Economics 236B, Spring 2008.
**Applied macroeconomics**
Instructor: Yuriy Gorodnichenko
Office: 693 Evans Hall
Class Meets: **Tue** 4-6 pm, Evans 639
Office Hours: **Tue** 1-3pm or by appointment.

# Syllabus

The main objective of the course is to introduce tools of applied macroeconomics. The emphasis is on econometric and computation techniques. Since the best way to learn tools is to practice them, you will be required to do a number of extensive exercises.

The reading list is not designed to be comprehensive. Instead, it contains a few influential references for selected topics plus a selection of leading-edge treatment of the topics. You are expected to read the papers for discussion in advance and come prepared to discuss them.

Note that I will not provide problem set solutions or extensive comments on individual problem sets. Basically, I will just make sure you did it. As a part of the regular homework assignments, I will also require you to write computer projects. The computer projects may be done in small groups (no more than three students per group), but each homework must be submitted individually. The programming language I use is MATLAB. You can use any language you like (GAUSS, FORTRAN90, C++, etc.), but I will give you assistance with MATLAB code only.

Grade:

- 15% = Three referee reports (four pages, 1.5 spaced).

- 45% = Weekly homework assignments. Grading is check, check plus, check minus. Acceptable homework must have both report and code. The code should be self-contained so that anyone can run it. You should plan that each homework assignment takes about a day or more to complete. For each assignment, homework with the fastest code (in Matlab) receives a 50% premium.

- 40% = Project (replicate a paper or own idea). Deadline is May 12. No exceptions. Code must be provided with the project. Possible papers for replication (other papers are subject to instructor's approval):
  Klenow and Willis, JME 2007.
  Bernanke and Mihov, QJE 1998.
  Dotsey, King, Wolman, QJE 1999.
  Beaudry and Portier, AER 2006.
  Bernanke, Boivin, Eliasz, QJE 2005.
  Stock and Watson, JASA 2002.
  Cooper and Haltiwanger, REStud 2006.

Prerequisites: first year graduate sequence in econometrics and macroeconomics.

Main textbook: Fabio Canova. 2007. Methods for Applied Macroeconomic Research. Princeton University Press.

Recommended textbooks

James Hamilton, 1994. Time Series Analysis. Princeton University Press.

Mario Miranda and Paul Fackler, 2002. Applied Computational Economics and Finance. MIT Press.

David De Jong and Chetan Dave, 2007. Structural Macroeconometrics. Princeton University Press.

Carlo Favero, 2001. Applied Macroeconometrics. Oxford University Press.

Burkhard Heer and Alfred Maussner, 2005. Dynamic General Equilibrium Modelling. Springer.

Jerome Adda and Russell Cooper, 2003. Dynamic Economics: Quantitative Methods and Applications. MIT Press.

Helmut Lutkepohl, 1993. Introduction to Multiple Time Series Analysis. Springer-Verlag.

Fumio Hayashi, 2000. Econometrics. Princeton University Press.

Thomas Sargent and Lars Ljungqvist, 2004. Recursive Macroeconomic Theory, 2nd ed. MIT Press 2004.

Walter Enders, 2004. Applied Econometric Time Series. Wiley.

Tentative topics

Introduction:

1. Univariate time series
    a. ARIMA, estimation, lag selection,
    b. Spectrum, filters, trend-cycle decompositions
2. Vector autoregressions
    a. Estimation and inference
    b. Impulse response, confidence intervals
    c. Variance decomposition
    d. Structural VAR: short-run and long-run identification
    e. Cointegration
3. State space models, Kalman filter and dynamic factor models
4. DSGE
    a. Linearization
    b. Solution
    c. Analysis and estimation: calibration, GMM, MLE, QBE, SMM
5. Dynamic programming
    a. Introduction
    b. Approximations and numerical solution
    c. Uncertainty
    d. Estimation
6. Models with heterogeneous agents (time permitting)

Readings

Larry Summers, 1991. "The Scientific Illusion of Empirical Macroeconomics," *Scandinavian Journal of Economics* 93(2): 129-148.

1. Univariate time series
   a. Theory
      Hamilton, Chapters 3 and 6.
      Canova, Chapter 3.
      DeJong and Chate, Chapter 3.

   b. Applications
      Charles Nelson and Charles Plosser, 1982. "Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications," *JME* 10(2): 139–162. [link]
      Pierre Perron, 1989. "The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis," *Econometrica* 57 (6): 1361-1401. [link]
      Marianne Baxter and Robert King, 1999. "Measuring Business Cycles: Approximate Bandpass Filters for Economic Time Series," *REStat* 81(4): 575–593. [link]
      Andrew Harvey and A. Jaeger, 1993, "Detrending, Stylized Factors, and the Business Cycle," *Journal of Applied Econometrics* 8(3): 231–247. [link]
      Timothy Cogley and James Nason, 1995. "Effects of the Hodrick-Prescott Filter on Trend and Difference Stationary Time Series: Implications for Business Cycle Research," *JEDC* 19(1-2): 253–278. [link]
      James Stock and Mark Watson, 1999. "Business Cycle Fluctuations in U.S. Macroeconomic Time Series," *Handbook of Macroeconomics*, Chapter 1 (also available as NBER WP 6258).

2. Vector autoregressions
   a. Theory
      Canova, Chapter 4.
      Hamilton, Chapters 10, 11, and 19.
      Favero, Chapter 6.
      Lutkepohl, Chapters 2, 3 and 4.
      Lawrence J. Christiano, Martin Eichenbaum and Charles L. Evans, 1999. "Monetary policy shocks: What have we learned and to what end?" In *Handbook of Macroeconomics*, pp. 65-148. [link]

   b. Applications
      Matthew Shapiro and Mark Watson, 1988. "Sources of Business Cycle Fluctuations," *NBER Macroeconomics Annual*, Vol. 3, pp. 111-148. [link]
      Olivier Blanchard and Danny Quah, 1988. "The Dynamic Effects of Aggregate Demand and Supply Disturbances," *AER* 79(4), 655-673. [link]

Jordi Gali, 1999. "Technology, Employment, and the Business Cycle: Do Technology Shocks Explain Aggregate Fluctuations?" *AER* 89(1), pp. 249-271. [link]

Paul Beaudry and Franck Portier, 2006. "Stock Prices, News, and Economic Fluctuations," *AER* 96 (4): 1293-1307. [link]

Ben Bernanke and Ilian Mihov, 1998. "Measuring Monetary Policy," *QJE* 113(3), pp. 869-902. [link]

Ben Bernanke and Alan Blinder, 1992. "The Federal Funds Rate and the Channels of Monetary Transmission," *AER* 82(4), pp. 901-921. [link]

Robert King, Charles Plosser, James Stock, and Mark Watson, 1991. "Stochastic Trends and Economic Fluctuations," *AER* 81(4), pp. 819-840. [link]

Lawrence J. Christiano, Martin Eichenbaum and Charles L. Evans, 1999. "Monetary policy shocks: What have we learned and to what end?" In *Handbook of Macroeconomics*, pp. 65-148. [link]

V. V. Chari, Patrick Kehoe, and Ellen McGrattan, 2005. "A Critique of Structural VARs Using Real Business Cycle Theory," Federal Reserve Bank of Minneapolis, Working Paper #631 [link]

Lawrence Christiano, Martin Ecihenbaum and Robert Vigfusson, 2006. "Assessing Structural VARs," *NBER Macroeconomics Annual*, Vol. 21. [link]

Christopher Sims, 1992. "Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy," *EER* 36(5): 975-1000. [link]

Christopher Sims, 1980. "Macroeconomics and reality," *Econometrica* 48(1): 1-48. [link]

Yuriy Gorodnichenko. 2006. "Reduced rank identification of structural shocks in VARs" [link]

Jon Faust and John H. Rogers, 2003. "Monetary policy's role in exchange rate behavior," *JME* 50(7): 1403-1424. [link]

Lutz Kilian, 1999. "Small sample confidence intervals for impulse response functions," *REStat* 80(2): 218-230. [link]

3. Kalman filter and dynamic factor models
   a. Theory

Hamilton, Chapter 13.

Lutkepohl, Chapter 13.

Canova, Chapter 11.1.

Andrew Harvey, 1991. *Forecasting, Structural Time Series Models and the Kalman Filter*. Cambridge University Press.

B.D.O. Anderson and J.B. Moore, 1979, *Optimal filtering*, Dover Publications, New York (reprinted in 2005).

   b. Applications

Jean Boivin and Marc Giannoni, 2006. "DSGE models in a data-rich environment," mimeo. [link]

James Stock and Mark Watson, 2002. "Forecasting using principal components from a large number of predictors," *JASA* 97(460): 1167 -1179 [link]

Mario Forni, Marc Hallin, Marco Lippi, and Lucrezia Reichlin (2000), "The Generalized Dynamic Factor Model: Identification and Estimation," *REStat* 82(4): 540-554. [link]

Ben Bernanke, Jean Boivin, and Piotr Eliasz, 2005. "Measuring the effects of monetary policy: A factor-augmented vector autoregressive (FAVAR) approach," QJE 120 (1): 387-422. [link]

James Stock and Mark Watson, 2002. "Macroeconomic forecasting using diffusion indexes," JBES 20 (2): 147-162.

James Stock and Mark Watson, 1989. "New Indexes of Coincident and Leading Economic Indicators," NBER Macroeconomics Annual.

John Geweke, 1977. "The dynamic factor analysis of economic time series models," in D.J. Aigner and A.S. Goldberger, Editors, *Latent variables in socio-economic models*, North-Holland, Amsterdam (1977), pp. 365–383 Chapter 19.

Robert Townsend, 1983. "Forecasting the Forecasts of Others," *JPE* 91(4): 546-588. [link]

Guido Lorenzoni, 2006. A Theory of Demand Shocks. Mimeo. [link]

Michael Woodford, 2002, "Imperfect Common Knowledge and the Effects of Monetary Policy," in P. Aghion, R. Frydman, J. Stiglitz, and M. Woodford, eds., *Knowledge, Information, and Expectations in Modern Macroeconomics: In Honour of Edmund S. Phelps*, Princeton: Princeton University Press.

Todd E. Clark and Kwanho Shin, 2000. "The Sources of Fluctuations within and across Countries," in *Intranational Macroeconomics*, Gregory D. Hess and Eric van Wincoop, eds. Cambridge University Press.

Ayhan Kose, Christopher Otrok, and Charles Whiteman, 2003. "International Business Cycles: World, Region, and Country-Specific Factors," *AER* 93(4): 1216-1239. [link]

Gregory Connor and Robert Korajczyk, 1988. "Risk and return in an equilibrium APT: Application of a new test methodology," *Journal of Financial Economics* 21(2): 255-289.

4. DSGE
   a. Theory

      Heer and Maussner, Chapter 2.

      Canova, Chapter 2.

      Favero, Chapter 8.

      DeJong and Chate, Chapter 2.

      Roger Farmer, 1999. Macroeconomics of Self-fulfilling Prophesies. MIT Press, Chapters 2 and 3.

   b. Estimation and inference

      Canova, Chapters 5.4, 6.4, 7.

      De Jong and Chate, Chapters 6, 7 and 8.

      Victor Chernozhukov and Han Hong, 2003. "An MCMC approach to classical estimation," *Journal of Econometrics* 115(2), pp 293-346. [link]

Francisco Ruge-Murcia, 2007, "Methods to Estimate Dynamic Stochastic General Equilibrium Models," *JEDC* 31 (8): 2599-2636. [link]

Lecture notes from Frank Schorfheide (http://www.econ.upenn.edu/~schorf/ )

c. Applications

Finn E. Kydland; Edward C. Prescott, 1982. "Time to Build and Aggregate Fluctuations," *Econometrica*. 50(6), pp. 1345-1370. [link]

Frank Smets and Rafael Wouters, 2007. "Shocks and frictions in US business cycles: A Bayesian DSGE approach," *AER* 97 (3): 586-606 [link]

Peter Ireland, 2004. "Technology shocks in the New Keynesian model," *REStat* 86 (4): 923-936 [link]

Lawrence Christiano, Martin Ecihenbaum, and Charles Evans, 2005. "Nominal rigidities and the dynamic effects of a shock to monetary policy," *JPE* 113(1): 1-45. [link]

Frank Smets and Rafael Wouters, 2002. "An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area," *JEEA* 1(5): 1123-1175 [link]

Craig Burnside, Matrin Eichenbaum and Sergio Rebelo, 1993. "Labor Hoarding and the Business Cycle," *JPE* 101, 245–273. [link]

Richard Clarida, Jordi Gali, and Mark Gertler, 2000. "Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory," *QJE* 115, 147–180. [link]

Marco Del Negro, Frank Schorfheide, Frank Smets, and Raf Wouters, 2007, "On the Fit and Forecasting Performance of New Keynesian Models," *JBES* 25, 123–143. [link]

Christopher House and Matthew Shapiro, 2006. "Phased-in tax cuts and economic activity," *AER* 96(3): 1835-1849. [link]

Yuriy Gorodnichenko and Serena Ng, 2007. Estimation of DSGE models when data are persistent. Mimeo. [link]

Jesus Fernandez-Villaverde, Juan Rubio-Ramirez, Tom Sargent, and Mark Watson, 2007. "ABCs (and Ds) of understanding VARs," *AER* 97 (3): 1021-1026. [link]

5. Dynamic programming

a. Theory, computation and estimation

Miranda and Fackler, Chapters 6, 7, and 9.

Adda and Cooper, Chapters 2 and 3.

Heer and Maussner, Chapter 4.

b. Applications

Russell Cooper and John Haltiwanger, 2006. "On the nature of capital adjustment costs," *REStud* 73 (3): 611-633. [link]

Margaret Slade, 1998. "Optimal pricing with costly adjustment: Evidence from retail-grocery prices," *REStud* 65 (1): 87-107. [link]

Glenn Hubbard, Jonathan Skinner and Stephen Zeldes , 1995. "Precautionary Saving and Social Insurance," *JPE* 103(2): 360-399. [link]

Christopher Carroll, 1994. "How Does Future Income Affect Current Consumption?" *QJE* 109(1): 111-147. [link]

Pierre-Olivier Gourinchas and Jonathan Parker, 2002. "Consumption over the Life Cycle," *Econometrica* 70(1): 47-89.

Susumu Imai, Neelam Jain, and Andrew Ching, 2007. "Bayesian Estimation of Dynamic Discrete Choice Models," mimeo [link]

Edward Knotek, 2005. "Convenient Prices, Currency, and Nominal Rigidity: Theory with Evidence from Newspaper Prices," Kansas Fed WP, [link]

Andriy Norets, 2006. "Inference in Dynamic Discrete Choice Models with Serially Correlated Unobserved State Variables," mimeo. [link]

6. Models with heterogeneous agents
   a. Theory

Heer and Maussner, Chapters 5 and 6.

Victor Rios-Rull, 1995. "Models with Heterogeneous Agents," in T. Cooley, ed., *Frontiers of Business Cycle Research*, Princeton University Press.

Per Krusell and Antony Smith, 1998. "Income and wealth heterogeneity in the macroeconomy," *JPE* 106(5): 867-896. [link]

   b. Applications

Per Krusell and Antony Smith, 1998. "Income and wealth heterogeneity in the macroeconomy," *JPE* 106(5): 867-896. [link]

Peter Klenow and Jonathan Willis, 2007. "Sticky information and sticky prices," *JME* forthcoming [link]

Mikhail Golosov and Robert Lucas, 2007. "Menu costs and Phillips curves," *JPE* 115(2): 171-199. [link]

Julia Thomas, 2002. "Is lumpy investment relevant for the business cycle?" *JPE* 110(3): 508-534. [link]

Virgiliu Midrigan, 2006. "Menu Costs, Multi-Product Firms, and Aggregate Fluctuations," mimeo. [link]

Michael Dotsey, Robert King and Alexander Wolman, 1999. "State-dependent pricing and the general equilibrium dynamics of money and output," *QJE* 114 (2): 655-690. [link]