

ACT230 – Math of Finance
Fall Term, 2013

Important Note:

This course is NOT for students who wish to pursue an actuarial science major or specialist program. If that is what you aspire to do, please enrol in *ACT240 – Fundamentals of Investment and Credit* instead. The prerequisite for ACT240 is MAT137Y (minimum grade 65%) or MAT157Y.

Vital Statistics:

Instructor: Vicki J. Zhang, FSA, MAAA, ACIA, MStat

Lectures: Tuesdays, 7-9pm

Lecture location: Koffler House 108 (569 Spadina Crescent)

Tutorials: Tuesdays, 6-7pm

Tutorial Location: TBA

Office: 6th floor, SS Room 6015

Office Hour: Mondays, 2-4pm

Blackboard: <http://portal.utoronto.ca>

Email: vickijing.zhang@utoronto.ca

Evaluation:

5% class participation (including class discussions, survey participations, but excluding course/instructor evaluation)

35% assignments (five assignments)

60% final exam

Notes on assignments:

There will be five case study assignments throughout the semester. (each worth 7%):

- 1- Fractional Insurance Premium
- 2- Index Annuity tracking S&P500
- 3- Variable Annuity(VA) with Guaranteed Life Withdraw Benefits (GLWB)
- 4- What is VA Guaranteed Life Income Benefits (GLIB) Guarantee worth?
- 5- Shall I prepay my mortgage?

- I will provide ample background in the assignment documents and will ensure the assignments only use the level of materials we have covered up to the time of the assignment in this course.
- Each of the five questions has a “hard” (technical) part and a “soft” part involving understanding and communicating the implications of the assignment.
- You will first complete the technical part on an Excel spreadsheet I will provide. You are then required to write notes at the end of your spreadsheet to communicate your reflections on the assignment (not on the technical details, but bigger-picture implications). These notes should be concise but you should strive to use the best sentences you can come up with to express your thoughts.

- I will recap the technical part of the assignment at the beginning of each class. Time permitting, we will have about 10 minutes of class discussion on the larger implication of the cases at the beginning of the lectures.
- Materials covered in the assignments are not directly tested in final exams.

Texts and Reference:

The main textbook we will use for this course is Broverman's Study Guide for SOA EXAM FM/ CAS EXAM2. The Actuarial Club has made cheaper version of this study guide available (after acquiring permission from Prof. Broverman). I will arrange for them to make an appearance in the first two lectures so you can purchase the study guide from them.

I have also asked the library to put the following SOA official textbook for FM on the course reserve: Mathematics of Investment and Credit (S. Broverman). This book can be used as a reference for the course. You are, however, not required to purchase this book.

Schedule of Topics:

Lecture 1 - September 10: Course Introduction and Math Review

- Overview of the course, including the pedagogical and intellectual goals
- The use of Excel in this course
- Concept of interest

Lecture 2- September 17:

- Present Value of cashflow
- Nominal rates of interest

Lecture 3- September 24:

- Force of interest
- A tale of inflation in Western countries
- Introduction to annuity immediate

Lecture 4- October 1:

- Annuity Immediate and Annuity Due
- Assignment #1: Cost of Fractional Premium (**Due date: October 7**)

Lecture 5- October 8:

- Recap Assignment #1
- Annuity valuation
- Reconcile interest accumulation and payment period
- Assignment #2: Indexed annuity tracking S&P500 (**Due date: October 15 5pm**)

Lecture 6- October 15

- Recap Assignment #2
- Continuous annuity
- Annuity products in the market
- Valuation of annuities following a geometric progression

- Increasing and decreasing annuities

Lecture 7- October 22:

- Increasing and decreasing annuities (continued)
- Assignment #3: Guarantee in VA products with GLIB rider (**Due date: October 28**)

Lecture 8- October 29:

- Recap Assignment #3
- Amortization of a loan

Nov 4: (last day to drop class)

Lecture 9- November 5:

- Sinking fund method of loan repayment
- Assignment #4: Variable Annuity(VA) with Guaranteed Life Withdraw Benefits (GLWB) (**Due date: November 15**)

November 12: Fall break, no class

Lecture 10- November 19:

- Recap Assignment #4
- Bond valuation
- Assignment #5 Shall I prepay mortgage? (**Due date: November 25**)

Lecture 11- November 26:

- Recap Assignment #5
- Bond Amortization and callable bonds
- Green Bond (tentative)

Lecture 12- December 3:

- Recap key concepts and formula for the final exam

Final Exam – Date TBA

- Covers all the math questions we covered in the course
- Context-specific materials in course assignments are not tested

Missed Assignments or Exams

- There is no make-up assignment
- There will be **one** make-up final test arranged by Faculty of Arts and Science directly.