

Department of Accounting and Finance

AG426 Advanced Derivatives

2025/26 Semester 1

20 Module Credits

Module Details

Module Description

This module covers advanced material in derivatives pricing, such as stochastic calculus and its implication in finance under financial market frictions. The course particularly focuses on applying option valuation techniques to capital investment decisions of firms, which is referred to as real option valuation. The new approach dramatically departs from the orthodox theory and "it has shown that the traditional 'net present value' rule, which is taught to virtually every business school student and student of economics, can give very wrong answers" (Dixit and Pindyck, 1994). By the end of this course, students will have a good understanding of how derivative contracts work, how they are priced using modern financial language. Students will also learn how to employ numerical methods to price complex financial derivatives with the help of MATLAB software. Most importantly, students will better understand how investment decisions to be made with the ongoing uncertainty of economic environments.

Teaching Hours

Lecture: Friday 11am-1pm in RC503.

Lab: Friday 1-2pm in LT301b

3 hour lectures in weeks 1, 2, 8, 9 and 10.

2 hour lectures and 1 hour lab in weeks 3, 4, 6 and 7.

No lecture and lab in week 5, the time slot is reserved for Group assignment preparation.

Prerequisites

Honours entry requirements.

Contact Details

Lecturer: Dr Hai Zhang

Room number: Stenhouse 3.26

Telephone: 0141 548 4983

E-mail: hai.zhang@strath.ac.uk

Office Hours: Friday 13:30-14:30

Module Learning

Module Aims

Teaching methods will include formal lecturing but there will also be an emphasis in the learning process on student participation through group work and debate. There will be 10 two-hour lectures plus 10 one-hour seminars/labs. This will prepare you for the modes of Assessment (explained below). Active participation in workshops is important and this will be encouraged by the tutor to the extent of occasionally requiring short presentations/discussions by the students. At all times students are expected to supplement their learning by reading the prescribed textbook(s), newspaper (such as Financial Times and Wall Street Journals) and web articles from services such as Bloomberg, Yahoo Finance, CNBC etc.

Learning Objectives and Outcomes

Subject-specific knowledge and skills

On completing this module you will be able to:

- A.1 Understand a model for the random behaviour of share prices.
- A.2 Understand stochastic calculus and Wiener process.
- A.3 Understand in detail futures and options.
- A.4 Understand the theoretical principles which sustain option pricing models.
- A.5 Understand advanced techniques to price derivatives.
- A.6 Understand numerical option pricing methods, i.e. Monte Carlo simulation, FDM, etc..
- A.7 Understand empirical volatility models: such as Garch models.
- A.8 Estimate different measures of the risk of a portfolio of derivatives.
- A.9 Estimate the Value at Risk of a portfolio of financial assets.
- A.10 Understand how option-pricing techniques can be used to assess the investment decision in real assets.

Cognitive abilities and non-subject specific skills

During the module you will:

- B.1 Develop academic skills in reading and understanding academic writing.
- B.2 Develop numerical skills while understanding the pricing of complex derivative instruments.
- B.3 Develop your team work and your computational skills through a group assignment.
- B.4 Develop the ability to explain and discuss complex issues.

Module Structure

Timetable

Week Number	Topic	Lecture chapters	pre-reading chapters
WEEK 1	Introduction; Wiener Processes & Ito's Lemma	Hull Chapter 14	
WEEK 2	The Black-Scholes differential equation	Hull Chapter 15	
WEEK 3	Numerical Procedures: Binomial trees	Hull Chapter 21	
WEEK 4	Monte Carlo simulation	Hull Chapter 21	
WEEK 5	Group Assignment Preparation (No lecture & Lab) Week		
WEEK 6	Finite difference methods	Hull Chapter 21	
WEEK 7	Value at Risk and Expected Shortfall	Hull Chapter 22	
WEEK 8	Estimating Volatilities and Correlations	Hull Chapter 23	
WEEK 9	Real Options	Hull Chapter 36	
WEEK 10	Real Option and Its applications	Hull Chapter 36	
WEEK 11	Revision session.		

Assessment and Feedback Details

1. Group project worth 30%. Due: Thursday 13th of November 2025, 4pm. Marks/Feedback will be released on or before Thursday 4th December 2025.
2. Final exam worth 70%. Date: During semester 1 exam diet.

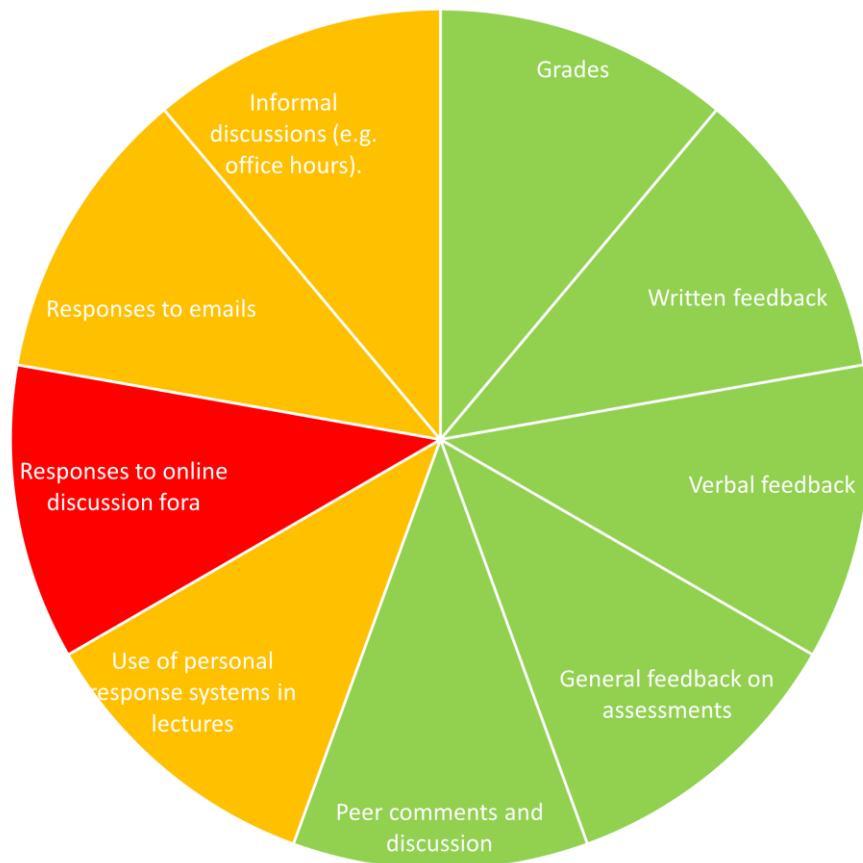
An overall weighted average mark of 40% is required to pass the module.

It is a requirement for course completion to submit all assessed coursework. Non-submission of any part will result in an overall mark of zero being awarded for the module.

The following forms of feedback will assist you in this module:

<i>Feedback category</i>	<i>Details for module</i>	<i>Colour</i>
Grades	Students will receive marks on the class test, the group assignment, and the final exam.	Green
Written feedback	Students will receive written feedback on the group assignment comparing their submission against the marking criteria for the assignment.	Green
Verbal feedback	Students can receive verbal feedback on the class tests and the final exam by attending a drop-in session.	Green
General feedback	Students will receive general feedback on group project, the final exam, and the overall performance.	Green
Peer comments and discussion	Students will have the opportunity to have peer discussion and receive comments within the tutorials.	Green
Use of personal response systems in lecture	Lecturers will use a personal response system as appropriate.	Amber
Responses to online discussion forum	As this is an on-campus class, there is no online discussion forum	Red
Responses to email	Students are encouraged to use office hours to ask questions relating to the course material. Students can email the course administrator for general enquiries about the class, issues with signing up for tutorials etc.	Amber
Informal discussions	There are weekly drop-in sessions for any student wishing to discuss questions with teaching staff.	Amber

	Information on office hours is available under People on the class MyPlace page.	
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Artificial Intelligence

You are not permitted to use Gen-AI tools for this module unless you are a student with an adjustment report on Pegasus where this is explicitly specified as a 'reasonable adjustment'. Any student suspected of using such tools will be subject to investigation outlined in the [Student Discipline Procedure - Academic Misconduct.pdf \(strath.ac.uk\)](#) process.

Reading List

Please refer to the AG426 Myplace page to access the Reading List.

UG Module Manual (Honours)

Please refer to the accounting and finance UG manual module for the following ([Honours Module Manual.docx](#)):

- Tutorial Attendance
- Useful Contacts
- Penalties for Late Submission
- Feedback
- Compensation Scheme

- Resit Policy – no resits in honours year
- Universal Marking Guide
- Useful Links