
Short Course: Teaching Statistics in Finance

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The Centre for Academic Practice at Nottingham Trent University played host on 10 May to a short course on the Teaching of Statistics in Finance, aimed primarily at lecturers in HE. The day attracted a healthy turnout of around fifteen delegates, and the session was led by Professor Tony Lawrance, who is Professor of Statistics in the School of Mathematics and Statistics at the University of Birmingham.

Professor Lawrance has for some years run a final year module on Statistics in Finance for students at Birmingham, and the day's activities centred on that module and the material therein. The course assumes what could reasonably be considered a 'second level' course in Statistics as its pre-requisite, along with some sundry topics (such as Lagrange multipliers) which could generally be expected to appear in the first two years of an undergraduate Mathematics programme. Financial Statistics is something of a sideline for Professor Lawrance, whose main area of research is in time series, and perhaps a touch surprisingly little material on time series appeared during the day. That said, in most undergraduate programmes that topic would presumably be covered elsewhere.

The course began with a run-through of some fundamental ideas in Finance, including compounding interest, present and future values, debt/loan repayment and cash flows. No student of the subject is likely to progress far without these key ideas firmly grasped, so dwelling a little on these basic concepts is unlikely to be time wasted when teaching the material to undergraduates. Professor Lawrance then progressed to what was his main subject for the day, the analysis of financial portfolios, a topic of inherent interest to everyone since we all have a 'portfolio' of some description (cash stashed under the mattress being of the 'no risk, no return' variety, for instance). The key problems here are essentially of an optimisation ilk, the aim essentially being to maximise expected return for a given risk level, and are interesting and accessible enough to provide an enjoyable, well-motivated area for final year study, incorporating some nice Mathematics on the way to the finding of the hyperbolic curves which comprise the famous Markowitz efficient frontier solution. Around half of the day was spent on portfolio analysis, allowing for a reasonably thorough treatment.

Financial Options, put simply, are bought to provide the right to buy (or sell) an asset at some time fixed in the future at a price determined today. The pricing of options forms a cornerstone of Financial Mathematics,

but the treatment here was understandably quite scanty. Firstly, as Professor Lawrance pointed out, rather few individuals actually own options, and they are not things that students are likely to have come across or purchased. More importantly perhaps, a detailed study of options pricing requires a knowledge of probability theory somewhat beyond what might be covered in most undergraduate courses. So no equivalent martingale measures here then, quite appropriately, but rather an introduction to pricing via the concept of *arbitrage* – essentially the condition that no 'free lunches' are available. Armed with this condition some well-known results for pricing options follow relatively easily. Professor Lawrance concluded proceedings with an introduction to insurance, with both life and non-life being briefly described.

No review of the day's activities would be complete without praise for the excellent book of notes which Professor Lawrance produced for each delegate. These were finely presented, readable and accessible, and helpfully even included examples of assessments which had been set in the past. Details were also given in the notes of how to perform various calculations using either Maple or Matlab, along with worked examples, and suitable software provides an ideal complement to an undergraduate module in the topic. Matlab appears to have the edge here perhaps, having a comprehensive Financial toolbox available (which requires the Statistics and Optimisation toolboxes incidentally), along with various other relevant add-ons.

On an individual note, the short course in part inspired me to read further about the subject of Mathematical Finance, both out of personal interest and the recognition that the field is an important and evolving one. I was also motivated to become more expert on Matlab, something I had put off for too long. To conclude, I feel sure I speak for all delegates in offering a hearty thanks to Professor Lawrance and the Maths, Stats & OR Network for such an enjoyable day's introduction to teaching Finance to undergraduate mathematicians.