

MSc Financial Engineering **For students entering in 2008**

Awarding Institution:	The University of Reading
Teaching Institution:	The University of Reading Henley Business School
Programme length:	10 months (41 weeks - full-time) 18 months (flexible-learning) 24 months (distance-learning)
Date of specification:	21 st March 2008
Programme Director:	Professor Carol Alexander
Board of Studies:	ICMA Centre
Accreditation:	N/A

Summary of programme aims

The aim of the programme is to prepare graduates for a career in financial engineering. The programme will provide participants with the opportunity to develop the skills necessary to price and trade different types of derivatives and demonstrate their understanding of derivatives markets for equities, foreign exchange, interest rates and credit risk.

Formats

The MSc programme is offered on a full-time residential basis, by Flexible Learning (FL - a combination of distance study and full-time study) and also by Distance Learning (DL – both FL and DL will be available in the future). The Masters degree by Flexible or Distance Learning is aimed at participants who cannot come to Reading for 10 months of full-time study or who do not wish to give up their jobs in order to do so. It is essential that high quality specialized courses are offered within the programme. The broader educational aims of the flexible-learning and distance-learning versions of the course are, therefore, the same as those of the existing full-time programme. The formats can be summarised as follows:

Full-time study (10 months): this requires full-time attendance on campus at the University of Reading.

Flexible learning (18 months): this requires studying Part 1 by distance learning for 12 months followed by full-time attendance on campus at the University of Reading for Part 2 for 6 months.

Distance learning (24 months): this requires studying both Part 1 and Part 2 by distance learning.

Transferable skills

Students will have the opportunity to enhance their skills relating to numeracy, problem-solving, communication, information handling and the use of information technology, programming languages, time management, handling deadlines and career planning.

The quantitative skills developed, including the knowledge of derivatives pricing tools and methods and the use of programming languages like C++ and VBA, are much in demand in the financial industry. All other skills are not specific to particular industries. Students will have the opportunity to improve their communication skills both in the preparation of projects and written assignments and during the interaction with their classmates in the

online discussions that support their learning. Also, students will have regular tasks to complete, thus developing their problem-solving abilities. The distance-learning modules will be supported by online discussion and web-based resources. The significant role of programming in will enhance the use of information technology in the programme.

Programme Content

Programme Summary			<i>Credits</i>	<i>Level</i>
	<i>Mod Code</i>	<i>Module Title</i>		
Part 1	ICM107	<i>Securities, Futures and Options (Compulsory)</i>	20	M
	ICM109	<i>Derivatives Pricing (Compulsory)</i>	10	M
	ICM110	<i>Stochastic Calculus for Finance (Compulsory)</i>	10	M
	ICM111	<i>Mathematics for Financial Engineering (Compulsory)</i>	20	M
	ICM112	<i>C++ for Financial Engineering (Compulsory)</i>	10	M
	ICM113	<i>Topics in Financial Engineering (Compulsory)</i>	10	M
Part 2	ICM245	<i>Equity and Foreign Exchange Derivatives Modelling (Compulsory)</i>	10	M
	ICM246	<i>Interest Rate Derivatives Modelling (Compulsory)</i>	10	M
	ICM247	<i>Credit Derivatives Modelling (Compulsory)</i>	10	M
	ICM248	<i>Numerical Methods for Derivatives (Compulsory)</i>	10	M
	ICM218	<i>Research Project (Compulsory)</i>	20	M
	ICM208	<i>Volatility Analysis (Compulsory)</i>	20	M
	ICM244	<i>Principles of Financial Engineering (Optional)</i>	20	M
	ICM221	<i>Hedging (Optional)</i>	20	M
	ICM201	<i>Portfolio Management (Optional)</i>	20	M
	ICM204	<i>Financial Econometrics (Optional)</i>	20	M
	ICM207	<i>Market Risk (Optional)</i>	20	M
	ICM243	<i>Bond Market Pricing and Trading Strategies (Optional)</i>	20	M
	ICM242	<i>Liquidity Risk (Optional)</i>	10	M
	ICM254	<i>Advanced Methods in Financial Research (Optional)</i>	10	M

In addition students will be offered a choice of up to 20 credits from a list provided by the department of Mathematics on a yearly basis. These modules will be subject to each student providing evidence that they satisfy the pre-requisite of any module being offered.

Part-time/Modular arrangements

Part 1 of the programme can be studied by distance learning over a 12-month period starting in September of each year. Following successful completion of Part 1, participants can either join Part 2 of the full-time programme in the following January or continue with distance learning in September.

Progression requirements

N/A

Summary of teaching and assessment

Teaching is organised in modules. The method of delivery varies among modules, especially in terms of the proportions of time allocated to lectures, seminars and computer-room sessions. All modules are part-assessed via a multiple-choice test or coursework that can take a variety of forms. Final assessment normally involves a written examination, and also incorporates coursework marks. Exceptions are the 'C++ for Financial Engineering' and the 'Numerical Methods for Derivatives' courses which will be fully assessed by coursework.

The full-time programme is taught over two 11-week terms. Part 1 begins at the beginning of Freshers' Week in September of each year. Examinations for Part 1 modules are held in Week 1 of the following spring term. Part 2 occupies 9 weeks of the spring term and 2 weeks at the beginning of the summer term. Examinations for Part 2 are normally held in late May / early June.

The core of the distance-learning part of the programme (Part 1 for flexible-learning and Parts 1 and 2 for distance learning) will consist of paper-based learning materials. These will be supported by e-lectures, including either moving-image footage of lectures from the full-time programme or lecturers talking direct to camera and will employ internet learning technology. This will involve the use of a Learning Management System that will include tutor-moderated online discussion groups. The internet will be used to create a community of learners linked by the web, in order to support their learning. All students, whether full-time, flexible or distance learners, will study the same materials and will sit the same examinations.

In June of each year, distance-learning participants will be recommended to attend a one-week non-compulsory consolidation programme at the ICMA Centre where they will meet their fellow participants. During that period, they will be able to attend special lectures in support of the modules they are studying, attend study skills sessions and participate in programming sessions.

The University's taught postgraduate marks classification is as follows:

<u>Mark</u>	<u>Interpretation</u>
70 – 100%	Distinction
60 – 69%	Merit
50 – 59%	Good standard (Pass)
<u>Failing categories</u>	
40 – 49%	Work below threshold standard
0 – 39%	Unsatisfactory Work

To pass the MSc students must gain an average mark of 50 or more overall. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.*

Students who gain an average mark of 70 or more overall and have no mark below 40 will be eligible for a Distinction. Those gaining an average mark of 60 or more overall and have no mark below 40 will be eligible for a Merit.

* The provision to permit a candidate to be passed overall with a profile containing marks below 40 is made subject to the condition that there is evidence that the candidate applied his or herself to the work of those modules with reasonable diligence and has not been absent from the examination without reasonable cause.

After graduation, students may have the opportunity to get involved with various short-term numerical projects linked with investment banks and other financial institutions. Also, as the ICMA Centre has strong links with several international research centres, exchange programs can be offered for interested students. Furthermore, some students will be able to collaborate with staff members undertaking research over the summer months, with the prospect of submitting research papers.

Admission requirements

Special admissions procedures apply to full-time, flexible-learning and distance-learning applicants with particular attention to the students' numerical skills and background that includes good mathematical skills. The entry requirements are as follows:

Undergraduate Degree: Minimum 2:1 or the equivalent from an overseas institution.

Degree Discipline: Mathematical and engineering degrees are preferred. Applicants must have a very good level of numeracy including knowledge of mathematical and statistical concepts.

English: If the applicant's native language is not English, then proof of proficiency is required. The two approved tests are:

TOEFL (Test of English as a Foreign Language) - score of 590 or above.

IELTS (British Council International English Language Test) - score of 6.5 or above.

GMAT (*Graduate Management Admissions Test*)

We strongly recommend that applicants submit a GMAT score, particularly if they have been out of education for more than a few years. We may ask an applicant to submit a GMAT score if we think it appropriate in their individual case.

Admissions Tutor: Dr Simone Varotto

Support for students and their learning

University-wide support for students and their learning falls into two categories. Learning support includes IT Services, which has several hundred computers, and the University Library, which holds over a million volumes across its three sites, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses the Student Access to Independent Learning (S@IL) computer-based teaching and learning facilities. There are also language laboratory facilities both for those students studying a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors and the Students' Union.

In addition, the ICMA Centre provides three purpose-built dealing rooms that include Reuters and Bloomberg terminals and high-specification PCs that students routinely use for *INVEST* trading simulations and course work. Furthermore, the ICMA Centre has its own library that holds journals specialising in finance that are not available in the main university library. Each student is given a hand-held calculator for use throughout their studies. The ICMA Centre's Continuing Professional Development Unit provides specialised careers advice targeted at the investment banking industry as part of a non-credit Continuing Professional Development (CPD) module.

Learning support also includes a student handbook containing full details of the programme structure and administration. Blackboard is used to manage teaching and learning and to monitor student progress for full-time, flexible learning and distance learning students. Student learning is also supported by moderated web-based discussion boards.

Distance learners will be able to meet with other students in their cohort and teaching and support teams during the non-compulsory week at the ICMA Centre in the June of the year of distance learning.

Career prospects

Graduates of the ICMA Centre have an enviable record of attainment when it comes to gaining employment in the financial services industry. The global investment banking and securities markets attract the very best applicants and competition for entry-level positions remains intense. Despite the volatile nature of the financial markets, demand for well-qualified recruits remains high.

Financial Engineering is a sector of the financial industry that has been growing very rapidly over the past two decades. Demand for well-qualified graduates in this area is high, it greatly exceeds supply and there are strong reasons to suppose that this demand will continue to grow. Many leading universities in the US offer degrees in Financial Engineering and these are very popular. However, in the UK there is only one institution that offers a MSc degree in Financial Engineering, but its curriculum is not competitive. Several UK universities offer Masters programmes in related areas to financial engineering, like MSc. Mathematical Finance. The ICMA centre is in a unique position and is thriving to offer the most prestigious of these qualifications. We have very strong links with the quantitative finance profession mainly through the research and other activities of Faculty members, namely Prof. Salih Neftci, who is a leading expert in Financial Engineering, and Prof. Carol Alexander, Chair of Risk Management. The ICMA centre has built a reputation for being the quality-oriented top ranked university in the UK for research in quantitative finance. Graduates of the proposed MSc programme would thus have excellent career prospects.

ICMA Centre graduates from the programme will be equipped with knowledge and transferable skills that are also prized by employers inside and outside of the quantitative finance sector. Many of our graduates are currently enjoying successful careers with investment banks, specialist IT firms, multinational companies, global consulting organisations and hedge funds.

Since our inception in 1994, at least 75% of our graduates each year have secured employment within three months of graduation.

Opportunities for study abroad or for placements

We plan to introduce new opportunities to study abroad. These would be in the form of exchange programs during the months after graduation. The ICMA Centre enjoys inter-university relationships and has been previously involved in exchange programs with some of these. Additionally, after graduation, students could get the opportunity to get involved with different short-term numerical projects linked with banks and financial institutions.

Educational aims of the programme

Each module sets explicit objectives and learning outcomes in a limited and well-defined area of the course syllabus. Some of these learning outcomes relate to key theoretical concepts, and are achieved through directed study supported by lectures, seminars and dealing room simulations in which students uncover theoretical concepts through their own actions. The programme offers several specialized courses that are not available to students studying for a different degree. It also has workshops that focus on building the applications in C++, a software all-so-often used in quantitative finance (and VBA as well). Achievement of these outcomes is assessed through written examinations, assignments and computer-based projects.

Other objectives require students to demonstrate that they can apply specific techniques introduced in the module to new problems. These learning outcomes are achieved in part through seminar work based on exercises and problems set by lecturers and led by course tutors. They are also achieved through individual project work. Achievement of these outcomes is assessed through written examinations, and in some modules, graded project work.

On completion of the Masters degree by full time, flexible learning or distance learning, students should be able to demonstrate extensive knowledge of quantitative finance theory and its application to derivatives pricing in different markets. They should be able to apply their knowledge to practical problems at a level of sophistication approaching that encountered in the industry. They should also have acquired transferable core skills in computing and quantitative analysis.

The distance-learning modules are the same as those taught on the existing residential version of the programme.

Programme Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Knowledge and Understanding

A. Knowledge and understanding of:

The fundamental theory of finance and asset pricing in complete and incomplete markets.

The theory of derivatives pricing using probabilistic framework with an overview of stochastic calculus and its applications in different markets: equity, foreign exchange, interest rates and credit risk.

Analytical techniques used routinely in the valuation of derivative securities, mostly in stochastic calculus.

Numerical techniques for the valuation and hedging of different derivative securities, like simulations, finite differences and binomial trees.

Quantitative techniques including: advanced probability concepts, ODE's and PDE's, stochastic differentiation, transform methods, optimization, calibration and interpolation.

Teaching/learning methods and strategies

Formal lectures and tutorials, supervision supported by directed and assessed self-study. Feedback and guidance are an important part of the process.

This body of knowledge is communicated by detailed, paper-based lecture notes. These are supported by lectures or e-lectures and a Learning Management System (LMS). The LMS provides the students with the ability to participate in online discussion.

Assessment

Knowledge is tested via tests, tutor-marked assignments, tutor-moderated online discussion boards and unseen written examinations.

Courses are assessed through a combination of coursework (assignments and projects), tests and unseen examinations. Practical project work is also assessed and provides a source of feedback on the performance of the students.

Skills and other attributes

B. Intellectual skills – able to:

Use, analyse and assess the pricing methods for different types of derivatives in equity, foreign exchange, interest rates and credit risk markets.

Read, understand and discuss the relevant literature in books and refereed academic journals.

Think logically and apply analytical principles to a range of problems in finance, especially is derivatives pricing and trading.

Gather financial data and validate the hedging models used by derivative securities traders.

Teaching/learning methods and strategies

Substantive problems are illustrated in lectures and smaller group seminars. Project work and assignments provide related opportunities for problem solving. Lectures supported by tutorial discussions provide the basis of ensuring the growing knowledge base becomes comprehensible.

These skills are developed by each of the core modules, which are supported by key milestones and submission of tutor-marked assignments. Students will be able to perform and analyse different pricing methodologies for a wide range of derivatives.

Assessment

Through tutor-marked assignments, project work, tests, moderated online discussions and unseen written examinations.

C. Practical skills – able to:

Use different software (C++, VBA) to apply the techniques presented for the valuation of derivatives.

Use spreadsheet software effectively as an interface and to solve simple problems.

Utilise Reuters and Bloomberg business information and analytical tools.

Communicate ideas online.

Operate effectively in a simulated front office environment, including the ability to validate quantitative trading models using fundamental principles.

Teaching/learning methods and strategies

Practical skills are introduced in lectures, developed in supporting tutorials and computer-based sessions, and reinforced by problem sets and supervised project work.

Teaching is supported by a LMS that requires students to participate in asynchronous online discussions.

The teaching of essential software (C++, VBA) is included in the programme.

Most modules have practical exercises based on programming and the use of spreadsheets.

Assessment

These are assessed through projects, assignments, computer-based sessions and tutorials. For flexible learners, tutor-marked assignments based on C++, VBA and Excel spreadsheets will be submitted electronically as part of the milestones built into the programme calendar.

D. Transferable skills – able to:

Communicate complex issues clearly and effectively both orally and in writing.

Gather and interpret data, and present results.

Demonstrate familiarity with the workings of the international financial markets.

Use IT, including programming, data exchange, graphics, spreadsheet and directed website searches.

Contribute to online group discussions.

Use library and web-based resources.

Manage time to achieve goals.

Teaching/learning methods and strategies

The use of IT is an integral part of the practical side of the course.

Programming languages are taught in two modules: ‘C++ for Financial Engineering’ and ‘Numerical Methods for Derivatives’ whilst they are applied in almost all of the other modules. Their use is encouraged through applications that require programming and the use of spreadsheet software for interface. These involve programs that price derivatives using different methods, website searches and use of library resources.

Communication and presentation skills are assessed at several points throughout the programme. Good time management is essential for organising a timetable to complete project work.

Assessment

Assessment of transferable skills is incorporated at several points in the programme through projects, assignments and computer-based tutorials. These are also assessed by means of unseen written examinations, tutor-marked assignments and moderated online discussion.

Please note - This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the process of academic development and feedback from students, quality assurance processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.