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

ECON*6390 Empirical Finance **Winter 2016**

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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 (45%) 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. Forecasting and Portfolio Selection Project (50%). 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, VECH, 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.

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 Policies

Grading Policies

Your project mark will be based on both the quality of your final project paper turned in at the end of the semester and on the 7 assignments during the semester that will form the basis of your final project paper. Feedback on your assignments will be given prior to the add-drop date and the mark for your project will be provided at the end of the semester.

Assignments 1 -7 are respectively due on the Friday at the end of weeks 1,2,3,5,7,9, and 11, respectively, subject to any possible extensions that may be posted on the external web page under the link entitled "Assignments".

Late Passes and Late Penalty: Each team has seven one day late passes. This is to allow you some flexibility in dealing with illness, personal difficulties, term exams and assignments from other classes. After the seven one day late passes have been used up, a penalty of at least 5 percent of the maximum assignment value will be applied to each day any assignments are late. You may not use a doctor's note or similar excuse to avoid such penalties unless your doctor's note explains more than seven days of lateness. In other words, the late passes are intended to cover the first seven days of any illness or personal difficulty. These late passes may only be used for the individual assignments themselves and not your final project paper submission, which must be timely submitted to avoid penalty.

For the final project please (a) upload one copy to course link and (b) provide me with one hard-copy. The copies must be identical. Please note a five percent per day penalty penaly will apply to your finanl project if it has not been submitted by the final day of lecture. The late passes may not be employed for the final project.

Please note that software will be used to verify the originality of your assignments and final project paper.

Remark Requests: Any request to remark an exam or assignment must be addressed to your instructor in writing (hard copy) within six weeks and must include the following (i) your name, contact information (telephone and email), and signature, (ii) a clear description of where and why you feel that you were graded in error, and (iii) the following statement exactly as it appears here "In requesting a re-grade I certify that I have not written on, erased, or in any way changed my copy of the exam/assignment since it was handed back to me. I understand that to do so would constitute a serious academic offense. I also understand that my entire exam/assignment will be re-graded (with particular attention paid to the points that I have bro ught up) and understand that as a result my score on the exam/assignment could fall as well as rise"

Course Policy on Group Work:

Both teammates are expected to contribute substantively to every assignment and are expected to work collaboratively and to be responsive to each others e-mails/communications. If a team is not functioning well, either team member may request to disband the team within five calendar days of the official due date of any assignment by sending an e-mail from their own university e-mail address to their teammate's University e-mail address and to my University e-mail address, including the following information: full name of each team-mate including yourself, group number, and brief reason for requesting that the team disband. Requests to disband cannot be made outside of the five day window mentioned above, except if one team-member is non-responsive to

e-mails/communications for a period of three days or longer. If the request to disband is approved, both team members must promptly share all work done to date. Thereafter, they will work on the remaining assignments individually. No academic cons ideration will be given to any student due to the malfunction and/or disbandment of a team. It is each student's responsibility to find a suitable teammate.

All group members are jointly and separably responsible for ensuring the quality and academic integrated of the material submitted on behalf of the group. No academic consideration can be provided on the basis that a mistake was made by another group member, as all group members are responsible for verifying the final assignment before submission.

Course Policy regarding use of electronic devices and recording of lectures

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

University Policies

Academic Consideration

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. The Academic Misconduct Policy is detailed in the Undergraduate Calendar: https://www.uoguelph.ca/registrar/calendars/undergraduate/2015-2016/

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term

disability should contact the Centre for Students with Disabilities as soon as possible. For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.csd.uoguelph.ca/csd/ Note: Contact should be edited for regional campuses.

Course Evaluation Information

Please refer to the Course and Instructor Evaluation Website

Drop date

The last date to drop one-semester courses, without academic penalty, is Friday, March 11 2016. For regulations and procedures for Dropping Courses, see the Academic Calendar: https://www.uoguelph.ca/registrar/c 2016/