

Part II: Investment and Consumption under Uncertainty

Professor

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Overview

In the first half of this course you studied the neo-classical growth model, which describes the long run determinants of GDP. In this half, we focus on the behavior of two main components of GDP: consumption and investment. Over five weeks, we will study several different models. The focus is on understanding how these models work and what we can learn from them, but also on how well they describe (features of) the real world. Within each topic, we will approximately follow the historical evolution of our thinking and motivate each step by evaluating the empirical performance of the models.

While the emphasis is on economic content, an important second objective is to familiarize you with the most important techniques that are commonly used in modern macroeconomics. A firm's decision how much of its revenues to invest in capital accumulation and a consumer's choice how much of her income to save are two examples of intertemporal optimization problems. When studying investment, we will primarily consider deterministic optimization problems, or models in which agents have perfect foresight. But many real-world problems cannot be understood in a deterministic setting. Therefore, when we study consumption, we will introduce uncertainty in the model, so that agents have to form expectations about the future, and use stochastic dynamic programming to solve the resulting intertemporal optimization problems.

This course targets primarily future PhD students and aims to prepare you to produce rather than simply consume research. Unless you have a strong background in the material that we cover, you will find that this is a hard course that requires a lot of work. In particular, it will be impossible to earn a good grade without spending many hours a week solving problem sets that will at times be quite technical. If you are mainly interested at a more intuitive introduction to macroeconomics (and do not plan to do a Ph.D.), it is recommended that you take the parallel course in "Macroeconomics".

Grading

Your grade for this half of the course will be based on weekly problem sets (20%) and an exam (80%). The exam will contain short answer questions as well as some longer problems. Your final course grade will be the simple average of your grades in the first and second halves of the course.

The weekly problem sets are meant to help you understand the material and prepare for the exam. There will be a problem set every week, posted on the course website after the Thursday lecture and due at the beginning of class on Tuesday the week after.

Solutions that are handed in late will not be graded. You are encouraged to do the problem sets in groups of 2 or 3 students. Please hand in one copy of the solutions for the group. I strongly recommend you not to divide up the problems, but rather to work on all problems together. It will be hard to pass the exam without the practice you get from doing all problems.

The TA will discuss the problem sets in the practice session. No written solutions will be made available, so you should make sure to attend the practice sessions if you have problems solving the problem sets.

Course outline and preliminary reading list

Starred readings will be discussed in class. Non-starred readings are classics, recent articles on the topic or -in the case of textbooks- alternative readings. I will only briefly discuss these in class and you are therefore responsible for the global content but not for the details of these readings. You will find links to all the readings, as well as updates and changes to the reading on the course website.

1. Investment

*Romer (1996), chapter 8

Robert E. Lucas, Jr (1967). Optimal Investment Policy and the Flexible Accelerator, *International Economic Review*, 8(1), pp. 78-85.

James Tobin (1969). A General Equilibrium Approach To Monetary Theory, *Journal of Money, Credit and Banking*, 1(1), pp.15-29.

*Fumio Hayashi (1982). Tobin's Marginal q and Average q : A Neoclassical Interpretation, *Econometrica*, 50(1), pp.213-224.

Lawrence H. Summers (1981). Taxation and Corporate Investment: A q -Theory Approach, *Brookings Papers on Economic Activity*, 1981(1), pp. 67-140 (with comments by Barry P. Bosworth, James Tobin and Philip M. White)

Andrew B. Abel and Olivier J. Blanchard (1986). The Present Value of Profits and Cyclical Movements in Investment, *Econometrica*, 54(2), pp. 249-274.

Mark E. Doms and Timothy Dunne (1998). Capital Adjustment Patterns in Manufacturing Plants, *Review of Economic Dynamics*, 1(2), pp. 409-429

Avinash K. Dixit and Robert S. Pindyck (1994). *Investment under uncertainty*, Princeton University Press.

Giuseppe Bertola and Ricardo J. Caballero (1994). Irreversibility and Aggregate Investment, *Review of Economic Studies*, 61(2), pp.223-246.

2. Consumption: the intertemporal savings decision under uncertainty

The canonical consumption model

*Adda and Cooper (2003), sections 6.1 - 6.2.2 and 6.3 - 6.3.2

*Deaton (1992), section 3.1

Deaton (1992), chapters 1 and 2

Blanchard and Fisher, section 6.2 and 3.4

Romer (1996), sections 7.1, 7.2 and 7.4

Milton Friedman (1957). A Theory of the Consumption Function.

Franco Modigliani (1986). Life Cycle, Individual Thrift, and the Wealth of Nations,

American Economic Review, 76(3), pp.297-313.
Robert J. Barro (1979). On the Determination of the Public Debt, Journal of Political Economy, 87(5), pp. 940-971.

Stochastic dynamic programming

*Adda and Cooper (2003), chapter 2
Stokey and Lucas (1989), chapters 1, 2, 4 and 9
Ljungqvist and Sargent (2004), chapter 3

Empirical performance of the Life-Cycle / Permanent Income Hypothesis

*Deaton (1992), chapters 3.2 - 4
Romer (1996), section 7.3
Robert E. Hall (1978). Stochastic Implications of the Life-Cycle Permanent-Income Hypothesis, Journal of Political Economy, 86(6)
Orazio Attanasio (1999). Consumption, chapter 11 in John B. Taylor and Michael Woodford (eds), Handbook of Macroeconomics, volume 1B (or NBER Working Paper 6466), sections 1 - 3.3
Marjorie A. Flavin (1981). The Adjustment of Consumption to Changing Expectations About Future Income, Journal of Political Economy, 89(5), pp.974-1009.

3. Asset pricing, consumption CAPM and the equity premium puzzle

*Adda and Cooper (2003), sections 6.2.3 and 6.3.3
Bagliano and Bertola (2004), section 1.4
Romer (1996), section 7.5
Blanchard and Fisher (1989), section 6.2 (p.279-288)
Paul Samuelson (1969). Lifetime Portfolio Selection by Dynamic Stochastic Programming, Review of Economics and Statistics, 21, pp.239-246.
Robert C. Merton (1969). Lifetime Portfolio Selection under Uncertainty: The Continuous-Time Case, Review of Economics and Statistics, 3, pp. 247-57.
Rajnish Mehra and Edward C. Prescott (1985). The Equity Premium: A Puzzle, Journal of Monetary Economics, 15, pp.145-162.
Rajnish Mehra and Edward C. Prescott (2003) The Equity Premium in Retrospect, NBER Working Paper No. 9525.
Lars Peter Hansen and Kenneth J. Singleton (1982). Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models, Econometrica, 50(5), pp. 1269-1286. Errata (1984).
Lars Hansen and Ravi Jagannathan (1991). Implications of Security Market Data for Models of Dynamic Economies, Journal of Political Economy, 99, pp.225-262.
John Cochrane and Lars Hansen (1992). Asset Pricing Explorations for Macroeconomists, NBER Macroeconomics Annual, edited by Olivier Jean Blanchard and Stanley Fischer, pp.115-182.

4. Precautionary savings

*Adda and Cooper (2003), section 2.5 and chapter 3
Stokey and Lucas (1989), section 3.2
Ljungqvist and Sargent (2004), chapter 4
*Adda and Cooper (2003), sections 6.2.4, 6.3.5 and 6.3.6
Deaton (1992), chapter 6
Romer (1996), section 7.6

Blanchard and Fisher (1989), section 6.2 (p.288-291)

*Christopher Carroll (2001). A Theory of the Consumption Function, with and without Liquidity Constraints, *Journal of Economic Perspectives*, 15(3), pp.23-45 (or: Deaton, chapter 6).

Christopher Carroll (1997). Buffer-Stock Saving and the Life Cycle / Permanent Income Hypothesis, *Quarterly Journal of Economics*, 112, pp.1-55.

Angus Deaton (1991). Saving and Liquidity Constraints, *Econometrica*, pp.1221-1248.

Pierre-Olivier Gourinchas and Jonathan Parker (2001). The Empirical Importance of Precautionary Saving, *American Economic Review* P&P.

5. Introduction to business cycles and unemployment

*David Romer (1996). *Advanced Macroeconomics*, chapter 4

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

*King, Robert G. and Sergio T. Rebelo (1999). Resuscitating Real Business Cycles. In: John B. Taylor and Michael Woodford (eds), *Handbook of Macroeconomics*, volume 1B, pp.927-1007.

*Richard Rogerson, Robert Shimer and Randall Wright (2005). Search Theoretic Models of the Labor Market. *Journal of Economic Literature*, 43 (4): 959-988.

Christopher Pissarides (2000). *Equilibrium Unemployment Theory*, 2nd edition. Cambridge: MIT Press, chapters 1 and 2

Textbooks

Adda, J. and R. Cooper, *Dynamic Economics*, MIT Press, 2003

Bagliano, F.-C. and G. Bertola, *Models for Dynamic Macroeconomics*, Oxford University Press, 2004

Barro, R.J. and X. Sala-i-Martin, *Economic Growth*, McGraw Hill, 1995

Blanchard, O.J. and S. Fisher, *Lectures on Macroeconomics*, MIT Press, 1998

Deaton, A., *Understanding Consumption*, Clarendon Press, 1992

Ljungqvist, L. and T.J. Sargent, *Recursive Macroeconomic Theory*, MIT Press, 2000

Romer, D., *Advanced Macroeconomics*, McGraw Hill 1996, or a later edition

Stokey, N.L. and R.E. Lucas, with E.C. Prescott, *Recursive Methods in Economic Dynamics*, Harvard University Press, 1989