

**Carleton University
Department of Economics**

**ECON 5055 F
Financial Econometrics**

Instructor: Ba Chu

Fall 2022

Office: Loeb B-857

Telephone: 520-2600 ext. 1546

E-mail: ba.chu@carleton.ca

Class hours: Tuesdays, 6:05 – 8:55 p.m.

Place: SA 309

Office hours: TBC

Nature of the Course:

This course explains econometric tools used for financial modelling. The focus will be on (a) constructing [linear] models from equity returns and (b) implementing some of these models in Python. During the course, I will mainly give an economic interpretation of the models/concepts without using too much mathematics. A more rigorous statistical inference of time series models of stock returns will be given in Time Series Econometrics (ECON 5713) offered in the winter.

To understand the material of this financial econometrics course, students are expected to have taken or be taking concurrently ECON 5027 or an equivalent course in econometrics/statistics.

Note: Students are advised to check [cuLearn](#) regularly [every day] for course material and latest announcements.

Plagiarism:

Please be aware that plagiarism is serious offence at Carleton and should be recognized and avoided. For further information on how to do so, please see the [University Academic Integrity of Offenses of Conduct](#).

Requests for Academic Accommodations:

For Religious Obligations	To be worked out on individual basis with instructor. Consult Equity Services Website or an Equity Advisor (ext. 5622) for Policy and list of Holy Days (www.carleton.ca/equity)
For Pregnancy	Contact Equity Services (ext. 5622) to obtain <i>letters of accommodations</i>

For Students with Disabilities:

Students with disabilities needing academic accommodations are required to contact a coordinator at the Paul Menton Centre to complete the necessary *letters of accommodation*. The student must then make an appointment to discuss their needs with the instructor at least two weeks prior to the mid-term examination. He/she must also check with the PMC for accommodations for formally scheduled final examinations.

Texts and References:

O. Linton, *Financial Econometrics: Models and Methods*, Cambridge University Press, 2019

T. A. Severini, *Introduction to Statistical Methods for Financial Models*, CRC Press, 2018 (a very good supplementary text).

W. Enders, *Applied Econometric Time Series*, 2nd edition, New York: Wiley, 2004 (supplementary text) HB139.E55 2004

P. Kennedy, *A Guide to Econometrics*, 5th edition, Cambridge: The MIT Press, 2003. (supplementary text) HB139 .K45 2003

J.Y. Campbell, A. Lo, and A.C. MacKinlay, *The Econometrics of Financial Markets*, Princeton University Press, 1996 (supplementary text). HG4523 .C27

D. Ruppert, *Statistics and Finance: An Introduction*, Springer, 2004 (supplementary text)

C. Gourieroux and J. Jasiak, *Financial Econometrics: Problems, Models, and Methods*, Princeton University Press, 2001 (supplementary text)

The Campbell et al. book is the classic textbook covering most standard topics of financial econometrics. The Linton book, the Severini book, and the Ruppert book provide a good recent review of all the important topics in the area. The Gourieroux and Jasiak book is a good reference for diffusion processes for asset pricing and high-frequency data models. The Kennedy book provides a good introduction of the econometric tools used for time series analysis. If you want to review standard time series models, you can refer to the Enders textbook.

Notes on Course Assessment:

1. There will be one exam weighted at 35% to be held on the last day of this course (December 6, 2022), and three big assignments weighted at 30% after the 4th week. The rest 35% weight is awarded for an in-class presentation.
2. For your assignments, you may need to use Python or any programming language of your choice. If you decide to use Python, then you can access Jupyter Notebook at <https://colab.research.google.com> (you need to have a Gmail account to use Colab).

There are many excellent resources to learn Python. But I find this one giving a quite good fresh start: <https://www.youtube.com/c/Coreyms/videos?>

3. It is very important to keep in mind that assignments will be due approximately TWO WEEKS after they are made available online. An assignment must be submitted within 15 minutes since the beginning of the class on the due date. No late or deferred assignment/exam will be accepted. If you fail to submit an assignment on time or if you miss the exam without a verifiable reason, a zero weight of the assignment/exam missed will be assigned to your final grade.

4. Individual in-class presentations will be scheduled on around the third/fourth week of October. I will provide a list of papers in various topics so that students are welcome to choose any topic that they are interested in. *Students are expected to let me know the papers to be chosen for their presentations by the end of September* - please note this deadline. If the class size is big (say, more than 20), then each group of two or three students may work on a presentation.

Reading Assignments:

Readings in theory/applied work will be assigned as the course progresses.

1. Background Material

- a. financial markets
- b. types of financial assets traded in a financial market
- c. financial returns and their descriptive statistics
- d. utility functions and risk aversion
- e. portfolio choice

Linton, Ch. 1
Severini, Ch. 2

2. Time Series Models of Stock Returns

- a. autoregression
- b. random walk
- c. return predictability
- d. predicting stock returns

Linton, Ch. 2
Ruppert, Ch. 4
Severini, Ch. 3

M. Hashem Pesaran & A. Timmermann, "Predictability of Stock Returns: Robustness and Economic Significance," *Journal of Finance*, 1995, 50(4), 1201-2228.

3. Capital Asset Pricing Model (CAPM)

- a. Wald-type test of CAPM
- b. Fama and MacBeth's (1973) regression

Linton, Ch. 7

Severini, Ch. 7

R. Grauer, "Investment Policy Implications of the Capital Asset Pricing Model," *Journal of Finance*, 1981, 36(1), 127-141.

4. Factor Models

- a. diversification
- b. arbitrage pricing theory
- c. testing factor models

Linton, Ch. 8

Severini, Chs. 9 and 10

E.F Fama & K.R. French, "A five-factor asset pricing model," *Journal of Financial Economics*, 2015, 116(1), 1-22.

E.F. Fama & K.R. French, "Common risk factors in the returns on stocks and bonds," *Journal of Financial Economics*, 1993, 33(1), 3-56.

5. Volatility Modelling

- a. ARCH and GARCH models
- b. realized volatility
- c. stochastic volatility

Linton, Ch. 11

Ruppert, Ch. 12

T. Bollerslev, R.F. Engle, & J.M. Wooldridge, "A Capital Asset Pricing Model with Time-varying Covariances," *Journal of Political Economy*, 1988, 96(1), 116-131.

6. Risk Management with Value-at-Risk (VaR)

- a. VaR for individual asset
- b. VaR for a portfolio of assets

Linton, Ch. 14

Ruppert, Ch. 11

- A. Patton, "On the Out-of-Sample Importance of Skewness and Asymmetric Dependence for Asset Allocation," *Journal of Financial Econometrics*, 2004, 2(1), 130-168.
- B. Chu, "Recovering copulas from limited information and an application to asset allocation," *Journal of Banking & Finance*, 2011, 35(7), 1824-1842.

Notes:

Student or professor materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

Thank you! If you have any further question/concern, please feel free to ask me for help.