



Seminar on Financial Mathematics



Lecture co-financed by the European Union in scope of the European Social Fund





ABSTRACT

Financial Mathematics and Computational Finance are multi-disciplinary subjects whose main aim is to provide *indicators* that can be computed from various forms of (historical) financial data in order to give financial analysts a range of quantitative measures from which economic decisions can be inferred. This approach is particularly important in the field of *Algorithmic Trading* where trades are exchanged without the need for human intervention and is becoming an increasingly common practice in financial industries world-wide, e.g. nearly 40% of US trades are now based on Algorithmic Trading.

An essential part of financial mathematics is the modelling of stochastic fields and the application of such models to statistical signal processing – a financial time series may be considered to be a digital signal. This seminar examines the role of the Kolmogorov-Feller (KF) equation in financial mathematics and begins by considering the following questions:

- How may the KF equation be derived from concepts in Statistical Mechanics?
- Why is the KF equation applicable to computational finance?

The seminar will then address a new class of solution to the KF equation which is based on the application of the Green's function method to develop an iterative solution whose convergence criterion is well defined. This solution is then used for modelling non-Gaussian processes with long term correlations and results presented on the analysis of two types of financial time series:

- (i) Carbon price indices
- (ii) Currency pairs

In the latter case, a live demonstration is provided relating to the implementation of the model using *Metatrader*.

The KF Equation:

$$\tau \frac{\partial}{\partial t} u(x, t) = -u(x, t) + u(x, t) \otimes_x p(x)$$

Jonathan Blackledge <http://jmblackledge.web.officelive.com> holds a PhD in *Theoretical Physics* from London University, England and a PhD in *Mathematical Information Technology* from the University of Jyväskylä, Finland. He is currently the *Stokes Professor* at Dublin Institute of Technology, Ireland and a *Distinguished Professor* at the Centre for Advanced Studies, Warsaw University of Technology, Poland. He is a Fellow of the Institute of Physics and a Fellow of the Institute of Mathematics and its Applications.



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