



THE LONDON SCHOOL
OF ECONOMICS AND
POLITICAL SCIENCE

STATISTICS

DEPARTMENT OF STATISTICS

PhD
PROGRAMME



DEPARTMENT OF STATISTICS AND CATS RESEARCH CENTRE

The Department of Statistics at LSE is one of the oldest and most distinguished in the UK. It has a rich research portfolio covering core areas of statistical inference and real applications, particularly in the economic, financial and actuarial, social and industrial arenas. The close collaboration between departments, its London location and strong international partnerships are reflected in the research life of the Department of Statistics through the members of staff, PhD students, postdoctoral research fellows and the thriving visitor and seminar programmes. Research in the department is concentrated in the following areas and research proposals should normally be linked to one of these areas:

Risk and Stochastics

The department covers a wide range of modern stochastic finance, with an emphasis on insurance and financial mathematics, and has close links with insurance companies and financial institutions.

Social Statistics

PhD programmes of study in social statistics typically include both methodological development and the application of statistical methods to a social science field or to address new developments in social data, such as in sample surveys or social networks. Research topics may be identified in

advance by the applicant or may be arrived at through communication with a potential supervisor. The relative emphasis on methodology/theory vs. application may vary. Methodological areas of research include latent variable modelling, multilevel modelling, longitudinal data analysis, causal modelling, categorical data analysis, measurement error, missing data, survey methods, model selection and Bayesian methods.

Time Series

The Department of Statistics has a long and distinguished history in time series analysis. The time series group also has a strong link with the Econometrics group in the Department of Economics. Research interests in the group encompass many aspects of the discipline. Methodological research is guided by applications with the aid of both academic and industrial experts. The theoretical activity in recent years covers a wide spectrum, ranging from linearity to nonlinearity, from stationary to nonstationary processes, from parametric to nonparametric and semiparametric, from spectral approach to wavelets, from ultra-high dimensional time series to space-time modelling, from state-space models to Bayesian and computational methods. Applications include biological, economic, energy and financial, eg, back testing for financial risk management, structural modelling of weather series, forecasting electricity loads, etc.

More information about the Department of Statistics research can be found on the LSE website at: lse.ac.uk/statistics/research/Home.aspx

Centre for the Analysis of Time Series (CATS)

The Centre for the Analysis of Time Series (CATS) was established in 2000 and is based within the Department of Statistics at LSE. CATS is at frontier of time series analysis in many subject areas; ranging from the stochastic to the deterministic, from linearity to nonlinearity, from the parametric to the semi-parametric and the non-parametric. The research centre is interdisciplinary, working in partnership with industry and other academic institutions, and guided by application; the centre seeks practical solutions to real-world problems. Prospective PhD students can expect a lively and engaging course of study that will introduce new forecasting methods as well develop the critical reasoning necessary to choose the most suitable tools for the task in hand.

More information about the Centre for Analysis of Time Series can be found on the LSE website at: lse.ac.uk/CATS

ACADEMIC STAFF

Risk and Stochastics

Dr Beatrice Acciaio

Research interests include stochastic calculus and its applications to finance, risk measures and optimal risk sharing, robust finance and information asymmetry.

Professor Pauline Barrieu (Deputy Head of Department)

Research interests include model uncertainty; insurance-linked securitization; contract designing; environmental economics and financial mathematics.

Dr Erik Baurdoux

Research interests include optimal stopping; stochastic games; Lévy processes and financial and insurance mathematics.

Dr Luciano Campi

Research interests include stochastic calculus and its applications to finance; information asymmetry and insider trading; credit risk; financial markets and transaction costs; energy markets.

Dr Umut Cetin

Research interests include stochastic calculus; theory of martingales and Markov processes; liquidity risk and credit risk modelling; asymmetric information in financial markets; carbon finance.

Dr Angelos Dassios (Doctoral Programme Director)

Research interests include stochastic processes; theory and applications of piecewise deterministic Markov processes; risk theory; insurance and financial applications of stochastic processes.

Professor Kostas Kardaras

Research Interests include stochastic analysis; martingales and the general theory of stochastic processes; foundations of mathematical finance and economics; stochastic control; optimisations and Monte Carlo methods.

Dr Hao Xing

Research interests include stochastic calculus; analysis of differential equations and their application in finance and insurance; economic models of interacting agents.

Social Statistics

Dr Wicher Bergsma

Research interests include categorical data analysis; multivariate analysis; statistical learning; measurement of association and testing of independence; maximum likelihood estimation.

Dr Sara Geneletti

Research interests include causal inference; graphical models; Bayesian inference; evidence synthesis.

Dr Kostas Kalogeropoulos

Research interests include Bayesian inference; Markov Chain Monte Carlo; sequential Monte Carlo; inference on models with stochastic differential equations; infectious disease modelling with evidence synthesis. (Also see Time Series).

Dr Jouni Kuha

Research interests include statistical methods for social research, including multilevel modelling, event history (survival) analysis and structural equation modelling (SEM), with applications in demography, psychology, education and public health.

Professor Irini Moustaki

Research interests include latent variable models; structural equation models; categorical data; missing values; outliers; composite likelihood estimation methods; applications to social sciences and health.

Professor Chris Skinner (Head of Department)

Research interests include sample surveys; measurement error; missing data; statistical disclosure control; official statistics and social science applications.

Professor Fiona Steele

Research interests include statistical methods for social research, including multilevel modelling, event history (survival) analysis and structural equation modelling (SEM), with applications in demography, psychology, education and public health.





Time Series

Dr Matteo Barigozzi

Research interests include time series analysis; dynamic factor models (stationary and nonstationary); volatility modelling; graphical models and social networks.

Dr Yining Chen

Research interests include shape-constrained estimation, nonparametric classification and regression, semiparametric modelling and time series analysis.

Professor Piotr Fryzlewicz

Research interests include multiscale modelling and estimation; time series (especially nonstationary time series); change-point detection; high-dimensional statistical inference and dimension reduction; randomised algorithms; statistical learning; data visualisation; statistics in finance; statistics in the social sciences; statistics in neuroscience.

Dr Kostas Kalogeropoulos

Research interests include Bayesian inference; Markov Chain Monte Carlo; sequential Monte Carlo; inference on models with stochastic differential equations; infectious disease modelling with evidence synthesis. (Also see Social Stochastics).

Dr Clifford Wai-Fung Lam

Research interests include semiparametric modelling; variables and feature selections; regularization methods; high-dimensional data analysis; time series and factor modelling; spatial econometrics modelling.

Dr Xinghao Qiao

Research interests include functional and longitudinal data analysis, high dimensional statistics, statistical machine learning and time series analysis.

Professor Qiwei Yao

Research interests include time series analysis; factor modelling and dimension reduction; nonparametric regression; spatial and temporal modelling; financial econometrics.

CATS

Professor Leonard Smith (Director of the Centre for the Analysis of Time Series)

Research interests include predictability of nonlinear systems; simulation of weather and climate; chaos; applied probabilistic forecasting including the implications uncertainly; ambiguity and model inadequacy hold when relating mathematical results to reality; science-informed policy; robust decision-making.

Professor Henry Wynn (Chair of the Centre for the Analysis of Time Series)

Research interests include experimental design; discrete tube theory; engineering applications and computer experiments; search and optimisation; algebraic statistics; stochastic orderings and group invariant orderings; risk.

PHD PROGRAMME

A PhD offers the chance to undertake a substantial piece of supervised work that is worthy of publication and which makes an original contribution to knowledge in a particular field. Research programmes are designed to produce professional social scientists, well versed in a range of advanced statistical techniques and methods, in addition to having an in-depth knowledge of a particular area. The maximum period of full-time registration is four years.

Training Courses

In the first twelve months and beyond students are able to attend various MSc and research training courses at LSE and other colleges of the University of London to enhance their background knowledge and research skills.

Supervision

Each student is assigned a first and second supervisor with whom they meet frequently to discuss their research. There is also plenty of opportunity to participate in poster presentations, seminars and conferences.

All PhD students at the London School of Economics and Political Science have the opportunity to take advantage of research methodology courses provided by the Department of Methodology. More information can be found on the LSE website at: lse.ac.uk/methodology/Home.aspx

Further courses are available at the London Graduate School in Mathematical Finance londonmathfinance.org.uk and the London Taught Course Centre (LTCC) ltcc.ac.uk

First year: MPhil

All students registering for a programme of study leading to a PhD begin under MPhil registration. Students are expected to attend courses suggested to them by their supervisor and perform well in any mandatory summer examinations. They should also complete any necessary training in research techniques and/or computing. Throughout their first year students perform literature searches and become more familiar with their chosen research topic. By the end of the year they are expected to have written up an introductory chapter for their thesis, as well as any new results they may have obtained. Assessment by the supervisor is based on these. Students will be asked to present their research topics at the annual PhD presentation event.

Second year: MPhil/PhD

In the second year students become more deeply involved with their research topic, producing and writing up new results. During this time students need to meet with supervisors on a regular basis to discuss their academic development and at some stage during the year there will be a formal review of their progress. Following the successful assessment of their work, students may be

recommended for upgrade to PhD. Students should also be able to present their current research at departmental seminars and will be asked to present their research findings at the annual PhD presentation event.

The opportunity to upgrade this registration to PhD typically comes in the second year.

Third and fourth year: PhD

The third year demands considerable and rapid progress with research and a substantial part of the year should be spent consolidating material students have already assembled. The role of the supervisor is to ensure the thesis is of a high standard. At the beginning of the fourth year students should submit their entry form for PhD examination and should be close to submitting their thesis.

Thesis examination

When a thesis is nearly ready for submission, the supervisor will nominate a suitable internal examiner and external examiner. The internal examiner will be from the LSE or another college of the University of London, while the external examiner will be from another university. After the examiners have read the thesis, a date will be arranged for a viva examination. Students should expect to give a short presentation of their work and answer general questions on their area of research, as well as on the details of their thesis.

APPLICATION PROCESS

You should apply online. When applying, you should provide evidence of your ability to undertake independent research and state your research topic as accurately as possible on a separate sheet. Your research proposal should address the following questions:

- What is your general topic?
- What questions do you want to answer?
- What is the key literature and its limitations?
- What are the main hypotheses of the work?
- What methodology do you intend to use?
- What theoretical/conceptual framework will you adopt?
- What are your case studies, if any, and what are your case selection criteria?
- What previous research have you undertaken in this field?

Most applicants will have little or no prior experience of research and therefore we do not expect a fully-developed research proposal. We are assessing the potential of the applicant for research and the chosen topic. The following is a guideline of what to emphasise in the proposal:

- A research question rather than a very broad research area
- Be specific, to aid selectors to assess the suitability of the topic for PhD study

- A statement of how the proposed research builds on earlier research on the topic, with reference to two or three key papers
- Demonstrate your understanding of the area and the need for further research
- Selectors will look for a sense of the merits of your approach
- Most topics will involve an application of the proposed methods to a substantive research question. Give a brief outline of this question and explain how it will benefit from this particular approach. What datasets might be used?
- Be specific about the training and skills you have to undertake the proposed research (do not simply list courses attended: this information is already available in the CV and transcripts)

Your research proposal should be approximately 1,500 words in length. MPhil/PhD applications that are received without a research proposal that addresses these questions will not be considered.

In addition, you should submit a personal statement of between 1,000 and 1,500 words, describing your academic interests and your purpose and objectives in undertaking a doctoral research degree. Your personal statement should also explain why you have chosen LSE.

Your personal statement should provide the following:

- A clear sense of why you wish to undertake a PhD
- What you hope to gain from PhD study
- Why have you chosen this particular topic?
- Details of prior research experience – for example, an undergraduate and/or MSc project
- To what extent did the project involve independent thinking?
- Why have you chosen to apply to this department rather than another statistics department?
- If you have discussed your research proposal with a member of academic staff prior to the submission of your application, why do you consider that person to be an appropriate supervisor for your research?

Applicants who are nominated by the selectors for possible admission to the MPhil/PhD programme will be interviewed by members of the academic staff of the department before any final decision is reached regarding entry, either in person or by Skype. More than one interview might be conducted.

Once the application form has been submitted candidates can view the status of their application online.

Information about fees, financial aid and accommodation is also available in the prospectus. To request a copy of the prospectus by mail please complete the online request form on the website lse.ac.uk/study/graduate

POSTGRADUATE FUNDING

Funding schemes to support PhD studies are operated on a competitive basis and awards are made based on academic merit, research potential and personal motivation to undertake doctoral research studies. You should refer to the Financial Support Office website for up-to-date information.

LSE PhD Scholarships

Each year LSE offers a number of full scholarships for new PhD students. The scholarships cover fees and living expenses for three years. They are available for Home UK/EU and Overseas students undertaking research in any LSE discipline, with annual renewal subject to satisfactory academic performance at the School. Scholarships are awarded on academic merit and research potential.

Economic and Social Research Council (ESRC)

ESRC funding to LSE includes studentship provision. With the mutual emphasis on economics and social sciences, ESRC is a major sponsor of LSE research. From 2011, only institutions who hold the status of Doctoral Training Centres (individual institutions and some consortia of a number of universities) will be able to hold ESRC studentships. LSE has been awarded Doctoral Training Centre status and has a total of 36 studentships per year to spread across disciplines.

ESRC studentships are usually available to UK/EU students only.

Studentships are awarded by nomination only and eligibility criteria apply. Please take a look at the information provided on the Financial Support Office website:

lse.ac.uk/intranet/students/studentServicesCentre/financialSupport/esrc.aspx

Teaching Opportunities

Many of our research students take part-time posts in the department teaching undergraduate Statistics classes and marking. Students usually undertake teaching responsibilities after their first year of study.





INFORMAL APPLICATION ENQUIRIES

Places on our MPhil/PhD programme are limited and we strongly recommend that you submit your full application and supporting documents to the Graduate Admissions Office as early as possible. However, you may wish to first send an informal application email to the research administrator to enquire about making a formal application within the area of your research interests and to check about the availability of potential supervisors.

To do this, please submit the following documents:

- A brief research proposal that clearly states the specific areas of your proposed research
- A brief personal statement that states your academic interests and your purpose and objectives in undertaking doctoral research study. You should also state your reason for applying to the Department of Statistics at LSE
- An up-to-date CV (curriculum vitae)
- Academic transcripts covering your study to date

Your informal application documents will be forwarded to appropriate members of academic staff for consideration and the research administrator will communicate the recommendation back to you as soon as possible.

If a formal application is invited, this should be made to the Graduate Admissions Office in accordance with the normal application procedure.

All enquiries and statements of interest should be directed to the research administrator rather than to individual members of staff. Research administrator email **i.marshall@lse.ac.uk**

SUGGESTED RESEARCH AREAS OF PHD RESEARCH PROJECTS

Risk and Stochastics

Energy markets

Excursions of Lévy processes and applications in finance and insurance

Financial market with frictions

Information asymmetry

Interface between insurance and finance

Lévy Processes

Optimal stopping

Point processes in insurance and credit risk

Quantile options and options based on occupation times

Stochastic analysis and its applications in financial mathematics

Stochastic control and analysis of partial differential equations in mathematical finance

Social Statistics

Analysis of complex survey data

Disclosure risk assessment and statistical disclosure control

Estimation from survey data (and related data), taking account of nonresponse and using auxiliary information

Latent transition and latent class models for modelling diagnostic tests

Latent variable models and structural equation models for categorical data

Longitudinal data analysis, especially event history (survival) analysis and dynamic panel models

Modelling response strategies and detection of outliers in educational and behavioural sciences

Multilevel simultaneous equations modelling of correlated social processes

Time Series

Big Data: analysing vast time series

Estimation of stochastic volatility models

Forecasting functional time series and classification

Financial econometrics

Functional time series analysis

Dimension reduction and factor modelling

High-dimension variable selection

High dimensional time series analysis

Multiscale methods in data analysis, including Unbalanced Haar, Haar-Fisz and Wild Binary Segmentation

Multiscale methods for image analysis

Nonparametric regression

Probabilistic prediction and risk management

Randomised algorithms in time series analysis

Re-weighted iterative penalty methods for data smoothing

Spatio-temporal modelling

Variable selection

MPHIL/PHD FREQUENTLY ASKED QUESTIONS

What are the minimum entry requirements for admission onto G4ZS MPhil/PhD Statistics?

All applicants should have completed a taught MSc containing a substantial statistical component, usually with a Distinction, plus a bachelor's degree of high standard. Overseas students should consult the Graduate Prospectus for details of equivalent qualifications.

Which type of references do I need to provide?

You must supply two academic references from teaching members of your current or most recent university department.

Do I need to submit a GRE (Graduate Record Examination) or GMAT (Graduate Management Admissions Test)?

GRE and GMAT are not normally required for applications to G4ZS MPhil/PhD Statistics.

Do I need to provide an English test?

There is an English language requirement for all applicants for whom English is not their first language. The British Council's International English Language Testing System (IELTS) is an accepted qualification. Applicants should already have or expect to gain a minimum score of 7.0 in the IELTS.

When should I apply?

You should apply as early in the academic year as possible.

Do I need to secure the interest of a potential supervisor before submitting my application?

Your priority should be to submit your application and research proposal as early as possible.

Can I apply to pursue a PhD part-time?

We will consider applications for part-time registration, subject to visa regulations, but we strongly recommend full-time registration. We do not recommend attempting to pursue a PhD while in full-time employment. Students who require a Tier4 visa to study in the UK are not eligible for part time registration.

What is the maximum period of registration?

The maximum period of full-time registration is four years.

Do you offer distance learning?

No.

Will you consider my application without a research proposal?

No.

How to contact us

For general information about the PhD programme please contact Ian Marshall (research administrator) at the Department of Statistics or visit the departmental web page: **lse.ac.uk/statistics**

Email: **i.marshall@lse.ac.uk**

Tel: **+44 (0)20 7955 7511**



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