

**BUSINESS F770**  
**Financial Economics and Quantitative Methods**  
**Fall 2023 Course Outline**

**Finance and Business Economics**  
**DeGroote School of Business**  
**McMaster University**

**COURSE OBJECTIVE**

This course explores the theoretical and conceptual foundations of finance. It seeks to explain the decisions taken by various participants of the financial markets, the pricing of financial instruments, and various observed market phenomena.

**INSTRUCTOR AND CONTACT INFORMATION**

**Clarence C.Y. Kwan**  
Professor of Finance  
E-mail: [kwanc@mcmaster.ca](mailto:kwanc@mcmaster.ca)  
Office: DSB 312

Office Hours: by Appointment

**Class Time**

Week 1, Friday, September 15, 9:00 a.m. to 11:50 a.m..

Weeks 2 to 13, Wednesdays, 10:30 a.m. to 1:20 p.m..

Unavoidable scheduling changes, if any, will be brought to the attention of the class in advance.

**Important Notice**

For email communications with the instructor, please always use a McMaster University email account and “Business F770” or “F770” for the subject heading.

**COURSE DESCRIPTION**

Topics covered in this course are as follows: Consumption and investment decisions under certainty; utility theory; stochastic dominance; state preference theory; mean-variance portfolio theory; asset pricing and market equilibrium; mean-variance spanning; alternative portfolio frameworks; option properties and option pricing models; theory of capital structure; dividend policy; concepts of risk sharing; principal-agent problem and incentive contracting. Required statistical tools are covered as well.

## LEARNING OUTCOMES

This course formally covers various fundamental topics in finance. As most analytical results are derived, the approach will enable each student to understand more fully the implications and the limitations of such results and to relate them properly to empirical evidence. Upon successful completion of the course, each student will have a solid theoretical foundation for studying various advanced topics in finance afterwards.

## REQUIRED COURSE MATERIALS AND READINGS

There is no textbook for this course. The required reading materials are primarily in Clarence C.Y. Kwan, *Business F770, Financial Economics and Quantitative Methods: Lecture Notes*, Fall 2023 (hereafter, *Lecture Notes*).

The *Lecture Notes* in the current form are not intended for general distributions. Electronic access via a password is provided primarily to students registered in the Fall 2023 class of Business F770 at McMaster University. The electronic files will be posted on the course site on McMaster's Avenue-to-Learn. It is each student's responsibility not to forward such files to others.

If further descriptions, clarifications, and/or explanations of some materials covered in the *Lecture Notes* – especially those involving mathematical and statistical topics, as well as institutional procedures and practices – are needed, students are encouraged to use reliable online resources, such as Wikipedia and Investopedia. However, as the quality of online information cannot be held to the same standard as that of peer-reviewed publications, caution is needed when assessing the credibility of any online materials.

Specific reading materials are listed on pages 3-8 of the course outline. As some essential course materials draws on T.E. Copeland, J.F. Weston, and K. Shastri, *Financial Theory and Corporate Policy, Fourth Edition*, (2005), Pearson Addison Wesley, Boston, MA; ISBN 0-321-12721-8 (hereafter, *CWS*), references to the corresponding chapters in *CWS* are provided when applicable.

All peer-reviewed journal articles listed in the course outline, as well as any additional journal articles assigned during the Term, can be accessed electronically (by registered students) from the McMaster libraries website. There will also be some *Supplementary Notes* by the instructor, to be distributed to class, as additional reading materials.

## EVALUATION

There are two components for evaluation:

1. The percentage marks of a series of assignments, 50%.
2. The percentage marks of the final (cumulative) examination, 50%.

The use of word-processing software that can handle mathematical symbols is required for each assignment. The details about the feedback process – until each assignment is deemed *completed* – will be provided in class. Please note that the course materials of Business F770 in Fall 2023 will account for 40% of the Finance PhD Comprehensive Examination in June 2024.

The conversion of numerical grades to letter grades is as follows:

Grade	Points	Equivalent Percentages
A+	12	90 – 100
A	11	85 – 89
A-	10	80 – 84
B+	9	77 – 79
B	8	73 – 76
B-	7	70 – 72
F	0	69 and under

[https://academiccalendars.romcmaster.ca/content.php?catoid=42&navoid=8734#2.6.1\\_Averaging\\_of\\_Letter\\_Grades](https://academiccalendars.romcmaster.ca/content.php?catoid=42&navoid=8734#2.6.1_Averaging_of_Letter_Grades)

## MORE DETAILED COURSE DESCRIPTION AND CORRESPONDING READING MATERIALS<sup>1</sup>

### *0. Preliminaries*

*Lecture Notes*, Chapter 1.

### *1. Consumption and Investment Decisions under Certainty: A Brief Review*

In a world that is characterized as being without risk, an individual seeks to optimize his/her satisfaction from current and future consumptions. Any forgone current consumption will allow the individual to have a higher consumption in the future. We seek to understand how rational decisions are made under different characterizations of the economy.

*Lecture Notes*, Chapter 2.

*CWS*, Chapter 2.

### *2. Utility Theory: A Brief Review*

We examine an individual's attitude towards risk. The concepts of risk aversion, risk premium, and certainty equivalent are considered. We also use some specific utility functions to illustrate these various concepts.

*Lecture Notes*, Chapter 3.

*CWS*, Chapter 4.

J.W. Pratt, "Risk Aversion in the Small and in the Large," *Econometrica*, 32 (1-2), (1964), 122-136.

<sup>1</sup> The additional reading materials are primarily original research articles on the corresponding topics. Each journal article indicated with an asterisk (\*) is a pedagogic version. The number of listed articles depends on the intended depth of coverage of the topics involved.

### **3. Stochastic Dominance**

For two competing investments with risky outcomes, we are interested in knowing whether one of them is always a better choice for a rational investor. We first consider a case where the investor's attitude towards risk does not matter. We then consider a different case where it does matter.

*Lecture Notes*, Chapter 4.

*CWS*, Chapter 4.

J. Hadar and W.R. Russell, "Rules for Ordering Uncertain Prospects," *American Economic Review*, 59 (1), (1969), 25-34.

### **4. State Preference Theory**

In this theory, the future is characterized as some potential states of nature with corresponding probabilities of occurrence. With the payoffs from individual financial securities being state-dependent, we seek to determine security prices.

*Lecture Notes*, Chapter 5.

*CWS*, Chapter 5.

### **5. A Mean-Variance Framework**

This theory captures the risk of an investment with the variance of the probability distribution of the investment's random rates of returns. It provides guidance for allocating investment funds among the securities considered to achieve the best risk-return trade-off.

*Lecture Notes*, Chapter 6.

*CWS*, Chapter 6.

### **6. Basic Portfolio Selection Models and Related Issues**

We explore analytical properties of minimum-variance portfolios. We provide a formal treatment of mean-variance portfolio analysis, based on a basic portfolio selection model. A crucial requirement for the covariance matrix of security returns is identified, and its implications are explored.

*Lecture Notes*, Chapters 7 and 18.

*CWS*, Chapter 6.

R.C. Merton, "An Analytical Derivation of the Efficient Portfolio Frontier," *Journal of Financial and Quantitative Analysis*, 7 (4), (1972), 1851-1872.

R. Roll, "Critique of the Asset Pricing Theory's Tests," *Journal of Financial Economics*, 4 (2), (1977), 129-176. (Read only the Appendix, pp. 158-162.)

\* C.C.Y. Kwan, "The Requirement of a Positive Definite Covariance Matrix of Security Returns for Mean-Variance Portfolio Analysis: A Pedagogic Illustration," *Spreadsheets in Education*, 4(1), (2010), Article 4.

\* C.C.Y. Kwan, “Remedies for Misapplications of Sylvester’s Criterion: A Pedagogic Illustration,” *Spreadsheets in Education*, 12, Issue 3, (September 2021).

\* C.C.Y. Kwan, “A Pedagogic Note on the Inverse of the Sum of Matrices: Miller’s Theorem and a Spreadsheet-Based Illustration,” *Spreadsheets in Education*, 13, Issue 1, (July 2022).

## **7. Portfolio Selection without Short Sales and Some Related Topics**

The Markowitz critical line method for portfolio selection is presented in some detail. The idea of critical lines is explained. For analytical convenience, the constraints considered are first confined to full allocation of investment funds and disallowance of short sales. Portfolio selection with investment limits for individual securities is also considered. The requirement for the covariance matrix of security returns, as identified earlier, is examined further here. Efforts to improve input quality are discussed. Shrinkage estimation of the covariance matrix of returns is introduced.

*Lecture Notes*, Chapters 8 and 9.

\* C.C.Y. Kwan, “A Simple Spreadsheet-Based Exposition of the Markowitz Critical Line Method for Portfolio Selection,” *Spreadsheets in Education*, 2(3), (2007), Article 2.

C.C.Y. Kwan, “What Really Happens If the Positive Definiteness Requirement on the Covariance Matrix of Returns Is Relaxed in Efficient Portfolio Selection?” *Financial Markets and Portfolio Management*, 32(1), (2018), 77-110.

O. Ledoit and M. Wolf, “Honey, I Shrunk the Sample Covariance Matrix,” *Journal of Portfolio Management*, (Summer 2004), 110-119.

\* C.C.Y. Kwan, “An Introduction to Shrinkage Estimation of the Covariance Matrix: A Pedagogic Illustration,” *Spreadsheets in Education*, 4(3), (2011), Article 6.

\* C.C.Y. Kwan, “Shrinkage of the Sample Correlation Matrix of Returns Towards a Constant Correlation Target: A Pedagogic Illustration Based on Dow Jones Stock Returns,” *Spreadsheets in Education*, 10(1), (2017), Article 3.

## **8. Market Equilibrium Considerations**

We consider the impact of the collective investment decisions by individual investors on security prices and expected returns. Some market-equilibrium models, including the Capital Asset Pricing Model and its variants, as well as the Arbitrage Pricing Model, and the corresponding implications are considered.

*Lecture Notes*, Chapters 10-12.  
*CWS*, Chapter 7.

W.F. Sharpe, “A Theory of Market Equilibrium under Conditions of Risk,” *Journal of Finance*, 19 (3), (1964), 425-442.

J. Lintner, “The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets,” *Review of Economics and Statistics*, 47 (1), (1965), 13-17.

J. Mossin, “Equilibrium in a Capital Market,” *Econometrica*, 34 (4), (1966), 768-783.

R. Roll, “Critique of the Asset Pricing Theory’s Tests,” *Journal of Financial Economics*, 4 (2), (1977), 129-176.

S.A. Ross, “The Arbitrage Theory of Capital Asset Pricing,” *Journal of Economic Theory*, 13 (3), (1976), 341-360.

\* C.C.Y. Kwan, “The Arbitrage Pricing Model: A Pedagogic Derivation and a Spreadsheet-Based Illustration,” *Spreadsheets in Education*, 9(1), (2016), Article 4.

### **9. Mean-Variance Spanning**

Under the mean-variance framework, we examine the spanning conditions; that is, the conditions under which the addition of a set of extra assets does not improve the portfolio performance in terms of risk-return trade-off. We also explore some practical implications of spanning.

*Lecture Notes*, Chapter 13.

G. Huberman and S. Kandel, “Mean-Variance Spanning,” *Journal of Finance*, 42(4), (1987), 873-888.

J.D. Jobson and B. Korkie, “A Performance Interpretation of Multivariate Tests of Asset Set Intersection, Spanning, and Mean Variance Efficiency,” *Journal of Financial and Quantitative Analysis*, 24, (1989), 185-204.

M. Raab and R. Schwager, “Spanning with Short-Selling Restrictions,” *Journal of Finance*, 48(2), (1993), 791-793.

G.V.G. Stevens, “On the Inverse of the Covariance Matrix in Portfolio Analysis,” *Journal of Finance*, 53(5), (1998), 1821-1827.

C.S. Cheung, C.C.Y. Kwan, and D.C. Mountain, “On the Nature of Mean-Variance Spanning,” *Finance Research Letters*, 6, (2009), 106-113.

\* C.C.Y. Kwan, “A Regression-Based Interpretation of the Inverse of the Sample Covariance Matrix,” *Spreadsheets in Education*, 7(1), (2014), Article 3.

### **10. Stochastic Dominance, Mean-Gini, and Asset Pricing**

We consider an alternative analytical framework, where risk of an asset is measured by its Gini coefficient. Various analytical issues pertaining to stochastic dominance and asset pricing are examined here.

*Lecture Notes*, Chapter 14.

R. Dorfman, “A Formula for the Gini Coefficient,” *Review of Economics and Statistics*, 61, (1979), 146-149.

S. Yitzhaki, “Stochastic Dominance, Mean Variance, and Gini’s Mean Difference,” *American Economic Review*, 72(1), (1982) 178-185.

H. Shalit and S. Yitzhaki, “Mean-Gini, Portfolio Theory, and the Pricing of Risky Assets,” *Journal of Finance*, 39(5), (1984), 1449-1468.

R.I. Lerman and S. Yitzhaki, “A Note on the Calculation and Interpretation of the Gini Index,” *Economics Letters*, 15, (1984), 363-368.

\* C.S. Cheung, C.C.Y. Kwan, and P.C. Miu, “Mean-Gini Portfolio Analysis: A Pedagogic Illustration,” *Spreadsheets in Education*, 2(2), (2007), Article 3.

## **11. Options Properties and Option Pricing Models**

Various basic option properties are considered. Also considered are derivations of the Cox-Ross-Rubinstein binomial option pricing model and the Black-Scholes option pricing model, as well as the convergence of the two models.

*Lecture Notes*, Chapters 15-19.  
*CWS*, Chapter 8.

F. Black and M. Scholes, “The Pricing of Options and Corporate Liabilities,” *Journal of Political Economy*, 81(3), (1973), 637-654.

J.C. Cox, S.A. Ross, and M. Rubinstein, “Option Pricing: A Simplified Approach,” *Journal of Financial Economics*, 7, (1979), 229-263.

\* Y. Feng and C.C.Y. Kwan, “Connecting Binomial and Black-Scholes Option Pricing Models: A Spreadsheet-Based Illustration,” *Spreadsheets in Education*, 5(3), (2012), Article 2.

\* K.D. Brewer, Y. Feng, and C.C.Y. Kwan, “Geometric Brownian Motion, Option Pricing, and Simulation: Some Spreadsheet-Based Exercises in Financial Modeling,” *Spreadsheets in Education*, 5(3), (2012), Article 4.

\* C.C.Y. Kwan, “Solving the Black-Scholes Partial Differential Equation via the Solution Method for a One-Dimensional Heat Equation: A Pedagogic Approach with a Spreadsheet-Based Illustration,” *Spreadsheets in Education*, 12, Issue 1, (September 2019).

## **12. Theory of Capital Structure**

Capital structure pertains to the corporate decision on how much debt and equity to have proportionally. The theory is considered with and without tax effects. Also considered is the effect of risky debt on capital structure, as well as risk sharing between debt and equity holders.

*Lecture Notes*, Chapter 20.  
*CWS*, Chapters 13 and 14.

F. Modigliani and M.H. Miller, “The Cost of Capital, Corporation Finance and the Theory of Investment,” *American Economic Review*, 48 (3), (1958), 261-297.

F. Modigliani and M.H. Miller, “Corporate Income Taxes and the Cost of Capital: A Correction,” *American Economic Review*, 53 (3), (1963), 433-443.

### **13. Dividend Policy: A Brief Review**

Arguments for and against dividend relevance are considered. Also considered is the concept of information content of dividends.

*Lecture Notes*, Chapter 21.  
*CWS*, Chapters 15 and 16.

### **14. Basic Concepts of Risk Sharing**

The coverage includes two-party and multi-party cases. Efficiency conditions for uncorrelated and correlated random outcomes are considered. Examples in the context of corporate merger are provided.

*Lecture Notes*, Chapter 22.

### **15. The Principal-Agent Problem and Incentive Contracting**

Incentive contracting for situations where the agent’s effort is observable and unobservable is considered. For the latter situation, also considered is the informativeness of indirect measures of the agent’s effort. The intensity of incentives (in incentive contracting) is examined.

*Lecture Notes*, Chapter 23  
*CWS*, Chapter 12.

M.C. Jensen and W.H. Meckling, “Theory of the Firm, Managerial Behavior, Agency Costs and Ownership Structure,” *Journal of Financial Economics*, 3 (4), (1976), 305-360.

### **16. Appendices**

The two appendices of the *Lecture Notes* cover various topics in matrix algebra that are relevant for this course. The coverage includes, but is not limited to, determinants and eigenvalues, matrix operations, and positive semi-definite and positive definite matrices.

*Lecture Notes*, Appendices A and B.



**The materials below are duplicated verbatim from the PhD Course Outline Template.**

Please review the Graduate Examinations Policy (if applicable):

<http://www.mcmaster.ca/policy/Students-AcademicStudies/GradExamsPolicy.pdf>

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***ACADEMIC INTEGRITY***

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You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at:

[www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity)

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
  2. Improper collaboration in group work.
  3. Copying or using unauthorized aids in tests and examinations
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***MISSED ACADEMIC WORK***

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Late assignments will not be accepted. No extensions are available except under extraordinary circumstances. Please discuss any extenuating situation with your instructor at the earliest possible opportunity.

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***STUDENT ACCESSIBILITY SERVICES***

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Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail [sas@mcmaster.ca](mailto:sas@mcmaster.ca).

For further information, consult McMaster University’s Policy for Academic Accommodation of Students with

[www.degroote.mcmaster.ca](http://www.degroote.mcmaster.ca)

Disabilities:

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

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### ***ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)***

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Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request, including the dates/times needing to be accommodated and the courses which will be impacted, to their Program Office normally within 10 days of the beginning of term. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

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### ***POTENTIAL MODIFICATION TO THE COURSE***

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The instructor reserves the right to modify elements of the course during the term. There may be changes to the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.