

A model prophet

Through his groundbreaking work on options valuation, structural models of credit risk and optimal pension fund investment, Robert Merton's influence on modern finance is profound. Navroz Patel talks to the Long-Term Capital Management co-founder and Nobel laureate about his work

Earlier this year, the US patent office published patent number 20070061238. Entitled *Method and Apparatus for Retirement Income Planning*, the patent might easily have been overlooked by anyone scrolling casually through the list of new filings. For someone with a knowledge of finance, however, the patent's authorship would have made it irresistible reading.

The inventors listed are: Zvi Bodie, a leading finance academic; Peter Hancock, former chief financial officer of JP Morgan; Roberto Mendoza, former vice-chairman of JP Morgan; and Robert Merton, a Nobel prize winner whose work with Myron Scholes and the late Fischer Black in developing the Black-Scholes option pricing formula in 1973 helped lay the foundations of modern derivatives markets.

The quarter's work to create a new kind of pension, of which the March 2007 patent describes a small part, is regarded by many in the market as the main success of Integrated Finance

Limited (IFL), a boutique firm founded by Hancock, Mendoza and Merton in 2001. Given the undoubted top-notch pedigree of its people, the strategic risk advisory and asset management firm created quite a stir when it launched, but its competitors claim it has so far failed to achieve its potential. The perception was reinforced when it closed a newly launched credit hedge fund last year after a lack of investor interest.

Merton, who now serves as chief science officer for Trinsum, the entity formed by IFL's January merger with Marakon, a New York-based high-end management consultancy, is pragmatic. "The way I look at it is we started two funds. One is successful, one closed," he says. "When a business is involved in multiple things, some work and some don't."

When asked if the perception that IFL had largely failed to capitalise on the immense intellectual power and market experience of its staff is fair, Merton pauses before answering. "Could we have done more and had more success? Sure. Do I think we're getting there? Yes. Getting Philips onboard is hopefully just the beginning," he says.

Dutch electronics giant Royal Philips Electronics was the first company to implement the firm's radical new pension system. Named SmartNest, the novel structured defined contribution scheme was very quietly rolled out for the company's top 400 executives in the Netherlands in January 2006.

"Without wanting to sound like I'm making excuses, the problems we are tackling are the big ones in risk management," Merton says. "Some things are naturally not going to work out when you're trying to commercialise financial science, especially when the thing you're offering is something quite different."

Merton claims other attempts to solve the pension problem have only ever offered partial solutions – and, in many cases, even these successes have been largely flawed. The difficulty is how to create a pension scheme that doesn't put too much of a burden on individuals to analyse investments, manages portfolios optimally and, from a technical and legal perspective, is structured as a corporate sponsor-friendly defined contribution scheme.

While admitting it's not perfect, Merton says the system he and his colleagues have developed is the first robust and scalable technology that solves the problem in an integrated fashion.

Standard defined contribution plans aren't the long-term solution for the pension problem, as they require individuals to answer a complex financial optimisation problem that has foxed even the sharpest minds in finance, argues Merton. "Asking individuals to make long-term calls on alpha and having their future level of comfort and happiness depend on that is a nutty way to do things," he adds.



Robert Merton, Trinsum

Instead, the system Merton and his colleagues created asks employees more answerable questions such as expected standard of living in retirement, retirement age and risk tolerance. A probability of achieving this goal is then calculated, based on the parameters entered into a web portal.

Once employees are comfortable with their choices and chance of success, money is deducted automatically from their salary and is invested in such a way that it gives the stated probability of achieving the desired retirement income.

A key concept underpinning the approach is that investors are most concerned about having access to a specified stream of income that is protected from longevity risk (so they don't outlive their assets) and is inflation-protected (so their standard of living is maintained). "So at its very core, what people are looking at, although they may not think about it like this, is a deferred real life annuity," Merton says. "We use market-proven technologies, the kind of dynamic replication that has been used by prop desks and hedge funds for years, to try to synthesise the required annuity."

In practice, this means employee contributions are dynamically allocated between a set of individual fixed-income portfolios of varying duration that reference both inflation and interest rates, and portfolios comprising equity, commodity and other asset classes such as real estate.

Rebalancing within SmartNest occurs as new money flows into the scheme from employees' salaries, and capital is deployed in the most efficient manner, depending on how the scheme has been set up, the cost and regulatory environments, says Merton. "Derivatives could be used, investments made in outside funds or we could even manage some funds ourselves if we eventually achieve a certain scale," explains Merton.

New York-based BlackRock is currently the asset manager of the Philips scheme, although Merton declined to discuss specifics. However, *Risk* has learnt the Dutch company is in the process of setting up the scheme in Germany and the UK, before extending to more employees in the Netherlands, and potentially elsewhere.

Beyond the user-friendly interface and sophisticated thinking underpinning the investment strategy, installing the system across jurisdictions presents a number of regulatory and practical obstacles. "The devil certainly is in the detail with this endeavour," Merton says.

With Trinum currently working on implementation of SmartNest for an unspecified US company, the work whose roots are in research originally published by Merton, Bodie and others decades ago is finally gaining some traction in the real world.

Merton, who in addition to his role at Trinum is a finance professor at Harvard Business School, views this lag as a consequence of the nature of risk management innovation. His decades of experience in the markets and academia have led him to conclude there are three factors that determine when a technology or technique is adopted by the market. "It's not about people suddenly getting a lot smarter and having a revelation that something is a great idea. It's about need, need and need."

Looking through a few examples from Merton's work helps illustrate why he might hold that view. The seminal paper by Myron Scholes and the late Fischer Black on the pricing of options and corporate liabilities, alongside Merton's paper that generalised the result, were published in 1973. By 1975,

virtually every trader on the floor of the Chicago Board Options Exchange was using a programmable Texas Instruments calculator to work out their Black-Scholes hedge ratios.

Contrast the speed of this adoption with another of Merton's influential research papers: his development of a structural model of credit risk in the 1970s. The key insight of this research – that a company's credit riskiness can be assessed by treating its equity as a call option on its assets – did not begin to be widely adopted until the late 1990s.

Often referred to as the Merton model, this structural approach now underpins most leading credit risk tools. It was the apparent ability of this class of model to catch a glimpse of the increasing credit risk of Enron long before other modelling approaches that proved the catalyst for its widespread adoption within risk management models.

Another big idea touted by IFL, and one that has graced the cutting edge section of *Risk* on several occasions over the past two decades, concerns sovereign swaps.

The basic idea is that a country can use large strategic risk trades to help protect its wealth. The classic example is Taiwan, which, as the largest exporter of computer chips, has a GDP that is heavily contingent on the volatile supply and demand dynamics of that market. Why not, the argument goes, enter into a swap with another country or counterparty that would benefit from exposure to the Taiwanese computer industry? In this way, a sovereign can gain diversification while retaining its comparative advantage.

Asked if IFL was ever successful in transacting such a deal, Merton is candid in his response: "The answer is no. If that had been the only thing we had focused on then my answer may have been different, but we were quite a small firm and we had to prioritise."

Still, the Nobel laureate insists that sovereign swaps will develop. "I haven't heard anyone say this can't work, and these transactions will be of huge worth, especially to smaller and developing countries," he adds.

Derivatives markets have come a long way since the early work of Black, Scholes and Merton. But the Harvard professor says he truly believes we are now only at the beginning of a phase of more creative, strategic use of the instruments. "I think in our own way, Myron, Fischer and I all realised that what we were creating was not just an approach to options pricing, but rather a paradigm," he says.

So does Merton believe derivatives have distributed risk across markets in a way that reduces systemic risk? "That's another way of asking if derivatives have made us safer. It sounds like a very sensible question. It's certainly an empirical question. But there is a subtlety here that too few appreciate," he says.

Derivatives are very efficient risk distribution tools that can make the world safer, he explains. But it's difficult to know if they are being used in that way, and if that has had a material impact on the likelihood, frequency or severity of systemic events.

The subtlety is that, as with anything that can be used to make things safer, derivatives can be used in a way that increases risk-taking. "Anti-lock breaks make a car safe in and of itself, but drivers can use this capability to drive faster in worse conditions," Merton says. "The idea that the only thing we are interested in is making things safer is untrue. Investing is after all a risk/return trade-off." ■