was global in scope but especially acute in the United States and a few other countries—has damaged short-term prospects for anyone seeking to enter the finance industry. Quants are no exception. Some even believe that, due to the role they played in some of the industry's more vulnerable areas, such as derivatives and hedge funds, quants may be affected more by the slowdown than most.

Emanuel Derman, a professor at Columbia University and one of the giants of quantitative analysis, believes that the recent crisis will make the job market for quants "obviously worse. There will be less appetite for complex products, less need for models, less money to hire, and less demand for quants in the short and intermediate run. ... It's hard to see out a long way with so many structural changes and government intervention." Still, he believes that the long-term outlook is solid because "derivatives and electronic markets and algorithmic trading are



Fast money. Christine Jerritts says that for "quants" working in finance, "translation is number one."

here to stay." Like Dyson, he believes that "in the long run, markets need more analytical and computer skills, not less." One possible bright spot even in the short term: The demand for quants in the regulatory area is likely to increase, Derman says.

In the decades since they first prowled Wall Street, quants have insinuated themselves deep into the fabric of the finance industry. So, though there will be ups and downs, quant careers aren't likely to disappear, even in a down market. "Nothing works if we're not there," Armet says. "The lights don't turn on if we're not there. ... We are essential to keeping the bank running." As long as banks keep running, there will be a demand for fresh talent. —ALAINA G. LEVINE

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