

MAT A32 : CALCULUS FOR MANAGEMENT I
WINTER 2021

GIULIO TIOZZO

Welcome to MAT A32! The course will cover an introduction to the techniques of calculus and mathematical analysis, geared towards applications to economics and the social sciences.

$$\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} = rV - rS \frac{\partial V}{\partial S}$$

Simulations of Small, Medium, and Large-Cap Stock Prices

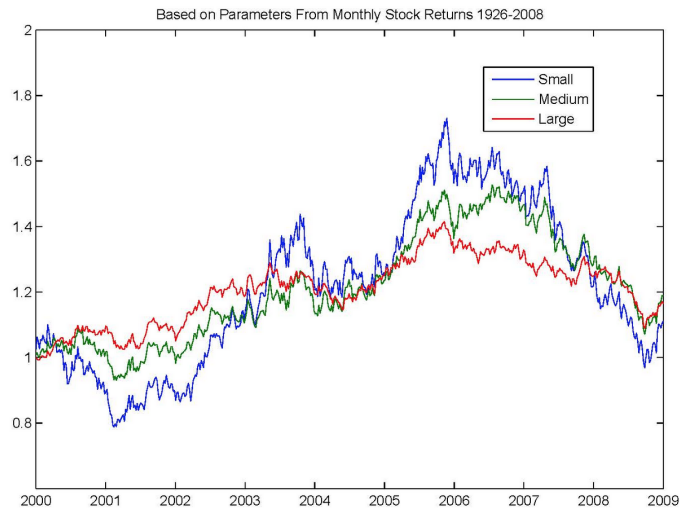


FIGURE 1. A famous mathematical equation in finance, the Black-Scholes equation (from Wikipedia). A thorough understanding of that equation is beyond the scope of this course, but we will lay the foundations of calculus, which is the language we use to describe mathematically complex phenomena such as the stock markets.

Course Schedule.

- Monday 1-2 PM
- Thursday 11 AM-1 PM

The course will be run virtually on Zoom. The link will be posted on Quercus. It is expected that all students join at the class time.

Course Instructor.

Prof. Giulio Tiozzo

Office: IC 495

Email: tiozzo@math.utoronto.ca

I will hold weekly office hours, on Zoom. The schedule of these will be decided during the first week of class.

Email Communication with Instructor. Please use your official utoronto email address when emailing Giulio Tiozzo. Put our course code MATA32S in the subject line of your email and include your names and your U of T student number. Giulio will not respond to emails that are sent using an email address different than a utoronto address or that do not include your names and U of T student number.

Textbook. *Introductory Mathematical Analysis for Business, Economics and the Life and Social Sciences*, 14th edition, by E. Haeussler, R. Paul and R. Wood. This book is in the UTSC Bookstore and is easy to find on-line as an e-book or other formats. This textbook (i.e. 14th edition) was used in MATA32F/S starting in the Fall of 2018. Used copies may be in the UTSC Bookstore and other places.

Documents and Postings. All course documents and announcements (except past final exams and tests) for MATA32S will be posted on Quercus, found at <https://q.utoronto.ca>

Many past final exams and midterm tests are archived at the website <https://www.math.utsc.utoronto.ca/a32f/>

Grading Scheme.

- (1) Five On-Line Quizzes 40% (8% each)
- (2) Midterm Test 25% (Date/Time TBA)
- (3) Final Examination 35% (Date/Time TBA)

Assignments. Assignments will be posted on Quercus generally on a week-to-week basis. These assignments contain practice problems from the textbook (14th edition) and other problems, information about study sections from the text, a summary of terms (i.e. vocabulary) and concepts to know, and usually some important notes or remarks about upcoming events (i.e. a quiz, the midterm test or final exam). Assignment problems are not to be handed in. However: you are strongly encouraged to work hard and consistently on all of the assignment problems.

Quizzes. There are five on-line quizzes, each worth 8% for a total of 40% of your entire MATA32S course grade. They take place in Weeks 3, 5, 7, 9, and 11 on Sundays from 8 PM to 9 PM (UTSC time) as follows:

- (1) Sunday January 31, 8 PM - 9 PM.
- (2) Sunday February 14, 8 PM - 9 PM.
- (3) Sunday March 7, 8 PM - 9 PM.
- (4) Sunday March 21, 8 PM - 9 PM.
- (5) Sunday April 4, 8 PM - 9 PM.

There will be several versions of quizzes and they will be made available on Quercus as a pdf. More information about quizzes will be made available in due course.

Important Minimum Requirement. You must obtain a score of 35% or higher on the final exam in order to pass the entire course. If your final exam score is less than 35%, then you will not pass the course regardless of your quiz scores and

midterm test score. Days and times for the midterm test and final exam will be posted at Quercus, announced in lectures, emailed to students, and stated in some assignments.

Prerequisite. Ontario Grade 12 Vectors and Calculus or equivalent. If you do not have this prerequisite or an equivalent prerequisite, then you cannot take MATA32S. If you do not have this prerequisite, or equivalent, you may be removed from the course.

Tutorials/Extra Help. You have been assigned a MATA32S tutorial number; please memorize this. You will need this number when submitting your quizzes, midterm test, and the final exam. You are also assigned a TA (teaching assistant) for your tutorial number. Your TA will be very happy to reply to your email questions about MATA32S content, assignments, and so on. You can also email them for study advice and suggestions. Your TA's name and email address will be posted on Quercus for easy reference.

SYLLABUS

Syllabus and schedule.

The tentative syllabus is as follows.

- (1) **Week 1, Lectures 1-2** (Jan 11-14) Course Introduction. Mathematics of finance: compound interest, present and future value, effective rate, equations of value (Sections 5.1 - 5.2).
- (2) **Week 2, Lectures 3-4** (Jan 18-21) Continuously compounding interest, effective rate, annuities, amortization (Sections 5.3 - 5.4).
- (3) **Week 3, Lectures 5-6** (Jan 25-28) Limits and continuity: limits at a point, infinite limits/limits at infinity, continuity (Sections 10.1 - 10.3).
- (4) **Week 4, Lectures 7-8** (Feb 1-4) Differentiation: the derivative and tangent line concepts, differentiation rules, interpretation of the derivative in economics/business, the marginal concept (Sections 11.1-11.5). Some additional topics in differentiation: derivatives of logarithm and exponential functions (Sections 12.1-12.2).
- (5) **Week 5, Lectures 9-10** (Feb 8-11) Additional topics in differentiation continued: elasticity of demand, implicit differentiation, logarithmic differentiation, Newton's method, higher derivatives (Sections 12.3-12.7).
Reading Week: Mon Feb 15 - Fri Feb 19.
- (6) **Week 6, Lectures 11-12** (Feb 22-25) Applications of derivatives and curve sketching: monotonicity, extrema, extrema on a closed interval, applications in economics, concavity, derivative tests, asymptotes, curve sketching (Sections 13.1-13.5).
- (7) **Week 7, Lectures 13-14** (Mar 1-4) Applications of derivatives continued: curve sketching continued, applied word problems in economics and management (Sections 13.3-13.6).
- (8) **Week 8, Lectures 15-16** (Mar 8-11) Integration: the indefinite integral, integration with initial conditions, applications in economics, elementary techniques of integration (Sections 14.2-14.4).
- (9) **Week 9, Lectures 17-18** (Mar 15-18) Techniques of integration continued: substitution, manipulations, integration by parts, applications in economics (Sections 14.4-14.5).

- (10) **Week 10, Lectures 19-20** (Mar 22-25) The definite integral, fundamental theorem of calculus, area beneath a curve, applications in economics (Sections 14.6-14.7).
- (11) **Week 11, Lectures 21-22** (Mar 29 - Apr 1) Area between curves, vertical and horizontal elements (Section 15.3).
- (12) **Week 12, Lecture 23** (Apr 5) Applications of areas between curves to consumers' and producers' surplus (Section 15.3-15.4).

COURSE POLICIES

Policy on Missing a Quiz or the Midterm Test. If you miss a quiz or the midterm test because of any of the following reasons: severe illness, severe injury or accident, family catastrophe, religious obligations, or legal obligations, and you wish compensation, then you must provide an email documentation note to Professor Tiozzo (the course coordinator) not later than three business days (i.e. Saturday, Sunday, and holidays do not count) after the missed quiz or missed midterm test. In order for your documentation to be valid and complete, it must clearly state:

- our course, MATA32S;
- your names printed, your U of T student number, and your signature (e-signature);
- your TA's name and your tutorial number;
- a thorough statement written by you of the very good reason(s) why you missed a quiz or the midterm test

The following reasons will not be considered for any sort of compensation for a missed quiz or midterm test: personal obligations that are not severe, catastrophic, or unplanned; work obligations; slight illness; misreading the time of day; lateness; timetable or other course conflict; other conflicting campus or university events (e.g. clubs, meetings), travel arrangements (e.g. flight tickets that have already been purchased or arranged).

Professor Tiozzo reserves judgment on your documentation as to whether it warrants any sort of compensation. If you miss a quiz or the midterm test, and go beyond the three day grace period, or you do not present sufficient documentation within three days, your score on the missed item will be zero. There are no make-up tests for any reasons. The granting of, nature of, and timing of compensation is entirely at Professor Tiozzo's discretion.

Missing the Final Exam. This is a very serious matter and is therefore not addressed at course-administrative/course coordinator level. UTSC policies and procedures about missing the final exam are found in the 2020/2021 UTSC Calendar and at the UTSC Registrar's web site.

Accommodations for Students with Ability Issues. Services and information available for students with ability issues can be found at UTSC AccessAbility Services, Room S302, see also www.utsc.utoronto.ca/ability

Administrative Problems/Issues. Professor Tiozzo is the Course Coordinator for MATA32S. Direct any of your MATA32S course administrative issues, TA concerns, or other questions of an administrative nature to him. You can contact him by email or in person.

Use of the internet. Students are encouraged to make use of the internet to supplement our course textbook, lectures, assignments/solutions, and tutorials. Practically every concept and idea in our course can be found online as a pdf document, or a video, or a slide presentation. However, material found on the internet or other books must be properly cited.

Student Responsibilities. As a student in MATA32S it is assumed you have read and understood this entire document by Thursday, January 21. You also have the responsibilities in the list below. At no point after Thursday, January 21 will it be an acceptable excuse or reason that you have not read or not accepted these responsibilities or contents of this entire document as justification for special consideration due to some troublesome administrative issue or otherwise.

- (1) You have read and understood the contents of this General Course Information and Policy document and the Course Outline and Schedule document.
- (2) You keep a record of your quiz scores and your midterm test score.
- (3) If you miss a quiz or the midterm test (and you wish compensation), you are responsible for the appropriate documentation as per the policy above.
- (4) You read and understand all postings to the MATA32S Quercus as they become available.
- (5) You are familiar with and abide by the University of Toronto Code of Behavior and Code of Student Conduct (see the UTSC 2020/2021 Calendar or the UTSC Registrar's web site).