**Forecasting and Time Series Analysis, BIA 6315S**

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Course Description

Forecasting is used to predict the future events or conditions. Therefore it allows us to make better decisions with low uncertainty. The primary objective of this course is to deliver the students with an understanding of the fundamentals of forecasting and its applications in the economic and business environment. The basic regression, time series econometrics, model building and specification, and hypothesis testing will be reviewed, followed by in-depth examination of various modern forecasting techniques used in economics and business. The course will conclude with a final presentation that is purpose built for solving a real business problem related to forecasting.

Required texts

* Forecasting: Principles and Practice (Rob J Hyndman and George Athanasopoulos) (FPP)
* Time Series Forecasting with R: A Hands-On Guide (Galit Shmueli and Kenneth C. Lichtendahl Jr) (TSF)

Other articles and suggested readings will be made available on Blackboard.

Learning Objectives

The goals of this course are that the students will:

* Understand role of forecasting in business
* Obtain skill in using statistical forecasting models
* Gain familiarity with features of time series such as
  + Autocorrelation
  + Exponential smoothing and differencing
  + Seasonality
* Use regression models, understanding how to deal with
  + Trend
  + Seasonal variables
  + Lagged variables
  + Autocorrelated errors
* Gain familiarity ARIMA models
* Get exposure to advanced forecasting techniques and time series topics

Evaluation

The student’s final grade will be determined as follows

* Six assignments worth a total of 300 points.
* Final Project: 100 pts <= 75 points for presentation, 25 points for documentation
* Discussion Participation and final project feedback: 100 pts.

**Total Points: 500 pts.**

Grading Scale

A = (4.0) – 90-100%  
B+ = (3.33) – 85-89.9%  
B = (3.0) – 80-84.9%

C = (2.0) – 70-79.9%

F = (0.0) – Less than 70%

Session 1 – August 23

Learning Objectives

* Review of relevant statistical concepts
* Introduction to time series and forecasting concepts
* Residuals and forecasting accuracy
* R forecasting tools

Recommended reading

* TSF: Chapters 1, 2, 3
* FPP: Chapter 1, Parts of Chapter 2

Assignments

* Assignment 1 – due August 30 at 5:45 pm.

Session 2 – August 30

Learning Objectives

* Introduction to autocorrelation
* Understand seasonality and cyclicality
* Examine special cases of white noise, random walks and drifts
* Learn to decompose time series data

Recommended reading

* TSF: Parts of Chapter 6, Chapter 7
* FPP: Parts of Chapter 2, Chapter 6

Assignments

* Assignment 2 – Due September 6 at 5:45 pm

Session 3 – September 6

Learning Objectives

* Refresh understanding of linear regression techniques, simple and multiple
* Comprehend implications of time series for regression including trends, lagged regressors, and residual diagnostics

Recommended reading

* TSF: Parts of Chapter 6, Chapter 7
* FPP: Chapters 4 and 5

Assignments

* Assignment 3 – due September 13 at 5:45 pm

Session 4 – September 13

Learning Objectives

* Understand transformation and adjustments such as exponential smoothing, Box-Cox transformations, etc.
* Understand the concept of stationarity and the implications
* Learn tools and techniques to address stationarity issues: differencing, unit root tests, backshift notation.

Recommended readings

* TSF: Chapter 5
* FPP: Chapter 7

Assignments

* Assignment 4 – due June September 20 at 5:45pm

Session 5 – September 20

Learning Objectives

* Gain experience with estimating ARIMA models both seasonal and non-seasonal models
* Understanding order selection
* Understand relationship between ARIMA and ETS

Recommended readings

* TSF: Parts of Chapter 7
* FPP: Chapter 8

Assignments

* Assignment 5 – due September 27 at 5:45pm

Session 6 – September 27

Learning Objectives

* Introduction to dynamic regression including regression with ARIMA errors and Fourier terms with seasonality
* Gain an understanding of advanced forecasting topics such as cross-validation, complex seasonality and forecasting proportions

Recommended readings

* FPP: Chapter 9

Assignments

* Assignment 6 – due October 4 at 5:45pm

Session 7 – October 4

Learning Objectives

* Introduction to additional advanced topics including logistic regression, neural networks, vector autoregression and forecasting hierarchical or grouped time series.
* Understand various case studies and applications

**Recommended readings**

* TSF: Chapter 8, Chapter 9

Assignments

* Prepare for final presentation

Session 8 – October 11

Learning Objectives

* Present final presentations in class
* Give feedback on presentations of others

Assignments

* Documentation – due October 15 at 11:59pm

**Online Wall Street Journal Subscription**

All Helzberg School of Management students are given an online subscription to the Wall Street Journal.  Using Google Chrome students can sign-up for the online journal at <https://accounts.rockhurst.edu/wsj/> (use your Rockhurst username and password).  Access to your online journal is at [www.wsj.com](http://www.wsj.com).  Should you have questions or problems contact the Helzberg School front desk (C201) at x4090 or email [lynn.ross@rockhurst.edu](mailto:lynn.ross@rockhurst.edu).  The customer service number for the online journal is 800-369-2834 or [onlinejournal@wsj.com](mailto:onlinejournal@wsj.com). Student guides can be found in C201.

**Academic Honesty Policy:**

Plagiarism and cheating will not be tolerated. The Rockhurst University Catalog provides examples of academic dishonesty and outlines the procedures, penalties, and due process accorded students involved in academic dishonesty. All infractions will be immediately referred to the Dean's office.  In your research paper, make sure you provide citations for all ideas and information that are not your own. This includes *copying, or the offering, requesting, receiving or using of unauthorized assistance or information in examinations, texts, reports, computer programs, term papers or other assignments*.

**Undergraduate Policy:**

<http://catalog.rockhurst.edu/content.php?catoid=8&navoid=380#Academic_Honesty_Policy>

**Graduate Policy:**

<http://catalog.rockhurst.edu/content.php?catoid=9&navoid=452#Academic_Honesty_Policy>

**Helzberg School Student Complaint Process**

Students who feel that they have a nontrivial complaint, either academic or nonacademic, should contact either Paul Nunez, Director of Undergraduate Advising, or Matt Honeycutt, Director of Graduate Advising, for guidance on submission.

**Course Assessments:**

Rockhurst University and The Helzberg School are committed to a comprehensive, ongoing assessment process. On occasion students will be expected to participate in aspects of this program so that the institution can document its strengths and identify opportunities for improvement. Student involvement is integral to the University’s success in this endeavor.

**ADA Statement**

RU official policy: “Rockhurst University is committed to providing reasonable accommodations for students with disabilities. Please contact Sandy Waddell, Director, Access Office (Massman Hall Room 7, (816) 501-4689, [sandy.waddell@rockhurst.edu](mailto:sandy.waddell@rockhurst.edu)) to provide documentation and request accommodations. If accommodations have already been approved by the Access Office, please communicate with the instructor of this course regarding these arrangements by the second week of class in order to coordinate receipt of services.”

**Student Resources**

In keeping with our commitment to *cura personalis*, “care of the whole person,” Rockhurst University provides a variety of programs and services beyond those of the Helzberg School of Management that are designed to support you as you pursue your education and navigate challenges, both expected and unexpected.  These include, but are not limited to: the Dean of Students Office, Dining Services, Bookstore, Counseling Center, Career Services, Access/Disability Services, Campus Ministry, Student Health Insurance and Clinic, Student Organizations & Greek Affairs (alumnus advisors), Athletics/Intramurals/Workout spaces, International and Multicultural Student Services, Security, Financial Aid, Student Accounts, Computer Services, The Registrar, The Library, Service Learning, and the Learning Center.  For information on any of these, please visit the University’s website at [www.rockhurst.edu](http://www.rockhurst.edu) – or call/visit Student Development at 816-501-4030 or Massman Hall, Room 1.

**Crisis Management**

The Crisis Management Team for Rockhurst University, out of a concern for the safety and welfare of all community members, urges you to familiarize yourself with Campus Emergency Procedures as well as emergency, evacuation, and shelter signage located within and outside of buildings across campus.  They also request that you sign up for Rock@lerts, the University’s emergency communications system.  All community members must comply with University staff instructions during regularly scheduled fire/tornado drills as well as actual emergencies.  Information regarding the above resources can be found at [www.rockhurst.edu/emergency](http://www.rockhurst.edu/emergency).

**University Communication with Students**

Clear and timely communication allows students to receive information related to policies, programs, events, and other practical matters (i.e. billing, grades, etc.) affiliated with their education at Rockhurst. The University has established several key routes for communication with students including:

* Rockhurst E-mail Account: All Rockhurst students receive a University e-mail account. All e-mail communication from the University is directed exclusively to the Rockhurst electronic mailbox system. Students are expected to access their e-mail account on a regular basis (daily is recommended) in order to stay abreast of important and time-sensitive information. University departments, faculty, and staff will routinely use e-mail to communicate important campus, academic, and extra-curricular/co-curricular information. It is the responsibility of each student to clean their e-mail boxes to allow capacity for incoming messages (i.e. empty deleted items, keep a limited number of sent items, etc.). For further information on your Rockhurst e-mail account, please see Computer Services (Conway Hall 413; x4357; [*www.rockhurst.edu*](http://www.rockhurst.edu/)).
* Addresses and Phone Numbers: Students are required to maintain accurate local, billing, permanent, and emergency contact information so that attempts to communicate by the U.S. Postal System as well as phone will not be impeded. To make changes to your addresses or phone numbers of record, please visit the Rockhurst website ([*www.rockhurst.edu*](http://www.rockhurst.edu/); Rockweb section under Registrar) or contact the University Registrar (Massman Hall 110).
* Campus Mailboxes: Undergrad Students who live in Rockhurst’s residence halls and Townhouse Village are assigned a campus mailbox located in Massman Hall where U.S. Postal Service mail and other University communications are delivered. For assignment inquiries please connect with Residence Life (Massman Hall 3) and for mailbox malfunctions please speak with the Mailroom staff (Massman Hall, Lower Level).