

Yale University
Department of Economics

General Economic Theory
Macroeconomics (Econ 510a)
First Half. Fall 2013

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Overview

This is the first half of the first semester in the graduate macroeconomics sequence. We state the main questions addressed by macroeconomics and begin the study of the standard models used to provide the answers. In doing so we cover tools central to macroeconomics, both when describing the facts (time series analysis) and when building models to address the main issues (stochastic dynamic programming).

Reading

It is essential that you be familiarized with one intermediate macroeconomics text, if you are not, make sure you read one as soon as possible, otherwise you'll perceive the macro sequence as a series of methods and models, not as a coherent attempt to understand economic fluctuations.

The main references are lecture slides posted on the course site. Required readings from the list below will be posted on the course site as well.

There are three textbooks for this semester, they will be useful throughout the entire first year. They are: Lars Ljungqvist and Thomas Sargent's *Recursive Macroeconomic Theory*, Third Edition, MIT Press, 2012; David Romer's *Advanced Macroeconomics*, Fourth Edition, McGraw-Hill, 2011; and Daron Acemoglu's *Introduction to Modern Economic Growth*, Princeton University Press, 2008.

There are two textbooks that may be useful for the time-series section: DeJong and Dave's *Structural Macroeconometrics*, Princeton University Press, 2007, is easier than the level of the course, while Fabio Canova's *Methods for Applied Macroeconomic Research*, Princeton University Press, 2007, is harder. There also is a textbook on dynamic programming I recommend. Stokey and Lucas's *Recursive Methods in Economic Dynamics*, Harvard University Press, 1989 is a classic worth owning. I have not ordered any of the three above books, you should buy them directly if so inclined.

Evaluation

There will be weekly problem sets and a closed book Mid-Term on Tuesday, October 15, from 10.30am to 1pm. The second half of the course will be evaluated in the Final Exam. The Mid-Term and Exam will be given equal weights in the final grade, accounting for 90% of the final grade.³ Problem sets account for the remaining 10%.

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³With one exception: students who do significantly better in the Exam than in the Mid Term will receive a somewhat larger weight on their Exam grade.

Calendar of Lectures and Problem Sets

Official times for lectures are Tuesday and Thursday at 11.30 and, only during the first half of the course, Wednesdays at 1.00pm. Official times for sections is Wednesdays at 2.30pm. See the calendar below for details.

Calendar of Lectures

Week beginning	Tuesday 10.30	Wednesday 1.00	Wednesday 2.30	Thursday 10.30
August 26:	—	Lecture 1	—	Lecture 2
September 2:	Lecture 3	Lecture 4	Session 1	Lecture 5
September 9:	Lecture 6	Lecture 7	Lecture 8	Session 2
September 16:	Session 3	Session 4	—	Session 5
September 23:	Lecture 9	Lecture 10	Session 6	Lecture 11
September 30:	Lecture 12	Lecture 13	Session 7	Lecture 14
October 7:	Lecture 15	Lecture 16	Session 8	Session 9
October 14:	Midterm	2nd half	2nd half	2nd half

Calendar of Problem Sets

Problem Set	Date posted	Date due
1	August 29	September 3
2	September 5	September 10
3	September 12	September 17
4	September 26	October 1
5	October 3	October 8
6	October 10	October 15

Notes:

There will also be special assignments posted by the TF on the computational (SDP) part of the course.

Handing in the last problem set (on the day of the mid term) is optional, if you do, your grade on this problem set can substitute for one of the regular problem sets.

Programming Skills

As part of the course you will learn how to apply time-series techniques to actual macroeconomic series. You will also learn to solve numerically stochastic dynamic programming problems. The starting point is the Matlab sessions you had during summer camp.

SYLLABUS

I. BASIC FACTS (AND THE TOOLS TO DESCRIBE THEM).

Lectures 1–5

Macroeconomic data are time-series. Therefore the theory of stochastic processes is used to describe the features of time-series relevant for macroeconomics. This includes exploring the possibility of estimating underlying parameters based on only *one* realization of a time series, isolating trends and cyclical components, describing the relation between various time-series, and understanding the role of the driving forces ('shocks') and their empirical counterparts.

1. **Course overview.**
2. **Why time series?:** The Slutsky-Frisch propagation mechanism. Exogenous and endogenous variables. The case for linear models. Macroeconomics: dynamics, aggregation, general equilibrium.
3. **Time series for macroeconomists:** Stationarity, ARMA models, autocorrelation and autocovariance functions, prediction and impulse-responses, Wold representation. Non-linear models: ARCH models, Markov switching models.
4. **Applications:** Rational expectations. Trend-cycle decomposition and the HP filter. The Great Moderation (?). Quantifying the cost of business cycles. Rational expectations and arbitrage.

DEJONG, D. AND C. DAVE (2007): *Structural Macroeconometrics*, Princeton University Press. Chs. 3 and 4.

CANOVA, F. (2007): *Methods for Applied Macroeconomic Research*, Princeton University Press. Chs. 1 and 3.

LJUNGQVIST AND SARGENT (2004): *Recursive Macroeconomic Theory*, Ch. 2.

STOCK, J. AND M. WATSON (1988): "Variable Trends in Economic Time Series,," *J. of Economic Perspectives*, **2**, Summer 1988, 147–174.

KYDLAND, F. AND E. PRESCOTT (1990): "Business Cycles: Real Facts and a Monetary Myth". *Federal Reserve Bank of Minneapolis Quarterly Review*, Spring, 3–18.

STOCK, J. AND M. WATSON (1999): "Business Cycle Fluctuations in U.S. Macroeconomic Time Series," Ch. 1, Vol. 1A, *Handbook of Macroeconomics*, J. Taylor and M. Woodford, eds., North Holland, 1999.

HAMILTON, J. (2005): "What's Real About the Real Business Cycle," NBER WP No. 11161, February 2005.

II. STOCHASTIC DYNAMIC PROGRAMMING.

Lectures 6–11

Stochastic dynamic programming (SDP) have become the central tool in macroeconomics. It provides a tractable, and at the same time broad enough way of incorporating dynamics, solving problems recursively is central to economics more generally. It is useful in other fields of economics as well (e.g., finance and industrial organization). In this part of the course we concentrate on individual agents solving a stochastic dynamic programming problem. Problem formulation, existence, uniqueness and computation of a solution are our main concerns. The closely related concept of recursive equilibrium is covered in the second half of the course.

The stochastic growth model is the workhorse model in macroeconomics. We begin our study in this section (a study that continues throughout the entire year). You will learn to log-linearize this model to obtain an approximate solution, and use it to introduce important topics in dynamic optimization and to motivate stochastic dynamic programming.

1. Problem Formulation: sequential formulation, recursive formulation and Bellman equation
2. Existence and uniqueness of a solution: contraction mapping theorem, Blackwell's Theorem
3. Finding the solution: cases with closed form solutions, log-linearization and solving linear rational expectations equations, numerical methods
4. Properties of the solution: envelope theorem, garbage in–garbage out result
5. Applications: search, quadratic adjustment costs and partial adjustment models, non-convex adjustment costs and S_s policies.
6. Formal derivations

Chapters 2.1 and 2.2 in Stokey and Lucas is a classic introductions to dynamic programming in macroeconomics. Well worth reading and working through.

KRUSELL, P. (2004): *Lecture Notes in Macroeconomics I*. Mimeo. Chapters 3 and 4.

UHLIG, H. (1997): "A Toolkit for Analyzing Nonlinear Dynamic Stochastic Models Easily", mimeo, Tilburg.

CAMPBELL, J. (1994): "Inspecting the Mechanism: An Analytic Approach to the Stochastic Growth Model," *J. of Monetary Economics*, **33**, June 1994, 463–506.

LUCAS, R.E. (1987): *Models of Business Cycles*, Oxford: Basic Blackwell.

STOKEY, N. AND R. LUCAS (1989): *Recursive Methods in Economic Dynamics*, Ch. 2 (sections 1 and 2). Cambridge–Mass.: Harvard University Press, 1989.

LJUNGQVIST AND SARGENT (2004): *Recursive Macroeconomic Theory*, Chs. 3 and 4.

STOKEY, N. AND R. LUCAS (1989): *Recursive Methods in Economic Dynamics*, Chs. 3, 4 and 9. Cambridge–Mass.: Harvard University Press, 1989.

III. ADVANCED TOPICS IN CONSUMPTION.

Lectures 12–16

The consumption/saving decision lies at the heart of the dynamics of most macroeconomic models. We apply the SDP formulation to solve a relatively general problem and obtain many classical models as particular cases. We emphasize the empirical implications of the models and the interplay between theory and evidence. You return to this topic later during the first year, when you consider dynamic stochastic general equilibrium (DSGE) models that incorporate household default and risk-sharing; when you do this the main insights from this section will be the benchmark against which you'll compare the models' predictions. We also cover two important topics related to fiscal policy: Ricardian equivalence and tax smoothing.

1. General consumption model
2. Perfect foresight and certainty equivalence
3. Estimating Euler equations
4. Precautionary saving and the buffer-stock model
5. Liquidity constraints and the income fluctuation problem
6. Risk sharing: complete vs. incomplete markets
7. Beyond standard utility maximization: habit formation, hyperbolic discounting,...
8. Consumption of durables

Reading the classics is particularly worthwhile for this material: Friedman and Modigliani's original work has many interesting insights and makes you wonder to what an extent the formal work that followed captured what they had in mind. The Summer 2001 issue of the *Journal of Economic Perspectives* includes a collection of good articles as well. The chapter in Romer's book on consumption is the chapter I like most in that book. Among the technically more sophisticated papers, Gourrinchas-Parker illustrates well a type of paper that aggregates in a mechanical manner microeconomic behavior resulting from relatively sophisticated dynamic programming to match aggregate variables (consumption in this case).

ROMER, D. (2006): *Advanced Macroeconomics*, Third Edition, Ch. 7.

DEATON, A. (1992): *Understanding Consumption*, Oxford: Oxford University Press, 1992.

GOLLIER, C. (2001): *The Economics of Risk and Time*, Section VI, Cambridge, Mass.: MIT Press, 2001.

ATTANASIO, O. AND G. WEBER (2010): "Consumption and Saving: Models of Intertemporal Allocation and Their Implications for Public Policy," *J. of Economic Literature*, **48** 693–751.

KRUEGER, D. (2007): *Consumption and Saving: Theory and Evidence*. Mimeo.

FRIEDMAN, M. (1957): *A Theory of the Consumption Function* Chaps. 1, 2, 3 and 9, Princeton University Press.

- MODIGLIANI, F. (1986): “Life Cycle, Individual Thrift, and the Wealth of Nations,” *American Economic Review*, **76**: 297–313.
- HALL, R.E. (1978): “Stochastic Implications of the Life Cycle–Permanent Income Hypothesis: Theory and Evidence”, *J. of Political Economy*, **86**, 971–987, 1978.
- CARROLL, C. (1992): “The Buffer-Stock Theory of Saving: Some Macroeconomic Evidence,” *Brookings Papers on Economic Activity*, No. 2, 61–156, 1992.
- GOURRINCHAS, P.O., AND J. PARKER (2002): “Consumption over the Life-Cycle,” *Econometrica*, **70** (1), 47–89.
- CARROLL, C. (2001): “A Theory of the Consumption Function, With and Without Liquidity Constraints,” *J. of Economic Perspectives*, **15** (3), Summer 2001, 23–45.
- TOWNSEND, R. (1994): “Risk Insurance in Village India,” *Econometrica*, **523** 539–591.
- FUCHS-SCHÜNDELN, N., AND M. SCHÜNDELN (2005): “Precautionary Savings and Self-Selection – Evidence from the German Reunification ‘Experiment’ ” *Quarterly Journal of Economics*, **120**, 1085–1020.
- HURST, E., A. LUSARDI, A. KENNICKELL AND F. TORRALBA (2008) : “The Importance of Business Owners in Assessing the Size of Precautionary Savings,” mimeo.
- PARKER, J., N. SOULELES, D. JOHNSON AND R. MCCLELLAND (2011): “Consumer Spending and the Economic Stimulus Payments of 2008,” mimeo.
- GROSS, D. AND N. SOULELES (2002): “Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence From Credit Card Data,” *Quarterly Journal of Economics*, **117** (1), February 2002, 149–185. Also, NBER WP No. 8314, June 2001.
- LUCAS, R.E. (1978): “Asset Prices in an Exchange Economy,” *Econometrica*, **46**, 1429–1446, 1978.
- BARRO, R.J. AND S. URSUA (2008): “Macroeconomic Crises since 1870,” *Brookings Papers on Economic Activity*, 255–350, 2008.
- AKERLOF, G. (2007): “The Missing Motivation in Macroeconomics,” *American Economic Review*, **97**:1, 5–36.
- JAPPELLI, T., M. PADULA AND L. PISTAFERRI (2008): “A Direct Test of the Buffer-Stock Model of Saving,” *J. of the European Economic Association*, **6**, 1186–1210.
- BLUNDELL, R., L. PISTAFERRI AND I. PRESTON (2008): “Consumption Inequality and Partial Insurance,” *American Economic Review*, **98**, 5, 1887–1921.
- AGUIAR, M. AND E. HURST (2005): “Consumption vs. Expenditure,” *J. of Political Economy*, October 2005, **113** 5, 919–948.