NATIONAL TAIWAN UNIVERSITY
Department of International Business

Quantitative Methods for Decision Making (數量方法與決策分析)

Professor Jr-Yan Wang (王之彥)   **Fall 2022**
Room 206, Building 2, College of Management   **Thursday 9:10-12:10**
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COURSE DESCRIPTION

This course is designed to introduce students several important methods in business data analysis and equip students with basic programming skill to implement the introduced methods.

The focus of this course is to learn the methods of **least squares regression (最小平方迴歸), linear programming (線性規劃), Monte Carlo simulation (蒙地卡羅模擬), and principal component analysis (主成分分析)**. In addition, students will practice to implement the above methods with **Excel VBA (Visual Basic for Applications)**. It is worth noting that the introduced methods rather than VBA are main focuses of the course, since these methods are highly useful for solving many managerial issues. As for VBA, it may be one of the most widely used computer programming languages in the business and finance fields, since Visual Basic is one of the simplest programming languages, and VBA allows programmers to utilize the functions provided in Microsoft Office products, such as Excel, Word, or PowerPoint. The learning-by-doing approach will be employed in this course. In addition to some background knowledge about VBA I teach, students should learn by themselves to advance their VBA programming skills as they complete the programming homework assignments.

However, since all of the introduced methods are expressed based on matrices and vectors, students need to learn the basic knowledge associated with matrices and vectors in the meanwhile. Specifically, **systems of linear equations (線性系統), matrix operations (矩陣運算), vector spaces (向量空間), and eigenvalues and eigenvectors (特徵值與特徵向量)** will be taught in this course. The knowledge is necessary for student who will learn Econometrics (計量經濟學) in the future.

LECTURE NOTES AND TEXT BOOK

Lecture Notes: http://homepage.ntu.edu.tw/~jryanwang/ → Course Information →
         Quantitative Methods for Decision Making (undergraduate level)

(The most updated PowerPoint files for the lecture each week are available after 9:00 p.m. every Wednesday.)

(DO NOT access NTU COOL for the syllabus and lecture notes.)

Required Text: Elementary Linear Algebra, by Larson, 2016, 8th ed.

(The representative bookstore of this book in Taiwan is 高立圖書. If you decide to purchase the text book together, you can contact Mr. 郭吉祥 via (02) 2290-0318 ext. 231.)

(The teaching assistant and I do not involve in ordering the text book for students, since I cannot guarantee that 高立圖書 offers us the lowest price for the text book.)

Lecture Video: The each-week lecture video will be posted on NTU COOL within 24 hours after the class dismissed. If not, please remind me via sending me an email.

EXAMS AND GRADING

Midterm Exam	30% (on Oct. 27th)
Final Exam	30% (on Dec. 22nd)
Programming HW 1 Matrix multiplication	5%
Programming HW 2 Matrix inversion	5%
Programming HW 3 CAPM (least squares regression)	10% (+3% bonus)
Programming HW 4 Portfolio frontier (quadratic programming)	10% (+3% bonus)
Programming HW 5 Compensation plan (Monte-Carlo simulation)	10%

※ The exam dates are regulated by NTU. Please ensure that you will be available to attend these two exams before you decide to take this course.

※ If you cannot attend the exams due to other reasons, you need to notify me in advance and show me some proofs, e.g., a medical diagnosis. Any late notification is not acceptable.

※ The range for each exam depends on the speed of my lecture. The range is not accumulative for the final exam.

※ The format for the two exams: 100% for calculation problems. Most calculation problems are collected from the exercises at the end of each section and chapter in the required text with minor modifications. **In the midterm exam, there will be a PROGRAMMING PROBLEM worth 6 points that is associated with Programming HW 1 and 2**.

※ The rule of **ALTERNATE SEATING (梅花座)** will be enforced if possible. Any dishonesty in the exams will lead to a failed result.

※ Students should prepare your personal calculators for the two exams. However, calculators which can implement matrix operations or vector calculations or have memorizing functions are forbidden.

※ Please attend the class on Nov. 3rd to take your graded examination sheets back. Do not take away graded examination sheets on behalf of other classmates. However, grades of the final exam will not be released.

※ For each programming homework, there are at least two weeks available for students to accomplish it.

※ For each homework, please prepare an zipped file (file name format: student-ID_student-name_HW#.zip, e.g., b07XXX001_王之彥_HW1.zip) and submit your homework via Google Forms before the midnight of the due date. The individual links for the four homework assignments are respectively as follows.

Programming HW1: https://forms.gle/MopeGbwyrG85VQqQ9

Programming HW2: https://forms.gle/Ve8Hi2NGRE52JKFt9

Programming HW3: https://forms.gle/tbWH31Kyi1abV68CA

Programming HW4: https://forms.gle/Ab8pZ4NvMHwUKq8LA

Programming HW5: https://forms.gle/yu6tjiiBYBNQJ26P8

※ The delay of handing in your programming homework will results in a percentage deduction (maximum 40%) from the score you earn according to the time of delay.

※ It is highly encouraged to discuss the homework with classmates, but **DO NOT COPY** programs from others. The copying behavior (according to the judgement of the teaching assistant) will result in a 50% deduction from your score and the score of the classmate who allows you to copy his/her programs.

※ To maintain fairness in the class, there are no make-up exams or other alternative measures for individuals. I will ignore all e-mails asking for any alternative way to make up your grades.

※ I will curve your final grades such that the average grade of this class is comparable to other classes offered by College of Management of NTU.

※ Special rules that will be applied once distance teaching is enforced: (1) there will be no more physical or on-line exam; (2) the maximal scores a student can earn will be adjusted to represent 100% of the final grade and any scores a student earn in this semester will be rescaled proportionally.

RULES IN CLASS

※ **DO NOT DISTRACT other students** from listening to my lecture, e.g., do not chat with other students when I am talking.

※ If you have any questions during my lecture, feel free to interrupt me by raising

your hand.

※ Due to the pandemic of COVID-19, please wear a mask in the classroom, especially when approaching to the lectern to ask me questions. Moreover, eating and drinking (except water) are not allowed in the classroom.

COURSE OUTLINE

Week	Date	Topic	Reading
1	Sept. 8	Course Introduction Introduction of EXCEL VBA (NB needed) Solving Systems of Linear Equations (Polynomial curve fitting)	Syllabus Ch. 1.2-1.3 (studying Ch. 1.1 by yourselves)
2	Sept. 15	Matrix Operations	Ch. 2
3	Sept. 22	Basic VBA programming - HW 1 and 2 assignments	Lecture Note
4	Sept. 29	Matrix Operations (Least squares regression) - HW 3 assignment	Ch. 2
5	Oct. 6	Determinants	Ch. 3
6	Oct. 13	Determinants (Cramer's rule to solve systems of linear equations)	Ch. 3
7	Oct. 20	Linear Programming Problem	Ch. 9
8	Oct. 27	**MIDTERM EXAM**	
9	Nov. 3	Linear Programming Problem (Optimization problems) - HW 4 assignment	Ch. 9
10	Nov. 10	Vector Space	Ch. 4.1-4.5, 4.7
11	Nov. 17	Vector Space	Ch. 4.1-4.5, 4.7
12	Nov. 24	Inner Product Space Monte Carlo Simulation - HW 5 assignment	Ch. 5.1-5.3 Lecture Note
13	Dec. 1	Eigenvalues and Eigenvectors	Ch. 7
14	Dec. 8	Eigenvalues and Eigenvectors	Ch. 7
15	Dec. 15	Eigenvalues and Eigenvectors (Principal component analysis)	Ch. 7
16	Dec. 22	**FINAL EXAM**	
17	Dec. 29	Self-studying and finishing programming HW	No lecture
18	Jan. 5	Self-studying and finishing programming HW	No lecture

※ The topics in the parentheses are the examples of the applications based on the knowledge of linear algebra learned in that chapter.

※ Note that the above schedule is an estimated version, I will dynamically adjust the

speed of my lecture according to the feedback of students.

OFFICE HOURS

Monday 15:10-16:30 and Thursday 15:10-16:30

Room 712, Building 2, College of Management

※ It is not suggested to ask academic questions in e-mails. The face-to-face communication is the best way to make me understand your questions and give you the most accurate instruction to solve your problems.

※ If you have difficulties in solving exercise questions at the end of each chapter, please ask the teaching assistant first. It is preferred to make an appointment with the teaching assistant rather than ask him questions in e-mails.

※ To maintain fairness in the class, the teaching assistant and I cannot help any student to debug his/her programs before the due date. Instead, the teaching assistant and I can explain the suggested approach or try to understand your approach and discuss it with you.

※ Try to fully utilize my office hours before making an individual appointment.

TEACHING ASSISTANT

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