

COURSE OUTLINES: BR2211 Financial and Risk Analytics I

Academic Year	AY2022	Semester	2
Course Coordinator	Ciyu Nie		
Course Code	BR2211		
Course Title	Financial and Risk Analytics I		
Pre-requisites	AB1202 Statistics and Analysis		
No of AUs	3		
Contact Hours	3		
Proposal Date	2021-11-01		

A) Course Aims

This course aims to provide an overview of data analytics application under financial, insurance and risk management context. In particular, it provides a holistic view of how data analytics affects the insurance and risk management decision making procedure. You will gain deeper understandings on data analytic framework, be able to perform data modellings and calibrate appropriate model to serve specific financial planning and risk management tasks. You will be able to use different simulation methods and generate scenarios for stress testing and risk analysis.

B) Intended Learning Outcomes (ILO)/Objectives

By the end of this course, you should be able to:

1. Describe the data analysis framework that can be applied in the finance, insurance and risk management practices, with special focus on financial/ insurance data processing;
2. Perform modelling using Regression, Time Series models, Clustering and basic Machine learning methods;
3. Perform appropriate model calibration, including model selection, validation and bootstrapping;
4. Perform simulations and construct appropriate scenario for stress testing and other use cases;
5. Describe the existing and potential data analytic solutions in finance, insurance and risk management.

See [Annex F](#) for learning objective taxonomy.

C) Course Content

- Data-analytic thinking and its application in finance, insurance and risk management;
- Principles of data wrangling, data preparation with exploratory data analysis ;
- Data modelling: Regression techniques, Time Series, Clustering and machine learning basics
- Model calibration: model selection, validation and bootstrapping
- Simulation methods: the basics, constructing scenarios and stress testing
- Finance, insurance and risk management tasks with data analytic solutions (case studies)

D) Assessment (includes both continuous and summative assessment)					
Component	ILO Tested	NBS Learning Goal (Refer to Annex E for list)	Weighting	Team/ Individual	Assessment Rubrics (Please insert rubrics as Appendix)
1. Final Examination	ILO1-5	Critical Thinking, Acquisition of knowledge	45%	Individual	N.A
2. Coursework: Mid-term quiz	ILO1-2	Critical Thinking, Acquisition of knowledge	20%	Individual	N.A
3. Coursework: Case Study project in-class presentation**	ILO1-5	<ul style="list-style-type: none"> • Teamwork & Interpersonal skills • Oral communication • Problem Solving & Decision Making • Critical Thinking 	25%	15% Group + 10% Individual	<ul style="list-style-type: none"> • Teamwork & Interpersonal Skills Rubric (For Peer Rating) • Case study project Rubric
4. Coursework: Class participation*	ILO1-5	Oral communication	10%	Individual	Class participation Rubric
Total			100%		
<p><u>Important Notes:</u></p> <p>* Class participation mark will be moderated so that the mark distribution will be the same across instructors.</p> <p>** Every member in each group is required to present project presentation. Peer evaluation is mandatory. Instructors will take into account the peer evaluation (Rubric 2) when awarding individual student's final mark for their project presentation.</p> <p>Case Study Project Presentation:</p> <ul style="list-style-type: none"> - The marking will be based on presentation and not on documents prepared, but the students will need to submit presentation slides for the case study projects - The 25% marks will be based on the following: <ul style="list-style-type: none"> o Problem Solving & Decision Making + Critical Thinking will be graded as a group with 15% o Presentation is graded individually with 10% 					
E) Formative feedback					
You will receive verbal feedback from me about your presentations, as well as in-class discussion. You will receive summative group feedback on the exam following the conclusion of the module.					
F) Learning and Teaching approach					
Approach	How does this approach support you in achieving the learning outcomes?				
Seminars	The interactive seminar session where there is ample opportunities for open discussion on				

	the conceptual questions raised in the class allows you to think critical and share their ideas and concept with the class. This also allows me to get the concepts clearly through the entire class by involving you and ensure that the targeted learning outcomes are being achieved
In-Class activities	Some learning outcomes for this course are skills which are practical in nature and cannot be achieved by reading and writing. The achievement of such learning outcomes requires hands-on experience, in-class activities provide such opportunities.

G) Reading and References

Ruppert, David, and David S Matteson. Statistics and Data Analysis for Financial Engineering: With R Examples. New York, NY: Springer New York, 2015.

Rattenbury, Tye, Joseph M Hellerstein, Jeffrey Heer, Sean Kandel, and Connor Carreras. Principles of Data Wrangling: Practical Techniques for Data Preparation. Sebastopol: O'Reilly Media, Incorporated, 2017.

Chew, Chee Hua. Artificial Intelligence, Analytics and Data Science / Chew Chee Hua. Singapore: Cengage Learning Asia, 2020.

Additional readings and resources may be provided.

H) Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned pre-class readings and activities (e.g. tutorial questions provided), attend all seminar classes punctually and take all scheduled assignments and tests by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for seminar sessions they have missed. You are expected to participate in all seminar discussions and activities.

(2) Absenteeism

Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a lecture, you must inform the course instructor via email prior to the start of the class.

I) Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

J) Course Instructors

Instructor	Office Location	Phone	Email	Consultation Hours
Ciyu Nie	S3-B1A-33	67906256	cynie@ntu.edu.sg	By prior appointment via email

K) Planned Weekly Schedule

Week	Topic	ILO	Readings/ Activities
1	Introduction: the roles of data-analytics in Finance, Insurance and Risk Management	ILO1	Handouts & Tutorial questions
2	Data preparation: Data workflow framework and Exploratory data analysis	ILO1,2	Handouts & Tutorial questions
3	Data Modelling: Regression I	ILO2	Handouts & Tutorial questions
4	Data Modelling: Regression II	ILO2	Handouts & Tutorial questions
5	Data Modelling: Time Series I	ILO2	Handouts & Tutorial questions
6	Data Modelling: Time Series II	ILO2	Handouts & Tutorial questions
7	Data Modelling: Clustering/ Machine Learning basics	ILO2	Handouts & Tutorial questions
8	Recess		
9	Model Calibration: Model selection, validation and bootstrapping	ILO3	Handouts & Tutorial questions
10	Simulation methods: Introduction and the basics	ILO4	Handouts & Tutorial questions
11	Simulation methods:	ILO4	Handouts & Tutorial questions

	Sensitivity analysis, scenario generation and stress testing		
12	Data analytic solutions in finance, insurance and risk management (case studies and presentations)	ILO5	Handouts & Tutorial questions
13	Data analytic solutions in finance, insurance and risk management (case studies and presentations)	ILO5	Handouts & Tutorial questions

ANNEX B: ASSESSMENT CRITERIA FOR _____**Class Participation Rubric**

Traits		Performance		
		1	6	10
ENGAGEMENT (50 POINTS)	Engagement and listening	<ul style="list-style-type: none"> • Is routinely unengaged in class/group discussions and comments • Often spends class time doing other work or email • Does not listen to others; regularly talks or does not pay attention while others speak/present the materials 	<ul style="list-style-type: none"> • Is occasionally engaged in class/group discussions and comments • Occasionally spends class time doing other work or email • Occasionally inattentive or talks while others speak/present the materials 	<ul style="list-style-type: none"> • Is always voluntarily engaged in class/group discussions and comments • Does not spend time doing other work or email • Listens attentively when others speak/present materials
	Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed			
CONTRIBUTION (50 POINTS)	Frequency of class participation (25 points)	<ul style="list-style-type: none"> • Seldom speaks up • Speaks up when called upon by instructor or peers, but rarely volunteers. 	<ul style="list-style-type: none"> • Occasionally speaks up 	<ul style="list-style-type: none"> • Frequently speaks up
		Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed		
	Quality of class participation (25 points)	<ul style="list-style-type: none"> • Makes comments that are vague and uninformative 	<ul style="list-style-type: none"> • Contributes comments, some of which are relevant and/or constructive 	<ul style="list-style-type: none"> • Always contributes comments or raise questions that are relevant/insightful
		Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed		
Overall/ Other comments				

Teamwork & Interpersonal Skills (Peer Evaluation) Rubric**Learning Objective: The ability to work effectively with others in a group setting.**

Traits	Performance	
<p><u>1. Roles and Responsibility (RR)</u> Behaves professionally by upholding responsibility and assuming accountability for self and others in progressing towards the team's goal.</p>	<p>Scant Unclear about his/her own role; refuses to take a role in the group; insists to work individually and has limited coordination or communication with others.</p>	<p>Substantially Developed Always fulfills responsibilities; performs his/her role within the group with enthusiasm and demonstrates willingness to work collaboratively.</p>
Evaluation: Scant <u>1 2 3 4 5 6 7</u> Substantially Developed		
<p><u>2. Communication (CM)</u> Identifies appropriate mechanisms to coordinate and correspond with team members.</p>	<p>Scant Modes of communication are not appropriate, causing confusion and miscommunication among team members.</p>	<p>Substantially Developed Modes of communication are appropriate, and maintaining timely communication and correspondence with team members.</p>
Evaluation: Scant <u>1 2 3 4 5 6 7</u> Substantially Developed		
<p><u>3. Conflict Resolution (CR)</u> Resolves conflicts using a variety of approaches.</p>	<p>Scant Does not recognize conflicts or is unwilling to resolve conflicts.</p>	<p>Substantially Developed Consistently resolves conflicts through facilitating open discussion and compromise.</p>
Evaluation: Scant <u>1 2 3 4 5 6 7</u> Substantially Developed		
<p><u>4. Contributions (CT)</u> Contributes positive input for the team; effectively utilizes one's knowledge and expertise.</p>	<p>Scant Largely disinterested in working in a group and refuses to participate; observes passively or is unwilling to share information with other team members.</p>	<p>Substantially Developed Actively attends and participates in all activities and provides meaningful contribution in articulating ideas and opinions.</p>
Evaluation: Scant <u>1 2 3 4 5 6 7</u> Substantially Developed		
<p><u>5. Relationship (RS)</u></p>	<p>Scant Rarely listens to others and does not acknowledge the opinions that differ from his/her own.</p>	<p>Substantially Developed Engages in respectful relationships with all other members in the team. Embraces and accepts diverse points of view without prejudice.</p>

Maintains cooperative interaction with other team members regardless of individual /cultural differences and respects diverse perspectives.	Evaluation: Scant <u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>5</u> <u>6</u> <u>7</u> Substantially Developed
---	---

References:

Teamwork Value Rubric - Association of American Colleges and Universities. Retrieved from <http://www.aacu.org/value/rubrics/pdf/teamwork.pdf>.

Case Study Project Rubric

Traits	%	Performance									
		Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed									
		Not Yet					Substantially Developed				
Problem Solving and Decision Making Ability to make judgments and draw appropriate conclusions based on the analysis of data, while recognizing the limits of this analysis.	30	Uses the analysis of data as the basis for tentative, basic judgments, although is uncertain about drawing conclusions from this work.	Uses the analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.								
Critical Thinking Identifies and considers other theoretical perspectives that are important to the analysis of the issue	30	Deals only with a single perspective and fails to discuss other possible perspectives, especially those salient to the issue. Fails to identify or hastily dismisses strong, relevant counter-arguments.	Addresses perspectives noted previously, and additional diverse perspectives drawn from outside information. Identifies the salient arguments (reasons and claims) pro and con.								
Oral Communication Content & Structure <ul style="list-style-type: none"> • Presents relevant information • Supports main points with strong evidence • Organises content coherently • Signals transitions between points 	20	Content is erroneous or irrelevant; references and supporting materials are absent. Lacks of depth in content and little insights are exhibited. Presentation falls outside set time parameters. Organizational pattern (specific introduction and conclusion, sequenced materials within the body, and transitions) is not observable.	Content is accurate, thorough, and directly on point; strong support and references are provided. Exhibits depth and insight in content. Effective use of time and stays within time parameters. Organizational pattern is clearly and consistently observable and makes the content of the presentation cohesive.								
Oral Communication Verbal & Non-Verbal <ul style="list-style-type: none"> • Speaks at appropriate speed and volume • Uses correct grammar and pronunciation • Establishes eye contact • Uses gestures and movement to convey energy and confidence 	20	Grammar, pronunciation and word choice are deficient. Vocal delivery is too soft or too fast to understand; gap-fillers interfere with expression. Eye contact, posture, gestures, movement and facial expressions are inappropriate and significantly distracting.	Free of errors in grammar and pronunciation; good choices of word enhance clarity of expression. Vocal delivery is varied and dynamic. Speech rate, volume, and tone facilitate audience comprehension. Minimal gap fillers. Eye contact, posture, gestures, movement and facial expressions make the presentation compelling, and speaker appears polished and confident.								
Total	100										