



THE ROBERT DAY SCHOOL
CLAREMONT MCKENNA COLLEGE

Economics 123
Fall 2015

Quantitative Data Analysis
Course Outline

Dr. M.W.Keil
Bauer 315

Course #	Lecture Times	Exams
Econ 123	Sa 9:00-12:00 Sa 13:00-16:00 every week	every Sa 9:00-10:00 no final
Office Hours	Sa after 16:00 every week	or by appointment

<u>Meeting Dates:</u>	September 5:	Intro/Excel/STATA (Manfred Keil)
	September 12:	STATA (Manfred Keil)
	September 19:	Python (Sean Adler)
	September 26:	Python (Sean Adler)
	October 3:	SQL (Will Dodds)
	October 10:	SQL (Kevin Williams)
	October 17:	Big Data (Brian Kriegler)

There is a possibility that we will have an additional lecture on Big Data & Google Auctions (Hal Varian).

Textbook and Software

There is a textbook for the Python part of the course, and a STATA tutorial.

Downey, A. (2012): *Think Python: How to Think Like a Computer Scientist*. Needham, MA: Green Tea Press. <http://www.greenteapress.com/thinkpython/thinkCSpy.pdf>

Keil, M. (2015): *STATA 13 Tutorial to Accompany Introduction to Econometrics by James H. Stock and Mark W. Watson*

I have placed both documents into your Resource folder in Sakai.

All programs we will use are free, with the exception of STATA. You have two options to acquire STATA: the STATA/IC version can be “rented” for \$69 for one semester from the STATA website, or you can use the 30 free trial version (for details, read the first few pages of the STATA tutorial and see below). However, most likely you will use STATA for your final project, and you must have a version of STATA ready for use on September 5 (first class).

Learning Objectives

At the completion of this course, students will

- be able to analyze economic and financial data and present its inherent features;
- have a working knowledge of simple and advanced data analysis, including regressions;
- work with statistical packages and programming languages commonly used in the business and government sector;
- be able to test theories, evaluate policies, and forecast.
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Prerequisites

Econ 50; Econ 101 or Econ 102; Econ 120 or equivalent (can be waived by instructor)

Grading Criteria:

Participation	25%
Short Examinations	50%
Final Project	15%
Exercises	10%

Expected work load: 18-22 hours per week (including lectures).

As a rule, there is no “incomplete grade” in this class.

p.m. In general, I will most often fly into the San Francisco/Silicon Valley area on Friday, and will return to the Greater Los Angeles area on Sunday. As a result, I can meet with students after 4:45 p.m. on Saturdays, or if you feel the need, Sunday mornings. We will also try to organize some Saturday evening event(s).

The idea for this course came to me in January 2013, while visiting Washington, D.C. for an advisory board meeting. I stayed for an extra day to catch up with five former

CMC/SCR students who we had placed with the Federal Reserve Board in D.C. and the Urban Institute (subsequently one of your alumnae left the Fed to work at Google, and another graduate from SCR joined the Fed in 2013; see also the CMC Magazine story on this). All of these students had worked for me as Research Assistants in the Lowe Institute/CMC as part of the UCLA-Anderson School/CMC Inland Empire Forecast Project. Most of them had been either my senior or junior student managers. Going with these five former students for dinner, I brought up the question: “if we, at The Claremont Colleges, could make one change to the curriculum to improve the probability of placing more students with the Federal Reserve, what would it be?” The unanimous answer was “programming.” This has been echoed during dinner conversations with alumni both in SoCal and NorCal. Subsequently many of your peers at CMC have started to take programming courses at HMC (106 of them during the Fall Semester 2013 and over 200 for the Spring Semester 2015); it has become clear to an increasing number of students that in order to succeed in this information society, you will have to be able to program/code. While you can learn programming by taking a CS course, ECON 123 will add to this trend by teaching you a variety of programming languages using economic and business applications; most importantly, this is a programming course for non-CS majors.

For the Fall 2015 semester, you will be exposed to SQL, Python, and STATA (after doing some introductory work in Excel). We may also have a presentation by Hal Varian, the Chief Economist at Google. If that happens, he will give you an idea on how Google uses data analysis in its environment. Dr. Varian is one of the top economists in the world and many of you will use his textbook in Microeconomics. He left his academic appointment at UC Berkeley to work for Google. Clearly there were other possibilities of exposing you to a variety of different programming languages and statistical packages (SAS, SPSS, R, EViews, Gauss, MATLAB, etc.). We will evaluate the choice made for the spring semester at the end of the term.

The Economist recently ran several interesting stories about Economics and Silicon Valley. I will send you copies in the Announcement folder soon. I found the following quote remarkable: “Tech giants like Google, Facebook and LinkedIn all hire economists. It means those drawn to the subject ... by the lure of Wall Street might be better off shifting track, twinning economics with coding rather than trading.” (The Economist, “Economics Evolves: A Long Way from Dismal.” January 10th, 2015, Leaders.

Let me emphasize that you cannot learn computer languages/statistical packages in a one-to-two weekend session. It is similar to learning a real language such as German, meaning, it requires practice to master the language or you will forget quickly what you learned. However, by talking to some of your peers at The Claremont Colleges and CMC alumnae/alumni, I have realized that many of you are quite good at acquiring this knowledge on your own as long as you had some useful initial introduction to the topic. For example, there is a course for Python at the Kahn Academy, and they recently added “SQL for 12-Year-Olds” if you are interested. ECON 123 is supposed to give you this initial introduction

with the expectation that you will go deeper into these languages/packages when you consider further applications, either while at work or at college.

With the exception to the two weekends where I teach STATA, I view myself more as a co-ordinator than an instructor. We will bring in alumni the other weekends. Will Dodds'13, who received a full ride in the Economics Ph.D. program at Stanford will, be in charge of SQL, and Kevin Williams'08, who is a Ph.D. Student at UC Davis and worked as a programmer at Atlassian before, will give you the introduction to SQL. Sean Adler'13, who stayed at CMC for the fall semester 2013 to complete a double major in Economics-Computer Science, will work with you on Python. Sean, who was my econometrics tutor, was heavily involved in the CMC computer club, and now works at Counsyl as a Software Engineer. Brian Kriegler'01 graduated from CMC with a degree in Mathematics-Economics. He went on to get an M.S. and Ph.D. in Statistics from UCLA and is currently the Managing Director of Econ One. Differently from my econometrics course at CMC, I will present forecasting/time series techniques in STATA, after a review of regression analysis.

There will be a tutor for the course. Nina Kamath took Econ 123 during the fall semester 2014, and works as an RA at both the Lowe Institute and the Rose Institute/CMC. Nina also completed Econ 125 as one of the top students and hence will be able to help you with regression analysis questions. We will set up two hours per week where you can be in touch with her via Fuzebox or some other video device.

The **purpose of this course** is to give you the ability to use different quantitative tools and techniques to analyze data and to present your findings. You will get a working knowledge of statistical theory and procedures, including both descriptive statistics and statistical inference. The course also provides you with the necessary background for more advanced data analysis. Examples from various business and economics applications will be studied throughout the course.

Project:

At the end of the semester, you will choose an interesting topic of your own and write up your findings in a formal paper. You will use techniques studied in the lectures, or reach out for new topics, depending on your interests. I want you to show off what you have learned here. Use some of the programming languages you encountered and show me how these can be applied to data analysis. This is a group project involving three or four students. I will determine the group composition after the first week of the semester. It will reflect students with a variety of knowledge in computing and statistics.

The final paper will give you a chance to integrate the expertise acquired during the semester and exhibit it in its best light. I hope that, because of applying statistical techniques in the context of a topic that you are excited about, you will remember these better. Show me

that you can be imaginative in finding your own topic.

Software

You will be using different types of software for the course. Some of these, such as *Python* and *SQL* are free for you to download. I will give you instructions before you have to use that software for the upcoming Saturday.

Some of the software you will have to purchase, although using a student version will make this quite inexpensive.

STATA

This is the most commonly used statistical software package in economics and finance. All econometrics instructors including myself use it in Econ 125. STATA will be essential for your subsequent work in advanced courses and for your senior thesis.

STATA runs on the Windows (2000, 2003, XP, Vista, Server 2008, or Windows 7), Mac, and Unix computers platform. It is produced by StataCorp in College Station, TX. You can read about various product information at the firm's Web site, www.stata.com. There are 19 manuals that can be purchased with STATA 13, although subsets can be bought separately. Perhaps the most useful of these are the *User's Guide* and three volumes of the *Base Reference Manuals*, but everything is available for free through the help function. You can order STATA by calling (800) 782-8272 or writing to service@stata.com. In addition, if you purchase the Student Version ("GradPlans"), you can acquire STATA at a steep discount. Prices vary, but you could get a "perpetual license" for STATA/IC for \$189, or a six-month license for as low as \$69.

For our course, you will have to purchase at least the six-month license, and we will use it for weekends 1-2. Go to <http://www.stata.com/order/>, then click on "United States" followed by "Educational." Next click on "Single User" and type in "Claremont McKenna College" in the next frame. Next order "Stata/IC" for the 6 months version.

