Lutz Kilian
Fall 2008

Economics 407: Financial Econometrics

Lecture:	Monday/Wednesday 4:00AM-5:30PM in Lorch 173.
Office hours:	Monday 5:30PM-6:30PM in Lorch 309.
First Day of Class:	Wednesday, September 3.
Last Day of Class:	Monday, December 8.
Email:	lkilian@umich.edu.

Requirements:

The course covers topics in time series analysis with an emphasis on applications rather than statistical theory. The aim of the course is to equip students with a working knowledge of important econometric techniques used in macroeconomics, international finance, and financial economics. Substantial emphasis will be placed on the development of programming skills in MATLAB (a matrix algebra program). Regression analysis will be conducted primarily in matrix notation.

This is not a finance course; I will not teach you how to succeed as a trader or how to make money. Rather the emphasis is on understanding and learning how to apply the econometric tools used by academics and practitioners working in these areas. The course will be helpful for anyone interested in pursuing a graduate degree in a quantitative field, but equally helpful for students interested in working at research institutions or financial institutions. Rather than focusing narrowly on the application of econometric tools in finance, I will try to convey a deeper understanding of the most important tools used in applied time series analysis, their proper use and their limitations.

Students taking 407 are expected to have completed 405. They must have completed or take concurrently 406 (or equivalently 503). I will take for granted a thorough understanding of the material taught in 405. Unlike in 406, my focus will be on time series analysis, making 406 and 407 somewhat complementary. In addition, I will take for granted a good understanding of matrix algebra and calculus. If you are not familiar with matrix algebra, I recommend that you delay taking 407 until you have completed a course in matrix algebra. 435 is not required for 407, but may be helpful. The same goes for 402, 442, and related macroeconomic courses.

Grading:

There will be no midterm or final exams in this course. Course grades for Economics 407 will be based on a course paper (33%) and regular homework assignments (66%). This may not sound like much, but this course is quite work-intensive and will involve long hours in the computer lab. You should anticipate that this course is likely to be the most time-demanding course you will experience as an undergraduate. If you do not have the time to give this course your full attention, you may want to take the course at some other time.

The problem set questions will be made available on ctools. They typically will consist of programming exercises in the matrix algebra software MATLAB. They may be prepared in groups of up to three students, but must be handed in individually. Please indicate the other group members, as applicable, and include all of the code along with your written interpretation of the results. Problem sets will be graded on a scale of √+, √, √-, and fail. There will be no extensions.

All problem sets for this course must be coded in MATLAB. There are no exceptions. One of the aims of this course is to make you proficient in MATLAB programming, so you can tackle new challenges on your own. MATLAB is used extensively among practitioners and among researchers and is indispensable for your career whether you plan to go to Wall Street, the Federal Reserve Board or a research institution. It might not be the only software you will have to master, but it will be the most useful and versatile software. MATLAB is available on UNIX through ITD (http://www.itd.umich.edu). It is also available at various locations on campus. Please contact ITD as soon as possible to set up a UNIX account and/or to find out where you will have access to MATLAB. For plotting results, only a PC will work.

The term project involves identifying an econometric technique and applying it to financial or macroeconomic time series. You will write MATLAB code implementing this technique. The code should be well documented and accompanied by a readme-file with instructions, by a description of how this technique works and what it accomplishes, and an empirical application to actual data. The empirical application may replicate some findings in the literature, but it has to be of substantive interest. The empirical analysis should be concisely written and clearly spell out the question of interest and the findings. You may also substitute a methodological question for the empirical application. All topics are subject to my approval. The papers are due by December 17 at 8:00AM without fail. Please drop them off at my office.

The course paper should not exceed 10 pages in length. The format of the papers should adhere to the standards required for submission to an academic journal (including a separate title page with an abstract summarizing the paper; a complete list of references; a list of data sources). The presentation should be explicit enough for a classmate to be able to replicate all results. Data sources must be documented and modeling choices should be defended. You should clearly explain what the research question is, why the question is interesting, and what you have learned.

You may find it useful to consult my homepage for examples of the format of unpublished papers. A short, but polished paper is vastly preferred to a longer, but shoddy one. Papers must not be co-authored.

Readings:

Upon reviewing possible choices for textbooks, I discovered that no book adequately covers the material I have in mind. Hence, I will draw selectively on various sources, depending on the topic. The discussion of the vector autoregressive model will follow chapters 1-7 of Lütkepohl (2005, also available as a paperback) and hence is required. This book is helpful when it comes to coding the vector autoregressive model because it provides detailed instructions and numerical examples. It also contains a useful review of matrix algebra in the appendix.

Lütkepohl, H. (2005), *New Introduction to Multiple Time Series Analysis*, New York: Springer.

An earlier version of this book (also available as a paperback) will do just as well for this course and may be less expensive:

Lütkepohl, H. (1st ed. 1991 or 2nd ed. 1993), *Introduction to Multiple Time Series Analysis*, New York: Springer.

Finally, for those of you on a tight budget, the book is available online in pdf-format from *mirlyn*.

I will make extensive use of my lecture notes in class. A pdf copy of my lecture notes will be posted on ctools. You may download or print the notes from ctools. I will also ask Dollarbill (on Church near the intersection with South University) to prepare bound copies for your convenience. You will be expected to bring those lecture notes to class.

The list below contains additional textbooks and monographs that you may find useful for this class. I will not follow any one book closely.

Financial Econometrics:

Brooks, C. (2008), *Introductory Econometrics for Finance*. 2nd ed., Cambridge: Cambridge University Press.

Christoffersen, P.F. (2003), *Elements of Financial Risk Management.* Amsterdam: Academic Press.

Tsay, R.S. (2005), *Analysis of Financial Time Series*. 2nd ed., New York: Wiley.

Wang, P. (2007), *Financial Econometrics*, London: Routledge.

Time Series Econometrics:

Enders, W. (1995), *Applied Econometric Time Series*, New York: Wiley.

Hamilton, J.D. (1994), *Time Series Analysis*, Princeton, NJ: Princeton University Press.

Unit Roots and Cointegration:

Maddala, G.S., and I.-M. Kim (1998), *Unit Roots, Cointegration, and Structural Change*, Cambridge, U.K.: Cambridge University Press.

Forecasting:

Diebold, F.X. (2006), *Elements of Forecasting*, Cincinnati, 4th ed., South-Western College Publishing.

Applications in International Finance:

Mark, N.C. (2001), *International Macroeconomics and Finance*, Blackwell Publishers.

Sarno, L., and M.P. Taylor (2002), *The Economics of Exchange Rates*, Cambridge University Press.

Econometrics Background:

Judge, G. G., R.C. Hill, W.E. Griffiths, H. Lütkepohl, and T.-C. Lee (1988), *Introduction to the Theory and Practice of Econometrics*, 2nd ed., New York: Wiley.

Kennedy, P. (2008), *A Guide to Econometrics*, 6th ed., Blackwell Publishers.

Stock, J.H., and M.W. Watson (2003), *Introduction to Econometrics*, Boston, MA: Addison-Wesley.

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