

ST401-15 Stochastic Methods in Finance

20/21

Department

Statistics

Level

Undergraduate Level 4

Module leader

Gechun Liang

Credit value

15

Module duration

10 weeks

Assessment

Multiple

Study location

University of Warwick main campus, Coventry

Description

Introductory description

This module runs in Term 1 and is only available to students in their final year of an integrated masters in the Department of Statistics. It is not available as an Unusual Option.

Pre-requisites: ST318 Probability Theory and ST339 Introduction to Mathematical Finance.

Leads To: ST909 Continuous Time Finance for Interest Rate Models.

Results from this module may be partly used to determine exemption eligibility in the Institute and Faculty of Actuaries module CM2. (Independent application with the IFoA may be required to receive the exemption.)

[Module web page](#)

Module aims

To provide an introduction to continuous time stochastic models as applied in mathematical finance. To cover, in conjunction with parts of the Institute and Faculty of Actuaries syllabus. To gain an understanding of Brownian Motion and Stochastic Calculus. To be able to use this to

model the evolution of financial markets in continuous time and price a variety of financial instruments.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Content:

Introduction to Brownian Motion and Stochastic Calculus.

Introduction to SDEs (Stochastic Differential Equations) and Markov processes.

Continuous-time models of security prices.

Risk-neutral evaluation and equivalent martingale measures, Girsanov and martingale representation theorems.

Black-Scholes theory: PDE and SDE approaches.

Basic Greeks, delta-hedging.

Put-Call parity and Put-Call symmetry.

Introduction to optimal stopping and American Options.

Bond prices and term structure of interest rates: Hull-White, Vasicek and CIR models.

Learning outcomes

By the end of the module, students should be able to:

- Know how probability models are used in financial mathematics
- Understand the concept of Brownian motion

Indicative reading list

[View reading list on Talis Aspire](#)

Subject specific skills

TBC

Transferable skills

TBC

Study

Study time

| Type | Required | Optional |
|---------------|-----------------------------|----------------------|
| Lectures | 30 sessions of 1 hour (20%) | 2 sessions of 1 hour |
| Tutorials | 5 sessions of 1 hour (3%) | |
| Private study | 115 hours (77%) | |
| Total | 150 hours | |

Private study description

Weekly revision of lecture notes and materials, wider reading, practice exercises and preparing for class tests and the examination.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group B1

| | Weighting | Study time | Eligible for self-certification |
|--|-----------|------------|---------------------------------|
| In-person Examination Answer all questions. | 100% | | No |

- Answerbook Pink (12 page)

Assessment group R

| | Weighting | Study time | Eligible for self-certification |
|--|-----------|------------|---------------------------------|
| In-person Examination - Resit Answer all questions. | 100% | | No |

~Platforms - Moodle

- Answerbook Pink (12 page)
- Students may use a calculator

Feedback on assessment

Solutions and cohort level feedback will be provided for the examination.

[Past exam papers for ST401](#)

Availability

Post-requisite modules

If you pass this module, you can take:

- ST958-15 Advanced Trading Strategies

Courses

This module is Optional for:

- Year 1 of TMAA-G1PE Master of Advanced Study in Mathematical Sciences
- USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics
 - Year 3 of G300 Mathematics, Operational Research, Statistics and Economics
 - Year 4 of G300 Mathematics, Operational Research, Statistics and Economics

This module is Option list A for:

- Year 4 of USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics
- Year 5 of USTA-G301 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics (with Intercalated
- Year 4 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)

This module is Option list D for:

- Year 4 of USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics
- Year 5 of USTA-G301 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics (with Intercalated

This module is Option list E for:

- Year 4 of USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics
- Year 5 of USTA-G301 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics (with Intercalated