

BUS 306, Quantitative methods & dynamic forecasting

Department of International Management and Math, Fall 2018

Instructor : Sanja Dudukovic Ph.D. in Statistics
Classes : TUE/FRI 1:00 – 2 :15 PM, EC (LAC 5)
Professor : Sanja Dudukovic, PhD in Statistics
Email : Sdudukovic@fus.edu
Office hours: TUE/FRI 11:30 -12:30; TUE/FRI 16:00-17:00,
Wednesday: exceptionally and by appointment; Office 4 –LAC

Prerequisites: MAT201, grade C or above, ECN100; BUS326 recommended

Texts :

📖 Anderson D. at all: Statistics for Business & Economics 13 Ed Revised, Cengage, 2017
(Chapters 7,8,9,10,11, 13, 14, 15, 20)

Additional readings (Readings will be posted on the public drive: K/BUS306FALL2018)

📖 Newbold & Boss: Introductory Business Forecasting, South Western Publishing
Company, 2009 (Chapters 1, 2, 3, 4,);

📖 Box G. and Jenkins M: Time Series Analysis, Forecasting and Control (selected chapters), 1996.

Course description: Today's ever-changing business environment call for managers who can not only track macro environmental , market and industry linear trends, but who also can take advantage of emerging opportunities through sophisticated dynamic forecasting .The first part of the course provides inferential statistics as applied to dynamic and volatile business systems. It addresses population parameter estimation, hypothesis testing of mean and proportion differences, statistical quality control, analysis of variance. The second, computer based part, introduces statistical model building, Dynamic multiple regression analysis, Logistic regression and ARMA (Autoregressive Moving Average models), seasonal model building and dynamic forecasting. Internet business& economic time series are used to evaluate the model building methods.

As a byproduct, students will be able to conduct a month long research projects and use their cumulative knowledge in economics, finance , marketing and environmental science to establish the appropriate theoretical basis and business& economic context for the empirical analysis of the existing economic and business theoretical concept . They will ultimately empirically investigate relationships between theoretically-linked economic , business or environmental time series , by using statistical models and methods they had learnt in the class and present the research findings through a Power Point presentation and a research paper . Model-eliciting activities (MEAs) are usually given to students to work on in groups in a classroom setting. After students have produced a solution and written their reports, they share their solutions with the class. These presentations may lead to further class discussion and groups going back to re-examine and revise their models.

Learning objectives : Students are expected to know a) estimation theory main principles (CLT); b)how to apply sampling distributions in the case of population parameters estimation; c) how to state and test business hypothesis ;d) how to apply statistical quality control in survey analysis; f) model building steps and assumptions; g) how to make linear multiple regression models , seasonal models , dynamic regression models as well as ARMA -autoregressive moving average models and test their significance; h) how to integrate quantitative methods with business and economics by making a research paper using real data taken from internet. EXCEL, Views 10 and occasionally SPSS are used to substantiate computer empirical analysis.

Course Requirements: On a weekly basis students are asked to submit assignments. Assignments are assigned each class but are collected each Friday. Feedback is given within a week. **No late assignments** are accepted. Supplementary cases and some short research papers are assigned for reading and presentation. Students are also required to complete one month long research paper about economic or business models based on Internet data. Model-eliciting activities (MEAs) are usually given to students to work on in group. After students have produced a solution and written their PPT research reports, they

share their solutions with the class, which evaluates the results. These presentations may lead to further class discussion and groups going back to re-examine and revise their models. Revised results are graded by professor.

Attendance policy: Regular class attendance is necessary for good performance and is required. In the case of long illness official medical excuse should be provided. Non compliance will incur reduction of the final grade by at least 10%. Students who accumulate more than 4 absences regardless the reason are advised to withdraw from the course or they risk receiving an F grade for the course. Students are expected to arrive promptly for class. **There will be no make-up examinations.**

Grading policy:

Assignments /cases	10%
Quizzes	20%
Mid-term examination	25%
Final examination	30%
Research/presentation	15%

Academic Dishonesty and Professionalism: Please refer to Franklin's Statement on Cheating and Plagiarism in the Academic Catalog for the full description (page 217):

https://www.fus.edu/images/pdf/FUS_ACADEMIC_CATALOG_2018_2020_web.pdf. To summarize here: you are to do your own work. Behaviors such as copying the work of others, self-plagiarism using third-party services, or any other circumvention of doing your own work are dishonest and not acceptable in this class or at this institution.

Students should strive to be "professional" in their conduct in the class, treating fellow students and the instructor as they would respect co-workers in a job setting. Students are encouraged to collaborate in advance of completing any assignment, but they should independently conduct any analyses and produce original written reports of any results or answers. I.e., all final written products must be your own original work. Students are expected to arrive promptly for class.

Teaching methods: In addition to teaching-learning methods based on textbooks and cases, within the course new methods are used when appropriate: problem based learning (PBL) and interactive engagement (IE) learning methods. When PBL method is applied, students are given a problem before gaining some knowledge. The problem is posed in such a way that the students discover that they need to gain some new knowledge before they can solve the problem. If IE method is applied, during and after the lecture students do activities in which their lecture-learning is strengthened (by reinforcement) and extended (by application in different contexts). Thus some elements of a student's previous knowledge are becoming stronger and more profound due to its application, while their overall knowledge is becoming broader due to the new ideas-and-computer based skills they are learning from the exploratory extension (where exploration involves extending old knowledge beyond simple application). Three software products are used: Excel, SPSS and E –Views. Solved class problems will be posted on the public drive: K/BUS306/Fall2018.

Active learning & Class assessment: There will be several short tests at the end of the classes. These tests will not be announced in advance. They serve to assess students learning during the classes and will not be graded.

Students with Disabilities: If you have a physical, psychiatric, or learning disability, and require accommodations, please let the professor know within the first two weeks of the semester so that your learning needs can be appropriately met.

Research topic will be determined with the professor on individual basis right after the travel break. (See below detained requirements).

Class schedule:

- Week1: Normal distribution review
 - Central limit theorem and Sampling distributions
 - Sample means – X bar distribution
 - Sampling distribution – probability calculations
- Week 2 Interval estimation and confidence interval
 - The case of population mean, population proportion

- (Sample means and sample proportions)
- Week3: Sample size calculation
Confidence interval -Small sample case
Estimation properties of an estimator
Introduction to hypothesis testing
Population mean testing
- Week4: Population proportion testing
Quiz 1 (September 21)
(Chapters 6, 7, 8 and 9)
- Week5: Hypothesis testing and applications
Tests involving population mean differences
Tests involving population proportion differences
Real world examples in outcome assessment (survey analysis)
- Week6: Statistical Quality Control
Population mean and proportion control
- Week7: ANOVA applications in business by using SPSS and Data Analysis Add-In or XLSTAT Add-In
Midterm exam (October 12)
(Chapters 7, 8, 9, 10, 13 and 19)
- Week8: Business forecasting –model building review
Linear regression- review Coefficient of determination
Multiple Regression assumptions
Regression estimation using Linest and selected Internet data
- Week 9 Model building using real data from Internet, Macrobond and
Using Eviews
Model Testing: t-test and F test
- Week 10 Linear and Dynamic Regression in practice
Introduction to dynamic models
Real Business cycles, Franklin enrollment forecasting
CPI –the case of Switzerland
- Week11: **Quiz 2 –November 20;** (Chapters 14 and 15 and 16)
Time Series Analysis –Additional Readings and notes
Identification tools (Box-Jenkins)
Autoregressive models using Eviews
Comparison of dynamic and static models using real world data from Internet
ARMA model testing: Box-Pierce test
Autocorrelation function of residuals.
- Week12: Work on project class .Integration with Business and Economic models
Research project presentations
- Week 13: Research project presentations-2
Final Review

Final exam (Cumulative): Tuesday, 11 Dec 18:30-20:30 , EC, LAC

BUS 306 -Quantitative methods & Dynamic forecasting Research Paper Requirements –Fall 2018

"Business & Economic forecasting by using Dynamic Multiple regression and Time Series Analysis "

The task is to use the dynamic modeling techniques (Multiple regression, Autoregressive models, Logistic regression) you will learn in the second term: to test how the theoretical concepts in finance, marketing and economics matches reality. You are also required to choose one long time series, which is not seasonally adjusted and make and interpret its Autoregressive Moving Average Model.

Use your cumulative knowledge in economics finance, marketing and sport management to establish the appropriate theoretical basis and business & economic context for your empirical analysis. You are supposed to find at list three scholar articles dealing with the topic you have chosen to investigate. Please come to me to get a topic approval.

After choosing a research concept you want to test ,you need to choose several business, economic or financial time series which theory suggests are closely related (although the direction of causality may be ambiguous). Download updated Time Series from the Internet or Macrobond. Each time series has to have at least 60 observations.

Some linear regression examples are listed below but you are welcome to come up with your own. Originality will be rewarded:

Business Cycle Models
Country Risk Models
Monetary Policy models
Interest rate Spread and its determinants
Exchange rate determinants
Imports, GDP and exchange rate
Dynamic Okun's law
Dynamic Philips curve
Predicting customer churn
Share price index and consumer price index (test whether stock market investment is a good hedge against inflation, etc.)
CAP model
Price/Share forecasting model
Economic Growth model
Bankruptcy determinants

Two method you should use:

- Use LINEST or Eviews to make Multiple Linear Regression or Dynamic Regression models and test them by using t and F tests.
- Use AR , seasonal AR or ARMA Models , appropriate identification tools (Autocorrelation and partial autocorrelation function); Use Eviews software to estimate model parameters and coefficient of determination; Use autocorrelation function to test residuals by using Q test

Instructions and Deadlines

- Presentation Date Due: November 30
- Dead line for group topic and data approval based on EXCEL template: November 20.
- Individual Research paper date due: the last class December 7.
- The project accounts for 10% of your total course mark.
- Word limit = 2500 (excluding tables and diagrams).

- Treat this assignment as a draft of an undergraduate journal article.
- All tables and graphics should be integrated with the text - Choose Representative and important information.

Additional Comments

- Use your cumulative economics knowledge and any relevant literature to establish the appropriate theoretical basis and economic context for your empirical analysis. You are supposed to find at list three scholar articles dealing with the topic you have chosen to investigate. Please come to me to get a topic approval. A significant proportion (5%) of the mark will be dependent on your economic analysis and argument through the paper.
- After choosing a research concept you want to test ,you need to choose several business, economic or financial time series which theory suggests are closely related (although the direction of causality may be ambiguous). Download updated Time Series from the Internet or Macrobond . Use monthly, quarterly and yearly data, over as long a time period as possible (at least 60 data points).
- Make use of all the relevant statistical modeling you have learned in the class and you have read about from the books and articles.
- Remember (and use!) the typical, research paper structure and proper referencing, presentation

Useful addresses for historical data:

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<https://fred.stlouisfed.org/>
<http://www.economagic.com>
<http://pwt.econ.upenn.edu/>
<http://cdiac.esd.ornl.gov/>
<http://www.mixmarket.org/>
<http://www.rug.nl/ggdc/productivity/pwt/>
http://pwt.econ.upenn.edu/php_site/pwt62/pwt62_form.php
<http://rfe.wustl.edu/>
<http://rfe.wustl.edu/Data/USMacro/index.html>
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html
<http://www.gpoaccess.gov/eop/tables04.html>
<http://www.nber.org/cycles/hall.htm>
<http://www.lib.umich.edu/libhome/documents.center/stecon.html>
<http://research.stlouisfed.org/fred2/> ;
<http://www.stls.frb.org/fred/>
<http://ssdc.ucsd.edu/gpogate/erp2000/>
<http://www.forecasts.org>
<http://www.hussmanfunds.com/html/datapage.htm>
<http://www.bos.frb.org/economic/nee/neeidata.htm>
<http://www.clevelandfed.org/Research/data/index.cfm#>
<http://lmi.state.oh.us/PROJ/LeadingIndicators.htm#EconomicBulletins>
<http://finance.yahoo.com/bonds>
<http://www.helsinki.fi/WebEc/webecc8d.html>
http://www.gold-eagle.com/gold_digest_99/crimi032399.html
<http://www.globalfinancialdata.com/index.php3>
<http://datacentre2.chass.utoronto.ca/pwt/alphacountries.html>