Macroeconometrics
Fall 2023

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Classes: Wednesdays 10:30-1.

This course will cover a range of topics in time series econometrics and empirical macroeconomics and finance that arise in current research. This course should be taken by people with an interest in either empirical macro or empirical finance and is likely to be helpful to a graduate student with time-series empirical interests, especially in searching for a dissertation topic.

There is no textbook for the course; instead there are readings from a number of books and journal articles.

The course will involve a number of assignments which will be long and difficult and will involve assembling and working with data. For standardization purposes, you should all do this empirical work in Matlab.

Everyone should turn in their own assignments, though you may work on them together. Doing these assignments carefully and on your own is an important learning experience and is for your own long-term good. The course grade will be based on the assignments.

Here is a list of topics that will be covered and readings on these topics.

1. Structural VARs and the identification of policy shocks. Vector autoregressions are a potentially powerful and widely-used method for identifying the effects of certain underlying shocks, including monetary policy and productivity shocks on macroeconomic aggregates. We will talk about the identifying assumptions that are crucial to this work.
Bernanke, B.S. and K.N. Kuttner (2005). What Explains the Stock Market's Reaction to Federal Reserve Policy?, *Journal of Finance* 40, 1221-1257.
Blanchard, O.J. and D. Quah (1989): The Dynamic Effects of Aggregate Demand and Aggregate Supply Disturbances, *American Economic Review*, 79, pp.655-673.
Canova, F. (2007): "Methods for Applied Macroeconomic Research", Princeton University Press, Chapter 4, 9 and 10.
Christiano, L.J., M. Eichenbaum and C. Evans (1996): The Effects of Monetary Policy Shocks: Evidence from the Flow of Funds, *Review of Economics and Statistics*, 78, pp.16-34.
Christiano, L., M. Eichenbaum and R. Vigfusson (2006) Assessing Structural VARs, *NBER Macroeconomics Annual* 2006, 1-72.
Faust, J. (1998): The Robustness of Identified VAR Conclusions about Money, *Carnegie Rochester Series on Public Policy*, 49, pp.207-214.
Faust, J., E. Swanson, and J.H. Wright (2004): Identifying VARs Based on High-Frequency Futures Data. *Journal of Monetary Economics* 51, pp.1107-31.

Francis, N., M.T. Owyang, J.E. Roush and R. DiCecio (2014): A Flexible Finite-Horizon Alternative to Long-run Restrictions with an Application to Technology Shocks, *Review of Economics and Statistics*.

Hamilton, J.D. (1995): "Time Series Analysis". Princeton University Press, Chapter 11.

Inoue, A. and L. Kilian (2013): Inference on Impulse Response Functions in Structural VAR Models,

Kilian, L. (1998): Small Sample Confidence Intervals for Impulse Responses, *Review of Economics and Statistics*, 80, pp.218-230.

Leeper, E. and D. Gordon (1994): The Dynamic Impacts of Monetary Policy: A Lesson in Tentative Identification, *Journal of Political Economy*, 102, pp. 1228-1247.

Romer, C.D., and D.H. Romer (2004). A New Measure of Monetary Shocks: Derivation and Implications. *American Economic Review* 94 1055-1084.

Romer, C.D., and D.H. Romer (1989). Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz. *NBER Macroeconomics Annual* 4: 121-170.

Rudebusch, G.D. (1998): Do Measures of Monetary Policy in a VAR Make Sense? *International Economic Review*, 39, 907 – 931.

Rubio-Ramirez, J.F., D.F Waggoner and T.Zha (2010): Structural Vector Autoregressions: Theory of Identification and Algorithms for Inference, *Review of Economic Studies*, 77, pp.665-696.

Runkle, D. (1987): Vector Autoregressions and Reality, *Journal of Business and Economic Statistics*, 5, pp.437-442.

Sims, C.A. (1980): Macroeconomics and Reality, *Econometrica*, 48, pp.1-48.

Sims, C.A. (1992): Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy, *European Economic Review*, 36, pp. 975-1011.

Uhlig, H. (2005): What are the Effects of Monetary Policy on Output? Evidence from an Agnostic Identification Procedure, *Journal of Monetary Economics*, 52, pp.381-419.

2. The equity premium puzzle.

Aït-Sahalia, Y., J.A. Parker and M. Yogo (2004): Luxury Goods and the Equity Premium, *Journal of Finance*, 59, pp.2259-3004.

Bansal, R. and A. Yaron (2005): Risks for the Long Run: A Potential Resolution of Asset Pricing Puzzles, Journal of Finance, 59, pp.1481-1509.

Barro, R.J. (2006): Rare Disasters and Asset Markets in the Twentieth Century, *Quarterly Journal of Economics*, 121, pp.823-866.

Campbell, J.Y. and J.H. Cochrane (1999): By Force of Habit: A Consumption Based Explanation of Aggregate Stock Market Behavior, *Journal of Political Economy*, 107, pp.205-251.

Constantinedes, G. (1990): Habit Formation: A Resolution of the Equity Premium Puzzle, *Journal of Political Economy*, 98, pp.519-543.

Hansen, L.P. and R. Jagannathan (1991): Implications of Security Market Data for Models of Dynamic Economies, *Journal of Political Economy,* 99, pp.225-262.

Mehra, R. and E. Prescott (1985): The Equity Premium: A Puzzle, *Journal of Monetary Economics*, 15, pp. 145-161.

Piazzesi, M., M. Schneider and S. Tuzel (2007): Housing, Consumption and Asset Prices, *Journal of Financial Economics*, 83, pp.531-569.

Rietz, T. (1988): The Equity Risk Premium: A Solution, Journal of Monetary Economics, 22, pp.117-131.

3. Instrumental variables and GMM. All estimators can be thought of as GMM estimators. This principle will be developed. Identification and problems of weak identification will be discussed. The main applications will be to the estimation of forward-looking macroeconomic models and the consumption CAPM.

Anderson, T.W. and H. Rubin (1949). Estimators of the Parameters of a Single Equation in a Complete Set of Stochastic Equations, *Annals of Mathematical Statistics* 21, 570-582.

Andrews, D.W.K. and J.H. Stock (2006): "Inference with Weak Instruments" in R. Blundell, W.K. Newey and T. Persson, eds., Advances in Economics and Econometrics, Theory and Applications, 9th Congress of the Econometric Society, Cambridge University Press.

Campbell, J.Y., A.W. Lo and C. McKinlay (1996): "The Econometrics of Financial Markets", Princeton University Press, Chapter 8.

Canova, F. (2007): "Methods for Applied Macroeconomic Research", Princeton University Press, Chapter 5.

Clarida, R., J. Gali and M. Gertler (1998): Monetary Policy Rules in Practice: Some International Evidence, *European Economic Review*, 42, pp.1033-1067.

Dufour, J.-M. (1997): Impossibility Theorems in Econometrics with Applications to Structural and Dynamic Models, *Econometrica* 65, 1365-1387.

Dufour, J.-M. (2003): Identification, weak instruments, and statistical inference in econometrics, *Canadian Journal of Economics.*

Eichenbaum, M.S., L.P. Hansen and K.J. Singleton (1988): A Time-Series Analysis of Representative Agent Models of Consumption and Leisure Choice under Uncertainty, *Quarterly Journal of Economics*, 103, pp.51-78.

Epstein, L. and S. Zin (1991): Substitution, Risk Aversion and Temporal Behavior of Consumption and Asset Returns: An Empirical Analysis, *Journal of Political Economy*, 199, pp.263-286.

Gali, J. and M. Gertler (1999): Inflation Dynamics: A Structural Econometric Model, *Journal of Monetary Economics*, 44, pp.195-222.

Hall, R.E. (1978): Stochastic Implications of the Life-Cycle Permanent Income Hypothesis: Theory and Evidence, *Journal of Political Economy*, 86, pp.971-987.

Hansen, L.P. (1982): Large Sample Properties of Generalized Method of Moments Estimators, *Econometrica*, 50, pp.1029-1054.

Hansen, L.P., J. Heaton and A. Yaron (1996): Finite Sample Properties of Some Alternative GMM Estimators, *Journal of Business and Economic Statistics*.

Hansen, L.P. and R. Jagannathanan (1991): Restrictions on Intertemporal Marginal Rates of Substitution Implied by Asset Returns, *Journal of Political Economy*, 99, pp. 225-262.

Hansen, L.P. and K.Singleton (1982): Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models, *Econometrica*, 50, pp.1269-1286.

Kleibergen, F.R. (2002): Pivotal Statistics for Testing Structural Parameters in Instrumental Variables Regression, *Econometrica* 70, 1781-1803.

Kleibergen, F.R. and S. Mavroeidis (2009): Weak Instrument Robust Tests in GMM and the New Keynesian Phillips Curve, *Journal of Business and Economic Statistics*, 27, pp.293-311.

Staiger, D. and J.H. Stock (1997): Instrumental Variables Regression with Weak Instruments, *Econometrica* 65, 557-586.

Stock, J.H. and J.H. Wright (2000): GMM with Weak Identification, *Econometrica*, 68, pp.1055-1096.

Stock, J.H., J.H. Wright, and M. Yogo (2002): A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments, *Journal of Business and Economic Statistics* 20, 518-529.

Yogo, M. (2004): Estimating the Elasticity of Intertemporal Substitution when Instruments are Weak, Review of Economics and Statistics, 86, pp.797-810.

4. The Kalman Filter and its Applications. Nonlinear filtering and Markov Chain Monte Carlo. A wide class of problems in applied macroeconometrics is characterized by a model in state-space form with observed data related to an underlying latent process.

Canova, F. (2007): "Methods for Applied Macroeconomic Research", Princeton University Press, Chapter 6.

Durbin, J. and S.J. Koopman (2001): Time Series Analysis by State Space Methods, Oxford University Press.

Fernandez-Villaverde, J. and J.F. Rubio-Ramirez (2007): Estimating Macroeconomic Models: A Likelihood Approach, *Review of Economic Studies*, 74, pp 1059-1087.

Harvey, A.C. (1981): "Time Series Models", Cambridge University Press.

Harvey, A.C. (1989): *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge University Press.

King, R.G, J.H. Stock and M.W. Watson (1995): Temporal Instability of the Unemployment-Inflation Relationship, Economic Perspectives of the Federal Reserve Bank of Chicago.

Kuttner, K.N. (1994): Estimating Potential Output as a Latent Variable, *Journal of Business and Economic Statistics*, 12, pp. 361-368.

Ljungqvist, L. and T.J. Sargent, T.J. (2004), Recursive Macroeconomic Thoery, 2nd edition, MIT Press.

Stock, J.H. and M.W. Watson (1991): A Probability Model of the Coincident Economic Indicators, in "New Methods in Business Cycle Research".

Stock, J.H., and M.W. Watson (1998): Asymptotically Median Unbiased Estimation of Coefficient Variance in a Time Varying Parameter Model, *Journal of the American Statistical Association*, Vol. 93, No. 441, March 1998, pp. 349-358.

Stock, J.H. and M.W. Watson (2007): Has Inflation Become Harder to Forecast? *Journal of Money, Credit and Banking,* 2007, Vol. 39, Number 1, pp. 3-34

5. Markov switching models

Engle, C. and J.D. Hamilton (1992): Long Swings in the Dollar: Are they in the data and do the markets know it, *American Economic Review*, 80, pp.689-713.

Hamilton, J.D. (1989): A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle, *Econometrica*, 57, pp.357-384.

Hamilton, J.D. (1995): "Time Series Analysis". Princeton University Press, Chapter 22.

Kim. C-J. and C.R. Nelson (1999): "State-Space Models with Regime-Switching". MIT Press.

6. Effects of News Announcements. News announcements, in conjunction with high-frequency data, come as close as we get to a natural experiment in macroeconomics.

Andersen, T.G., T. Bollerslev, F.X. Diebold and C. Vega (2003a): Micro Effects of Macro Announcements: Real-Time Price Discovery in Foreign Exchange, *American Economic Review*, 93, pp.38-62.

Andersen, T.G., T. Bollerslev, F.X. Diebold and C. Vega (2007): Real-Time Price Discovery in Global Stock, Bond and Foreign Exchange Markets, *Journal of International Economics*, 73, pp.251-277.

Cook, T. and T. Hahn (1989): The Effect of Changes in the Federal Funds Target on Market Interest Rates in the 1970s, *Journal of Monetary Economics*, 24, pp.331-351.

Ederington, L. and J.H. Lee (1993): How Markets Process Information: News Releases and Volatility, *Journal of Finance*, 48, pp.1161-1191.

Faust, J., J.H. Rogers, S-Y.B. Wang and J.H. Wright (2007): The High-Frequency Response of Exchange Rates and Interest Rates to Macroeconomic Announcements, *Journal of Monetary Economics*.

Kuttner, K.N. (2001): Monetary Policy Surprises and Interest Rates: Evidence from the Fed Funds Futures Market, *Journal of Monetary Economics*, 47, pp.523-544.

7. Macroeconomics and the Term Structure of Interest Rates. This topic will consider exercises on reverse-engineering macroeconomic expectations from benchmark fixed income markets. It considers work on the term structure of interest rates, but not getting into the more technical multi-factor models of the term structure. It will be concerned with such questions as the measurement of monetary policy expectations from

futures and options markets, the effects of inflation targeting, predictive relations and the term structure, stock-bond correlations and their interpretation.

Beechey, M.J. and J.H. Wright (2009): The High-Frequency Impact of News on Long-Term Yields and Forward Rates: Is it Real?, *Journal of Monetary Economics*, 56, pp.535-544.

Campbell, J.Y. and R.J. Shiller (1991): Yield Spreads and Interest Rate Movements: A Birds' Eye View, *Review of Economic Studies*, 58, pp.495-514.

Campbell, J.Y., A. Sunderam and L.M. Viceira (2007): Inflation Bets or Deflation Hedges The Changing Risks of Nominal Bonds, working paper.

Campbell, J.Y., R.J. Shiller and L.M Viceira (2009): Understanding Inflation-Indexed Bond Markets, *Brookings Papers on Economic Activity*, 1, pp.79-120.

Cochrane, J.H. and Monika Piazzesi (2005): Bond Risk Premia, *American Economic Review*, 95, pp.138-160.

Fama, E. F. and R. R. Bliss (1987): The Information in Long-Maturity Forward Rates, *American Economic Review,* 77, pp.680-692.

Gürkaynak, R. S., B. Sack and E. T. Swanson (2005a): The Excess Sensitivity of Long Term Interest Rates: Evidence and Implications for Macroeconomic Models, *American Economic Review*, 95, pp.425-436.

Gürkaynak, R. S., B. Sack and E. T. Swanson (2005b): Do Actions Speak Louder than Words The Response of Asset Prices to Monetary Policy Actions and Statements, *International Journal of Central Banking*, 1, pp.55-93.

Gürkaynak, R. S., B. Sack and E. T. Swanson (2007): Market Based Measures of Monetary Policy Expectations, Journal of Business and Economic Statistics, 25, pp.201-212.

Gürkaynak, R. S., B. Sack and J. H. Wright (2007): The U.S. Treasury Yield Curve: 1961 to the Present, *Journal of Monetary Economics*, 54, pp.2291-2304.

Gürkaynak, R. S., B. Sack and J. H. Wright (2010): The TIPS Yield Curve and Inflation Compensation: 1961 to the Present, *American Economic Journal: Macroeconomics*, 22, pp.70-92.

Hamilton, J.D. (2008): Daily Changes in Federal Funds Futures Prices, *Journal of Money, Credit and Banking*, forthcoming.

Piazzesi, M. and M. Schneider (2006): Equilibrium Yield Curves, *NBER Macro Annual*, 21, pp.389-442.

Shiller, R., J. Y. Campbell and K. Schoenholtz (1983): Forward Rates and Future Policy: Interpreting the Term Structure of Interest Rates, *Brookings Papers on Economic Activity*, 1, pp.173-217.

8. Forecasting. Special attention will be given to new (and old) developments in forecasting with large datasets, including model averaging and factor methods and also to inference when the regressors are highly persistent. The role of surveys in forecasting will also be discussed.

Ang, A., G. Bekaert and M. Wei (2007): Do Macro Variables, Asset Markets or Surveys Forecast Inflation Better?, *Journal of Monetary Economics*, 54,pp.1163.1212.

Clark, T.E. and M. McCracken (2001): Tests of Equal Forecast Accuracy and Encompassing for Nested Models, *Journal of Econometrics*, 105, pp.85-110.

Diebold, F.X. and R.S. Mariano (1995): Comparing Predictive Accuracy, *Journal of Business and Economic Statistics*, 13, pp.253-263.

Elliott, G. and J.H. Stock (1994): Inference in Time Series Regression When the Order of Integration of a Regressor is Unknown, *Econometric Theory*, 10, pp.672-700.

Elliott, G., C. Granger and A. Timmerman (eds.) (2006): Handbook of Economic Forecasting, North-Holland Press.

Faust, J. and J.H. Wright (2009): Comparing Greenbook and Reduced Form Forecasts using a Large Realtime Dataset, *Journal of Business and Economic Statistics*, 27, pp.468-479.

Faust, J. and J.H. Wright (2013): Forecasting Inflation, Handbook of Economic Forecasting, Volume 2A, Elsevier.

Granger, C. W. J. and Bates, J.: 1969, The combination of forecasts, *Operations Research Quarterly* 20, pp.451-468.

Hansen, B.E. (2007): Least Squares Model Averaging, *Econometrica*, 75, pp. 1175-1189.

Hodrick, R.J. (1992): Dividend Yields and Expected Stock Returns: Alternative Procedures for Inference and Measurement, *Review of Financial Studies*, 5, pp.357-386.

Marcellino, M., J.H. Stock and M.W. Watson (2006): A Comparison of Direct and Iterated Multistep AR methods for Forecasting Macroeconomic Time Series, *Journal of Econometrics*, 135, pp.499-526.

Meese, R. and K. Rogoff (1983): Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample?, *Journal of International Economics*, 14, pp.3-24.

Mincer, J. and V. Zarnowitz (1969): "The Evaluation of Economic Forecasts" in J. Mincer (ed.), Economic Forecasts and Expectations, NBER, New York.

Romer, C.D. and D.H. Romer (2000): Federal Reserve Information and the Behavior of Interest Rates, *American Economic Review*, 90, pp.429-457.

Stock, J.H., and M.W. Watson (1999): Forecasting Inflation, *Journal of Monetary Economics* 44:293-335.

Stock, J.H. and M.W. Watson (2002): Forecasting Using Principal Components from a Large Number of Predictors, *Journal of the American Statistical Association*, 97, pp.1167-1179.

Wright, J.H. (2008): Bayesian Model Averaging and Exchange Rate Forecasts, *Journal of Econometrics*, pp.329-341.

9. Real-time data in macroeconomics. Data get constantly revised. Part of this is the effect of more complete information becoming available; some of it is definitional changes. Sometimes the effects of data revisions can be large and can alter the conclusions of empirical studies. The Philadelphia Fed has done an enormous public service in making a real-time dataset available to researchers.

Diebold, F.X. and G.D. Rudebusch (1991): Forecasting Output with the Composite Leading Index: A Real-Time Analysis, *Journal of the American Statistical Association*, 86, pp.603-610.

Faust, J., J. Rogers and J.H. Wright (2005): News and Noise in G-7 GDP Announcements, *Journal of Money, Credit and Banking*, 37, pp.403-419

Mankiw, N.G. and M.D. Shapiro (1986): News or Noise: An Analysis of GNP Revisions, *Survey of Current Business*, May 1986, pp.20-25.

Orphanides, A. (2001): Monetary Policy Rules Based on Real-Time Data, *American Economic Review*, 91, pp. 964-985.

10. Unit Roots, Spurious Regressions, Near Unit Roots and Cointegration. This topic was all the rage in time series econometrics 20 years ago. It's not generating anything like the same research interest now, but it's still important to be familiar with some of the classic papers in this literature and what the implications are for inference.

Campbell, J.Y. and P. Perron (1991): Pitfalls and Opportunities: What Macroeconomists should know about unit roots, *NBER Macroeconomics Annual*, pp.141-200.

Christiano, L.C. and M. Eichenbaum (1990): Unit Roots in GNP: Do we know and do we are?, *Carnegie-Rochester Conference Series on Public Policy*, 32, pp.7-62.

Cochrane, J.H. (1988): How Big is the Random Walk in GNP, *Journal of Political Economy*, 96, pp.893-920.

Elliott, G. (1998): The Robustness of Cointegration Methods when Regressors Almost Have Unit Roots, *Econometrica*, 66, pp. 149-58

Engle, R. F. and Granger, C. W. J. (1987): Co-integration and error-correction: Representation, estimation and testing, *Econometrica* 55, pp.251-276.

Granger, C. W. J. and Newbold, P. (1974): Spurious regressions in econometrics, *Journal of Econometrics* 2, pp.111-120.

Hamilton, J.D. (1995): "Time Series Analysis". Princeton University Press, Chapters 15, 17, 18 & 19.

Nelson, C.R. and C.I. Plosser (1982): Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications, *Journal of Monetary Economics*, 10, pp.139-162.

Perron, P. (1989): The Great Crash, the Oil Price Shock and the Unit Root Hypothesis, *Econometrica*, 57, pp.1361-1401.

Stock, J.H. (1991): Confidence Intervals for the Largest Autoregressive Root in U.S. Macroeconomic Time Series, *Journal of Monetary Economics*, 28, pp.435-459.

11. Persistence in volatility. Modeling and some implications.

Anderson, T.G. and T. Bollerslev (1998): Answering the Skeptics: Yes, Standard Volatility Models Do Provide Accurate Volatility Forecasts, International Economic Review, pp.885-905.

Bollerslev, T. , R.F. Engle and D.B. Nelson (1995): "ARCH Models" in Handbook of Econometrics Vol. 4, R.F. Engle and D.L McFadden (eds.).

Campbell, J.Y., A.W. Lo and C. McKinlay (1996): "The Econometrics of Financial Markets", Princeton University Press, Chapter 12.

Engle, R. (1982): Autoregressive conditional heteroskedasticity with estimates of the variance of UK Inflation, *Econometrica*, 50, pp.987-1008.

Jones, C.M., O. Lamont and R.L. Lumsdaine (1998): Macroeconomic News and Bond Market Volatility, *Journal of Financial Economics*, 47, pp.315-337.

Hamilton, J.D. (1995): "Time Series Analysis". Princeton University Press, Chapter 21.

Schwert, G. W.: 1990, Stock volatility and the crash of '87, *Review of Financial Studies* 3, 77-102.

12. Structural stability. Do economic relationships change over time? How do we tell, especially when the time of the possible break is not known *a priori*.

Andrews, D.W.K. (1993): Tests for Parameter Instability and Structural Change with Unknown Change Point, *Econometrica*, 61, pp.821-856.

Elliott, G. and U. Müller (2007): Confidence sets for the date of a Single Break in Linear Time Series Regressions, *Journal of Econometrics*, 141, pp.1196-1218.

Elliott, G. and U. Müller (2006): Efficient Tests for General Persistent Time Variation in Regression Coefficients, *Review of Economic Studies*, 73, pp.907-940.

Hansen, B.E. (2001): The New Econometrics of Structural Change: Dating Changes in U.S. Labor Productivity, *Journal of Economic Perspectives*, 15, pp.117-128.

McConnell, M.M. and G. Perez-Quiros (2000): Output Fluctuations in the United States: What Has Changed Since the Early 1980s?, *American Economic Review*, 90, pp.1464-1476.

Nyblom, J. (1989): Testing for the Constancy of Parameters over Time, *Journal of the American Statistical Association*, 84, pp.223-230.

Romer, C.D. (1986): Is Stabilization of the Postwar Economy A Figment of the Data?, *American Economic Review*, 76, pp.314-334.

13. Estimation of the output-inflation tradeoff (if any). This applies a number of the methods for identification, handling structural change etc. that we cover in the course.

Ball, L. and N.G. Mankiw (2002): The NAIRU in Theory And Practice, *Journal of Economic Perspectives*, 16, pp. 115-136.

Ball, L. and S. Mazumder (2011): Inflation Dynamics and the Great Recession, *Brookings Papers on Economic Activity*.

King, R.G, J.H. Stock and M.W. Watson (1995): Temporal Instability of the Unemployment-Inflation Relationship, *Economic Perspectives of the Federal Reserve Bank of Chicago*.

Staiger, D., J.H. Stock and M. Watson (1997): The NAIRU, Unemployment and Monetary Policy, *Journal of Economic Perspectives*, 11, pp.33-51.

14. Empirical Work Related to the Financial Crisis. The current financial crisis and recession is going to be the subject of research in macroeconomics and finance for a generation, including applied econometric work. We'll talk about a few of the papers related to the topic and to "quantitative easing" more generally

Bernanke, B., V. Reinhart and B.P. Sack (2004): Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment, *Brookings Papers on Economic Activity*.

DiMaggio, M. and A. Kermani (2014): Credit-Induced Boom and Bust.

Gagnon, J., M. Raskin, J. Remache, and B. Sack (2011): Large-Scale Asset Purchases by the Federal Reserve: Did They Work?, *International Journal of Central Banking*, 7, 3-44.

Greenwood, R. and D. Vayanos (2014): Bond Supply and Excess Bond Returns, *Review of Financial Studies*.

Krishnamurthy, A. and A. Vissing-Jorgensen (2012): The Aggregate Demand for Treasury Debt, *Journal of Political Economy*, 120, pp.233-267.

McAndrews, J., A. Sarkar and Z. Wang (2008): The Effect of the Term Auction Facility on the London Inter-Bank Offered Rate, working paper.

McGough, B., G.D. Rudebusch and J.C. Williams (2005): Using a Long-Term Interest Rate as the Monetary Policy Instrument, *Journal of Monetary Economics*, 52, pp.855-879.

Rogers, J., C. Scotti, and J.H. Wright (2014): Evaluating Asset-Market Effects of Unconventional Monetary Policy: A Multi-Country Review, *Economic Policy*.

Sufi, A. and A. Mian (2009): Household Leverage and the Recession of 2007 to 2009, working paper.

Taylor, J. and J.C. Williams (2009): A Black Swan in the Money Market, *American Economic Journal: Macroeconomics,* 1, pp.58-83.