Heriot-Watt University

Risk and Modelling Theme

School of Mathematical and Computer Sciences

Post:	**Chair in Actuarial/Financial Mathematics**
Salary:	**From £53,650 dependent on qualifications and experience**
Ref:	**181/08**
Closing date:	**31 January 2009**
Location:	**School of Mathematical and Computer Sciences**
	Edinburgh Campus
Theme:	**Risk and Modelling Theme**

Heriot-Watt University in 2008 launched its strategic plan for the next decade: "Focus on the Future". "Risk and Modelling" was selected as one of five topical themes for new investment, and to launch the theme, we announce eight new academic appointments in financial and actuarial risk as part of the new centre *Financial Risk and Actuarial Modelling, Edinburgh* (FRAME)..

Job Description

One senior appointment at Professorial level, with the possibility to be the Director of FRAME. The successful candidate will enhance the University's world-leading reputation in research and teaching, and will share responsibility, with other senior colleagues, for strengthening relations with the financial services industry, particularly in expanding knowledge transfer and continuing professional development. He/she will have a track record of research leadership in academia or industry, and outstanding communication skills. The planned investment includes suitable administrative support for this person.

Application Details

Further information may be obtained by contacting: Professor Angus Macdonald (+44 (0)131 451 3209, A.S.Macdonald@hw.ac.uk); Professor Alexander McNeil (+44 (0)131 451 3230, A.J.McNeil@hw.ac.uk); or Professor Andrew Cairns (+44 (0)131 451 3245, A.J.G.Cairns@hw.ac.uk).

Please return your completed application forms to the Human Resources Office, Heriot-Watt University, Edinburgh, EH14 4AS or to hr@hw.ac.uk by no later than the *closing date: 31 January 2009*

Further Particulars

Actuarial/financial mathematics is a key discipline underlying the financial services sector. In the last three decades, it has become an important area of applied research based on advanced probability and statistics. Banking and, increasingly, insurance regulation, is based on mathematical modelling of economic and stochastic phenomena, and there is exceptionally high demand for individuals with the necessary high-level skills, at a minimum of Masters level and often with PhDs. This is an expanding area of mathematics, with strong interactions between academia and industry, and where cutting edge research finds applications unusually

quickly. It is important to enhance academic strengths in this subject, to keep the U.K. at the forefront of research and education.

Research and Teaching in Actuarial/Financial Mathematics

The Department of Actuarial Mathematics and Statistics, in the School of Mathematical and Computer Sciences at Heriot-Watt University, is the top-rated department in the U.K. in actuarial/financial mathematics (Grade 5 (Statistics and Operational Research) in RAE 2001), and covers actuarial/financial mathematics and applied probability/statistics.

It is part of the Maxwell Institute for Mathematical Sciences (with the Department of Mathematics at Heriot-Watt University (5 in Applied Mathematics) and the School of Mathematics at the University of Edinburgh (5* in Pure Mathematics, 5 in Applied Mathematics, 4 in Statistics and Operational Research). The Maxwell Institute, alongside the International Centre for Mathematical Sciences (also based in Edinburgh) is an international centre of excellence, covering the whole range of mathematical science. Actuarial/financial mathematics is a key specialism of the Institute, with close links to the financial services industry in Edinburgh, and with the Actuarial Profession.

Heriot-Watt was the first university in the U.K. to offer a specialist degree course in Actuarial Science. The Department now offers BSc degrees in Actuarial Science, Financial Mathematics and Statistics; and MSc degrees in Actuarial Science and Financial Mathematics. There is a large and very active PhD program.

Institutional Priority

Actuarial/financial mathematics is regarded as a key area for investment in research infrastructure by Heriot-Watt University. In 2005, the Department of Actuarial Mathematics and Statistics moved, to a new purpose-built building whose £3.5 million cost was been substantially met by the Scottish Funding Council. From 2009, research, continuous professional development (CPD) and teaching in actuarial/financial mathematics will be expanded by the creation of a new centre: "Financial Risk and Actuarial Modelling, Edinburgh" (FRAME) with eight new academic posts.

Future Developments

FRAME will unify the research, knowledge transfer, CPD and teaching in the areas of actuarial science, financial mathematics and quantitative risk management. Persons appointed to the new posts in FRAME will be working in these and related areas (including in particular statistics) and will have an exceptional record of scholarship and/or professional experience. Key developments include:

- Closer integration with financial services employers
- An expanded program of Continuous Professional Development and Knowledge
- Transfer for the financial services sector
- A new MSc in Actuarial Management
- A new MSc in Quantitative Risk Management

The Department of Actuarial Mathematics and Statistics at Heriot-Watt University

is the top-rated department in the U.K. in actuarial/financial mathematics, and is part of the Maxwell Institute for Mathematical Sciences. It has particularly close links with the Actuarial Profession, and with the U.K. financial services industry. It has thriving BSc, MSc and PhD programs.

Further Particulars

The School of Mathematical and Computer Sciences

The **School of Mathematical and Computer Sciences** (MACS) is a flagship school of scholarship and advanced learning in the core analytical areas underpinning commerce, science and engineering. The School's good research and teaching rankings, coupled with steady growth, particularly in research partnerships, have led to a lively and stimulating environment for research and study at all levels.

The School is a collegiate grouping of three discipline areas: Mathematics, Actuarial Mathematics and Statistics, and Computer Science. It is housed on the Riccarton campus in the modern (1989) Earl Mountbatten building and the newer (2005) connected Colin Maclaurin building. There are 118 full-time staff of whom 68 are academics and 21 are research assistants. The School has 990 undergraduate, postgraduate and research students. Undergraduate total is 742 (101 overseas). MSc total is 177 (115 overseas). PhD students number 71 (39 overseas). The total income of the School is above 11M£ per year.

At undergraduate level modular-based courses are on offer that are demanding on the students but offer assured careers in growth areas. Recent examples include the degree in financial mathematics that prepares students for careers in investment or finance companies and banks. The School offers various degrees in computer science and information technology where students may specialise in leading areas such as natural computing, interactive systems and affective processing. The School is limited to its Government allocation for funded places in the Home and EU market and is successful in attracting overseas students. The quality of teaching in the School is good, with Mathematics and Statistics ranked 21st in the UK for student satisfaction, and Computer Science 17th. All courses are accredited with the relevant professional organisations.

At postgraduate level the School's one-year Diploma and MSc courses are expanding to meet demand from both the home and overseas markets. Popular courses include the MSc/Diploma in Actuarial Science, the UK's premier course in this discipline, and the MSc/Diploma in Financial Mathematics. The MSc in Applied Mathematical Sciences, available full and part-time, is aimed at Scientists and Engineers who need a stronger mathematical backing for their work than provided in today's undergraduate courses. Over half the postgraduate taught students are from overseas, giving a strongly international context to advanced study in the School. An IT MSc degree is taught at the Dubai Campus, and has 28 students this year.

MACS has an outstanding research profile, with 2 returns at grade 5 (Applied Mathematics; Actuarial Mathematics and Statistics) including 36 research active staff. One return was at grade 4 (Computer Science) including 19 research active staff in the most recent Research Assessment Exercise. One member of the school is a

Fellow of the Royal Society, and twelve are Fellows of the Royal Society of Edinburgh.

In 2005, the departments of AM&S and Mathematics in partnership with Edinburgh University's School of Mathematics set up the Maxwell Institute for Mathematical Sciences with the aid of substantial funding from SFC backed by investment from the two universities. The Maxwell Institute brings together research in mathematical sciences from across the two institutions and combines some of the world's top research groups in Actuarial Science, Mathematical Biology, Applied Probability, Applied Analysis, Operational Research, and many areas of pure mathematics. The Maxwell Institute made combined submissions to RAE2008 in Mathematics, Applied Mathematics and Statistics & OR. The School is also involved in the Scottish pooling in Computer Science (SICSA).

External research funding sources include EPSRC, ESRC, MRC, BBSRC, NERC, EU, SHEFC RDG, DTI, Royal Society, Royal Society of Edinburgh, London Mathematical Society, Edinburgh Mathematical Society, and the British Council.

Research in Mathematics

The unit, which was rated as Grade 5 in RAE 2001, has a wide range of research interests, relating to mathematics and applications. Our research falls into the five broad categories given below. To a great extent these divisions are arbitrary, since most research groups have strong links with other groups, both within the unit and elsewhere. For example the applied analysis group use computational applied mathematics in many cases to model systems, then try to prove more rigorous results based on the intuition offered by numerical simulations.

Applied analysis. Applied Analysis remains the core departmental research activity. Although centred on the study of differential equations, it encompasses wide-ranging themes that include the multi-dimensional calculus of variations, coagulation-fragmentation models, non-linear dynamics, continuum mechanics, phase transitions, reaction-diffusion equations, and turbulence. Close interaction occurs with the Computational Applied Mathematics and Mathematical Biology groups.

*Computational applied mathematic*s. This group has strong interests in developing new tools in numerical analysis and computer algebra, and applying these tools to problems in other areas of mathematics, science and engineering. It has strong links with industrial companies that include British Gas, Edinburgh Petroleum Services, Jaguar, RHM Technology, and Unilever. Some of these activities have been funded by TCS awards, and the group has won two TCS prizes in recent years.

Mathematical Physics. The Mathematical Physics group has experienced continued expansion in recent years. Current activity includes studies of integrable systems and associated algebras, D-Brane dynamics and M-theory, state sum models in quantum gravity and topological field theory. The Edinburgh Mathematical Physics Group, formed jointly with Edinburgh University in 1999, holds regular seminars and advanced lecture courses and helps to attract high-quality postgraduate students and research associates.

Mathematical biology. This group, led by Jonathan Sherratt, has rapidly developed an international reputation and achieved a genuinely interdisciplinary character that ensures problems studied remain strictly relevant to practical issues in biology and

medicine, and environmental development. Problems studied include modelling tumour growth, wound healing, ecological modelling, reaction-diffusion equations.

Algebra and topology*.* This group is predominantly concerned with geometric group theory, topology, and applications of these areas of pure mathematics in other areas of mathematics and physics. Interests include the application of algebraic topology to quantum field and string theories, homological problems in geometric group theory, free subgroups in finitely presented groups and families of commutative semifields.

Research in Actuarial Mathematics and Statistics

The unit, which was rated as Grade 5 in RAE 2001, boasts a broad portfolio of high-quality research, relating to mathematics and statistics as applied in the insurance and financial industries and the physical and life sciences. Our research falls into the four broad categories given below.

Financial Mathematics and Insurance and Finance*.* AMS Financial mathematicians are involved in a range of projects from theoretical to applied research. Topics of current interest include pricing of financial contracts in incomplete markets, the development of new interest-rate models and risk assessment and management. Much of the insurance-related work in AMS concerns financial risk and its management. Projects include pension metrics and guaranteed annuity options.

Actuarial Mathematics*.* A large part of AMS research in this area is carried out by the Genetics and Insurance Research Centre (GIRC). This Centre uses mathematical models to assess the impact of genetic testing on the insurance industry, policyholders and care providers from an impartial point of view. AMS is active in several other areas of actuarial research including risk theory, income protection insurance and critical-illness insurance.

Theoretical and applied probability*.* Probabilists in AMS are active in several areas including asymptotic analysis of general stochastic processes, combinatorial probability and stochastic differential equations. The members of the group have many international collaborations. Their research has diverse applications ranging from the design and control of communications networks to polymer physics.

Applied statistics*.* Much of our research in applied statistics relates to the life sciences. Areas of achievement include development of smoothing techniques for analysing agricultural variety trials which are now also finding application in the insurance industry. A second area of activity is in epidemic modelling where the group is at the forefront of developing methods for fitting stochastic models to observations of disease dynamics in populations of humans, animals and plants. The group has many collaborations in the UK and abroad.

Research in Computer Science

Computer Science research activities have grown and diversified in keeping with a large subject area. The traditional close contact with industry has been maintained and enhanced, with emphasis being placed on the application of research to the solution of real problems. We received a Grade 4 in the 2001 Research Assessment Exercise. Our current research is carried out within five major groupings described below.

Database, Information and Knowledge Based Systems. In its current research, the group focuses providing integrated access to collections of heterogeneous information sources, and developing user interfaces to information systems that adapt to the needs of individual users. The application areas range from advanced mobile phone services and medical information systems to biological databases and monitoring of high-performance computing Grids.

Dependable Systems. The Dependable Systems Group aims to improve the reliability and predictability of computer systems through the development and application of rigorous design, implementation and verification techniques. Research strengths include parallel and distributed functional programming, mathematical reasoning and theorem proving, and performance modelling and simulation.

ULTRA. The Useful Logics, Types, Rewriting, their Automation and Application to programming languages and theorem provers (ULTRA) group focuses on: "Logic" as an essential foundation for rigorous reasoning in Mathematics and Computer Science; "Type theories" to increase expressiveness and safety; and "Rewriting" to guarantee efficient computations. We are part of international consortiums in the field.

Image Processing and Visualisation. This group specialises in Advanced Imaging, Analysis and Visualisation Techniques, including augmented and immersive virtual reality and surface texture analysis. It covers a wide variety of application areas, including Bio- and Medical-informatics and industrial manufacture and textiles.

Intelligent Systems. The Intelligent Systems Laboratory was founded in 1984 to pursue applied research into Artificial Intelligence. Currently active research areas include Computational Neuroscience, Soft Computing, Fault-tolerant Robotics, Intelligent User Interfaces and Training Systems.