

Instructor: Professor Chun Wang
(Office 5306)
e-mail: cwang@brooklyn.cuny.edu
Class Website: Blackboard (Please check it regularly since lecture notes will be posted before each lecture!)

Office Hours: Friday 2:00 – 3:00 pm or by appointment. The best way to communicate with me outside of class is by e-mail. Please mark “**Econ82400**” in the subject line so that we know your message is no spam.

Class Meets: Friday 10:30 a.m. – 12:30 p.m. Lecture Room 3309
12:30 – 1:30 p.m. Lab Room 6418

TA: Dorian Abreu (dorianabreu@gmail.com)

Learning goals and outcomes:

- Students will understand the current literature on applied time series econometrics and the tools used for that.
- Students will learn univariate and multivariate models with stationary and nonstationary time series and applications in macroeconomics, finance and international finance.
- Students will learn to use Stata and Eviews in the lab to analyze time series data.
- Students will be able to conduct independent research in applied macroeconomics and finance after completing the course.

Assessment:

The course grade will be determined as follows:

- Written midterm (Oct 28th, in-classroom): 20 percent
- Empirical midterm (due on Nov 4th, in a group of two students): 20 percent
- Five homework assignments: 20 percent
- Term paper: 40 percent (includes the quality of the oral presentation and written paper)

Five homework assignments and written midterm are related to the first two learning goals.

Empirical midterm is closely related to the third learning goal.

Term paper is related to all four learning goals and outcomes.

Reference books:

1. Graduate Level Books:

(F) Favero, Carlo A., *Applied Macroeconometrics*, 2001, Oxford University Press.

(E) Enders, Walter, *Applied Econometric Time Series*, 2010 or 2014, Wiley.

(LK) Lutkepohl, Helmut and Markus Kratzig, *Applied Time Series Econometrics*, 2004, Cambridge University Press.

(L) Lutkepohl, Helmut, *New Introduction to Multiple Time Series Analysis*, 2010, Springer-Verlag.

(H) Hamilton, James, *Time Series Analysis*, 1994, Princeton University Press.

2. Online Lecture notes on econometrics for macro/finance:

John Cochrane (Chicago), *Time Series for Macroeconomics and Finance*
http://faculty.chicagogsb.edu/john.cochrane/research/Papers/time_series_book.pdf

D.S.G. Pollock (Queen Mary College), *The Methods of Time Series Analysis*
<http://www.qmw.ac.uk/~ugte133/courses/tseries/proserie.htm>

Paul Söderlind (St. Gallen), *Lecture Notes in Financial Econometrics*
<http://home.tiscalinet.ch/paulsoderlind/Courses/OldCourses/FinEcmtAll.pdf>

A.W. van der Vaart (Vrije U), *Time Series*
<http://www.cs.vu.nl/sto/onderwijs/timeseries/dictaat01.pdf>

3. Intermediate Level Books

Greene, W.H. *Econometric Analysis*, 7th edition, Prentice Hall

Stock, James H. and Mark W. Watson (2010) *Introduction to Econometrics*, 3rd edition, Prentice Hall

COURSE OUTLINE

I. Introduction to time series:

Preliminary concepts: time-series data, technical issues raised by time series data, data transformation

Review of stationary time series models, AR, ARMA and ARIMA models;
Ch 3 (Cochrane), Ch. 2 (E), Ch. 2 (H)

Trends and decomposition of univariate nonstationary time series.
Ch. 2 (F), Ch. 2 and 4 (E), Ch. 2 (LK).

Pagan, A. (2005) “The getting of macroeconomic wisdom”,
<http://econrsss.anu.edu.au/~arpagan/pdf/wisdom.pdf>

Beveridge, S. and C. Nelson (1981) “A new approach to the decomposition of economic time series into permanent and transitory components with particular attention to the measurement of business cycle” *Journal of Monetary Economics*.

Hodrick, R. and E. Prescott (1997) “Postwar US business cycles: an empirical investigation”, *Journal of Money, Credit and Banking*, 29, 1-16.

King, R., C. Plosser, J. Stock and M. Watson (1991) “Stochastic trends and economic fluctuations” *American Economic Review*, 81, 4, 820-40.

Leeper, E., C. Sims, and T. Zha (1996) “What does monetary policy do”, *Brookings Paper on Economic Activity*, 2, 1-79.

II. Univariate nonstationary models, spurious regressions, unit roots, nonstationarity tests

and breaks

Ch. 4 (E), Ch 2, 2.7(LK)

- Stock, J. (1994) "Unit roots, structural breaks and trends", *Handbook of Econometrics Volume 4*, Engle and McFadden (eds.), Elsevier, New York.
- Zivot, E. and D. Andrews (1992) "Further evidence on the Great Crash, the oil-price shock and the unit root hypothesis", *Journal of Business Economics and Statistics*, 10, 251-270.
- Andrews, D. (1993) "Tests for parameter instability and structural change with unknown change point", *Econometrica*, 61(4), 821-56.
- Bai, J. and P. Perron (1998) "Estimating and testing linear models with multiple structural changes", *Econometrica*, 66(1), 47-78.
- Bai, J. and P. Perron (2003) "Critical values for multiple structural change tests", *Econometrics Journal*, 6, 72-78.

III. Multivariate Models: Cointegration, VAR models and Error Correction Models

Ch. 2 (E), Ch. 5 (E), Ch 3. (LK)

- Watson, M. (1994) "Vector autoregressions and cointegration", *Handbook of Econometrics Volume 4*, Engle and McFadden (eds.), Elsevier, New York.
- Soderlind, P. and A. Vredin (1996) "Applied cointegration analysis in the mirror of macroeconomic theory", *Journal of Applied Econometrics*, 11(4), 363-81
- Wickens, M.R. (1996) "Interpreting cointegrating vectors and common stochastic trends", *Journal of Econometrics*, 74(2), 255-71.
- Pagan, A. (2003) "An examination of some tools for macroeconomic model building", <http://econrsss.anu.edu.au/~arpagan/pdf/metulect.pdf>

IV. Unstructural VAR models

Ch. 3, 6 (F), Ch.5 (E), Ch.3 (LK), Ch. 2 (L)

- Cochrane, J. (1994) "Permanent and transitory components of GNP and stock prices", *The Quarterly Journal of Economics*, February, 241-265.
- Uctum, M. (1999) "European integration and asymmetry in the European Monetary System", *Journal of International Money and Finance* 18(5), 769-798.
- Jorda, O (2005) "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review*, March
- Jorda, O (2007) "Simultaneous Confidence Regions for Impulse Responses" *Review of Economics and Statistics*, 91(3): 629-647

V. Structural VAR models

Ch. 6 (F), Ch. 5 (E), Ch. 4 (LK), Ch.5 (E).

- Watson, M. (1994) "Vector autoregressions and cointegration", *Handbook of Econometrics Volume 4*, Engle and McFadden (eds.), Elsevier, New York.
- Leeper, E., C. Sims, T. Zha, R. Hall, B. Bernanke (1996) "What does monetary policy do?"

Brooking Papers on Economic Activity” 1996(2), 1-78.

Blanchard, O. D. Quah (1989) “The dynamic effects of aggregate demand and supply disturbances”, *The American Economic Review*” 79(4), 655-73.

Bagliano, F., C. Favero (1998) “Measuring monetary policy with VAR models: an evaluation”, *European Economic Review*, 42, 1069-1112.

VI. Multivariate Models: Johansen Approach

Ch. 2 (F), Ch. 3 (LK), Ch. 5 (E).

Johansen, S. and K. Juselius (1990) “Maximum likelihood estimation and inference on cointegration –with applications to the demand for money”, *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.

Hendry, D. and K. Juselius (2000) “Explaining cointegration analysis: part II”, <http://ideas.repec.org/p/kud/kuiedp/0020.html> .

Johansen, S., K., Juselius (2005) “Extracting information from the data: a Popperian view on empirical macroeconomics”, <http://ideas.repec.org/p/kud/kuiedp/0505.html>

Pagan, A. (2005) “Some issues in using VARs for macroeconometric research”, http://econrsss.anu.edu.au/~arpagan/pdf/Fry_Pagan_192005.pdf

VII. Dynamic factor model

Stock, J. H., and M. W. Watson (2011) Dynamic Factor Models, in *Oxford Handbook of Forecasting*, Michael P. Clements and David F. Hendry (eds). Oxford: Oxford University Press.

Li (1991), “Sliced Inverse Regression for Dimension Reduction,” *Journal of the American Statistical Association*, 86, 316-327.

Bernanke, B.S. and Boivin, J. (2003) “Monetary Policy in a Data-Rich Environment,” *Journal of Monetary Economics*, 50, 525-546

Bernanke, B.S., Boivin, J. and Eliasz, P. (2005) “Measuring the Effects of Monetary Policy: A Factor-Augmented Vector Autoregressive (FAVAR) Approach,” *Quarterly Journal of Economics*, 120, 387-422

Pan, H., and C. Wang (2012) “Government Debt in the Euro Area - Evidence from Dynamic Factor Analysis,” *Economics Letters*, Volume 115, Issue 2, Pages 272-275

Lin, C., and C. Wang (2013) “Forecasting China’s Inflation in a Data-rich Environment.” *Applied Economics*, Volume 45, Issue 21, Pages 3049-3057

VIII. Applications (if time permits)

Clarida, R., J. Gali (1994) “Sources of real exchange rate fluctuations: how important are nominal shocks?”, *Carnegie-Rochester Conference Series on Public Policy*, 41, 1-56.

*Kim, S. and N. Roubini (2000) “Exchange rate anomalies in the industrial countries: a solution with a structural VAR approach”, *Journal of Monetary Economics* 45, 561-586.

Grilli, V. and N. Roubini (1996) “Liquidity models in open economies: theory and empirical evidence”, *European Economic Review* 40, 847-59.

Bagliano, F., C. Favero (1999) “Information from financial markets and VAR measures of

- monetary policy”, *European Economic Review* 43, 825-37.
- Bernanke, B. I. Mihov (1998) “The liquidity effect and long-run neutrality”, *Carnegie-Rochester Conference Series on Public Policy* 49, 149-194.
- (1998) “Measuring monetary policy”, *The Quarterly Journal of Economics*, August, 869-902.
- Eichenbaum, M. and C. Evans (1995) “Some empirical evidence on the effects of shocks to monetary policy on exchange rates”, *The Quarterly Journal of Economics*, 110, 4, 975-1009.
- Christiano, L., M. Eichenbaum, C. Evans (1996) “The effects of monetary policy shocks: evidence from the flow of funds”, *The Review of Economics and Statistics*, 16-34.
- Cushman, D. and T. Zha (1997) “Identifying monetary policy in a small open economy under flexible exchange rates” *Journal of Monetary Economics*”, 39, 433-48.
- Gordon, D. and E. Leeper (1994) “The dynamic impacts of monetary policy: an exercise in tentative identification”, *Journal of Political Economy*, 102(6), 1228-46.
- Leeper, E. (1997) “Narrative and VAR approaches to monetary policy: common identification problems”, *Journal of Monetary Economics* 40, 641-57.
- Strongin, S. (1995) “The identification of monetary policy disturbances: explaining the liquidity puzzle”, *Journal of Monetary Economics* 35, 463-97.
- Merican, Y., Yusop, Z., Noor, Z. M. and Hook, L. S. (2007) “Foreign Direct Investment and the Pollution in Five ASEAN Nations”, *International Journal of Economics and Management* 1(2): 245-261
- Corsetti, G. and Konstantinou, P. “Macroeconomic dynamics and the accumulation of net foreign liabilities in the US: an empirical model,” memo
- Juselius, K. and Franchi, M. (2007) “Taking a DSGE Model to the Data Meaningfully,” *Economics Open Assessment E-Journal*, No. 2007-4
- Bandt, O., Banerjee, A. and Kozluk, T. (2008) “Measuring Long-Run Exchange Rate Pass-Through,” *Economics Open Assessment E-Journal*, Vol.2, 2008-6

TERM PAPER

The paper should be around 12 to 15 type-written pages, double-spaced, normal sized fonts (10-12 points), and margins (1 inch all around). It will be based on a simple economic or financial model that establishes one or more relationships for **at least three** economic variables.

By **November 11th**, you are expected to hand in a proposal with the following information: (i) The objective of the paper (ii) A sketch of the model you are using, which will establish relationships among variables (iii) Source of the series you will be using (iv) A graph showing the evolution of the series over time. During the last two weeks of the class (**December 2nd and December 9th**), you will be presenting orally the main results. The final version of your paper is due at the latest on December 30th (**Penalty will be given for the late submission**). The grade on the term paper will reflect the presentation as well as the content.

The paper should contain the following sections:

1. Introduction

Description of the problem, brief literature review, your contribution (can be replication of an existing paper).

2. Model you are using:

Description of the relationships that you are expecting to uncover.

(Examples: Purchasing power parity, uncovered /covered interest parity, Saving-Investment correlation and Feldstein-Horioka puzzle, forward and spot exchange rate, stock prices and dividends, consumption and income, or any other economic/financial equilibrium relation).

3. Methodology

Description of the methodology used in the paper you are replicating. If you are not replicating any paper, then briefly summarize what you will do (even though we know what you will do, methodology is a section that you always need to describe in an article).

4. Data

Description of the data sources, of any transformation to the data, computation that you made. Plot of the data, analysis of any patterns such as seasonality, trends, stability, volatility, co-movements among the series.

5. Univariate properties of the series

Test stationarity of the series (You should use **at least two unit tests**.); Decompose the series into permanent versus transitory components. If you are using multiple series, then pick two that are the most interesting.

6. Test endogenous structural breaks and exogenous breaks.

7. Cointegration analysis

Estimation of a VAR; Determination of the optimal lag structure; Block-exogeneity

Granger-causality tests; Cointegration tests by comparing the residual based tests to the Full Information Maximum Likelihood (FIML) estimation test; VECM: Analysis of the cointegration relations and the loading matrix; Long-run restriction.

8. Estimation of a SVAR when considering the contemporaneous relationship among the endogenous variables in the VAR system. Short-run and/or long-run restrictions.
9. Apply principal components analysis, factor analysis, and dynamic factor model. You can at least to see if factors can be constructed using your data set.
10. Conclusion.
11. Appendix if necessary.

FYI: Stephen Klein is the Economics subject librarian from the Mina Rees (Graduate Center) Library. You may contact him by sklein@gc.cuny.edu for assistance finding course readings and preparing for your research papers. You are encouraged to visit our Economics Subject Guide: <http://libguides.gc.cuny.edu/economics>

On-line data relevant for the course:

- US data
<http://www.usc.edu/schools/sppd/research/casden/research>
- Penn World Tables
<http://pwt.econ.upenn.edu/>
- Real-time data
<http://www.phil.frb.org/econ/forecast/readow.html>
- International data
<http://www.imf.org/external/data.htm>
<http://www.imf.org/external/pubs/ft/weo/2006/01/data/index.htm>
- US Economic Accounts (at the national, regional, industrial and international levels):
<http://www.bea.gov/bea>
- US International investment positions, balance of payments
<http://www.bea.gov/bea/di1.htm>
- Global Financial Data (paid source but some historical series available free).
http://www.globalfinancialdata.com/index.php3?action=sample_data