Time Series Econometrics

Course Details

Course Title	Time Series Econometrics (ECO602M)
Prerequisite	None
Prerequisite to	ECO602W
Faculty	Justin Raymond S. Eloriaga
Term/Time/Room	Term 3 AY 2019 – 2020 / 18:00 – 21:15 (G01) Wednesday / Full Online

Course Description

This course is a rigorous introduction to the fundamentals of time series econometrics. In particular, this course aims to introduce students to the theoretical and empirical underpinnings behind the classical and modern forecasting methodologies with various applications to microeconomics and macroeconomics. This course starts with an introduction to the stochastic processes and the notion of a time series, differentiating non-stationary and stationary data and discussing the different classes of univariate stationary forecasting models such as the Autoregressive, Moving Average, and Autoregressive Moving Average. After which, the course shall generalize these constructs to the multivariate forecasting models such as the Vector Autoregression, Structural Vector Autoregression, and Vector Error Correction Models. Other topics such as advanced panel data models, non-parametric forecasting techniques, and other forecasting methods may also be dabbled into from time to time, depending on the progression of the class. These fall into the Brown Bag sessions outlined in the course timeline.

This course relies heavily on concepts that have been introduced in economic statistics and basic econometrics such as regression, probability density functions, hypothesis testing, and key classical linear regression model assumptions. Therefore, students enrolled in the course are expected to review their materials from the previous classes as these will be very helpful in understanding some of the ideas in this course. Excellent resources to review the necessary prerequisites are Brooks (2019) and Wooldridge (2016).

Course Objectives

This course is intended to achieve the following

1. Familiarize students with the classical and modern forecasting models that have shaped how we analyze economic markets and control economic quantities for the purposes of projection or scenario analysis.
2. Introduce students to univariate and multivariate forecasting techniques with applications to forecasting in microeconomics and macroeconomics.
3. Inculcate students with the skills necessary to comprehend and perform the state-of-the art econometric methodologies.
4. Enhance students' problem-solving, critical thinking, and analytical skills by using verbal reasoning, graphics, statistics, regression, and mathematics to evaluate economic problems and issues.

Course Learning Outcomes

See the table entitled Course Learning Outcomes. During the course, students are expected to improve their written communication, interpersonal communication, problem solving, numeracy, and teamwork skills. Students are also expected to develop their skills in computer programming and working with a programming language, namely, R. The course will try and introduce the language as easily and intuitively as it can. Students however are expected to review codes and explore other coding practices which may further advance their study.

Learning Outcome (ELGA)	**Learning Outcomes**
Intellectually Inquisitive	LO1: Identify the basic time series process by differentiating stochastic from deterministic, static and dynamic, stationary from non-stationary. LO2: Distinguish between the most fundamental stationary univariate forecasting approaches. LO3: Extend basic concepts to multivariate forecasting and relate necessary economic intuition whether in a structural or non-structural manner. LO4: Identify the best forecasting or econometric model to be used given a particular set of conditions, assumptions, or limitations. LO5: Apply basic forecasting techniques to model economic quantities and forecast in-sample.
Technically Proficient	LO6: Apply forecasting techniques to perform out of sample forecasts using a plethora of models with varying assumptions and results. LO7: Model changes in the economy by introducing innovations and disturbances. LO8: Functionally articulate forecasts and simulations in a palatable manner.
Agent of Positive Social Change	LO9: Identify key economic development issues where counterfactual scenarios may be implemented to determine the cost of policy.
Globally Competitive	L10: Explain in non-technical terms the essence of forecasting and communicate results in a palatable manner.

Learning Plan

An estimate of the topics covered per week are given in the table to follow and closely follows the flow in the lecture notes. As such, it is expected that the student continually refer to the notes in case they miss sessions or need to refresh on certain topics. Each week, we will meet synchronously for 45 minutes to 1 hour and 15 minutes. After this synchronous session, students are expected to watch the YouTube lectures on my channel and attempt answering the Problem Sets. Use the repeat button on the videos *liberally*.

Week	Topic	Learning Activities
0	*Review of Basic Econometrics*	
		Class Discussion
1	*Introduction to Time Series*	Problem Set 1
		Term Paper
		Class Discussion
2	*Moving Average and Autoregressive*	Problem Set 1
		Term Paper
		Class Discussion
3	*Naïve Forecasting and Forecasting Errors*	Problem Set 1
		Term Paper
		Class Discussion
4	*Box Jenkins Methodology*	Problem Set 1
		Term Paper
		Class Discussion
5	*Forecast Evaluation and Application*	Problem Set 1
		Term Paper
		Class Discussion
6	*Vector Autoregression (VAR)*	Problem Set 2
		Term Paper
		Class Discussion
7	*Structural Vector Autoregression (SVAR)*	Problem Set 2
		Term Paper
		Class Discussion
8	*Cointegration and Error Correction*	Problem Set 2
		Term Paper
		Class Discussion
9	*Vector Error Correction Model (VECM)*	Problem Set 2
		Term Paper
		Class Discussion
10	*Brown Box Topic 1*	Problem Set 2
		Term Paper
		Class Discussion
11	*Brown Box Topic 2*	Problem Set 2
		Term Paper
		Class Discussion
12	*Course Capstone and Model Combination*	Problem Set 2
		Term Paper
13	*Research Break*	
		Class Discussion
14	*Group Presentations*	Term Paper
		Paper Presentation

Assessment and Requirements

The requirements and their respective grade allocations are discussed in this section. The details of the assessments are also given.

Requirements and Breakdown

Student Assessment Items	Due Date	Weighting	Learning Outcomes
Problem Set 1	Week 7	30%	LO1, LO2, LO5, LO6, LO8
Problem Set 2	Week 13	30%	LO1, LO2, LO3, LO4, LO5, LO6, LO7
Empirical Paper	Week 14	40%	LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8, LO10

Grading System

96 – 100.0	**4.0**
90 – 95.99	3.5
84 – 89.99	3.0
78 – 83.99	2.5
72 – 77.99	2.0
66 – 71.99	1.5
60 – 65.99	1.0
Below 60	0.0

Remember that all graduate courses require a minimum credit of 2.0 and all undergraduate courses require a minimum credit of 1.0. Your grades are rounded off, not rounded *up* to the nearest two decimal place.

Details of the Assessments

Problem Sets Students will be given problem sets that tackle the application of the concepts and techniques that are currently being discussed in class or to be discussed soon. Students are expected to have read the appropriate references before tackling each problem set. These assignments are an individual effort. You are not allowed to consult with nor be consulted by your classmates. A grade of 0.0 will be given for reports that are suspected to be copies (in full or in part) of each other.

Your answers should be word processed (MSWord or Pages or LaTeX) and printed on A4-size or short bond papers (front side only). You can generate equations using the application MathType or the built in Equation Editors if you are using MSWord or Pages. It is the most convenient way to work in Word or Pages with mathematical expressions that have many Greek letters and may be useful for your homework answers. Google Docs is not recommended. Assignments are a mix of practical applications using R/Python/Eviews and mathematical proving or derivations.

You need to submit electronically (justin.eloriaga@dlsu.edu.ph) a pdf version of your word-processed assignment. PLEASE NAME the pdf file SURNAME_ECO602M_ProblemSetX. The deadline for electronic submission of the pdf copy is the Friday of the week of submission. Each person is also required to submit the problem set in the AnimoSpace portal for the course.

Empirical Paper Students are to submit a final empirical term paper which concerns any empirical study which is an application of lessons or concepts learned in class. Students are suggested to explore their respective research interests, whether it is in the field of microeconomics or macroeconomics. Other applications may also be explored. Students may opt to make the term paper individually or in pairs.

Students are to submit a concept paper on Week 10 of the term which contains the following

1. Brief Background of the Study
2. Research Objectives
3. Methodology

This concept paper shall be *peer reviewed* using AnimoSpace's peer review function. Give a half page review of what you think the paper you reviewed should improve upon. The professor will likewise review all papers and give a similar review. Please take these reviews into consideration as you build your final project.

At the end of the term, students are to submit a final term paper which contains everything in the concept paper in addition to the following.

1. Brief Review of Related Literature
2. Theoretical Framework
3. Results and Discussion
4. Conclusions

Students are expected to submit just a soft copy of the paper to justin.eloriaga@dlsu.edu.ph in addition to any codes used to generate the results and an excel file of the data used. The paper must be submitted in .pdf form. The deadline will be on the 14th week at a schedule announced by the professor. Each student is also required to submit the .pdf file of the paper on AnimoSpace. The criteria for grading the term paper is seen in the next page. I do not impose a specific format (i.e. Chapter I, Chapter II, Chapter III, etc.). You are all graduate students with the capability to write clearly and in the manner you see fit. I also have no prescribed length. Generally, I think a good term paper can be less than 10 pages in length (excluding references). Do not afraid to be novel in your approach, just do what you think is right. Excellent papers shall be *required* to submit their papers for presentation at the Philippine Economics Summit. Details on that will follow.

Each group shall be required to present their work to the rest of the class during the last meeting of the term. This group presentation shall comprise 15 percent of the total grade allocation for the empirical paper. The presentation should be at most 15 minutes per paper.

Bonus Seatworks Finally, there are two bonus seatworks available. These are not graded but act as bonuses to the problem set. The bonus seatworks are posted on AnimoSpace and are multiple choice or True/False questions. A twenty minute time limit is imposed. Up to a maximum of plus three percent to the final grade is attainable for each seatwork. It is encouraged that students answer the seatwork after they have accomplished the problem sets.

Learning Outcome/Criteria	Excellent (90-100)	Very Satisfactory (80-89)
Technical Sophistication	The review adequately covers all technical aspects needed to carry out the empirical methodology of the paper.	The review satisfactorily covers some technical aspects that are critically needed to carry out the empirical methodology of the paper.
Replicability	The authors did submit and fully documented data and provided log and other relevant files. No problems were encountered in replicating the results.	The authors did submit and fully documented data and provided log and other relevant files but some problems are encountered in replicating the results.
Clarity and degree of testability of hypotheses	The paper's hypotheses are testable and the all steps were taken to achieve the conclusion	The paper's hypotheses are testable but not all steps were taken to achieve the conclusion.
Application of Economic Theories	The paper adequately covers all technical aspects and is able to apply necessary foundations to the full extent.	The paper satisfactorily covers some technical aspects that are critically needed to carry out the empirical methodology of the paper.

Learning Outcome/Criteria	Satisfactory (60-79)	Needs Improvement (0-59)
Technical Sophistication	The review provides a minimal (many of the technical aspects are ignored) yet acceptable coverage of the technical aspects needed to carry out the empirical methodology of the paper.	The review is not helpful and totally irrelevant for carrying out the methodological objectives of the empirical paper.
Replicability	The authors did submit and fully documented data and provided log and other relevant files but there are a lot of problems in replicating the results.	The authors did not submit the dataset or failed to provide log files and other relevant files.
Clarity and degree of testability of hypotheses	The paper's hypotheses are non – testable	The hypotheses are in no way related to the paper's
Application of Economic Theories	The paper provides a minimal (many of the technical aspects are ignored) yet acceptable coverage of the technical aspects needed to carry out the empirical methodology of the paper.	The paper is not helpful and totally irrelevant for carrying out the methodological objectives of the empirical paper.

Learning Resources

The following are the main references of this course

- Brooks, C. (2019). Introductory econometrics for finance. Cambridge university press.
- Eloriaga, J. (2020). Time series econometrics.
- Enders, W. (2008). Applied econometric time series. John Wiley & Sons.
- Hamilton, J. D. (1994). Time series analysis . New Jersey: Princeton.
- Lütkepohl, H. (2013). Introduction to multiple time series analysis. Springer Science & Business Media.

Supplementary references include

- Dreyfus, G. (2005). Neural networks: methodology and applications. Springer Science & Business Media.
- McCandless, G. (2008). The abcs of rbcs. Cambridge, Massachusetts, London: Harvard.
- Wooldridge, J. M. (2016). Introductory econometrics: A modern approach. Nelson Education.

Contact and Consultation Hours

My consultation hours are every Friday from 6:00 pm to 7:00 pm and Saturday from 9:00 am to 11:00 am. Please set an appointment at least one day in advance. Meetings are usually held at the SOE Office Mezzanine Area but if an online Zoom meeting is feasible, that is preferred,

Department Approval

Syllabus prepared by

Justin Raymond S. Eloriaga

Approved by

Dr. Arlene B. Inocencio
Department Chair

Dr. Marites M. Tiongco
Dean