Course Outline: ACSC 390AC Winter 2012
Mathematics of Finance III Derivative Pricing
Tuesdays and Thursdays 1:00-2:15pm CW307.37
Final Exam 3 Hours Data and Location TBA

Instructor
Peter Douglas, CW 307.24
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Office Hours
Tuesdays and Thursday 2:30-4:00 pm
Mondays 9-12 am
Other times by appointment (note that I am off campus on Wednesdays and alternate Fridays)

Text: *Derivative Markets* (Second Edition), 2006, by McDonald, Robert L. Chapters 9-13,18-24

Other Materials: A class website will be maintained URCourses. This will contain electronic copies of assignments, solution sets and other items of interest.   There will be no paper handouts provided in class.

Overview
ACSC 390AC covers the pricing of European and American style options on investment vehicles including sticks, currencies, commodities and indices. At the end of the term, students will be expected to:

  i)   Use put-call parity to determine the relationship between prices of European put and call options and to identify arbitrage opportunities.
  ii)   Calculate the value of European and American options using the binomial model.
  iii) Calculate the value of European and American options using the Black-Scholes option-pricing model.
  iv)   Identify the situations where the values of European and American options are the same.
  v)   Interpret the option Greeks.
  vi)   Explain the cash flow characteristics of the following exotic options: Asian, barrier, compound, gap, and exchange.
  vii) Explain the properties of a lognormal distribution and explain the Black-Scholes formula as a limited expected value for a lognormal distribution.
  viii) Explain what it means to say that stock prices follow a diffusion process.
  ix)   Apply Itô's lemma in the one-dimensional case.
  x)   Simulate lognormal stock prices.
  xi)   Use variance reduction techniques to accelerate convergence on simulation
  xii) Explain and demonstrate how to control risk using the method of delta-hedging.

This material forms learning objectives B and C under Society of Actuaries Exam MFE (or Casualty Actuarial Society 3F). In addition, if time allows the course will cover the interest rate models covered under Learning Objective A of exam MFE/3F.

Course Requirements
  1) An awareness of the U of R General Calendar.

  2) Pre-requisites for this course are ACSC216 and STAT251. In addition, it is suggested that students have completed ACSC318 or be taking ACSC318 simultaneously with ACSC316.

  3) Students are assumed to have a working knowledge of calculus.

4) Completion of class assignments (approximately 8-10).   These should be legible, on 8.5×11" paper and stapled together. Please ensure that you clearly identify your assignments with your name and student number. Assignments are due at the start of class on the assigned date (generally on Tuesdays).   No credit will be granted for late papers.

5) At least one assignment will take the form of a 30-minute in class quiz using Society of Actuaries questions.

6) For many assignments, it is recommended that students use of Excel or similar packages

7) Two midterm exams to be written in class time.

8) One 3-hour final exam (date and location to be announced).

9) A tentative class schedule has been posted on the class website. This will be updated during the term.

10) Alternate arrangements for midterm and final exams may be made at the discretion of the instructor for students who provide prior notice and adequate documentation. However, the instructor reserves the right to deny such arrangements for students who have not completed the course assignments to date.

11) For the midterm and final exams, students are required to bring photo ID a non-programmable pocket calculator. Students should note that the instructor will not provide calculators for the midterms or final exam.

12) Programmable calculators, laptop PCs and other electronic devices will not be permitted in the exams room. Students interested in writing actuarial exams in the future may wish to purchase an approved Society of Actuaries calculator. Further details on approved SOA calculators may be found on the SOA website .

13) Note that the SOA set of tables and formula sheets for Course MFE will be provided for the exams. These can be found online at the SOA website and at the class website.

Actuarial Science Program
Students interested in the Actuarial Science program are encouraged to contact the instructor for additional information. Actuarial Science students should ensure that they complete the pre-requisites for later ACSC courses in a timely manner. In particular, note that ACSC 217 (offered only in the Winter term) requires the completion of STAT 251 (offered only in the Fall term).

In addition, ACSC students are strongly encouraged to write the Society of Actuaries exams. Information on preliminary SOA exams can be found through the Be An Actuary website at http://www.beanactuary.org/exams/

Grading
Final grades will be based in on the higher of:
  A) Class average calculated as follows:
      i)   Assignments 10% (average of best 5 assignments)
      ii)   Midterms 40% (i.e. 20% each)
      iii)   Final Exam 50%
  B) 100% Final exam (i.e. if this is higher than your class average)

The instructor reserves the right to
  a)   Fail a student who does not pass the final exam
  b)   Refuse to allow a deferred final to a student who has not completed the requirements of the course, or who does not receive a passing average for the two midterms.