

CAROLYN PHELAN PHD

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PROFILE

For the past 4 years I have been working in the Computer Science department University College London, initially as a Senior Teaching Fellow and currently in the equivalent position of Lecturer(Teaching). The majority of my teaching work are in the area of finance, including mathematical and machine learning techniques applied to financial problems. In addition to my lecturing work I also do a large amount of work with industry as part of my work with UCL IXN(Industry exchange network). This role followed my return to academia to study at a postgraduate level after a 13-year career as an engineer in the mobile phone industry. My PhD was in Computational Finance and was undertaken within the Financial Computing and Analytics Research Group of University College London. This was completed in less than 3 years and resulted in a pass with no corrections, with several publications arising from the work.

Having returned to academia after working in industry for several years, I have discovered a love of both research and teaching and am therefore highly focused on developing this new career further. I have also found that my industry experience of training and managing technical teams has strengthened my abilities in the areas of lecturing to students, supervising projects and maintaining close relationships with external stakeholders.

TEACHING EXPERIENCE

Lecturer (Teaching) & Senior Teaching Fellow, University College London

July 2018 – present

Shortly prior to the completion of my PhD I took up a teaching role within the Financial Computing and Analytics Group of the Computer Science department at UCL. This role was in a temporary capacity for 9 months before being made permanent in 2019. The role has included the following responsibilities

- Module leader for the MSc level course Financial Institutions and Markets for 4 years: this is included in several MSc programmes and is taught to between 70 and 130 students. On taking over the module, this required the redesign of the lecture materials and course structure, the preparation of all lecture and electronic support materials and the writing and marking of coursework assignments and exam papers.
- Joint module leader for the MSc level course Machine Learning with applications in Finance. This is taught to up to 50 students and provides an introduction to supervised and unsupervised learning techniques. A number of programming exercises are used which are based around financial applications.
- Director of IXN Innovation. IXN Innovation is part of the wider UCL IXN scheme which enables students to do project work alongside industry partners. The Innovation stream is focussed on the 3-month summer projects on our specialist MSc. This work included the development of a set of best practises for the scheme which ensures the best outcomes for students and our industrial partners.
- Mentoring of colleagues. Following the development of best practises for IXN Innovation, I mentored colleagues on other specialist MSc in the adoption and best use of these methodologies.
- Project coordinator for Finance MScs. Direct management of 70-140 student projects for the MSc in Computational Finance and the MSc in Financial Risk Management. These projects take place as part of the IXN Innovation scheme and therefore this role requires the building of strong relationships with industry partners, assessment of the technical content of projects and the accurate matching of student skills with the requirements of industry partners. Responsibilities also include the provision of training and support to students to ensure their success within a commercial environment.

- The writing and teaching of the introductory MSc level course “Introduction to Mathematics and Programming for Finance” which provides students on the MSc in Computational Finance and the MSc in Financial Risk Management with sufficient background in mathematics, MATLAB and Python to undertake their other modules. In response to students’ requests and COVID-19, this was transferred to be completely pre-recorded and online, allowing students to access it at their own convenience and providing equality of access to students with diverse learning needs.
- Managing the UCL Bloomberg room. UCL Computer Science has 12 Bloomberg terminals available for staff and student use and this work has included supporting users to allow them to access the service and liaising with Bloomberg. During COVID-19, I coordinated the introduction of the disaster recovery service to allow remote use, including creating a Moodle page to manage this and a set of fair-use rules.
- Academic supervision of around 25 MSc final projects and around 5 undergraduate projects.
- Institutional activities, including interview panels, exam boards and viva examinations.

Teaching assistant – University College London

Sept 2015 – July 2018

Teaching assistant for the MSc level courses: Numerical methods in finance (COMPG005), Stochastic processes (COMPG008). Assisted in the supervision of MSc dissertations and acted as mentor for two first year research students. This work received excellent feedback and included the following responsibilities

- Preparation of MSc level exam questions
- Marking of assessments and final exams
- Supervision of research students

RESEARCH EXPERIENCE

Financial Computing and Analytics Group University College London

July 2018-present

Since the completion of my PhD, I have continued my research in the area of finance. Initially this has been in areas arising from my PhD such as the extension of the Spitzer based option pricing techniques to stochastic volatility. More recently, I have also developed an interest in the insurance industry and the area of InsurTech. As part of this work, I have also been acting as second supervisor for a number of PhD students.

PhD Computational Finance, University College London

Sept 2015 – July 2018

Advisor – Dr Guido Germano

Research topic – Fourier transform methods for pricing double barrier options and other exotic options.

This work concerns the numerical pricing of path dependent options based on Lévy processes with barriers monitored in discrete and continuous time. The main focus of the thesis is option pricing but the work also has relevance for more general studies of financial risk. Option pricing techniques can be used as a model for credit risk and more generally our technique would be applicable to computing ruin probabilities, which is a classical problem in actuarial science and probability. Key areas studied in depth as part of this research include

- Exotic financial options
- Accurate mathematical modelling of real-world problems
- Stochastic processes, especially Lévy processes and local stochastic volatility models for finance
- Numerical methods for calculating expectations applied to finance
- Fluctuation identities and their applications
- Fourier transform methods and their numerical implementation
- Error bounds for numerical methods
- Stochastic differential equations and Ito calculus
- Numerical solutions for the Wiener-Hopf and Fredholm equations in a general setting

PUBLICATIONS

- Hilbert transform, spectral filters and option pricing. *Annals of Operations Research* C. E. Phelan, D. Marazzina, G. Fusai and G. Germano. <https://doi.org/10.1007/s10479-018-2881-4>
- Fluctuation identities with continuous monitoring and their application to price barrier options. *European Journal of Operational Research*. C. E. Phelan, D. Marazzina, G. Fusai and G. Germano. <https://doi.org/10.1016/j.ejor.2018.04.016>
- Pricing perpetual Bermudan and quantile options with the Spitzer identities. *Quantitative Finance*. C. E. Phelan, D. Marazzina and G. Germano. <https://doi.org/10.1080/14697688.2020.1718192>
- Solution of Wiener-Hopf and Fredholm integral equations by fast Hilbert and Fourier transforms. *Under review at IMA Journal of applied mathematics*. G. Germano, C. E. Phelan, D. Marazzina and G. Fusai. <https://doi.org/10.48550/arXiv.2106.05326>
- Accurate numerical inverse z-transform and its use in the Fourier-z pricing of discretely monitored path-dependent options. *In preparation*. B. Loveless, C. E. Phelan, G. Germano.
- Expressions for the joint conditional characteristic function for the Heston model. *In preparation*. J. Liang, C. E. Phelan, G. Germano.
- Pricing discretely monitored barrier options with stochastic volatility using the Wiener-Hopf Method. *In preparation*. J. Liang, C. E. Phelan, D. Marazzina, G. Germano.

CONFERENCE COMMUNICATIONS - PRESENTATIONS

Spitzer based pricing methods for α -quantile and perpetual early exercise options. *42nd Annual Meeting of the AMASES 2018, Naples*. C. E. Phelan, D. Marazzina, G. Germano

Application of Wiener-Hopf Technique for Pricing discretely monitored barrier options with stochastic volatility. *42nd Annual Meeting of the AMASES 2018, Naples*. J. Liang, C. E. Phelan, D. Marazzina, G. Germano

Pricing methods for perpetual Bermudan and quantile options based on Spitzer identities. *Quantitative Finance Workshop 2018, Rome*. C. E. Phelan, D. Marazzina, G. Germano

Numerical pricing of discretely monitored barrier options with Lévy jump processes using the Hilbert transform and spectral filtering. *International Conference on Computational Finance 2017, Lisbon*. C. E. Phelan, D. Marazzina, G. Fusai, G. Germano

Progresses on pricing barrier options with the Spitzer identity. *Quantitative Finance Workshop 2017, Milan*. C. E. Phelan, D. Marazzina, G. Fusai, G. Germano

Improvement of numerical option pricing methods based on the Hilbert transform using spectral filtering. *Econophysics Colloquium 2017, Warsaw*. C. E. Phelan, D. Marazzina, G. Fusai, G. Germano

CONFERENCE COMMUNICATIONS - POSTERS

Numerical inversion of the z-transform with applications in discretely monitored exotic options. *Quantitative Finance Workshop 2019, Zurich*. Benjamin Loveless, Carolyn Phelan and Guido Germano

Jiaqi Liang, Carolyn E. Phelan, Daniele Marazzina and Guido Germano

Pricing of discretely monitored barrier options with stochastic volatility using the Wiener-Hopf method. *Quantitative Finance Workshop 2019, Zurich*. Jiaqi Liang, Carolyn E. Phelan, Daniele Marazzina and Guido Germano

CERTIFICATIONS

Fellowship of the Higher Education Academy (FHEA)

June 2021

PROFESSIONAL MEMBERSHIPS

Member of the Institute of Engineering and Technology (MIET)

1996 – present

INDUSTRIAL EXPERIENCE

Alcatel Lucent

2009

Radio Frequency (RF) Consultant. RF Engineer working on transmitter circuits for 4G and 3G base-stations. As an independent consultant I was required to rapidly learn about the technology used and make a strong contribution to the research and development output of the team from the very beginning.

Renesas Technology Europe

2001 – 2008

Principal RF Engineer. Technical team leader for several projects leading to several successful design wins. Led a project team providing RF design support for several Renesas customers. This work required me to form strong working relationships with individuals at all levels of our customers' organisations.

Ericsson Mobile Communications

1996 – 2000

RF Design Engineer. Key team member on several mobile phone projects.

This work included a three-month secondment to Lund, Sweden for a technology transfer programme.

QUALIFICATIONS

University College London

PhD Computational Finance – Pass with no corrections

2015 – 2018

University College London

MRes Financial Computing – Distinction – 82% average

2014 – 2015

Kings College London

2010 – 2013

MSc Financial Mathematics – Distinction – 88% average

Dissertation – Credit Value at Risk and Assessment of Credit Risk for Algorithmic Trading Strategies

University of Bath

1992 – 1996

BEng (Hons.): Electronic & communication engineering. Four Year Sandwich Degree Final mark – 2:1

GRE General Exam – Quantitative 168/170, Verbal Reasoning 170/170, Analytical Writing 5.5/6

2014

OTHER SKILLS AND EXPERIENCE

- Expert programming skills in MATLAB
- Programming skills in Python
- Use of Moodle to provide electronic resources to students
- Production of professional documents in Word and Latex
- Presentations to large groups in academic and industrial contexts