

Emanuel Derman

After 17 years at Goldman Sachs, Emanuel Derman decided it was time to take a break. Since leaving the firm in June, he has been writing a book and, in January, will begin teaching a course on volatility smiles at Columbia University. Derman's book is about what it is like to be a quant. "It deals with what it's like to move from a technical background to working with traders and sales teams," he says. "It's one-third quantitative in nature, one-third sociology and one-third memoir."



Alongside Fischer Black, Derman stands out as one of the key forces behind the development of Goldman's quantitative expertise. He was involved in a wide range of derivatives research, including ground-breaking work on the volatility smile, co-creation of the Black-Derman-Toy (BDT) interest rate model and pricing of exotics such as volatility swaps. He spent a decade as head of quantitative strategies at Goldman in New York before taking a role as managing director in firm-wide risk in 2000.

Derman says he is considering a move into the hedge fund sphere. But despite his long history at Goldman, his cutting-edge research has allowed him to keep one foot in academia, and he is also considering becoming a full-time academic.

Derman was a physicist before making the leap to Wall Street. In 1973, he earned a PhD in particle physics at Columbia, and went on to teach and conduct research at a variety of universities – including a stint at Oxford – before taking a position at AT&T Bell Labs in New York.

After about five years, and eager for a change of scene, he accepted an offer from Goldman Sachs at the end of 1985. At this time, Wall Street firms typically built many of their own computing systems, so Derman's experience in high-level language and model development was a good fit.

One of his first projects was to help rebuild the bond option desk's pricing model. Its Black-Scholes-like approach treated the bond's yield as a stochastic variable, but there was a problem: put-call parity – a fundamental relationship in derivatives pricing – was violated at long time horizons.

Derman discovered that the model was mistakenly using bond prices without the inclusion of accrued interest in some of its calculations. But once the problems were solved, the traders began clamouring for a better model.

Together with Bill Toy and Fischer Black, Derman created a new interest rate derivatives model. Though not published until 1990, Goldman's traders were using it as early as 1987. "Today BDT seems simplistic compared with market models and HJM [Heath-Jarrow-Morton]," says Derman. "But at that time practitioners weren't as sophisticated with regards to stochastic calculus and martingale valuation, so it was a

virtue,” he adds.

Before leaving for Salomon Brothers in 1988 Derman built an object-oriented library for running Goldman’s fixed-income analytics. He spent around a year at Salomon leading an adjustable rate mortgage group. But the opportunities for him to build models at Solly were limited, and he was tempted back to Goldman.

Black had hired Derman for his equities group, but actually left for Goldman Sachs Asset Management a week before Derman’s arrival. The equities division’s modelling, software and infrastructure were less developed than those in fixed income, and Derman’s group helped build software for pricing equity options and exotics.

This led Derman to research the volatility smile – the pattern created by an option price’s variation with strike price. The smile became apparent in equities after the 1987 stock market crash, and is thought to be partly the result of dealers’ crash phobia. Derman became acutely aware of the smile in 1990 when he saw it on an option trader’s screen in Tokyo. His team built a simple smile model, but its research was put on hold as other exotics model building took precedence.

In 1990, he was appointed head of quantitative strategies. His smile research resumed in 1993 when he and colleague Iraj Kani built a ground-breaking binomial – or implied tree – model. Published in Risk in 1994 (Riding on the smile [see profile of Bruno Dupire, page 34], Risk February 1994, page 32), the model provided an accessible way for traders to calibrate to the smile. It was a breakthrough at the time, but Derman is circumspect about its impact: “We thought it could be something like the next Black-Scholes equation; it provides insight but it’s not the perfect solution,” he says.

Concomitant with his team’s accomplishments in the pricing of exotic products, Derman sought to promote more of an open culture at Goldman – from educating traders to making research publicly available and writing understandable technical reports for clients. “[Quant] models should be taken seriously. But this isn’t physics – there aren’t categorical answers,” he says.

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