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McMaster University
DeGroote School of Business
Empirical Methods in Finance, F773

Course Outline

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Prof. John M. Maheu   2022

Office:	DSB-305
Office Hours:	TBA, or by appointment
Phone:	905-525-9140 ext. 26198
Class Times:	Thurs 11:30am-2:20pm, DSB-421
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Course Description:

This course will cover likelihood based estimation methods of time-series models used in empirical finance. Bayesian methods using simulation based estimation with Markov chain Monte Carlo methods as well as particle filtering will be covered. Popular models such as GARCH, stochastic volatility, Markov switching and vector autoregressions will be examined. The course will emphasize estimation, inference and forecasting using computer based applications.

Grading:

30% 3 assignments
30% test, March 3
40% term paper, due date to be determined
Late assignments or term paper will have 10% deducted per day late.

Conversions:

At the end of the course your overall percentage grade will be converted to your letter grade in accordance with the following conversion scheme.

Letter grade	Percent
A+	90 - 100
A	85 - 89
A-	80 - 84
B+	77 - 79
B	73 - 76
B-	70 - 72
F	00 - 69

Course Textbook:

Notes on Bayesian Econometrics, John M. Maheu, 2008, posted online.

Introduction to Bayesian Econometrics, Edward Greenberg, Cambridge University Press, 2012, second edition.

Greenberg can be ordered online for about $60 from amazon.ca. The text provides a good introduction to Bayesian methods and covers a few models used in finance.

General Background References:

There are a number of good references for the the following areas covered in this class.

Empirical finance

Analysis of Financial Time Series, Ruey S. Tsay, Wiley-Interscience, 2010

This is an excellent general reference for empirical finance.

Time-series methods

Time Series Analysis, James H. Hamilton, Princeton University Press, 1994

New Introduction to Multiple Time Series Analysis, Helmut Lutkepohl, Springer 2005

Bayesian methods

Contemporary Bayesian Econometrics And Statistics, John Geweke, Wiley, 2005

Bayesian Econometrics, Gary Koop, Wiley, 2003

Computer Assignments:

Students will complete computer assignments using R (or equivalent, Ox, Gauss, Matlab etc) econometric package. A personal version of R can be obtained free of charge from http://cran.r-project.org/. See the course website for links to R and Ox including downloading and documentation. Rstudio is an R interface that can be used to program and run R jobs from. It can be downloaded at https://www.rstudio.com/. Computer programming applications will be discussed extensively in class along with theory. Students can work together on the computer programming and model estimation but the *final write-up of an assignment should be done independently.* If plagiarism is detected University rules will be enforced.

Term Paper:

Students are required to complete an applied econometric paper based on a finance topic of their choice. Please feel free to discuss the suitability of your topic with me. In selecting a topic it may be helpful to look at current and past periodicals on econometrics in the library or online through the library web page. Some suggested sources are:

1. *Journal of Financial Econometrics*

2. *Journal of Business and Economic Statistics*

3. *Journal of Empirical Finance*

4. *Review of Economics and Statistics*

5. *Journal of Applied Econometrics*

Your paper can be completely original or you can base it on existing work using a different dataset and changing and/or expanding the analysis.

The term paper should consist of an Introduction, Model Description, Results, and Conclusion with References included. All mathematical equations should be written properly in the text. As an example, consider the AR(1)-ARCH(1) model.

$$
\begin{aligned}
y_t &= \mu + \phi y_{t-1} + \epsilon_t \\
\epsilon_t &= \sigma_t z_t \\
\sigma_t^2 &= \omega + \alpha \epsilon_{t-1}^2
\end{aligned}
$$

where $z_t \sim iid(0,1)$, and μ, ϕ, ω, and α, are parameters to be estimated.

Data sources should be included, along with footnotes, and correct citations. Using someone's idea or writings without a citation is plagiarism and University rules will be enforced. Your paper should be self contained. Finally, you should hand in a copy of your paper, and a disk with your computer code, the dataset and a file of your printout.

Topics to be covered:

1. Bayesian econometrics – the basics. Greenberg Ch 2,3,4

2. Simulation methods – classical simulation, Gibbs Sampling, Markov chain Monte Carlo (MCMC). Greenberg Ch 5,6,7

3. Gibbs Sampling examples. Greenberg Ch 8, Maheu (2008)

4. ARCH/GARCH models. Greenberg, Maheu (2008)

5. Stochastic volatility. Greenberg, Maheu (2008)

6. Realized volatility, Andersen and Benzoni (2009)

7. Markov-switching models. Maheu (2008)

8. Particle filtering methods

9. SUR model, Greenberg Ch 10.

10. Vector autoregressions (VAR) models, Maheu (2008), Karlsson (2012) and Koop and Korobilis (2009)

11. Bayesian nonparametrics, Greenberg Ch 9.

Academic Dishonesty:

It is the student's responsibility to understand what constitutes academic dishonesty. Please refer to the University Senate Academic Integrity Policy at the following URL:

http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf

This policy describes the responsibilities, procedures, and guidelines for students and faculty should a case of academic dishonesty arise. Academic dishonesty is defined as to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. Please refer to the policy for a list of examples. The policy also provides faculty with procedures to follow in cases of academic dishonesty as well as general guidelines for penalties. For further information related to the policy, please refer to the Office of Academic Integrity at:

http://www.mcmaster.ca/academicintegrity

In this course we will be using Turnitin.com which is a plagiarism detection service. Students will be expected to submit their work electronically to Turnitin.com so that it can be checked against the internet, published works and Turnitin's database for similar or identical work. If a student refuses to submit his or her work to Turnitin.com, he or she cannot be compelled to do so and should not be penalized. Instructors are advised to accept a hard copy of the assignment and grade it as per normal methods. The assignment can be subjected to a Google search or some other kind of search engine if the instructor wishes. To see guidelines for the use of Turnitin.com, please go to:

http://www.mcmaster.ca/academicintegrity/turnitin/students/index.html

Missed Academic Work

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.

Potential Modifications to the Course:

The instructor and university reserve the right to modify elements of the course during the term. The university may change 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.

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http://www.copyright.mcmaster.ca/Access_Copyright_Agreement

Student Accessibility Services:

Student Accessibility Services (SAS) offers various support services for students with disabilities. Students are required to inform SAS of accommodation needs for course work at the outset of term. Students must forward a copy of such SAS accommodation to the instructor normally, within the first three (3) weeks of classes by setting up an appointment with the instructor. If a student with a disability chooses NOT to take advantage of an SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. The SAS website is:

http://sas.mcmaster.ca