Research Profiles

Dr. Peter Forsyth, University of Waterloo, works in computational finance, using computer algorithms to assess financial risk, determine costs and develop investment strategies. Much of Peter's work has been in "hedging".

"Hedging is about managing risk and optimizing investment. A good hedge insulates you against the unknown", states Peter. "A computational finance approach uses science, mathematics and computing to make precise statements about something that seems uncertain so that better decisions can be made."

In the financial industry, hedging protects against loss and guarantees a specific return - much like an insurance policy. Fund managers dynamically manage bonds, options and other financial products to make sure that investments are not at risk, regardless of what happens in the market. For instance, managers can take "long" position in oil stocks, and "short" positions in oil futures, so that no matter how oil prices fluctuate, the risk would be minimized.

"Before, we assumed that the unknown random changes in prices were small. Now we can take the big jumps, the sudden big changes or events and hedge against those as well."

The recent market meltdown is widely attributed to poor hedging and mispricing of credit derivatives. Current models make the assumptions that credit quality moves randomly, but changes are small in small time intervals; and it is always possible to trade credit derivatives and bonds, so that a dynamic hedging strategy can be carried out. Most people realize (and have for a long time) that these two assumptions are unrealistic. The underlying process for credit quality should include jump processes, i.e. large discontinuous changes. Think of the credit quality of Lehman Brothers the day before they went bankrupt. Many traders have been quoted as saying "this market meltdown is a five sigma event," meaning that the current events are highly unlikely. Actually, if one assumes that the process followed by credit includes jump processes, the current meltdown is not so improbable; we can expect such situations about once every ten years. Markets can be ill-liquid, which means that it may not be possible to sell something at any value except zero. It is possible to reformulate the standard models as a problem in optimal stochastic control, and solve this problem for an optimal hedging strategy. This more general approach can handle jump processes and liquidity effects. The availability of SHARCNET computing resources makes it possible to test and validate these more general market models.

Peter and his grad students have applied the same principles and algorithms to decision-making problems in telecommunications, government and environmental issues.

For more information on Dr. Peter Forsyth or his research please visit:
http://www.cs.uwaterloo.ca/~paforsyt/