Western Science

Department of Statistical and Actuarial Sciences
FM 9528A Banking Analytics

Course outline for Fall 2020

THRIVE together

Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the Digital Student Experience website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: https://www.uwo.ca/health/.

Technical Requirements and Important Dates:

 Stable internet connection

 Laptop or computer

 Working microphone

 Working webcam

Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
September 9	November 2 - 8	December 9	December 10	December 11 - 22

* November 12, 2020: Last day to drop a first-term half course or a first-term full course without penalty

1. Course Information

Course information
This course will give students a mix of knowledge and practice in the use of business analytics tools, from using Excel for pricing a bond and calculating credit risk, to advanced deep learning models which will provide tools to tackle sophisticated problems using the latest computational tools. These models will be applied to several business problems within modern financial institutions, covering topics such as credit scoring, LGD and EAD modelling, and advanced models to extract complex non-linear patterns from large amounts of diverse data in topics such as collections, consumer fraud and other applications. The focus will be on the underlying principles, modelling methodologies, and implementation using appropriate software packages.

Monday 4:30 p.m – 6:00 p.m. Online.
Wednesday 10:30 a.m. – 12:30 p.m. Online.

Zoom information will be published in OWL. **Recordings of the lecture will be made available on the site.**

List of Prerequisites

No courses are required.

Basic financial and statistical knowledge is required to understand the concepts and underlying mathematical processes. Previous programming experience is desirable, but not required. The course will cover Excel and Python, with tutorials and online resources to support the analyses.

2. Instructor Information

Course Coordinator	Contact Information
Cristián Bravo	cbravoro@uwo.ca

Instructor(s) or Teaching Assistant(s)	Contact Information
Amirreza Seddighi	aseddig@uwo.ca
Sahab Zandi	szandi@uwo.ca

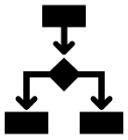
Office Hours	Method	Names
Wed 11am - 1pm	Zoom	Cristián
Fri 5.30pm – 6.30pm (odd weeks)	Zoom	Amirreza
Thu 5pm – 6pm (even weeks)	Zoom	Sahab

Students must use their Western (@uwo.ca) email addresses when contacting their instructors. We strive to answer all emails within 24 business hours.

3. Course Syllabus, Schedule, and Delivery Mode

The topics covered in this module will include:

- Introduction and overview of banking analytics: CRISP-DM, Analytics problems, designing a data-driven problem-solving strategy in financial institutions.
- Fixed income credit risk: Government bonds, bills, and notes: bond auctions and after-market trading Interest rate conventions (simple, compound, continuous compound), Decomposing bonds into cash flows of coupons. Pricing bonds: day count convention, clean and dirty price. The Yield Curve. The idea of the yield curve and its empirical phenomenology. Bootstrapping the yield curve from bond price.
- Retail credit risk modelling: Credit Scoring models, LGD and EAD models, basic concepts, working with software, dealing with difficulties;
- Advanced non-linear models and deep learning: basic principles, ensembles (Random Forest, XGBoosting), data interpretability.
- Introduction to deep learning and alternative data modelling: neural networks, architecture design, advanced models (CNN, LSTM, etc) and their applications in banking analytics.



Type	Mode	Dates	Time	Frequency
Lecture	Synchronous online	M/W	4.30pm	weekly

☒ A recording will be provided for synchronous sessions

Learning Outcomes

Having successfully completed the course, you will be able to demonstrate knowledge and understanding of:

A1. Basic principles of data science in Banking: CRISP-DM and definition of analytics

A2. Underlying theory of predictive modelling

A3. Solutions and technologies specifically designed for handling and extracting patterns from big data

Having successfully completed this course, you will be able to:

B1. Work with relevant software packages to develop banking analytics solutions

B2. Handle various types of data types

B3. Work with current software packages to create models using complex data sources.

(continues)

Table of Contents and Schedule

Week	Dates	Topic
1	Sept 9 – 13	Intro to Banking Regulation
2	Sept 14 – 20	Bonds and credit instruments
3	Sept 21 – 27	Provisions and capital requirements
4	Sept 28 – Oct 4	CRISP-DM and analytics in banking
5	Oct 5 – 11	Credit scoring and GLM applied in banking I
6	Oct 12 – 18	Credit scoring and GLM applied in banking II
7	Oct 19 – 25	LGD and EAD models – Introduction to ensembles
8	Oct 26 – Nov 1	Model interpretability and transparency
9	Nov 2 – 8	Reading Week
10	Nov 9 – 15	Introduction to deep learning
11	Nov 16 – 22	Convolutions and architecture design I
12	Nov 23 – 29	Convolutions and architecture design II
13	Nov 30 – Dec 6	Embeddings
14	Dec 7 – 9	Model deployment

Online Participation and Engagement

☒ Students are expected to participate and engage with content as much as possible

☒ Students can participate during sessions or post on OWL after watching the recording

☒ Students can also participate by interacting in the forums with their peers and instructors

4. Course Materials

There is no assigned textbook for the course. The course incorporates multiple sources, publications, and books which can be used as reference:

Books:

Core

Chollet, F. (2017) Deep Learning with Python. (9781617294433) Manning Publications (last five weeks)

Davison, M. (2017) Quantitative Finance: A Simulation Based Introduction using Excel. CRC Press 2014 (weeks 1-3)

Siddiqi, N. (2017) Intelligent Credit Scoring: Building and Implementing Better Credit Risk Scorecards, Second Edition. Wiley. (Week 5-6)

Hastie, T., Tibshirani, R. and Friedman, J. (2013) The Elements of Statistical Learning ,10th ed. NI, USA: Springer. Available freely online at https://statweb.stanford.edu/~tibs/ElemStatLearn/. Only some chapters are relevant to the course. They will be posted on OWL in each week's description. (Weeks 4 – 9)

Verbeke, W., Baesens, B. and Bravo, C. (2017) Profit Driven Business Analytics. Wiley and Sons. Chapter 5 (Week 6 and 8)

Additional Reading

Goodfellow, I., Bengio, Y. and Courville, A. (2017) Deep Learning. Freely available online at http://www.deeplearningbook.org/: MIT Press.

Thomas, L.C., Crook J.N. and Edelman. (2017) Credit Scoring and Its Applications, 2nd Edition. Philadelphia, PA, USA: SIAM Press

Students should check OWL (http://owl.uwo.ca) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.

All course material will be posted to OWL: http://owl.uwo.ca. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click here.

5. Methods of Evaluation

The course is mostly applied and will have three pieces of **individual** of coursework, distributed via OWL after each topic is covered in the lectures:

- 30%: Fixed income and introduction to lending exercise. Pricing bonds, yield curves and mortgages. Deadline October 14th, 23:59. 1500 words.
- 35%: Retail credit risk models. Deadline November 18th, 23:59. 2000 words.
- 35%: Non-structured data models and deep learning. Deadline December 18th, 23:59. 2000 words.

Click here for a detailed and comprehensive set of policies and regulations concerning examinations and grading.

Accommodated Evaluations

- Late assessments without illness self-reports will be subject to a late penalty discount of 10%/day (this means if your coursework gets an 80%, and you submit one day late, your final mark will be 80% - 10% = 70%). The day late starts at the 00:00 of the day after the deadline posted above. There are **NO EXCEPTIONS** to this policy.
- Late assessments with illness self-reports should be submitted within 24 hours of submission of the last illness self-report

- An assessment cannot be submitted after it has been returned to the class. A final, summative assessment will be assigned if the assignment is missed.
- If a make-up assessment is missed, the student will receive an INC and complete the task the next time the course is offered.
- If permission to waive the requirement that students receive evaluation on work totaling 15% of their final grade at least three days prior to the deadline for withdrawal without academic penalty has been obtained from the Dean's Office, a statement to this effect must be made.

Rounding of Marks Statement

Across the Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. ***Final grades*** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

6. Accommodation and Accessibility

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to

contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf
and for the Student Medical Certificate (SMC), see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:
https://multiculturalcalendar.com/ecal/index.php?s=c-univwo

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

7. Academic Policies

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with policy, http://www.uwo.ca/its/identity/activatenonstudent.html, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

All of the remote learning sessions for this course will be recorded.

The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Completion of this course will require you to have a reliable internet connection and a device that meets the system and technical requirements for both Zoom and Proctortrack. Information about the system and technical requirements are available at the following links:
https://www.proctortrack.com/tech-requirements/
https://support.zoom.us/hc/en-us

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please provide this information to the instructor in advance of the test or examination.

Professionalism & Privacy

Western students are expected to follow the Student Code of Conduct. Additionally, the following expectations and professional conduct apply to this course:

☒ Students are expected to follow online etiquette expectations provided on OWL

☒ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared

☒ Recordings are not permitted (audio or video) without explicit permission

☒ Permitted recordings are not to be distributed

☒ Students will be expected to take an academic integrity pledge before some assessments

☒ All recorded sessions will remain within the course site or unlisted if streamed

Copyright Statement

Please be aware that all course materials created by the instructor(s) are copyrighted and cannot be **sold/shared**. Those include materials used in tests/quizzes, midterms, and finals. Any posting/sharing of such materials in part or whole without owner's consent is considered as violation of the Copyright Act and will be considered as a scholastic offence.

In addition, online services such as Chegg are actively monitored. Any questions that are coming out during midterms and finals and are posted to an online service will be searched. Such an activity will be considered as a scholastic offence and will result in academic penalty.

8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at (519) 661-2147 if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital/.

Learning-skills counsellors at the Student Development Centre (http://www.sdc.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mental_health) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, http://westernusc.ca/services.