

University of Guelph
College of Management and Economics
Department of Economics and Finance

ECON*6390 Empirical Finance

Winter 2014

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It is your responsibility as a student to be aware of and to abide by the University's policies regarding academic misconduct, e-mail communication, maintaining copies of out-of class assignments, what to do when you cannot meet a course requirement and the drop date for this semester. To better understand these policies, visit:

<http://www.uoguelph.ca/economics/node/1115>

Course Description

This course is designed for advanced Undergraduate, Master's and Ph.D. students interested in Finance and/or Econometrics. The main focus will be on financial econometrics, the modeling of conditional volatilities and their application to financial data. Following a review of linear time series models, we will begin this segment by presenting the stylized facts that motivates this literature. Then we proceed to study the econometric approaches that have been developed to model this phenomenon, including the Generalized Autoregressive Conditional Heteroskedastic (GARCH) model, along with its various extensions and multivariate generalizations, stochastic volatility models and the recent literature on Realized Volatility.

Time permitting, other areas that may be covered in given years include market efficiency and asset pricing, derivative pricing models, term-structure models, market microstructure, and event-study analysis.

Course Requirements and Evaluation

Your mark will be assigned according to the following weights:

1. Final Exam (35%) The final exam will be a cumulative, limited-duration, closed book in class exam. Aids may include an aid sheet of limited size.

2. Class Participation (5%). Students will be expected to have completed the assigned readings ahead of lecture and to engage in meaningful discussion of the class material. Students are also asked to drop by office hours from time to time to discuss their progress on both their project and literature review and research proposal.
3. Literature Review and Research Paper Proposal (20%). For Ph.D. the goal of this assignment is to propose a research proposal that would be suitable as a Ph.D. thesis chapter. For MA students the goal of this assignment is to propose a research proposal that would be suitable as an MA paper. For undergraduates the goal is to produce a thorough and thoughtful literature review on a topic of your choosing.
4. Forecasting and Portfolio Selection Project (40%). You will be required to hand in between four and ten guided assignments throughout the term and a final project paper at the end of term. This project will require extensive statistical programming in a programming package of your choice. You will be required to work in teams of two for this project. You may choose a teammate within the first week of class or teammate will be chosen for you.

More instructions for the project will be provided on the course web page or in lecture.

Textbooks

There is no required textbook for this course. Specific chapters or sections from several of the books listed below are included in the reading list and all of these books are valuable references. However, you do not need to purchase them. Either a library (if available) or instructor copy of these books will be held for the course on short-term reserve. Of these books, the reading list draws most heavily from Campbell *et al.* (1997), Cochrane (2001), and Enders (2004).

Campbell, John Y., Andrew W. Lo and Craig MacKinlay (1997). *The Econometrics of Financial Markets*. Princeton University Press.

Cochrane, John H. (2001). *Asset Pricing*. Princeton University Press.

Cuthbertson, Keith and Dirk Nitzsche (2004). *Quantitative Financial Economics: Stocks, Bonds, & Foreign Exchange*. 2nd ed.. John Wiley & Sons.

Elton, Edwin J., Martin J. Gruber, Stephen J. Brown and William N. Goetzmann (2003). *Modern Portfolio Theory and Investment Analysis*. 6th ed.. John Wiley and Sons.

Enders, Walter (2004). *Applied Econometric Time Series*. Wiley Series in Probability and Statistics. 2nd ed.. Wiley.

Gourieroux, Christian and Joann Jasiak (2001). *Financial Econometrics*. Princeton University Press.

Hasbrouck, Joel (2007). *Empirical Market Microstructure: The Institutions, Economics, Econometrics of Securities Trading*. Oxford University Press.

Jr., Jonathan E. Ingersoll (1987). *Theory of Financial Decision Making*. Rowman & Littlefield Publishers, Inc.

Obstfeld, Maurice and Kenneth Rogoff (1996). *Foundations of International Macroeconomics*. MIT Press. Cambridge, Massachusetts.

- Stock, James H. and Mark W. Watson (2007). *Introduction to Econometrics*. Addison-Wesley Longman.
- Tsay, Ruey S. (2005). *Analysis of Financial Time Series*. 2nd ed.. John Wiley and Sons.
- Wang, Peijie (2003). *Financial Econometrics*. Routledge.

Topics Covered

A list of topics and suggested readings is included below. Due to time constraints some of the topics marked with a star (*) below be covered only briefly or skipped entirely. However, all topic areas are equally suitable for the research paper.

It is strongly suggested that students complete the readings ahead of lecture so that they are able to participate fully. A few of the readings include some highly technical mathematical material that may be difficult to follow. Students are not expected to understand such highly technical material unless or until it is covered in lecture. However, in all cases, students should attempt to understand the main arguments and findings in each paper.

1. Review of Linear Time Series Models with Application to Finance

- (a) Stationary ARMA modeling and forecasting (Enders, 2004, Chapter 2) (Tsay, 2005, Sections 2.1-2.6)
- (b) Non Stationary modeling, testing and forecasting (Enders, 2004, Chapters 4 and 6) (Tsay, 2005, Sections 2.7-2.8)
- (c) Tests of Random Walk in financial data (Campbell *et al.*, 1997, Section 1.5, 2.2-2.4, 2.7-2.9)

2. Volatility Modeling

- (a) Stylized facts for asset returns
Textbook Readings: (Enders, 2004, Section 3.1)
- (b) Autoregressive conditional heteroskedasticity (ARCH) and generalized ARCH (GARCH) models
Textbook Readings: (Enders, 2004, Section 3.2-3.5, 3.7-3.8)
Bollerslev, T., R. F. Engle and D. B. Nelson (1994). ARCH models. In: *Handbook of Econometrics Volume IV* (R. F. Engle and D L. McFadden, Eds.). Elsevier Science B.V.. pp. 2959–3038.
Bollerslev, T. (1986). Generalized autoregressive conditional heteroscedasticity. *Journal of Econometrics* **31**, 307–327.
Engel, R. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica* **50**, 987–1007.
- (c) Univariate generalizations of GARCH, including the ARCH-M, IGARCH, TARCH, and EGARCH models
Textbook Readings: (Enders, 2004, Section 3.6, 3.9-3.11), (Campbell *et al.*, 1997, Section 12.2.1)

- Engle, R. F. (2001). GARCH 101: The use of ARCH/GARCH models in applied econometrics. *Journal of Economic Perspectives* **15**, 157–168.
- Engle, R., D. Lilien and R. Robins (1987). Estimating time varying risk premia in the term structure: The ARCH-M model. *Econometrica* **55**, 391–407.
- Glosten, L. R., R. Jagannathan and D. E. Runkle (1993). On the relation between the expected value and the volatility of the nominal excess return on stocks. *Journal of Finance* **48**, 1779–1801.
- Nelson, D. B. (1990). Stationarity and persistence in the GARCH(1,1) model. *Econometric Theory* **6**, 318–334.
- Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica* **59**, 347–370.
- (d)* Multivariate generalizations of GARCH, including the constant-correlation, VEC, BEKK, and factor GARCH models
- Textbook Readings: (Campbell *et al.*, 1997)[Section 12.2.2]
- Bollerslev, T., R. G. Engle and J. M. Wooldridge (1988). A capital asset pricing model with time varying covariances. *Journal of Political Economy* **96**, 116–131.
- Bollerslev, T. (1990). Modelling the coherence in short-run nominal exchange rates: A multivariate generalized ARCH model. *The Review of Economics and Statistics* **72**, 498–505.
- Engle, R. F. and K. F. Kroner (1995). Multivariate simultaneous generalized arch. *Econometric Theory* **11**(01), 122–150.
- Ng, V., R. F. Engle and M. Rothschild (1992). A multi-dynamic-factor model for stock returns. *Journal of Econometrics* **52**(1-2), 245–266.
- (e) Stochastic volatility models
- Textbook Readings: (Campbell *et al.*, 1997, Section 12.2)
- Ghysels, E., A. C. Harvey and E. Renault (1996). *Stochastic Volatility*. Chap. 5. Vol. 14 of *Handbook of Statistics*. Elsevier Science.
- Melino, A. and S. M. Turnbull (1990). Pricing foreign currency options with stochastic volatility. *Journal of Econometrics* **45**(1-2), 239–265.
- Wiggins, J. B. (1987). Option values under stochastic volatility: Theory and empirical estimates. *Journal of Financial Economics* **19**, 351–372.
- (f) Realized volatility
- Andersen, T., T. Bollerslev, F. X. Diebold and H. Ebens (2001*a*). The distribution of realized stock return volatility. *Journal of Financial Economics* **61**, 43–76.
- Andersen, T., T. Bollerslev, F. X. Diebold and P. Labys (2001*b*). The distribution of realized exchange rate volatility. *Journal of the American Statistical Association* **96**, 42–55.
- Andersen, T., T. Bollerslev, F. X. Diebold and P. Labys (2003). Modeling and forecasting realized volatility. *Econometrica* **71**, 529–626.
- Barndorff-Nielsen, O. E. and N. Shephard (2004). Econometric analysis of realized covariation: High frequency based covariance, regression and correlation in financial economics. *Econometrica*.
- McAleer, M. and M. Medeiros (2008). Realized volatility: A review. *Econometric Reviews* **27**(1-3), 10–45.

Department of Economics and Finance Learning Objectives (skills and knowledge competencies) for this course:

Skills

- a **Written Communication:** The forecasting and portfolio selection assignment will require both regular assignments and a final paper in which you to clearly **analyze** and communicate your methodology and results.
- b **Oral Communication/Presentation:** As part of the class participation component, you will improve your **understanding** by asking and answering questions, as well as by providing thoughts and comments.
- b **Analytical Problem Solving:** The course lectures and exam(s) will require you derive results and solve problems, as you **analyze** the methodology.
- b **Problem Solving in a Real World Context:** The forecasting and portfolio selection assignment will require you to **apply** statistical forecasting and financial portfolio selection methodology to real world data in order to produce real time forecasts and portfolio choices. You will then **analyze** the results.
- b **Group Work:** You are required to work in groups on your forecasting and portfolio selection assignment.
- b **Computer Skills:** In order to complete your statistical forecasting and financial portfolio selection project you will need to acquire versatility in the **application** of one or more statistical programming packages, such as STATA, R (zero-cost), EVIEWS, or MATLAB.

Knowledge

- a **Statistical and Econometric Methodology:** Understand, analyze, and apply and autoregressive and moving average time series models, time series diagnostics and model selection procedures, unit root and random walk models and tests, models of generalized autoregressive heteroskedastic models and their generalizations, and methods of forecasting and forecast evaluations.
- b **Financial Asset Pricing, Corporate Finance and Risk Analysis:** Understand and apply asset pricing and portfolio selection models as part of the forecasting and portfolio selection project.

Physical and Mental Presence

Both your physical and mental presence are requested during course lectures. To encourage active engagement and minimize distractions, I ask that all electronic devices be turned off and put away during lecture.

Course Evaluations

You will be asked to complete an evaluation of this course at some time during the last two weeks of the semester. The Department of Economics policy regarding the conduct and use of these evaluations will be found at:

<http://www.uoguelph.ca/economics/academics/courses/course-evaluation>