

NATIONAL TAIWAN UNIVERSITY
Department of International Business
Quantitative Methods for Decision Making (數量方法與決策分析)

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Fall 2020
Monday 9:10-12:10
02-33664987

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)**. 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. It is worth noting that the introduced methods are highly useful for solving many managerial issues, and VBA may be the most widely used computer programming languages in the business and finance fields in practice.

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.

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 Sunday.)

(DO NOT access CEIBA 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.)

Lecture Video: The each-week lecture video will be posted on NTU COOL in the 24 hours after the class dismissed.

EXAMS AND GRADING

Midterm Exam	30% (on Nov. 9 th)
Final Exam	30% (on Jan. 11 th)
Program 1 Matrix multiplication and inversion	10%
Program 2 CAPM (least squares regression)	10%
Program 3 Portfolio frontier (quadratic programming)	10%
Program 4 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.
- ※ 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.
- ※ Graded examination sheets will be returned to students on Nov. 16th, but grades of the final exam will not be released.
- ※ For each programming homework, students will have at least two weeks to accomplish it.
- ※ For each homework, please prepare an Excel file (file name format: student-ID_student-name_HW#.xlsm, e.g., b07XXX001_王之彥_HW1.xlsm) 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.

HW1: <https://forms.gle/hKGmpuPu7HBeghDH7>

HW2: <https://forms.gle/Qu5QVjwgUyhGedq49>

HW3: <https://forms.gle/CismwtAswwd8A8wk7>

HW4: <https://forms.gle/J8netFwMAXGxmYkY6>

- ※ The delay of handing in your programming homework will result in a proper score deduction (maximum 40% deduction) in proportional 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% score reduction.
- ※ The grades for the first three homework assignments will be released near the end of the semester. Students who score less than 21 points (out of 30 points) can inquire the teaching assistant for the grading details of the submitted homework.
- ※ 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.
- ※ To maintain fairness in the class, there are no make-up exams or other alternative measures. I will ignore all e-mails asking for any alternative way to make up your grades.

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.

COURSE OUTLINE

Week	Date	Topic	Reading
1	Sept. 14	Introduction of Mathematics for Management Introduction of EXCEL VBA	Syllabus
2	Sept. 21	Solving Systems of Linear Equations (Polynomial curve fitting) Matrix Operations	Ch. 1 Ch. 2
3	Sept. 28	Matrix Operations (Least squares regression)	Ch. 2
4	Oct. 5	Basic VBA programming - Program 1	Lecture Note
5	Oct. 12	Determinants	Ch. 3
6	Oct. 19	Determinants (Cramer's rule to solve systems of linear equations)	Ch. 3

7	Oct. 26	Vector Space	Ch. 4
8	Nov. 2	Vector Space - Program 2	Ch. 4
9	Nov. 9	MIDTERM EXAM	
10	Nov. 16	Vector Space	Ch. 4
11	Nov. 23	Linear Programming Problem	Ch. 9
12	Nov. 30	Linear Programming Problem (Optimization problems) - Program 3	Ch. 9
13	Dec. 7	Monte Carlo Simulation - Program 4	Lecture Note
14	Dec. 14	Inner Product Space	Ch. 5.1 and 5.2
15	Dec. 21	Eigenvalues and Eigenvectors	Ch. 7
16	Dec. 28	Eigenvalues and Eigenvectors	Ch. 7
17	Jan. 4	Eigenvalues and Eigenvectors (Principal component analysis)	Ch. 7
18	Jan. 11	FINAL EXAM	

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

TEACHING ASSISTANT

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