Course Description

This course is an introduction to derivative pricing. Topics include: binomial tree model, stochastic calculus, Itô calculus, Black-Scholes model, market price of risk, log-normal models.

Course Prerequisites

MATH 2060.03 and (MATH 2120.03 or MATH 2135.03)

Course Objectives/Learning Outcomes

A student who is successful in this course should be able to:

• Derive Itô’s lemma for a function of one time dimension and one “space” dimension which follows a standard Weiner process.
• Derive the classic Black-Scholes PDE and solve it for a European call option.
• Explain the relevance of the market price of risk in valuing derivative securities
• Use the CRR binomial algorithm to price path-dependent options

Course Materials


Course Assessment

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Midterm</td>
<td>35%</td>
<td>11 Feb 2016</td>
</tr>
<tr>
<td>Final Exam</td>
<td>45%</td>
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</tbody>
</table>

There will be four assignments sets. Each problem set will have the same weight, 5% of the total 20%. The assignments will be due approximately every two weeks. The Midterm be held during regular class time (*Thursday, 11 February, 1 pm to 2:30 pm*).

The date of the final exam will be set by the registrar and will take place during the regular April examination period. Assignments must be done individually and handed in before or on the due date. Only hard copy is acceptable.
Conversion of numerical grades to Final Letter Grades

\[
\begin{align*}
(89.5, 100] & \rightarrow A^+ \\
(84.5, 89.5] & \rightarrow A \\
(79.5, 84.5] & \rightarrow A^- \\
(76.5, 79.5] & \rightarrow B^+ \\
(72.5, 76.5] & \rightarrow B \\
(69.5, 72.5] & \rightarrow B^- \\
(64.5, 69.5] & \rightarrow C^+ \\
(59.5, 64.5] & \rightarrow C \\
(54.5, 59.5] & \rightarrow C^- \\
(49.5, 54.5] & \rightarrow D \\
[0, 49.5] & \rightarrow F
\end{align*}
\]

Course Policies

Late assignments will not be accepted. Missed assignments will be given a score of zero. There are no make-up tests for missed tests. If a class is cancelled (due to weather, for example) on the day when either of the in-class tests is scheduled, the test will be rescheduled. If a class is cancelled on a non-test day, the decision to make up the class will depend on circumstances.

Approximate Schedule / List of Topics

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>Financial Derivatives, PDEs, Wiener Processes, Itô’s Lemma</td>
<td>WHD §1, 2</td>
</tr>
<tr>
<td>4, 5, 6</td>
<td>Black-Scholes PDE, Black-Scholes Formula, Limitations</td>
<td>WHD §3, 4, 5</td>
</tr>
<tr>
<td>7, 8, 9</td>
<td>American options, Binomial algorithm, Index, Currency, Exotic Options</td>
<td>WHD §7, 10, 11</td>
</tr>
<tr>
<td>10, 11</td>
<td>The “greeks”, Option Replication</td>
<td>WHD §16</td>
</tr>
<tr>
<td>12, 13</td>
<td>Interest Rate Derivatives</td>
<td>WHD §17</td>
</tr>
</tbody>
</table>

“WHD” refers the the text by Wilmott, Howison & Dewynne

ACCOMODATION POLICY FOR STUDENTS

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. The full text of Dalhousie’s Student Accommodation Policy can be accessed here:


Students who require academic accommodation for classroom participation or the writing of tests and exams should make their request to the Advising and Access Services Center (AASC) prior to or at the outset of the regular academic year. More information and the Request for Accommodation form are available at www.dal.ca/access.

ACADEMIC INTEGRITY

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty.

The Academic Integrity website (http://academicintegrity.dal.ca) provides students and faculty with information on plagiarism and other forms of academic dishonesty, and has resources to help students succeed honestly. The full text of Dalhousie’s Policy on Intellectual Honesty and Faculty Discipline
Procedures is available here:
http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.html

STUDENT CODE OF CONDUCT

Dalhousie University has a student code of conduct, and it is expected that students will adhere to the code during their participation in lectures and other activities associated with this course. In general:

“The University treats students as adults free to organize their own personal lives, behaviour and associations subject only to the law, and to University regulations that are necessary to protect

- the integrity and proper functioning of the academic and non-academic programs and activities of the University or its faculties, schools or departments;
- the peaceful and safe enjoyment of University facilities by other members of the University and the public;
- the freedom of members of the University to participate reasonably in the programs of the University and in activities on the University’s premises;
- the property of the University or its members.”

The full text of the code can be found here:
SERVICES AVAILABLE TO STUDENTS

The following campus services are available to help students develop skills in library research, scientific writing, and effective study habits. The services are available to all Dalhousie students and, unless noted otherwise, are free.

<table>
<thead>
<tr>
<th>Service</th>
<th>Support Provided</th>
<th>Location</th>
<th>Contact</th>
</tr>
</thead>
</table>
| General Academic Advising| Help with understanding degree requirements and academic regulations, choosing your major, achieving your educational or career goals, dealing with academic or other difficulties | Killam Library Ground floor Rm G28 Bissett Centre for Academic Success | In person: Killam Library Rm G28  
By appointment:  
- e-mail: advising@dal.ca  
- Phone: (902) 494-3077  
- Book online through MyDal |
| Dalhousie Libraries      | Help to find books and articles for assignments  
Help with citing sources in the text of your paper and preparation of bibliography | Killam Library Ground floor Librarian offices | In person: Service Point (Ground floor)  
By appointment:  
Identify your subject librarian (URL below) and contact by email or phone to arrange a time:  
| Studying for Success (SFS)| Help to develop essential study skills through small group workshops or one-on-one coaching sessions  
Match to a tutor for help in course-specific content (for a reasonable fee) | Killam Library 3rd floor Coordinator Rm 3104 Study Coaches Rm 3103 | To make an appointment:  
- Visit main office (Killam Library main floor, Rm G28)  
- Call (902) 494-3077  
- email Coordinator at: sfs@dal.ca or  
- Simply drop in to see us during posted office hours  
All information can be found on our website: www.dal.ca/sfs |
| Writing Centre           | Meet with coach/tutor to discuss writing assignments (e.g., lab report, research paper, thesis, poster)  
- Learn to integrate source material into your own work appropriately  
- Learn about disciplinary writing from a peer or staff member in your field | Killam Library Ground floor Learning Commons & Rm G25 | To make an appointment:  
- Visit the Centre (Rm G25) and book an appointment  
- Call (902) 494-1963  
- email writingcentre@dal.ca  
- Book online through MyDal  
We are open six days a week  
See our website: writingcentre.dal.ca |