ACT230H1 Mathematics of Finance for Non-Actuaries

Summer 2014

Class Information:

- Class meetings are on Tuesday and Thursday, 7:10-9:00pm in SS 1083.
- Tutorials are on Tuesday, 6:10-7:00pm in SS1083.
- Instructor: Dameng Tang, dameng.tang@mail.utoronto.ca
- Office hour: 6:00-7:00pm every Thursday in SS6026.

Course Description: This course will cover various topics in introductory mathematical finance. We will first deepen the understanding of interest rate by dealing with several different measurements, then head for some important and common applications: annuity valuation, loan amortization, consumer financing arrangements, and bond valuation. This course is aimed at a general audience who will not be continuing in the actuarial science program.

Topics: Effective rates of interest, compound interest & simple interest, accumulated amount function & present value, equation of value, nominal rates of interest, effective & nominal rates of discount, the force of interest, inflation & real rate of interest, present value and accumulated value of annuities (level payment, non-constant payment, with an emphasis on geometric progression pattern), level payment annuities with differing interest and payment period, m-thly payable annuities & continuous annuities, the amortization method of loan repayment (especially loans with level payments), the sinking-fund method of loan repayment, internal rate of return (IRR) & net present value (NPV), comparison of investments, dollar-weighted and time-weighted rate of return, the portfolio method and the investment year method, determination of bond prices (including bond prices between coupon dates), book value of a bond.

Prerequisites: First-year Calculus

Grading Policy:

- Quizzes (20%), Term Test (35%), Final Exam (45%)
- Please be advised that the quizzes will be given randomly during the lectures. It will be graded 7-10 and you will be asked to provide necessary intermediate calculations. If you miss a quiz with some legitimate reason, the credit will be shifted to final exam (but without a guarantee of minimum of 7 out of 10!).
- Both term test and final exams are multiple choice based and will be held on **June 3rd 7:00-8:30 pm**, and **June 24th 7:00-9:00 pm**, respectively (location will be announced beforehand). The final exam will be cumulative and covers all the topics of the course.

Textbook:

Professor Broverman's study guide for SOA Exam FM, 2012/2013 edition. Students are expected to read and understand the descriptive parts of the study guide themselves. Also, the study guide provides many problems that are similar to the ones you will see in exams of this course. This guide can be bought at a pre-notified lecture from the Actuarial Science Club personnel at a

ACT240 H1 F – Mathematics of Investment & Credit
Course Outline – Summer 2014

lectures: (L0101) Mon & Wed, 4:10-6 pm SS 1085
tutorials: (T0101) Mon & Wed, 3:10-4 pm

Instructor:	**J.G. Pitt**
Office Location:	**SS 6017** (subject to change)
Office Telephone:	**416-978-3490** (subject to change)
Email:	**greg.pitt@utoronto.ca**
Office Hours:	**Monday 2:05-2:55 pm, SS 6017**
	Tuesday 2:05-2:55 pm, SS 6017
	Wednesday 2:05-2:55 pm, SS 6017

TAs:	**Affan Chaudhry**	**affan.chaudhry@mail.utoronto.ca**
	Jinyoung Yang	**jinyoung@utstat.utoronto.ca**

official course description
ACT240H1   Mathematics of Investment & Credit   [24L/12T]
Interest, discount and present values, as applied to determine prices and values of annuities, mortgages, bonds, equities; loan repayment schedules and consumer finance payments in general; yield rates on investments given the costs on investments.

Prerequisite: MAT137Y1 (minimum grade 65%)/MAT157Y1
Exclusion: ACT230H1
Distribution Requirement Status: This is a Science course
Breadth Requirement: The Physical and Mathematical Universes (5)

course objectives
The successful student will learn how to perform basic calculations related to a wide variety interest-bearing financial instruments. The course should also be helpful in preparing for ACT245 and for professional actuarial examinations.

main text: (not required)
Broverman: *Mathematics of Investment and Credit*, 5th ed., ACTEX, 2010

supplementary books
Kellison: *The Theory of Interest*, 2nd ed. 1991
Broverman: *Study Guide for SOA exam FM / CAS exam 2*

determination of grades

assignment 1	5 %	due May 26, tutorial time
quizzes (4)	8 %	
tests (2)	25 %, 25 %	May 28 & June 11, tutorial slot (beginning)
additional assignments	3 %	
final exam	34 %	late June (tba)
TOTAL	100 %	

clean drop: 2014/06/09 - last day to drop this course from academic record and GPA .

course grades: After courses have been submitted to the records people, they will not be changed unless there was a clerical mistake. Students' access to see their final exam papers is through an appeal process with the Faculty of Arts and Science, not with the instructor.

marking issues: The TAs and the instructor are well aware of the importance of grades to most students, and great care will be taken in the marking of assignments, quizzes, and exams. In the unlikely event that you feel a question has been mis-marked, or the marks have been added up incorrectly, you can submit your test back to the instructor with a note explaining what you believe requires further examination. This must be done promptly after the marked paper is returned to you.

tests, quizzes, etc.
The term tests will NOT be administered during class hours. They will be during the tutorial time period, in room SF3201. They may include any material covered up to the end of the previous lecture, unless stated otherwise in class.

The final exam will be cumulative, and will include questions from all parts of the course. It may emphasize material that did not appear not on the tests.

For the various tests, students will be permitted to use a non-programmable, non-plotting calculator. If there is any doubt about the permissibility of your particular calculator, please consult in advance.

Students must bring their U of T student ID to all tests and exams.

Because of crowding in the classroom, multiple versions of the tests may be administered. The differences between versions will be slight and should not affect the difficulty of particular problems. The printed tests may contain a superset of questions, from which your specific questions will be determined on the basis of you student number.

How to present your work: Show your work (i.e., document your thought processes). Some wrong answers may be awarded partial credit, but not unless you show your work. **Careless rounding and similar sloppiness will result in deductions.**

Online quizzes may be offered, approximately once per week. The quizzes will be time limited. Multiple attempts may be offered.

Printed quizzes, if any, may contain a superset of questions, from which your specific questions will be determined on the basis of your student number.

assignments
Two assignments will be collected. You may consult with your fellow students, but each student must submit individual answers and document his/her thought processes.

problem sets
Problem sets, consisting of questions assigned from the book as well as supplementary questions, will be posted from time to time. These questions are for practice and discussion and not for handing in and grading.

absences/missed tests: In the event a student misses a test exam due to illness or domestic situation, the student must contact the Statistics departmental office immediately, and submit a medical certificate indicating type of illness and date of illness (or other applicable documentation for domestic situations) to the instructor. This should be done within 48 hours of the test date, if possible.

If a student misses a test for legitimate reasons, the missing points will be earned by shifting the weight to the next test or exam.

lectures
Ordinary classroom etiquette is expected of all of the students. This includes arriving on time, turning off cell phones and similar devices, and respect for fellow students.

Leaving the classroom while a lecture is in progress is disruptive and should be avoided. If you feel that you will need to leave class before it ends, please sit close to the exit and alert the instructor to your situation.

The class time will be used for lectures and discussion, based mostly on the material in the textbook. However, the instructor may assign additional reading and/or exercises to supplement the book.

Class participation is strongly encouraged: asking questions, comments that relate this course to others that you are taking, pointing out mistakes on the chalkboard, etc.

cancellation policy: In the event of inclement weather, instructor illness, or similar circumstances resulting in class cancellation, any test or assignment due date will be postponed for one week until the next class. Minor adjustments to the overall course schedule might be necessary, and these will be posted.

Formal rules are in place regarding the rescheduling of final exams, and these will be followed if necessary.

tutorials
Students are expected to attend the tutorial sessions. Tests will be administered during some of the tutorial time slots. Also, marked papers will be returned during tutorials. Occasionally, some new material may be presented during a tutorial if regular lecture time has not been sufficient.

The Statistics Aid Centre can be an important source of help with difficulties. It is located in Sidney Smith 1091. Your designated TA will be on duty at least one hour per week, but you may drop in at any time if you are willing to wait for other students to be served. Schedules will be posted as soon as they become available. Some additional information may be available at

http://www.utstat.utoronto.ca - click on Statistics Aid Centres for the schedule.

In the fall and winter terms, an additional centre at New College Wetmore 68A is open.

communication
The course website will be the centre for communication from the instructor to the students. The students are urged to complete the recommended problem sets. Solutions to some of these problems may be posted on the course web-site.

If we experience a Portal/Blackboard outage, the instructor will attempt to post essential material at http://utstat.utoronto.ca/~pitt/act240

The instructor and the TAs may be contacted by email at any time. In general, the TAs should be contacted regarding subject matter, and the instructor regarding administrative matters. Please include the course code (act240) in the subject line of all email messages. Note that if message traffic becomes excessive, the course email policy may be revised at any time during the term.

accessibility: Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability or health consideration that may require accommodations, please feel free to approach the instructor and/or the Accessibility Services Office as soon as possible. The Accessibility Services staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner you let them and the instructor know your needs, the quicker they can assist you in achieving your learning goals in this course.

For more information, please refer to   http://www.accessibility.utoronto.ca/

academic misconduct
Students should note that copying, plagiarizing, or other forms of academic misconduct <u>will not be tolerated</u>. Any student who is detected engaging in such activities will be subject to academic discipline ranging from a mark of zero on the test or examination to dismissal from the university. Any student abetting or otherwise assisting in such misconduct may also be subject to academic penalties.

academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves.

Familiarize yourself with the University of Toronto's *Code of Behaviour on Academic Matters* (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm). It is the rule book for academic behaviour at the U of T, and you are expected to know the rules. Potential offences include, but are not limited to:

In papers and assignments:
- Using someone else's ideas or words without appropriate acknowledgement.
- Copying material word-for-word from a source (including lecture and study group notes)

and not placing the words within quotation marks.

- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Including references to sources that you did not use.
- Obtaining or providing unauthorized assistance on any assignment including
  - working in groups on assignments that are supposed to be individual work,
  - having someone rewrite or add material to your work while "editing".
- Lending your work to a classmate who submits it as his/her own without your permission.

On tests and exams:

- Using or possessing any unauthorized aid, including a cell phone.
- Looking at someone else's answers
- Letting someone else look at your answers.
- Misrepresenting your identity.
- Submitting an altered test for re-grading.

Misrepresentation:

- Falsifying or altering any documentation required by the University, including doctor's notes.
- Falsifying institutional documents or grades.

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be investigated following the procedures outlined in the *Code*. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact the instructor. If you have questions about appropriate research and citation methods, seek out additional information from the instructor, or from other available campus resources like the U of T Writing Website. If you are experiencing personal challenges that are having an impact on your academic work, please speak to the instructor or seek the advice of your college registrar.

Note that because of crowding in the classroom, multiple versions of quizzes and tests may be administered. The differences between versions will be slight and should not affect the difficulty of particular problems.

summer courses
Students should note that summer courses present additional challenges that are not found in regular-term courses. The pace will be brisk, and those of you who are accustomed to short lectures during the day may find it difficult to adjust to long lectures in the evenings. Additionally, because of time constraints, students will be asked to learn a few topics via independent study.

topic coverage

act240 - 20145 – proposed topic schedule

L01 - 2013/05/12 (Mon)
time value of money

interest, compounding
equivalent and effective rates

L02 - 2013/05/14 (Wed)
debt vs equity
expected value
annuities

Victoria Day - 2013/05/20 (Mon)

L03 - 2013/05/21 (Wed)
discount
inflation
continuous compounding
generalization of annuities, intro

L04 - 2013/05/26 (Mon)
level payments; special payments
annuities due and immediate
non-constant payments
linear incr/decr
exp/geometric growth/decline
intermittent

L05 - 2013/05/28 (Wed)
test 1 - tutorial
non-constant annuities, concl.
loans, general
mortgages

L06 - 2013/06/02 (Mon)
loans & mortgages, concl.
credit card debt
sinking fund
bonds, introduction

L07 - 2013/06/04 (Wed)
bonds, continued
IRR

L08 - 2013/06/09 (Mon)
investment
dollar-weighted and time-weighted
investment portfolios

L09 - 2013/06/11 (Wed)
test 2 - tutorial
spot & forward rates
bonds, advanced topics

L10 - 2013/06/16 (Mon)
review of familiar financial instruments
including bond variants, T-bills, commercial paper
other financial instruments

L11 - 2013/06/18 (Wed)   review