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Syllabus
ECON 6218
Advanced Business and Economic Forecasting
Belk College of Business, UNCC
Spring 2019

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Instructor	: **Ercan Karadas**
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Office	: 227C Friday
Office Hours	: W 16:30 - 17:30 or by appointment (preferred)
Lectures	: 17:30 - 20:15, Room 801 (Computer Lab), Center City Campus

1 Course Description

Due to modern technology the amount of available data grows substantially from day to day. Successful companies know that. They also know that decisions based on data gained in the past, and modeled for the future, can make a huge difference. Proper understanding and training in time series analysis and forecasting will give you the power to understand and create those models. This can make you an invaluable asset for your company/institution and will boost your career!

Time series analysis and forecasting allows us to

- **see patterns:** we search for structures and patterns to describe time series data

- **model this data:** we want to explain the underlying process that generates the data

- **make forecasts:** we also study different ways to forecast future values or to research the effects of alternative scenarios.

Main course objectives:

- To develop the computer skills in R required to forecast business and economic time series data

- To learn about different ways in how you can handle date and time data in R.

- To visualize, clean and prepare your data in R.

- To obtain an understanding of common statistical methods used in business and economic forecasting.

- To gain insights into the problems of implementing and operating large scale forecasting systems for use in business.

The course starts with a through introduction to R programming language. In this section, the goal is to develop the necessary skills to perform statistical inference procedures and plotting in R. We will also learn how to write user defined functions and carry out simulations in R. Then we are going to proceed with advanced plotting features of R and we will put special emphasis on time series graphics. The second part of course starts with a review of multivariate regression in the context of time series data and then we will continue with learning how to decompose time series into different components (seasonal, cyclical, etc.) and how to smooth time series data using exponential smoothing. You will also learn about autocorrelation, stationarity and unit root tests. In the next part of the course, we look at univariate time series modeling techniques, which are known as ARIMA models. In the last part, we are going to extend our analysis to include a vector of variables as the object of study for forecasting purposes. If time permits, I will also briefly cover panel time series methods.

Prerequisites: ECON 6112.

2 Course Materials

- [**HA**] *Forecasting: Principles and Practice*, Hyndman, R. J., and Athanasopoulos, G. (2018), 2nd ed, OTexts (**Required**).

- [**SW**] *Introduction to Econometrics*, Stock, J.H., and M.W. Watson (2015), 3rd Edition Updated, Pearson Education (**Required**).

- [**LS**] *Lecture Slides* Computer-projected overhead lecture slides accompanying **SW** will be posted on Canvas (**Required**).

- [**JD**] *Econometric Methods*, J.Johnston & DiNardo, 4th ed., McGraw-Hill, 1996. (**Supplementary**)

- [**V**] *A Guide to Modern Econometrics*, M. Verbeek, 5th ed., Wiley, 2017. (**Supplementary**).

- [**P**] *Time Series and Panel Data Econometrics*, M. Hashem Pesaran, Oxford University Press, 2015. (**Supplementary**).

The ultimate resource will be my lecture slides [**LS**] which will follow [**HA**] and [**SW**] very closely most of the time. Last part of the course will draw materials mostly from Supplementary books listed above. But you do NOT need to buy any of these books. I will post the lecture notes and the required readings on Canvas.

Students are expected to have completed the readings ahead of class to facilitate class participation and discussion. You need to take this seriously to be able to make the most out of this class as we will cover a lot of advanced material in just one semester.

Class Website: I will post course related materials to the course Canvas page. Please, be sure to visit the course web page regularly, as all materials for the class, occasional messages and any changes in the schedule will be posted there.

3 Computer software

The course will make heavy use of the statistical software R. No prior knowledge of this programming language is assumed, it will be introduced in the first few weeks. It is essential to have a good command of R to complete this course successfully. Be familiar with R as soon as possible (if you are reading this syllabus before the first lecture, start now!). R has been increasingly being used in economics, finance and data science in both the academic and private sectors, so a good knowledge of R will not only help you in your homework assignments this semester but will also improve significantly your prospect in job search and getting in better graduate programs. Putting in a small amount of effort to learn R should serve you well in the future.

It is better if you have R installed on your computer. It is available for all major computing platforms: Windows, Mac OSX, and Linux.

3.1 Installation Steps

1) Download and install the R binaries for your operating system, accepting all the defaults:

   http://cran.r-project.org/

2) Go ahead and download Rstudio too, again, accepting all defaults:

   http://www.rstudio.com/products/rstudio/download/

3.2 Some Online Resources for R

Below provided some links to get you started with `R`.

1. **Basics.** A free interactive course covering the basics of R:

   https://www.codeschool.com/courses/try-r

   Another one:

   https://www.datacamp.com/courses/free-introduction-to-r

2. **Basics + Stats.**

   http://www.cookbook-r.com/

   and

   https://www.statmethods.net/index.html

4 Course Evaluation

Course Evaluation will be based on homework assignments, one midterm, one final exam, and a class project.

4.1 Homework Assignments

Problem sets will be assigned periodically throughout the semester. Problem sets will be a combination of theoretical exercises and empirical/computational/simulation exercises which you will do in `R`. Completion of the problem sets is extremely important because it is an essential element in learning the course content and preparing for the exams.

You are encouraged to work in small groups of size three at maximum and turn in a single solution set for the whole group. In order to prevent the free-rider problem among the group members, each week I will randomly select some of you to replicate your solutions using the podium computer.

You are expected to submit your problem set on time, meaning at the beginning of class on due date. Late submissions will not be accepted.

You will write and submit your solutions in R Markdown which I will teach you in the second week of the semester.

4.2 Exams

There will be one midterm and one final exam. Each exam could consist of three type of questions: i) multiple choice questions, ii) short answer questions, and iii) longer questions that require providing analytical solutions.

The exam content will be cumulative, but with an emphasis on the most recent material. All material discussed in the course is examinable unless stated otherwise.

A missed midterm exam will receive a grade of zero. The only exception to this policy is: you miss a midterm due to a serious medical emergency for which you notify me as soon as possible *before* the exam and you *must* provide a doctors note within one week of the exam). There is no make-up for the final exam.

No electronic devices other than basic calculators may be used during the exams.

4.3   Capstone Project

You are going to submit an applied econometric research project that relates to the material covered in the course. You will work on the project in groups of 2 students and present the findings of your research to the class at the final lecture(s) of the semester. Further information regarding the project will be provided after the spring break.

4.4   Grading

Your total score will be the weighted average of your scores from the problem sets, two midterms and the final exam according to the following weights:

Assessment	Weight
Homework Assignments	30%
Midterm	20%
Final	30%
Capstone Project	20%
Total	100%

Once your total score is calculated, your letter grade from the course will be determined by the following scale:

Letter	Percentile
A	30%
B	40%
C	20%
U	10%

Grades will be based solely on your total score. No extra work or additional credit can be assigned to improve your grade.

5   Miscellaneous Course Policies

- **Attendance**

  Class attendance and participation are expected and required. There will an attendance sheet circulating each class.

- **Classroom disruption:**

  Any classroom behavior that interferes with the instructor's ability to conduct class, failure to conform to the faculty members announced expectations for the classroom, or the ability of other Students to learn will be considered as **disruptive.**

  Examples of disruptive behavior in the classroom include, but are not limited to:

  - Use of cell phones or other electronic devices for voice or text communication in class, unless permitted by the faculty member.

  - repeatedly leaving and entering the classroom during class without authorization

  - making loud and distracting noises

  - monopolizing classroom discussions

  - talking when the instructor or others are speaking

  - exhibiting erratic, irrational behavior

  - persisting in speaking without being recognized

  - behavior that distracts the class from the subject matter or discussion

  - refusal to comply with faculty direction

  - making hostile remarks to or about other students in the class, other groups of people or the instructor

  - making physical or verbal threats to the faculty member or fellow classmates

- targeting individuals with disparaging comments because of their membership in a particular group

- **Communication with me**

  If you would like to meet me to ask your questions about the course material or the practice problems, here is the procedure you should follow:

  1. Drop in my office during one of my office hours (MW, 16.30-17.30). I would strictly prefer you come to my office hours. In this case, you don't have to email me in advance and this should be your default choice.
  2. Another option is to ask me your questions right after lectures.
  3. However, if these two don't work for you for some reasons, send me an email to make an appointment. In this case, here is the guideline:
     - You should send me an email at least **two days** in advance of the date that you are planning to schedule a meeting. I will NOT schedule a meeting for the next two business days following your email.
     - In your initial email you should **suggest three time slots** that would work for you and I'll try to pick one.
  4. Please do not send me questions via email.

- **Regrading**

  You may ask for a regrade within one week after the exam was distributed if you think your exam was graded incorrectly. If you ask for a regrade, you must email me explaining what specifically you view as having been graded incorrectly. I will then regrade your whole exam. So your score could go up or down.

- **Academic Integrity**

  Academic dishonesty in assignments, examinations, or other academic performance is prohibited and considered a violation of the student conduct. All students are responsible for knowing and adhering to the academic integrity policy of the university at: CODE OF STUDENT ACADEMIC INTEGRITY

6 Outline of the Course Content (Tentative)

Week	Topic	HA	Other Readings
1-2	Int. to forecasting and R	1	Notes, DataCamp
3	Time series (TS) graphics	2	SW 14.1-2
4	The Forecaster's Toolbox	3	-
5-6	TS Regression	5	-
7	TS Decomposition	6	P 16
8	Exponential smoothing	7	-
9-10	Forecasting with ARIMA	8	SW 14, JD 7
11	Dynamic regression	9	SW 15, JD 8
12	Volatility Models	-	V 8, P 18
13-15	Multivariate TS Models	-	SW 16, JD 9, V 9, P 21-2

7 Statements on Diversity and Disability Accommodations

Belk College statement on diversity
The Belk College of Business strives to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status.

University's statement on disability accommodations
UNC Charlotte is committed to access to education. If you have a disability and need academic accommodations, please provide a letter of accommodation from Disability Services early in the semester. For more information on accommodations, contact the Office of Disability Services at 704-687-0040 or visit their office in Fretwell 230.