Carleton University
Department of Economics

ECON 5055 F
Financial Econometrics

Instructor: Ba Chu **Fall 2023**

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Class hours: Tuesdays, 6:05 – 8:55 p.m. (September 12 – December 5) **Place:** Zoom
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. Students who believe they have taken a similar background course or courses from another university must provide appropriate documentation to the Department of Economics Graduate Administrator.

Note: Students are advised to check Brightspace regularly [every day] for course material and latest announcements.

Plagiarism:

Please be aware that plagiarism is a serious offence at Carleton and should be recognized and avoided. You are responsible for reading and knowing the information about plagiarism, Carleton University resources, and academic accommodations found in https://carleton.ca/economics/plagiarism-resources-and-accommodations/.

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 *letters of*

	accommodations

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

D.G. Luenberger, *Investment Science,* 2nd edition, Oxford University Press, 2013

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)

J. Siegel, *Stocks for the Long Run 5/E: The Definitive Guide to Financial Market Returns & Long-Term Investment Strategies,* McGraw Hill, 2014 (supplementary text)

B.G. Malkiel, *A Random Walk Down Wall Street: The Time-Tested Strategy for Successful Investing*, WW Norton, 2020 (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 Luenberger book is a very comprehensive, but not too mathematical, textbook – I personally like it a lot. 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. The last two books can help you to understand financial markets and investment strategies.

Notes on Course Assessment:

1. There will be one exam weighted at 35% to be held on the last day of this course (December 5, 2023), 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). You may also want to run Python locally on your computer by installing both the Anaconda environment and the IDE Microsoft Visual Studio Code (note that, to install a Python package for Anaconda, you will need to run *conda install -c conda-forge <package>* to avoid any conflict. Try not to use *pip install <package>* in a conda environment as much as possible.)

   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? (please take a look at this manual before watching these youtube videos.) If you want to learn more about Python, I shall recommend: *W. McKinney (2022). Python for Data Analysis Data Wrangling with pandas, NumPy, and Jupyter.*

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 of 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 presentations on Zoom will be scheduled for around the third/fourth week of October. I will provide a list of papers on 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.

5. *Students write in-person exams on Brightspace in the classroom.* Please note that tests and examinations in this course will use a remote proctoring service provided by Scheduling and Examination Services. You can find more information at https://carleton.ca/ses/e-proctoring. To know how to log into the CoMas e-Proctoring platform, please refer to this guide: https://carleton.ca/ses/wp-content/uploads/CoMaS-Student-Instructions-v.-1.06.pdf. Students are required to have **webcams** (and a laptop) to use with the e-Proctoring platform.

Reading Assignments:

Further readings in theory/applied work may 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. autoregresion
   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
Luenberger, Ch. 8

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:

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