ECON 4325-001
Economic Forecasting
Spring 2018

<u>Instructor</u>: Dr. Aaron Smallwood
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<u>Course Webpage</u>: Please refer to blackboard for all course related content.

Special note: Please check the course website before each class, as I will frequently post data that we will work with in class. Students are encouraged to bring their laptops to class so that they can follow the examples directly.

<u>Time and Location</u>: T-Th 12:30 - 1:50, COBA 138.
<u>Office Hours</u>: Wednesday 5:45- 6:45 (pm) Thur. 11:00 - 12:00 (p.m.)
<u>Textbook</u>: The lectures will be loosely based on the following textbook:

Forecasting for economics and business, 1st edition. Author: Gloria Gonzalez-Rivera

Students will be required to obtain the software R. The software will be used in forecasting exercises throughout the course. The software is free and can be obtained by visiting the following website:

http://cran.r-project.org

Should the opportunity arise, I may also demonstrate how to conduct forecasting analysis using the software EViews. Acquisition of this software is entirely voluntary. A student version of the software can be obtained for $39.95 directly from the manufacturer at the following URL:

http://www.eviews.com/EViews9/EViews9SV/evstud9.html

<u>Textbook</u>: (optional) The author of the forecasting package in R co-wrote the following online textbook, which contains some useful commands in R:

Hyndman, Rob and George Anthanasopoulos (2012): Forecasting: principles and practice. Available via URL at: https://www.otexts.org/fpp

<u>Course Description and objectives</u>:
This is a challenging and extremely useful course that employs statistical techniques in developing forecasts for economic and financial data. The course begins with a description of what a forecast is and the tools necessary to evaluate competing forecasts. Simple methods, including naïve forecasts and forecasts based on exponential smoothing are introduced early. Various forecasting models are introduced, with emphasis placed on modeling the statistical properties of the data under consideration. As the course progresses, the models become more elaborate as we will introduce so-called "ARMA" and "SARIMA" models, forecasts based on regression models, and ultimately, multivariate techniques. Upon successful completion of the course,

1. The student will understand complicated statistical techniques related to modeling business data over time.
2. The student will independently be able to develop a model to forecast business data.
3. The student will be able to compare the relative forecasting ability of various models and choose the most appropriate model among a set of alternatives.
4. The student will gain familiarity with the computer package R and will be able to employ this software to develop and analyze forecasts.
5. The student will gain presentation skills and will be able to demonstrate how forecasting methods can benefit specific organizations that use them.

Grading:

Course grades will be based on the following:
1. Assignments 33%
2. Group presentation 13%
3. Midterm 27%
4. Final 27%

I. <u>Assignments</u>:

There will be a total of 3 assignments, which will be administered throughout the course. The assignments will be intensive in both mathematical and computational analysis associated with the techniques developed in this class. Each assignment is worth 11% of your overall grade. Assignments will be administered (and collected) on the following dates, subject to change (please refer to Blackboard for any update). In the event that a due date is changed, you will be given advance notice both in class and on Blackboard.

a. Assignment #1: Administered: February 6, Due: February 13.
b. Assignment #2: Administered: February 20, Due: February 27.
c. Assignment #3: Administered: April 5, Due: April 12.

Please note, as we will typically review the assignments at the beginning of class on the dates they are due, I am unable to collect assignments should you be late to class on any of the above dates. Please note that there is no flexibility on this policy. If you come into the classroom and attempt to turn in your assignment after I have collected them, you will receive a zero on the assignment. Please treat these dates as you would a critical deadline for a project with an employer. If you can not arrive on time or are unable to attend, I will be happy to make arrangements with you to allow you to turn in your assignment before the start of class. Again, regrettably, students that do not turn in their assignments at the start of class on their due dates will receive a zero on that assignment.

I anticipate that I will allow group collaboration on only one assignment. Otherwise, assignments should be completed individually without any assistance from other classmates. I am delighted to assist you on any assignments you are having difficulty with, but it will be considered a violation of the University's policy regarding academic conduct should you turn in individual assignments where it is clear that you have worked with others. Please refer to the University's policy on the honor code referenced later in this syllabus.

II. Group presentation:

The course will culminate in a group presentation where all methods taught in class will be brought to bear on a data set of your group's choosing. The group presentation will allow you to work in teams, while demonstrating your proficiency in technical analysis related to forecasting. The development of this skill will likely serve you quite well in the workplace someday. Specific instructions on group presentations will be given during the month of February. Presentations will be given on either April 26 or May 1.

III. Exams:

> Exam 1: Scheduled for March 6, 2018
> > Exam coverage: determined by pace of the course.
> Final Exam: May 10, 11:00 am -1:30 pm
> > Exam coverage: Again determined by the pace of the course.

Special notes: In the case of a necessitated emergency, properly documented, arrangements will be made to take the exam at a different time. An unexcused absence for an exam will result in a 0% on that exam.

IV. Participation and attendance:

Formally, there is no attendance policy. However, this is a challenging course, and I suspect you would find that there is not a good substitute for the in-class lecture. If you suspect, for any reason, that you may have difficulty attending every class, I would recommend not taking this course.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self- service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/aao/fao/).

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA), and Section 504 of the Rehabilitation Act. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671 is also available to all students

Non-Discrimination Policy: UT-Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.

Title IX Policy: The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. For information regarding Title IX, visit www.uta.edu/titleIX or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272- 7091 or jmhood@uta.edu.

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence. I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents' Rule 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University. Additional information is available at https://www.uta.edu/conduct/.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Campus Carry: Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit http://www.uta.edu/news/info/campus-carry/.

Student Feedback Survey: At the end of each term, students enrolled in face-to-face and online classes categorized as "lecture," "seminar," or "laboratory" are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback via the SFS database is aggregated with that of other students enrolled in the course. Students' anonymity will be protected to the extent that the law allows. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit http://www.uta.edu/sfs.

Final Review Week: for semester-long courses, a period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabus. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view at http://www.uta.edu/universitycollege/resources/index.php.

Course Outline: The following is a tentative outline of the course that is likely to change given the pace of our meetings.

Week 1 (Jan 16- Jan 18): Introduction to forecasting (chapter 1&4).

Week 2(Jan 23-25): Simple forecasting methods. Naïve forecasts, mean forecasts, and exponential smoothing (chapter 7 from Hyndman and Athanasopoulos).

Week 3(Jan 30, Feb 1): Exponential smoothing concluded, reviewing the linear regression model (chapter 2, main text).

Week 4 (Feb 6 - Feb 8): Linear regression model continued. Concept of stationarity introduced (chapter 2-3). Problem set #1 administered.

Week 5 (February 13 - 15): Statistical characteristics of data we wish to observe: Mean of the data, covariance of the data, indirect correlation of the data over time, and direct correlation of the data over time. Introduction to the Box-Jenkins methodology (chapter 3). **Problem set #1 is due.**

Week 6 (February 20-22): The building block of all forecasting models: the white noise process. How do we know if a model actually exists, which can be applied to our data? The Wold decomposition theorem. Introduction to ARMA models (chapter 6). Problem set #2 administered.

Week 7 (February 27-March 1): Properties of ARMA models. Introduction to forecasting with ARMA models (chapter 6,7,8). **Problem set # 2 is due.**

Week 8 (March 6 – 8). Exam #1. Return exam number 1 if possible.

Week 9 (March 20 -22): ARIMA models continued (chapter 7,8).

Week 10 (March 27-29): Introduction to stochastic trends. Dealing with unit roots (chapter 10).

Week 11 (April 3-5): Unit roots concluded. Dealing with seasonality. Introduction to SARIMA models (chapter 7-10). Problem set #3 is administered.

Week 12 (April 10 – April 12): Stochastic seasonality continued. Forecasting data with seasonal characteristics. In class exercise (chapter 7,8). Problem #3 is due.

Week 13 (April 17-19): In class exercise continued. Putting it all together. SARIMA models with trending. (chapter 7,8,10).

Week 14 (April 24– 26): Introduction to multivariate methods (chapter 11).

Week 15 (May 1 – May 3): Multivariate regression analysis. Contingency analysis. Vector autoregressions. (chapter 11). Review for final exam.
PRESENTATIONS TO BE HELD APRIL 26 AND/OR MAY 1