ECON 684: Applied Time Series Analysis and Forecasting
Winter 2016
Syllabus

Class time: Thursdays, 6:45 – 9:30pm (short break around 8pm). **Final exam is Feb 23.**
Class location: 1400 16th St. NW, Suite 140, Washington, DC
Instructor: David Burk, dburk@umd.edu
Office hours: Immediately after class, and by appointment.

TA: Hidehiko Matsumotoe (Hide – "Hee-Day"), DCmastersTA@econ.umd.edu
TA Office Hours: One day per week from 3:00-7:00 p.m. The TA Office Hours will not be on the same day each week. Hide will post his Office Hour Schedule on ELMS at the beginning of the term. He will also send weekly reminders via ELMS Announcements every Sunday evening.

Course Overview:
This course covers estimating, testing, and forecasting time series models. Topics include ARIMA models, volatility models, unit roots, spurious regression, cointegration, VAR models, and Granger casuality. There will be an emphasis on macroeconomic applications, such as studying the relationships between unemployment and inflation (i.e., the Phillips curve); unemployment and GDP (i.e., Okun's Law); the macroeconomy and various shocks; and the term structure of interest rates.

Evaluation
Problem Sets: 20% (4 problem sets in total)
Weekly Online Discussion Participation: 5%
Replication Project: 25%
Midterm: 25%
Final: 25%

The course will be graded on a curve. Your score for each component (problem sets, weekly online discussion participation, replication project, and exams) will be normalized and then combined into one "overall course score." I will letter grades based on those scores and my professional judgement. Having a score one standard deviation above the mean typically results in an A.

Problem Sets: Students may work in groups; if they do so a group should submit one set of answers for the whole group.

Weekly Online Discussion: There will be weekly online discussions which students are required to contribute to. Those discussions will typically deal with course reading. I will provide initial prompts for each week's discussion and facilitate discussion to make sure it is instructive and worthwhile. The discussion will be open for at least two days, but will never be open on the day of class (i.e., Thursday).

Replication Project: Students will replicate the primary results of a research paper their choosing that uses some of the methods discussed in class. Students are responsible for producing a short (less than 3 pages of single-spaced text, plus tables and figures) but highly polished paper that includes a summary of the central argument of the paper, their replication results, and an evaluation of the paper. (This paper could be a useful writing sample for any job applications). If time and class size permits, students also will give a brief but very focused presentation of their work to their classmates. To facilitate the production of high quality output, there are several intermediate assignments related to the replication paper: selecting an appropriate paper (I will help!); drafting a summary of the paper's argument and an outline of the proposed replication paper; obtaining the necessary data; and completing the replication analysis.

Reading Materials and Software

The main text which the course follows closely is *Applied Econometric Time Series*, Fourth Edition, by Walter Enders, 2015. Earlier editions are acceptable substitutes.

In addition, we will also study several articles and book chapters, all of which are available online to UMD students, and will be posted on ELMS:

- Diebold, Francis X., *Elements of Forecasting*, fourth edition, 2007.
- Bernanke, Ben S. and A. Blinder, "Credit, Money and Aggregate Demand," *The American Economic Review*, vol. 82, no. 4, 1992, pp. 901-921.
- Blanchard, O. and D. Quah, "The Dynamic Effects of Aggregate Demand and Supply Disturbances," *The American Economic Review*, vol. 79, no. 4, September 1989, pp. 655-673.
- Hansen, B., "The New Econometrics of Structural Change: Dating Breaks in U.S. Labor Productivity," *The Journal of Economic Perspectives*, Vol. 15, No. 4. (Autumn, 2001), pp. 117-128.
- Hamilton, J. "What is an Oil Shock?," *Journal of Econometrics*, April 2003, vol. 113, pp. 363-398.

For empirical analysis, I will use Stata in the classroom and in problem set solutions.

Tentative Schedule of Topics and Due Dates
This may change as the course proceeds. Keep an eye on ELMS announcements.

Date	Topic	Reading
Dec 1	What Time Series is Good For; Statistics, Econometrics, and Math Review; Difference Equations	Enders, Chapter 1
Dec 8	ARMA Processes: Introduction, and Moving Averages	Enders, Ch. 2; Diebold, Chs. 7 and 8
Dec 15	ARMA Processes: Autoregressions and ARMA; **PS1 DUE**	
Dec 22	MLE Estimation Theory; Intro to Forecasting	section on MLE from your econometrics text book; Diebold, Ch. 2
Dec 29	NO CLASS ☹	
Jan 5	Modeling Volatility: ARCH and GARCH processes; **PS2 due; select paper to replicate**	Enders, Ch. 3
Jan 12	**Midterm;** Non-stationary Processes: Trends and Unit Roots	Enders, Ch. 4
Jan 19	Non-stationary Processes: Cointegration; Structural Breaks; **submit draft of summary of paper**	Enders, Ch. 6; Hansen 2001
Jan 26	Intro to Vector Auto-Regression; **PS3 due**	Enders, Ch. 5
Feb 2	Structural VARs; **obtain data needed for replication**	
Feb 9	Applications of VARs; **PS4 due**	Bernanke and Blinder 1992; Blanchard and Quah 1989
Feb 16	Applications of VARs; **replication paper due**	Hamilton 2003
Feb 23	**FINAL**	

Course Objectives
Our program has 7 general learning outcomes for students:

1. Ability to understand, evaluate and analyze economic data
2: Ability to understand and interpret statistical evidence from economic data
3: Ability to apply empirical evidence to assessing economic arguments
4: Ability to apply macroeconomic theories to policy discussions
5: Ability to apply microeconomic theories to policy discussions
6: Ability to communicate economic ideas to a broader audience
7: Ability to evaluate the effectiveness of policy programs using sound economic techniques

The learning outcomes that pertain to this course primarily are 1, 2, 3, 4, and 6.

Course Website: Copies of the course syllabus, your grades, and other relevant links and documents will be posted on the course's ELMS/Canvas website. You can access the site via www.elms.umd.edu. You will need to use your University of Maryland "directory ID" and password.

Email: Email is the primary means of communication outside the classroom, and I will use it to inform you of important announcements. Students are responsible for updating their current email address via http://www.testudo.umd.edu/apps/saddr/ AND for paying attention to messages I send to the class via ELMS. Failure to check email, errors in forwarding email, and returned email due to "mailbox full" or "user unknown" will not excuse a student from missing announcements or deadlines. I will do my best to respond to email within 36 hours.

Contact Hours: Three credit courses at the University of Maryland require a minimum amount of contact between instructors and students. Our courses' 12 weekly 3-hour meetings only satisfy 80% of the university's contact requirement. The other 20% is satisfied by weekly mandatory and graded online contact. In principle, the contact hours requirement could be satisfied by scheduling 3 additional 150-minute meetings per term, or 6 additional 75-minute meetings, or 10 additional 45-minute meetings. But in practice the contact hours requirement is satisfied by the weekly online discussions. The weekly online discussions are a more flexible way to ensure that our program's courses in DC provide the same level of student-instructor contact as the traditional 15-week, face-to-face, version of the same course when it is taught on campus in College Park.

Work Load: Mastering the material covered in this course requires a significant amount of work outside of class. Students should expect to spend more time outside of class than in class – typically at least twice as much time. The courses in our DC program are 12-week courses that cover all the same material as a traditional semester-long 3-credit course (15 weeks). The compressed schedule makes it possible to complete our

degree in just 15 months if you take 2 courses each term. But the compressed schedule also implies an accelerated pace with an average of 25% more work per week in a given course (15/12 = 1.25). The normal full-time load in a master's program is 3 courses per semester, or 6 courses per year. Students who take 2 courses per quarter in our program complete 8 courses per year. So taking 2 courses per quarter in our program is equivalent to 133% of a full-time load (8/6 = 1.33).

Academic Integrity: The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards applicable to all undergraduate and graduate students, and you are responsible for upholding these standards as you complete assignments and take exams in this course. Please make yourself aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information see www.studenthonorcouncil.umd.edu.

Student Conduct: Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to show civility to one another or myself will be referred to the Office of Student Conduct. You are expected to adhere to the Code of Student Conduct.

Excused Absences: The University of Maryland's policy on excused absences is posted here:
http://www.president.umd.edu/administration/policies/section-v-student-affairs/v-100g

Please note:

If you miss any class meetings for any reason, you are still responsible for all material covered during the meeting you missed. It is your responsibility – not the instructor's – to get yourself caught up in the course. Instructors routinely facilitate things by posting lecture notes, etc.

If you need to miss an exam or other graded course requirement because of illness, injury, or some other emergency: Follow doctor's orders and get documentation. Get in touch with the instructor as soon as you're able – preferably prior to missing the exam or deadline. Communicate with the instructor to make up the course requirement as soon as possible. You are entitled to recover before you make up the course requirement, but you are not entitled to extra days to study beyond the time the doctor's note says you're incapacitated. If you are incapacitated for more than a week or so beyond the end of the term, your grade in the course will be an "Incomplete". In such cases you must negotiate a plan with your instructor for completing the course requirements. Once you make up the course requirement the instructor will change your "I" to the appropriate letter grade.

School Closings and Delays: Information regarding official University closing and delays can be found on the campus website and the snow phone line: (301) 405-SNOW (405-7669). Since our program is an evening program in downtown Washington, DC, rather

than a day program in College Park, we do not always cancel classes on the same days as the College Park campus. The program director will always announce cancellation information to the program as an announcement on the program's ELMS/Canvas site. This will generally be done by 1:00 p.m. on days when weather or other factors are an issue.

Students with Disabilities: The University of Maryland does not discriminate based on differences in age, race, ethnicity, sex, religion, disability, sexual orientation, class, political affiliation, and national origin. Reasonable accommodations will be made to students with documented disabilities. I will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and who provide me with a University of Maryland DSS Accommodation form.

Academic Progress: The graduate school requires that students maintain a GPA of at least 3.0. Students whose cumulative GPA falls below 3.0 will be placed on academic probation by the graduate school. Students on academic probation must ask the program's director to petition the graduate school if they want to remain in the program. The petition must include a plan for getting the student's GPA up to at least 3.0. Students who do not live up to their plan can be forced to leave the program without having earned the degree. Note: a grade of "B" corresponds to a GPA of 3.0. A grade of "B-" corresponds to a GPA of 2.7.

Building Access: The door to the building at 1400 16th Street is unlocked on weekdays until 7:00 p.m. Students who arrive after 7:00 p.m. or on weekends will find the door locked. The building's security guard is stationed at a desk just inside the door until 11:00 p.m. and will let you in. You can also call the phone on the security guard's desk by dialing (202) 328-5158. If the security guard happens to be away from his or her desk when you arrive, you can pick up the black phone to the right of the door at 1400 16th Street. You will be connected to the company that handles security for our building. If you tell them you are with the University of Maryland, they should ask you for a password. The password is "Drawbridge". When you tell them the password, they will be able to unlock the door for you.