ECON 5337-001
Business and Economic Forecasting
Spring 2018

<u>Instructor</u>: Dr. Aaron Smallwood
<u>Office Location</u>: COBA 327
<u>Phone</u>: (817) 272-3061
<u>Email</u>: smallwood@uta.edu
<u>Course Webpage</u>: All course material can be found on blackboard.

Please check blackboard 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 7:00 - 9:50 pm, COBA 151.
Office Hours:
Wednesday: 5:45-6:45 (pm)
Thursday 11:00 am – NOON
And by appointment

<u>Textbook</u>: The lectures will be based on the following textbook:

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

<u>Textbook: (optional)</u> 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>Software:</u>

Students will be required to obtain the software R. R can be obtained through the following url:

http://cran.r-project.org

Assignments will be based on R throughout the course.

Students also have the option of obtaining the very useful software EViews. The 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

Course Description and objectives:

This is a challenging and extremely useful course that employs statistical techniques in developing forecasts for business data. The course begins with a description of what a forecast is and the tools necessary to evaluate competing forecasts. Various forecasting methods are introduced, and eventually, emphasis is placed on modeling the statistical properties of the data under consideration. Very early, we will discuss simple methods that are free of complicated modeling, including naïve forecasts, forecasts, based on averages, and exponential smoothing. 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 maybe to a lesser extent EViews and will be able to employ these tools to develop and analyze forecasts.

Grading: Course grades will be based on the following:
Assignments 30%
Group Project 14%
Midterm 28%
Final 28%

I. Assignments:
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 10% of your overall grade. Assignments will be administered (and collected) on the following dates (dates are potentially tentative):

a. Assignment #1: Administered: January 31 Due: February 7
b. Assignment #2: Administered: February 21, Due: February 28
c. Assignment #3: Administered: April 4, Due: April 11.

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 arrive late to class on any of the above dates FOR ANY REASON. 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. Regrettably, students that do not turn in their assignments at the start of class on the dates listed above will receive a zero on that problem set.

To begin assisting you in working with others in the class, one of the assignments can be completed as a group project. I will provide clear instructions on which assignments can be completed with collaboration. Otherwise, working with others on the assignments, in any capacity, is not allowed. For individual assignments where collaboration occurs, the offending student will automatically be referred to the Office of Student Misconduct with the minimum recommendation that the student receive a 0 on the assignment in question. Please refer to the statement at the end of the syllabus regarding violations of the University Honor Code.

II.   Group Project:
By hopefully the start of the third month of class, groups of about 4-5 students will be formed. Each group will select a single series to forecast using all of the methods developed by the end of the semester. Group presentations are scheduled for April 25 or May 2. Additional details on presentations will be given throughout the course.

III.   Exams:
Exam 1: Scheduled for March 6, 2018
Exam coverage: determined by pace of the course.
Final Exam: Dec 9, 8:15-10:45 pm
Exam coverage: Again determined by the pace of the course.

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

At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which include establishing course-specific policies on attendance. As the instructor of this section, formally, attendance is not mandatory. You may have been successful in previous courses with intermittent attendance supplemented by reading the textbook. Unfortunately, this course will not lend itself well to that strategy. Due to the technical nature of the course and its difficulty, I do not anticipate that you will be successful without attending each class period. I understand the complexities that go along with a college schedule, especially for those that have significant responsibilities outside the classroom. However, if you feel that you may miss class even just on rare occasions, then I suspect you will find yourself struggling accordingly. Please feel free to discuss any specific concerns you may have.

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 to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

Non-Discrimination Policy: The University of Texas at 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/.

In my course, there will be at least two projects that must be completed individually. Working with others will not be allowed. Further, to the extent that it becomes necessary to use resources outside of class notes and the textbooks, proper citation must be adhered to at all times. For example, with proper attribution, one may include brief statements lifted directly from other sources within quotation marks. You should never quote entire paragraphs and for many assignments, direct quotation will not be appropriate anyway. If you are using another source for information that you are providing, proper citation must be given. Failure to do so results in plagiarism and is a violation of academic misconduct standards.

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:
Week 1 (Jan 17): Distribute syllabi and introduction to forecasting (chapter 1&4).

Week 2(Jan 24): Simple forecasting methods. Naïve forecasts, mean forecasts, and exponential smoothing (chapter 7 from Hyndman and Athanasopoulos).

Week 3(Jan 31): Exponential smoothing concluded, reviewing the linear regression model (chapter 2, main text). Problem set #1 distributed

Week 4 (Feb 7): **PROBLEM SET #1 IS DUE.** Linear regression model continued. Concept of stationarity introduced (chapter 2-3). Problem set #1 administered.

Week 5 (February 14): 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).

Week 6 (February 21): 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 #1 administered.

Week 7 (February 28): **PROBLEM SET #2 IS DUE.** Properties of ARMA models. Introduction to forecasting with ARMA models (chapter 6,7,8).

Week 8 (March 7). Exam #1.

Week 9 (March 21): Return exam #1. ARIMA models continued (chapter 7,8).

Week 10 (March 28): Introduction to stochastic trends. Dealing with unit roots (chapter 10).

Week 11 (April 4): Unit roots concluded. Dealing with seasonality. Introduction to SARIMA models (chapter 7-10). Problem set #3 is administered.

Week 12 (April 11): **PROBLEM SET #3 IS DUE**. In class exercise. (chapter 7,8).

Week 13 (April 18): Putting it all together. SARIMA models with trending. (chapter 7,8,10).

Week 14 (April 25): Introduction to multivariate methods (chapter 11).

Week 15 (May 2): Multivariate regression analysis. Contingency analysis. Vector autoregressions. (chapter 11). Review for final exam.
PRESENTATIONS TO BE HELD APRIL 25 AND/OR MAY 2.