Econ 395. Empirical Methods in Macroeconomics and Forecasting in Time Series Analysis.

Barbara Rossi

March 14, 2011

Course Description

- The course examines statistical techniques used to study time series data with special emphasis to applications in macroeconomics.

Course Description

- The course examines statistical techniques used to study time series data with special emphasis to applications in macroeconomics.
- The course has three specific objectives.

Course Description

- The course examines statistical techniques used to study time series data with special emphasis to applications in macroeconomics.
- The course has three specific objectives.
  - Equip students who anticipate using time series data in their Ph.D. research with state-of-the-art **empirical research tools**.

Course Description

- The course examines statistical techniques used to study time series data with special emphasis to applications in macroeconomics.
- The course has three specific objectives.
  - Equip students who anticipate using time series data in their Ph.D. research with state-of-the-art **empirical research tools**.
  - Lay out the **econometric theory of time series analysis**, with emphasis on recent developments.

Course Description

- The course examines statistical techniques used to study time series data with special emphasis to applications in macroeconomics.
- The course has three specific objectives.
  - Equip students who anticipate using time series data in their Ph.D. research with state-of-the-art **empirical research tools**.
  - Lay out the **econometric theory of time series analysis**, with emphasis on recent developments.
  - Analyze selected recent works in **macroeconomics with emphasis on their empirical implications** and analysis.

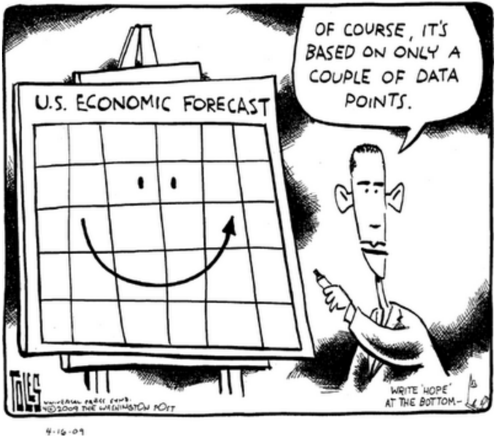
Course Description

- The course examines statistical techniques used to study time series data with special emphasis to applications in macroeconomics.
- The course has three specific objectives.
  - Equip students who anticipate using time series data in their Ph.D. research with state-of-the-art **empirical research tools**.
  - Lay out the **econometric theory of time series analysis**, with emphasis on recent developments.
  - Analyze selected recent works in **macroeconomics with emphasis on their empirical implications** and analysis.
- The course may be used toward minor field certification in either Macro or Econometrics (not both).

Course Description

- The course examines statistical techniques used to study time series data with special emphasis to applications in macroeconomics.
- The course has three specific objectives.
  - Equip students who anticipate using time series data in their Ph.D. research with state-of-the-art **empirical research tools**.
  - Lay out the **econometric theory of time series analysis**, with emphasis on recent developments.
  - Analyze selected recent works in **macroeconomics with emphasis on their empirical implications** and analysis.
- The course may be used toward minor field certification in either Macro or Econometrics (not both).
- Various problem sets, midterm and final exam. Possibility of a research paper.

Introduction: An Overview of Time Series Properties of Macro Data



Introduction: An Overview of Time Series Properties of Macro Data

- Goal: Learn how to estimate Business Cycles, interpret data

Introduction: An Overview of Time Series Properties of Macro Data

- Goal: Learn how to estimate Business Cycles, interpret data
- Main Reference: Stock and Watson, "Business Cycle Fluctuations in US Macroeconomic Time Series", in *Handbook of Macroeconomics*.

Introduction: An Overview of Time Series Properties of Macro Data

- Goal: Learn how to estimate Business Cycles, interpret data
- Main Reference: Stock and Watson, "Business Cycle Fluctuations in US Macroeconomic Time Series", in *Handbook of Macroeconomics*.
- Econometric theory: Correlation and basics of time series

Introduction: An Overview of Time Series Properties of Macro Data

- Goal: Learn how to estimate Business Cycles, interpret data
- Main Reference: Stock and Watson, "Business Cycle Fluctuations in US Macroeconomic Time Series", in *Handbook of Macroeconomics*.
- Econometric theory: Correlation and basics of time series
- Economic Application: Description of time series data

Introduction: An Overview of Time Series Properties of Macro Data

- Goal: Learn how to estimate Business Cycles, interpret data
- Main Reference: Stock and Watson, "Business Cycle Fluctuations in US Macroeconomic Time Series", in *Handbook of Macroeconomics*.
- Econometric theory: Correlation and basics of time series
- Economic Application: Description of time series data
- Stock and Watson, "Has the Business Cycle changed? Evidence and Explanations"

Vector Autoregressions (VARs)

- Goal: Estimate VARs and Impulse Responses, IRF confidence bands, estimate structural VARs. Learn about effects of monetary policy shocks.

Vector Autoregressions (VARs)

- Goal: Estimate VARs and Impulse Responses, IRF confidence bands, estimate structural VARs. Learn about effects of monetary policy shocks.
- Main References: Watson, Vector Autoregressions, *Handbook of Econometrics*. Chp 6 Hayashi

Vector Autoregressions (VARs)

- Goal: Estimate VARs and Impulse Responses, IRF confidence bands, estimate structural VARs. Learn about effects of monetary policy shocks.
- Main References: Watson, Vector Autoregressions, *Handbook of Econometrics*. Chp 6 Hayashi
- Econometric theory: Estimation and inference, Identification and interpretation of Impulse response functions and variance decomposition, Cholesky and Long-run identifications (and Shapiro and Watson's method), confidence bands

Vector Autoregressions (VARs)

- Goal: Estimate VARs and Impulse Responses, IRF confidence bands, estimate structural VARs. Learn about effects of monetary policy shocks.
- Main References: Watson, Vector Autoregressions, *Handbook of Econometrics*. Chp 6 Hayashi
- Econometric theory: Estimation and inference, Identification and interpretation of Impulse response functions and variance decomposition, Cholesky and Long-run identifications (and Shapiro and Watson's method), confidence bands
- Economic Application: Christiano, Eichenbaum and Evans, Monetary Policy Shocks: What Have We Learned and to What End?" in: *Handbook of Macroeconomics*.

Structural Breaks

- Goal: Learn how to test for structural breaks, understand the stability of monetary policy reaction function debate.

Structural Breaks

- Goal: Learn how to test for structural breaks, understand the stability of monetary policy reaction function debate.
- Main References: Stock, James H. "Unit roots, Structural Breaks and Trends," *Handbook of Econometrics* 4, Elsevier.

Structural Breaks

- Goal: Learn how to test for structural breaks, understand the stability of monetary policy reaction function debate.
- Main References: Stock, James H. "Unit roots, Structural Breaks and Trends," *Handbook of Econometrics* 4, Elsevier.
- Econometric theory: Tests for structural breaks

Structural Breaks

- Goal: Learn how to test for structural breaks, understand the stability of monetary policy reaction function debate.
- Main References: Stock, James H. "Unit roots, Structural Breaks and Trends," *Handbook of Econometrics* 4, Elsevier.
- Econometric theory: Tests for structural breaks
- Economic Application: Empirical evidence on structural breaks and their implications for an analysis of NAIRU, technology and monetary policy shocks

Structural Breaks

- Goal: Learn how to test for structural breaks, understand the stability of monetary policy reaction function debate.
- Main References: Stock, James H. "Unit roots, Structural Breaks and Trends," *Handbook of Econometrics* 4, Elsevier.
- Econometric theory: Tests for structural breaks
- Economic Application: Empirical evidence on structural breaks and their implications for an analysis of NAIRU, technology and monetary policy shocks
- Stock and Watson (1996), Evidence on Structural Instability in Macroeconomic Time Series Relations, *Journal of Business and Economic Statistics*.

Structural Breaks

- Goal: Learn how to test for structural breaks, understand the stability of monetary policy reaction function debate.
- Main References: Stock, James H. "Unit roots, Structural Breaks and Trends," *Handbook of Econometrics* 4, Elsevier.
- Econometric theory: Tests for structural breaks
- Economic Application: Empirical evidence on structural breaks and their implications for an analysis of NAIRU, technology and monetary policy shocks
- Stock and Watson (1996), Evidence on Structural Instability in Macroeconomic Time Series Relations, *Journal of Business and Economic Statistics*.
- Clarida, R., J. Gali and M. Gertler (2000), "Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory", *Quarterly Journal of Economics*.

Modeling and Inference in Persistent Time Series

- Goal: Learn to test for unit roots and construct confidence intervals for the largest root, Test for cointegration, Learn about the GDP and PPP debates

Modeling and Inference in Persistent Time Series

- Goal: Learn to test for unit roots and construct confidence intervals for the largest root, Test for cointegration, Learn about the GDP and PPP debates
- Main References: Stock, J. (1994), "Unit roots, structural breaks and trends," *Handbook of Econometrics*. Watson, M. (1994), "Vector Autoregressions and Cointegration", *Handbook of Econometrics*.

Modeling and Inference in Persistent Time Series

- Goal: Learn to test for unit roots and construct confidence intervals for the largest root, Test for cointegration, Learn about the GDP and PPP debates
- Main References: Stock, J. (1994), "Unit roots, structural breaks and trends," *Handbook of Econometrics*. Watson, M. (1994), "Vector Autoregressions and Cointegration", *Handbook of Econometrics*.
- Econometric theory: Tests for unit roots, Cointegration

Modeling and Inference in Persistent Time Series

- Goal: Learn to test for unit roots and construct confidence intervals for the largest root, Test for cointegration, Learn about the GDP and PPP debates
- Main References: Stock, J. (1994), "Unit roots, structural breaks and trends," *Handbook of Econometrics*. Watson, M. (1994), "Vector Autoregressions and Cointegration", *Handbook of Econometrics*.
- Econometric theory: Tests for unit roots, Cointegration
- Economic Application: GDP have a unit root? Does PPP hold?

Modeling and Inference in Persistent Time Series

- Goal: Learn to test for unit roots and construct confidence intervals for the largest root, Test for cointegration, Learn about the GDP and PPP debates
- Main References: Stock, J. (1994), "Unit roots, structural breaks and trends," *Handbook of Econometrics*. Watson, M. (1994), "Vector Autoregressions and Cointegration", *Handbook of Econometrics*.
- Econometric theory: Tests for unit roots, Cointegration
- Economic Application: GDP have a unit root? Does PPP hold?
- Nelson, Charles R., and Charles I. Plosser (JME 1982). "Trends and Random Walks in Macro-Economic Time Series: Some Evidence and Implications". Rudebusch, Glenn D. (AER 1993), "The Uncertain Unit Root in Real GNP". Rossi, B. (JBES 2005), "Confidence intervals for half-life deviations from PPP".

Structural Estimation of Macroeconomic models (GMM, CMD, with references to MLE)

- Goal: Learn how to estimate structural macro models and understand the lack of propagation debate in the 1990s

Structural Estimation of Macroeconomic models (GMM, CMD, with references to MLE)

- Goal: Learn how to estimate structural macro models and understand the lack of propagation debate in the 1990s
- Main References: Dave and De Jong, *Structural Macroeconometrics*, Princeton University Press. Canova, *Methods for Applied Macroeconomic Research*, Princeton University Press

Structural Estimation of Macroeconomic models (GMM, CMD, with references to MLE)

- Goal: Learn how to estimate structural macro models and understand the lack of propagation debate in the 1990s
- Main References: Dave and De Jong, *Structural Macroeconometrics*, Princeton University Press. Canova, *Methods for Applied Macroeconomic Research*, Princeton University Press
- Econometric theory: Tests for equal and absolute predictive ability

Structural Estimation of Macroeconomic models (GMM, CMD, with references to MLE)

- Goal: Learn how to estimate structural macro models and understand the lack of propagation debate in the 1990s
- Main References: Dave and De Jong, *Structural Macroeconometrics*, Princeton University Press. Canova, *Methods for Applied Macroeconomic Research*, Princeton University Press
- Econometric theory: Tests for equal and absolute predictive ability
- Economic Application: Forecasting inflation and GDP growth by using the term structure

Structural Estimation of Macroeconomic models (GMM, CMD, with references to MLE)

- Goal: Learn how to estimate structural macro models and understand the lack of propagation debate in the 1990s
- Main References: Dave and De Jong, *Structural Macroeconometrics*, Princeton University Press. Canova, *Methods for Applied Macroeconomic Research*, Princeton University Press
- Econometric theory: Tests for equal and absolute predictive ability
- Economic Application: Forecasting inflation and GDP growth by using the term structure
- Christiano, Eichenbaum, Evans (2005), Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy", *Journal of Political Economy*. Hall Inoue Nason and Rossi (2011), *Journal of Econometrics*.

Forecasting and Data Mining

Forecasting and Data Mining

- Goal: Learn how to make and evaluate forecasts

Forecasting and Data Mining

- Goal: Learn how to make and evaluate forecasts
- Main References: West (2008), Forecast Evaluation, *Handbook of Economic Forecasting I*. Clark and M. McCracken (2011), *Advances in Forecast Evaluation*, *Handbook of Economic Forecasting II*. Giacomini and Rossi (2011), *Advances in Forecasting under Model Instability*, *Handbook of Economic Forecasting II*.

Forecasting and Data Mining

- Goal: Learn how to make and evaluate forecasts
- Main References: West (2008), Forecast Evaluation, *Handbook of Economic Forecasting I*. Clark and M. McCracken (2011), *Advances in Forecast Evaluation*, *Handbook of Economic Forecasting II*. Giacomini and Rossi (2011), *Advances in Forecasting under Model Instability*, *Handbook of Economic Forecasting II*.
- Econometric theory: tests for equal and absolute predictive ability

Forecasting and Data Mining

- Goal: Learn how to make and evaluate forecasts
- Main References: West (2008), Forecast Evaluation, *Handbook of Economic Forecasting I*. Clark and M. McCracken (2011), *Advances in Forecast Evaluation*, *Handbook of Economic Forecasting II*. Giacomini and Rossi (2011), *Advances in Forecasting under Model Instability*, *Handbook of Economic Forecasting II*.
- Econometric theory: tests for equal and absolute predictive ability
- Economic Application: Is the Phillips Curve useful for forecasting Inflation?

Forecasting and Data Mining

- Goal: Learn how to make and evaluate forecasts
- Main References: West (2008), Forecast Evaluation, *Handbook of Economic Forecasting I*. Clark and M. McCracken (2011), *Advances in Forecast Evaluation*, *Handbook of Economic Forecasting II*. Giacomini and Rossi (2011), *Advances in Forecasting under Model Instability*, *Handbook of Economic Forecasting II*.
- Econometric theory: tests for equal and absolute predictive ability
- Economic Application: Is the Phillips Curve useful for forecasting Inflation?
- Giacomini, R. and B. Rossi (2009), "Detecting and Predicting Forecast Breakdowns", *Review of Economic Studies.*

What do I do?

- Development of new time series methodologies for forecasting and instabilities.

What do I do?

- Development of new time series methodologies for forecasting and instabilities.
  - "Optimal Tests for Nested Model Selection With Underlying Parameter Instability" (*Econometric Theory*, 2005)

What do I do?

- Development of new time series methodologies for forecasting and instabilities.
  - "Optimal Tests for Nested Model Selection With Underlying Parameter Instability" (*Econometric Theory,* 2005)
  - "Detecting and Predicting Forecast Breakdowns" (with R. Giacomini, *Review of Economic Studies* 2010)

What do I do?

- Development of new time series methodologies for forecasting and instabilities.
  - "Optimal Tests for Nested Model Selection With Underlying Parameter Instability" (*Econometric Theory*, 2005)
  - "Detecting and Predicting Forecast Breakdowns" (with R. Giacomini, *Review of Economic Studies* 2010)
  - "Advances in Forecasting in Unstable Environments" (with R. Giacomini, in preparation for the *Handbook of Economics Forecasting* Vol. 2)

What do I do?

- Development of new time series methodologies for forecasting and instabilities.
  - "Optimal Tests for Nested Model Selection With Underlying Parameter Instability" (*Econometric Theory,* 2005)
  - "Detecting and Predicting Forecast Breakdowns" (with R. Giacomini, *Review of Economic Studies* 2010)
  - "Advances in Forecasting in Unstable Environments" (with R. Giacomini, in preparation for the *Handbook of Economics Forecasting* Vol. 2)
- Empirical Applications in Forecasting Exchange Rates, Inflation, Output Growth

What do I do?

- Development of new time series methodologies for forecasting and instabilities.
  - "Optimal Tests for Nested Model Selection With Underlying Parameter Instability" (*Econometric Theory,* 2005)
  - "Detecting and Predicting Forecast Breakdowns" (with R. Giacomini, *Review of Economic Studies* 2010)
  - "Advances in Forecasting in Unstable Environments" (with R. Giacomini, in preparation for the *Handbook of Economics Forecasting* Vol. 2)
- Empirical Applications in Forecasting Exchange Rates, Inflation, Output Growth
  - "Can Exchange Rates Forecast Commodity Prices?" (with Y. Chen and K. Rogoff, *Quarterly Journal of Economics*, 2010)

What do I do?

- Development of new time series methodologies for forecasting and instabilities.
  - "Optimal Tests for Nested Model Selection With Underlying Parameter Instability" (*Econometric Theory,* 2005)
  - "Detecting and Predicting Forecast Breakdowns" (with R. Giacomini, *Review of Economic Studies* 2010)
  - "Advances in Forecasting in Unstable Environments" (with R. Giacomini, in preparation for the *Handbook of Economics Forecasting* Vol. 2)
- Empirical Applications in Forecasting Exchange Rates, Inflation, Output Growth
  - "Can Exchange Rates Forecast Commodity Prices?" (with Y. Chen and K. Rogoff, *Quarterly Journal of Economics*, 2010)
  - "Understanding Models' Forecasting Performance" (with T. Sekhposyan, *Journal of Econometrics* forthcoming)

What do I do?

- Development of new time series methodologies in empirical macroeconomics.

What do I do?

- Development of new time series methodologies in empirical macroeconomics.
  - "Identifying the Sources of Instabilities in Macroeconomic Fluctuations" (with A. Inoue, R*eview of Economics and Statistics*, forthcoming).

What do I do?

- Development of new time series methodologies in empirical macroeconomics.
  - “Identifying the Sources of Instabilities in Macroeconomic Fluctuations” (with A. Inoue, Re*view of Economics and Statistics*, forthcoming).
  - "Information Criteria for Impulse Response Function Matching Estimation of DSGE Models" (with A. Hall, A. Inoue, and J. Nason, *Journal of Econometrics*, forthcoming)

What do I do?

- Development of new time series methodologies in empirical macroeconomics.
  - “Identifying the Sources of Instabilities in Macroeconomic Fluctuations” (with A. Inoue, Re*view of Economics and Statistics*, forthcoming).
  - "Information Criteria for Impulse Response Function Matching Estimation of DSGE Models" (with A. Hall, A. Inoue, and J. Nason, *Journal of Econometrics*, forthcoming)
  - “Testing for Weak Identification in Macroeconomic Models” (with A. Inoue, *Journal of Econometrics*, forthcoming)

Summary of Econ395

- Intro: Basic Time Series Properties of Data, Filtering

Summary of Econ395

- Intro: Basic Time Series Properties of Data, Filtering
- VARs

Summary of Econ395

- Intro: Basic Time Series Properties of Data, Filtering
- VARs
- Unit Roots, Cointegration

Summary of Econ395

- Intro: Basic Time Series Properties of Data, Filtering
- VARs
- Unit Roots, Cointegration
- Structural Breaks

Summary of Econ395

- Intro: Basic Time Series Properties of Data, Filtering
- VARs
- Unit Roots, Cointegration
- Structural Breaks
- Structural Estimation

Summary of Econ395

- Intro: Basic Time Series Properties of Data, Filtering
- VARs
- Unit Roots, Cointegration
- Structural Breaks
- Structural Estimation
- Forecasting