

## **Econ 236D Behavioral Macroeconomics**

**Contact information:** Email – chen\_lian@berkeley.edu

**Time:** Weekly 2-hour lecture; Wednesday 1:10-3pm (start at 1:10pm sharp, per Berkeley tradition).

### **Course objectives and overview**

This course focuses on incorporating insights from behavioral economics into macroeconomic analysis.

The first block of the course will be about expectations formations. We will study models and empirical evidence on how expectations deviate from the Full Information Rational Expectations (FIRE) benchmark commonly used in macroeconomics.

The second block of the course will be about imperfect strategic interactions. We will study models and empirical evidence on how economic agents may not be able to perfectly coordinate their decisions. We will then study the implications on general equilibrium effects and macroeconomic policies.

The third block of the course will be about confidence, sentiments, and animal spirits. We will study how to incorporate those thought-after notions into modern business cycle models. We will also study the empirical evidence on their macroeconomic impacts.

The fourth block of the course will be about ambiguity aversion, model uncertainty, and robustness. We will study how to formalize these ideas and their macro implications.

The fifth block of the course will be about the macro implications of nonstandard preferences. Topics include behavioral consumption (habit formation, consumption commitment, excess sensitivity, hyperbolic discounting, and mental accounting), behavioral labor supply and wage rigidity, and behavioral portfolio choice (loss aversion, reference dependence, and narrow bracketing).

The course is designed equally for two different types of audience in mind: macroeconomists/financial economists who are interested in deviations from the standard models; behavioral economists who are interested in broadening the scope of potential applications.

This course can be used to fulfill the psychology and economics, macroeconomics, and finance field requirements this year.

### **Problem sets**

There will be two problem sets assigned through the course of the semester. I will hand out problem sets at least two weeks before they are due.

**Grading and course requirements**

The course requirements are the completion of two problem sets (25% in total), a referee report (30%), a research proposal/final presentation (40%), and participation (5% total).

## Tentative course outline and schedule

*Block 1:* Deviations from the Full Information Rational Expectations (FIRE) benchmark and Expectations formations

Lecture 1 (Jan 20). Noisy information models and rational inattention: foundations

- Noisy information models
- Rational inattention and sparsity

Lecture 2 (Jan 27). Noisy information models and rational inattention: related models, empirical evidence, and applications

- Imprecise perception
- Sticky information
- Kalman filter
- Empirical evidence

Lecture 3 (Feb 3). Overreaction in macroeconomic expectations

- Adaptive expectations
- Extrapolations
- Diagnostic expectations
- Bounded recall
- Empirical evidence
- **Problem set 1 assigned**

*Block 2:* Imperfect strategic interactions and macroeconomic implications

Lecture 4 (Feb 10). Models of imperfect strategic interactions

- Noisy (incomplete) information as a model of imperfect coordination
- Level-k thinking
- Cursed equilibrium
- Empirical evidence on imperfect strategic interactions
- Beauty contests

Lecture 5-6 (Feb 17 & Feb 24). Macroeconomics with imperfect strategic interactions

- Imperfect strategic interactions attenuate general equilibrium effects
- Inertia in macroeconomic responses
- Forward guidance puzzle
- A behavioral New Keynesian model
- Finite horizon planning
- **Problem set 1 due (Feb 17)**
- **Problem set 2 assigned (Feb 24)**

*Block 3: Confidence, sentiments, and animal spirits*

Lecture 7 (Mar 3). Confidence, sentiments, and animal spirits: notions, empirical evidence, and traditional approaches

- Keynes' animal spirits
- Traditional multiple equilibria models of coordination failures and animal spirits
- Evidence on the macro impact of confidence, sentiments, and animal spirits

Lecture 8 (Mar 10). Confidence and animal spirits: modern approaches

- The Barro-King comovement puzzle
- Models of news and noise shocks
- Modern approaches to confidence and animal spirits

*Block 4: Ambiguity aversion, model uncertainty, and robustness*

Lecture 9 (Mar 17). Ambiguity aversion, model uncertainty, and robustness

- Ellsberg paradox
- Models of ambiguity aversion
- Ambiguous business cycles
- Knightian uncertainty and complexity
- Robustness, model uncertainty, and monetary policy
- **Problem set 2 due**

*Block 5: Nonstandard preferences and macroeconomic implications*

Lecture 10 (Mar 31). Behavioral consumption I: habit formation and consumption commitment

- Habit formation
- Consumption commitment
- Macroeconomic and financial implications
- Excess smoothness in consumption

Lecture 11 (Apr 7). Behavioral consumption II: excess sensitivity, hyperbolic discounting, and mental accounting

- Excess sensitivity in consumption
- Puzzles on high-liquidity consumers' behavior
- Hyperbolic discounting
- Mental accounting

Lecture 12 (Apr 14). Behavioral labor supply and wage rigidity

- Fairness and labor supply
- Efficiency wage theory
- Wage rigidity

- **Referee report due**

Lecture 13 (Apr 21). Behavioral portfolio allocation: loss aversion, reference dependence, and narrow bracketing

- Narrow framing and the equity premium puzzle
- Prospect theory and asset prices
- Reference dependence
- Low interest rates and risk taking

Lecture 14 (Apr 28)

- Student Presentation
- **Research proposal due on May 2nd (Sunday after the last class)**

## Readings (subject to change)

The readings for this course are journal articles and unpublished papers. I've organized the readings by lecture topic below. The \* papers are the ones I plan to focus on, and are recommended, though not fully required, reading.

*Block 1: Deviations from the Full Information Rational Expectations (FIRE) benchmark and Expectations formations*

### Lecture 1: Noisy information models and rational inattention: foundations

- \*Gabaix, X. (2014). A sparsity-based model of bounded rationality. *The Quarterly Journal of Economics*
- \*Sims, C. A. (2003). Implications of rational inattention. *Journal of Monetary Economics*,
- \*Mackowiak, B., & Wiederholt, M. (2009). Optimal sticky prices under rational inattention. *American Economic Review*.
- \*Gabaix, X. (2019). Behavioral inattention. *Handbook of Behavioral Economics: Applications and Foundations*.

Theoretical and psychological foundations:

- Sims, C. A. (2010). Rational inattention and monetary economics. In *Handbook of Monetary Economics*. Vol. 3.
- Anderson, J. R. (2014). Cognitive psychology and its implications (8th Edition). Chapter 3.
- Caplin, A., & Dean, M. (2015). Revealed preference, rational inattention, and costly information acquisition. *American Economic Review*.
- De Oliveira, H., Denti, T., Mihm, M., & Ozbek, K. (2017). Rationally inattentive preferences and hidden information costs. *Theoretical Economics*.
- Maćkowiak, B., Matějka, F., & Wiederholt, M. (2018). Dynamic rational inattention: Analytical results. *Journal of Economic Theory*. *Mimeo*.
- Caplin, A., Dean, M., & Leahy, J. (2019). Rationally inattentive behavior: Characterizing and generalizing Shannon entropy. *Mimeo*.
- Afrouzi, H., & Yang, C. (2020). Dynamic Rational Inattention and the Phillips Curve. *Mimeo*.
- Miao, J., Wu, J., & Young, E. (2020). Multivariate Rational Inattention. *Mimeo*.
- Hébert, B. M., & Woodford, M. (2020). Neighborhood-Based Information Costs. *Mimeo*.
- Pomatto, L., Strack, P., & Tamuz, O. (2020). The cost of information. *American Economic Review*.

Applications:

- Van Nieuwerburgh, S., & Veldkamp, L. (2009). Information immobility and the home bias puzzle. *The Journal of Finance*.
- Van Nieuwerburgh, S., & Veldkamp, L. (2010). Information acquisition and

- under-diversification. *The Review of Economic Studies*.
- Maćkowiak, B., & Wiederholt, M. (2015). Business cycle dynamics under rational inattention. *The Review of Economic Studies*.
- Matějka, F., & McKay, A. (2015). Rational inattention to discrete choices: A new foundation for the multinomial logit model. *American Economic Review*.
- Kacperczyk, M., Van Nieuwerburgh, S., & Veldkamp, L. (2016). A rational theory of mutual funds' attention allocation. *Econometrica*.
- Matějka, F. (2016). Rationally inattentive seller: Sales and discrete pricing. *The Review of Economic Studies*.

## **Lecture 2. Noisy information models and rational inattention: related models, applications, and empirical evidence**

- \*Mankiw, N. G., & Reis, R. (2002). Sticky information versus sticky prices: a proposal to replace the New Keynesian Phillips curve. *The Quarterly Journal of Economics*.
- \*Woodford, M. (2019). Modeling Imprecision in Perception, Valuation, and Choice. *Annual Review of Economics*.
- \*Coibion, O., & Gorodnichenko, Y. (2012). What can survey forecasts tell us about information rigidities?. *Journal of Political Economy*.
- \*Coibion, O., & Gorodnichenko, Y. (2015). Information rigidity and the expectations formation process: A simple framework and new facts. *American Economic Review*.

### Applications:

- Reis, R. (2006). Inattentive producers. *The Review of Economic Studies*.
- Reis, R. (2006). Inattentive consumers. *Journal of Monetary Economics*.
- Alvarez, F. E., Lippi, F., & Paciello, L. (2016). Monetary shocks in models with inattentive producers. *The Review of Economic Studies*.
- Stevens, L. (2020). Coarse pricing policies. *The Review of Economic Studies*.

### Evidence:

- Mankiw, N. G., Reis, R., & Wolfers, J. (2003). Disagreement about inflation expectations. *NBER Macroeconomics Annual*.
- Chetty, R., Looney, A., & Kroft, K. (2009). Salience and taxation: Theory and evidence. *American Economic Review*.
- Khaw, M. W., Stevens, L., & Woodford, M. (2017). Discrete adjustment to a changing environment: Experimental evidence. *Journal of Monetary Economics*.
- Coibion, O., Gorodnichenko, Y., & Kumar, S. (2018). How do firms form their expectations? new survey evidence. *American Economic Review*.
- Khaw, M. W., Li, Z., & Woodford, M. (2020). Cognitive imprecision and small-stakes risk aversion. *The Review of Economic Studies*.
- Frydman, C., & Jin, L. J. (2020). Efficient coding and risky choice. *Mimeo*.

### Lecture 3. Overreaction in macroeconomic expectations

- \*Gennaioli, N., Ma, Y., & Shleifer, A. (2016). Expectations and investment. *NBER Macroeconomics Annual*.
- \*Bordalo, P., Gennaioli, N., Ma, Y., & Shleifer, A. (2020). Over-reaction in macroeconomic expectations. *American Economic Review*.
- \*Angeletos, G. M., Huo, Z., & Sastry, K. A. (2020). Imperfect macroeconomic expectations: Evidence and Theory. *NBER Macroeconomics Annual*.
- \*Afrouzi, H., Kwon, S. Y., Landier, A., Ma, Y., & Thesmar, D. (2020). Overreaction and Working Memory. *NBER Working Paper*.

#### Empirical evidence:

- Greenwood, R., & Shleifer, A. (2014). Expectations of returns and expected returns. *The Review of Financial Studies*
- Evans, G. W., & Honkapohja, S. (2001). *Learning and expectations in macroeconomics*. Princeton University Press.
- Malmendier, U., & Nagel, S. (2011). Depression babies: do macroeconomic experiences affect risk taking?. *The Quarterly Journal of Economics*.
- Malmendier, U., & Nagel, S. (2016). Learning from inflation experiences. *The Quarterly Journal of Economics*.
- Andrade, P., Coibion, O., Gautier, E., & Gorodnichenko, Y. (2020). No Firm is an Island? How Industry Conditions Shape Firms' Aggregate Expectations. *Journal of Monetary Economics*.

#### Applications:

- Fuster, A., Laibson, D., & Mendel, B. (2010). Natural expectations and macroeconomic fluctuations. *Journal of Economic Perspectives*, 24(4), 67-84.
- Fuster, A., Hebert, B., & Laibson, D. (2012). Natural expectations, macroeconomic dynamics, and asset pricing. *NBER Macroeconomics Annual*.
- Barberis, N., Greenwood, R., Jin, L., & Shleifer, A. (2015). X-CAPM: An extrapolative capital asset pricing model. *Journal of financial economics*.
- Bordalo, P., Gennaioli, N., & Shleifer, A. (2018). Diagnostic expectations and credit cycles. *The Journal of Finance*.
- Nagel, S., & Xu, Z. (2019). Asset pricing with fading memory. *NBER Working Paper*.
- Bordalo, P., Gennaioli, N., Porta, R. L., & Shleifer, A. (2019). Diagnostic expectations and stock returns. *The Journal of Finance*.
- Da Silveira, R. A., Sung, Y., & Woodford, M. (2020). Optimally Imprecise Memory and Biased Forecasts. *NBER Working Paper*.
- Molavi, P., Tahbaz-Salehi, A., & Vedolin, A. (2021). Model Complexity, Expectations, and Asset Prices. *NBER Working Paper*.

#### Adaptive expectations and the rational expectations revolution:

- Metzler, L. A. (1941). The nature and stability of inventory cycles. *The Review of*

- Economics and Statistics*, 23(3), 113-129.
- Cagan, P. (1956). "The Monetary Dynamics of Hyperinflation," in M. Friedman ed., *Studies in the Quantity Theory of Money*.
  - Nerlove, M. (1958). Adaptive expectations and cobweb phenomena. *The Quarterly Journal of Economics*.
  - Muth, J. F. (1961). Rational expectations and the theory of price movements. *Econometrica*.
  - Lucas, R. E. (1976). Econometric policy evaluation: A critique. *Carnegie-Rochester conference series on public policy*.

Representative heuristics:

- Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive psychology*.
- Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*.
- Gennaioli, N., & Shleifer, A. (2010). What comes to mind. *Quarterly Journal of Economics*.
- Bordalo, P., Coffman, K., Gennaioli, N., & Shleifer, A. (2016). Stereotypes. *The Quarterly Journal of Economics*.

*Block 2: Imperfect strategic interactions and macroeconomic implications*

#### **Lecture 4. Models of imperfect strategic interactions**

- \*Nagel, R. (1995). Unraveling in guessing games: An experimental study. *The American Economic Review*.
- \*Morris, S., & Shin, H. S. (2002). Social value of public information. *American Economic review*.
- \*Camerer, C. F., Ho, T. H., & Chong, J. K. (2004). A cognitive hierarchy model of games. *The Quarterly Journal of Economics*.
- \*Angeletos, G-M., & Lian, C. (2016). "Incomplete information in macroeconomics: Accommodating frictions in coordination." *Handbook of Macroeconomics*. Vol. 2. Chapter 7.
- \*Grossman, S. J., & Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *The American Economic Review*.
- \*Eyster, E., Rabin, M., & Vayanos, D. (2019). Financial markets where traders neglect the informational content of prices. *The Journal of Finance*.

Noisy (incomplete) information as a model of imperfect coordination:

- Angeletos, G. M., & Pavan, A. (2007). Efficient use of information and social value of information. *Econometrica*.
- Angeletos, G. M., & Lian, C. (2017). Dampening general equilibrium: From micro to macro. *NBER Working Paper*.

- Kyle, A. S. (1985). Continuous auctions and insider trading. *Econometrica*.

Level-k thinking:

- Stahl II, D. O., & Wilson, P. W. (1994). Experimental evidence on players' models of other players. *Journal of Economic Behavior & Organization*.
- Stahl, D. O., & Wilson, P. W. (1995). On players' models of other players: Theory and experimental evidence. *Games and Economic Behavior*.
- Ho, T. H., Camerer, C., & Weigelt, K. (1998). Iterated dominance and iterated best response in experimental "p-beauty contests". *American Economic Review*.
- Bosch-Domenech, A., Montalvo, J. G., Nagel, R., & Satorra, A. (2002). One, two, (three), infinity,...: Newspaper and lab beauty-contest experiments. *American Economic Review*.
- Crawford, V. P., Costa-Gomes, M. A., & Iriberri, N. (2013). Structural models of nonequilibrium strategic thinking: Theory, evidence, and applications. *Journal of Economic Literature*.
- Costa-Gomes, M. A., & Crawford, V. P. (2006). Cognition and behavior in two-person guessing games: An experimental study. *American Economic Review*, 96(5), 1737-1768.

Cursed equilibrium:

- Eyster, E., & Rabin, M. (2005). Cursed equilibrium. *Econometrica*.

Empirical Evidence:

- Coibion, O., Gorodnichenko, Y., Kumar, S., & Ryngaert, J. (2021). Do you know that i know that you know...? higher-order beliefs in survey data. *Quarterly Journal of Economics*.

## **Lecture 5. Macroeconomics with imperfect strategic interactions I**

- \*Woodford, M. (2003). Imperfect common knowledge and the effects of monetary policy. *Knowledge, Information, and Expectations in Modern Macroeconomics: In Honor of Edmund S. Phelps*
- \*Allen, Franklyn, Stephen Morris, and Hyun Song Shin (2006), "Beauty Contests and Iterated Expectations in Asset Markets," *Review of Financial Studies*.
- \*Angeletos, G. M., & La'O, J. (2010). Noisy business cycles. *NBER Macroeconomics Annual*.
- \*Angeletos, G. M., & Lian, C. (2018). Forward guidance without common knowledge. *American Economic Review*
- \*Farhi, E., & Werning, I. (2019). Monetary policy, bounded rationality, and incomplete markets. *American Economic Review*.

Complementary applications:

- Nimark, Kristoffer (2008), "Dynamic Pricing and Imperfect Common

- Knowledge,” *Journal of Monetary Economics*.
- Melosi, L. (2014). Estimating models with dispersed information. *American Economic Journal: Macroeconomics*.
  - Angeletos, G-M., & Lian, C. (2016). "Incomplete information in macroeconomics: Accommodating frictions in coordination." *Handbook of Macroeconomics*. Vol. 2. Chapter 8.
  - Kiley, M. T. (2016). Policy paradoxes in the New Keynesian model. *Review of Economic Dynamics*.
  - Andrade, P., Gabbalo, G., Mengus, E., & Mojon, B. (2019). Forward guidance and heterogeneous beliefs. *American Economic Journal: Macroeconomics*.
  - Carroll, C., Crawley, E., Slacalek, J., Tokuda, K., & White, M. N. (2020). Sticky expectations and consumption dynamics. *American Economic Journal: Macroeconomics*.

#### Macro backgrounds:

- Blanchard, O. J. (1985). Debt, deficits, and finite horizons. *Journal of Political Economy*.
- Gali, J. (1999). Technology, employment, and the business cycle: do technology shocks explain aggregate fluctuations?. *American Economic Review*.
- Basu, S., Fernald, J. G., & Kimball, M. S. (2006). Are technology improvements contractionary? *American Economic Review*.
- Werning, I. (2015). Incomplete markets and aggregate demand.

#### **Lecture 6. Macroeconomics with imperfect strategic interactions II**

- \*García-Schmidt, M., & Woodford, M. (2019). Are low interest rates deflationary? A paradox of perfect-foresight analysis. *American Economic Review*
- \*Woodford, M. (2019). Monetary policy analysis when planning horizons are finite. *NBER Macroeconomics Annual*.
- \*Gabaix, X. (2020). A Behavioral New Keynesian model. *American Economic Review*.
- \*Angeletos, G. M., & Huo, Z. (2021). Myopia and anchoring. *American Economic Review*.
- \*Lian, C. (2021). A theory of narrow thinking. *Review of Economic Studies*.

#### Complementary applications:

- Woodford, M. (2013). Macroeconomic analysis without the rational expectations hypothesis. *Annual Review Economics*.
- Iovino, L., & Sergeyev, D. (2020). Central bank balance sheet policies without rational expectations. *Mimeo*.
- Woodford, M., & Xie, Y. (2020). Fiscal and Monetary Stabilization Policy at the Zero Lower Bound: Consequences of Limited Foresight. *Journal of Monetary Economics*.

Block 3: Confidence, sentiments, and animal spirits

### Lecture 7. Confidence, sentiments, and animal spirits: notions, traditional approaches, and empirical evidence

- \*Akerlof, G. A., & Shiller, R. J. (2010). *Animal spirits: How human psychology drives the economy, and why it matters for global capitalism*.
- \*Diamond, P. A. (1982). Aggregate demand management in search equilibrium. *Journal of Political Economy*.
- \*Morris, S., & Shin, H. S. (1998). Unique equilibrium in a model of self-fulfilling currency attacks. *American Economic Review*.
- \*Beaudry, P., & Portier, F. (2006). Stock prices, news, and economic fluctuations. *American Economic Review*.
- \*Barsky, Robert, and Eric Sims (2011), News Shocks and Business Cycles. *Journal of Monetary Economics*.
- \*Angeletos, G. M., Collard, F., & Dellas, H. (2020). Business Cycle Anatomy. *American Economic Review*.

Notions:

- Pigou, A. C. (1927). *Industrial fluctuations*. Routledge.
- Kindleberger, C. P. (1978). *Manias, panics and crashes: a history of financial crises*. Palgrave Macmillan.
- Minsky, H. P. (1986). *Stabilizing an unstable economy*. New York: McGraw-Hill.
- Shiller, R. J. (2017). Narrative economics. *American Economic Review*.
- Cochrane, J. H. (1994). Shocks. *Carnegie-Rochester Conference Series on Public Policy*.

Evidence on the macro impact of news and noise shocks:

- Alexopoulos, M. (2011). Read all about it!! What happens following a technology shock?. *American Economic Review*.
- Blanchard, O. J., L'Huillier, J. P., & Lorenzoni, G. (2013). News, noise, and fluctuations: An empirical exploration. *American Economic Review*.
- Barsky, R. B., & Sims, E. R. (2012). Information, animal spirits, and the meaning of innovations in consumer confidence. *American Economic Review*.
- Barsky, Robert, Susanto Basu, and Keyoung Lee (2014), "Whither News Shocks?" *NBER Macro Annual*.
- Chahrour, R., & Jurado, K. (2018). News or noise? The missing link. *American Economic Review*.

Sentiment index in financial markets:

- Baker, M., & Wurgler, J. (2006). Investor sentiment and the cross-section of stock returns. *Journal of Finance*.

- Baker, M., & Wurgler, J. (2007). Investor sentiment in the stock market. *Journal of Economic Perspectives*.

Traditional multiple equilibria approaches:

- Blanchard, O. J., & Kahn, C. M. (1980). The solution of linear difference models under rational expectations. *Econometrica*.
- Cooper, Russell, and Andrew John (1988), “Coordinating Coordination Failures in Keynesian Models,” *Quarterly Journal of Economics*.
- Howitt, P., & McAfee, R. P. (1992). Animal spirits. *The American Economic Review*.
- Farmer, R. E., & Benhabib, J. (1994). Indeterminacy and increasing returns. *Journal of Economic Theory*.
- Farmer, R. E., & Guo, J. T. (1994). Real business cycles and the animal spirits hypothesis. *Journal of Economic Theory*.
- Obstfeld, M. (1996). Models of currency crises with self-fulfilling features. *European Economic Review*.
- Calvo, G. A. (1998). Capital flows and capital-market crises: the simple economics of sudden stops. *Journal of applied Economics*.
- Benhabib, J., & Farmer, R. E. (1999). Indeterminacy and sunspots in macroeconomics. *Handbook of macroeconomics*.
- Benhabib, J., & Wen, Y. (2004). Indeterminacy, aggregate demand, and the real business cycle. *Journal of Monetary Economics*.
- Benhabib, J., Wang, P., & Wen, Y. (2015). Sentiments and aggregate demand fluctuations. *Econometrica*.
- Kaplan, G., & Menzio, G. (2016). Shopping externalities and self-fulfilling unemployment fluctuations. *Journal of Political Economy*.

Global games:

- Morris, S., & Shin, H. S. (2000). Rethinking multiple equilibria in macroeconomic modeling. *NBER Macroeconomics Annual*.
- Morris, S., & Shin, H. S. (2003). Global games: Theory and applications. *Advances in Economics and Econometrics: Theory and Applications*.
- Weinstein, J., & Yildiz, M. (2007). A structure theorem for rationalizability with application to robust predictions of refinements. *Econometrica*.
- Morris, S., & Yildiz, M. (2019). Crises: Equilibrium shifts and large shocks. *American Economic Review*.
- Schaal, Edouard, and Mathieu Taschereau-Dumouche (2015), “Coordinating Business Cycles,” *mimeo*.

### **Lecture 8. Confidence, sentiments, and animal spirits: modern approaches**

- \*Barro, R. J., & King, R. G. (1984). Time-separable preferences and intertemporal-substitution models of business cycles. *Quarterly Journal of*

*Economics.*

- \*Lorenzoni, G. (2009). A theory of demand shocks. *American Economic Review*.
- \*Jaimovich, Nir, and Sergio Rebelo (2009), “Can News About the Future Drive the Business Cycle?,” *American Economic Review*.
- \*Angeletos, G. M., & La'O, J. (2013). Sentiments. *Econometrica*.
- \*Maxted, P. D. (2020). A macro-finance model with sentiment. *Mimeo*.
- \*Angeletos, G. M., & Lian, C. (2020). Confidence and the Propagation of Demand Shocks. *NBER Working Paper*.

Models of News and Noise shocks:

- Beaudry, P., & Portier, F. (2004). An exploration into Pigou's theory of cycles. *Journal of Monetary Economics*.
- Christiano, L., Ilut, C. L., Motto, R., & Rostagno, M. (2010). Monetary policy and stock market booms. *Macroeconomic Challenges: the Decade Ahead, Federal Reserve Bank of Kansas City, Policy Symposium, Jackson Hole Wyoming*.
- Schmitt–Grohé, S., & Uribe, M. (2012). What's news in business cycles. *Econometrica*.

Models of sentiments and animal spirits:

- Angeletos, G. M., Collard, F., & Dellas, H. (2018). Quantifying confidence. *Econometrica*.
- Angeletos, G. M. (2018). Frictional coordination. *Journal of the European Economic Association*.
- Bhandari, A., Borovička, J., & Ho, P. (2019). Survey data and subjective beliefs in business cycle models. *Mimeo*.
- Bordalo, P., Gennaioli, N., Shleifer, A., & Terry, S. J. (2020). Real credit cycles. *Mimeo*.
- Krishnamurthy, A., & Li, W. (2020). Dissecting mechanisms of financial crises: Intermediation and sentiment. *NBER working paper*.
- Beaudry, P., Galizia, D., & Portier, F. (2020). Putting the cycle back into business cycle analysis. *American Economic Review*.

Macro background and other approaches:

- Greenwood, J., Hercowitz, Z., & Huffman, G. W. (1988). Investment, capacity utilization, and the real business cycle. *American Economic Review*.
- Mavroeidis, S., Plagborg-Møller, M., & Stock, J. H. (2014). Empirical evidence on inflation expectations in the New Keynesian Phillips Curve. *Journal of Economic Literature*.
- Beaudry, P., & Portier, F. (2014). Understanding noninflationary demand-driven business cycles. *NBER Macroeconomics Annual*.
- Beaudry, P., Galizia, D., & Portier, F. (2018). Reconciling Hayek's and Keynes' views of recessions. *Review of Economic Studies*.

*Block 4: Ambiguity aversion, model uncertainty, and robustness*

**Lecture 9. Ambiguity aversion, model uncertainty, and robustness: notions and macroeconomic applications.**

- \*Ellsberg, D. (1961). Risk, ambiguity, and the Savage axioms. *The Quarterly Journal of Economics*.
- \*Gilboa, I., & Schmeidler, D. (1989). Maxmin expected utility with non-unique prior. *Journal of Mathematical Economics*.
- \*Hansen, L., & Sargent, T. J. (2001). Robust control and model uncertainty. *American Economic Review*.
- \*Hansen, L. P., & Sargent, T. J. (2010). Wanting robustness in macroeconomics. *Handbook of monetary economics*.
- \*Woodford, M. (2010). Robustly optimal monetary policy with near-rational expectations. *American Economic Review*.
- \*Caballero, R. J., & Simsek, A. (2013). Fire sales in a model of complexity. *The Journal of Finance*.
- \*Ilut, C. L., & Schneider, M. (2014). Ambiguous business cycles. *American Economic Review*.

Decision theory foundations:

- Knight, F. H. (1921). *Risk, uncertainty and profit*. Houghton Mifflin.
- Savage, L. J. (1954). *The foundations of statistics*. Courier Corporation.
- Epstein, L. G., & Schneider, M. (2003). Recursive multiple-priors. *Journal of Economic Theory*.
- Klibanoff, P., Marinacci, M., & Mukerji, S. (2005). A smooth model of decision making under ambiguity. *Econometrica*.
- Maccheroni, F., Marinacci, M., & Rustichini, A. (2006). Ambiguity aversion, robustness, and the variational representation of preferences. *Econometrica*.
- Strzalecki, T. (2011). Axiomatic foundations of multiplier preferences. *Econometrica*.

Robust control and model uncertainty:

- Hansen, L. P., Sargent, T. J., Turmuhambetova, G., & Williams, N. (2006). Robust control and model misspecification. *Journal of Economic Theory*
- Hansen, L. P., & Sargent, T. J. (2008). *Robustness*.
- Hansen, L. P., & Sargent, T. J. (2012). Three types of ambiguity. *Journal of Monetary Economics*.
- Adam, K., & Woodford, M. (2012). Robustly optimal monetary policy in a microfounded New Keynesian model. *Journal of Monetary Economics*.
- Barnett, M., Buchak, G., & Yannelis, C. (2020). Epidemic Responses Under Uncertainty. *NBER working paper*.

Macroeconomic applications:

- Ilut, C. (2012). Ambiguity aversion: Implications for the uncovered interest rate parity puzzle. *American Economic Journal: Macroeconomics*.
- Bianchi, F., Ilut, C. L., & Schneider, M. (2018). Uncertainty shocks, asset supply and pricing over the business cycle. *The Review of Economic Studies*.
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#### Block 5: Nonstandard preferences and macroeconomic implications

### **Lecture 10. Behavioral consumption: habit formation and consumption commitment**

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- \*Dynan, K. E. (2000). Habit formation in consumer preferences: Evidence from panel data. *American Economic Review*.
- \*Havranek, T., Rusnak, M., & Sokolova, A. (2017). Habit formation in consumption: A meta-analysis. *European Economic Review*.
- \*Chetty, R., & Szeidl, A. (2007). Consumption commitments and risk preferences. *The Quarterly Journal of Economics*.
- \*Chetty, R., & Szeidl, A. (2016). Consumption commitments and habit formation. *Econometrica*
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- Lettau, M., & Uhlig, H. (2000). Can habit formation be reconciled with business cycle facts?. *Review of Economic Dynamics*.
- Fuhrer, J. C. (2000). Habit formation in consumption and its implications for monetary-policy models. *American Economic Review*.
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- Smets, F., & Wouters, R. (2007). Shocks and frictions in US business cycles: A Bayesian DSGE approach. *American Economic Review*.

Habit formation in asset pricing:

- Sundaresan, S. M. (1989). Intertemporally dependent preferences and the volatility of consumption and wealth. *Review of Financial Studies*.
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- Abel, A. B. (1990). Asset Prices under Habit Formation and Catching up with the Joneses. *The American Economic Review*.
- Gali, J. (1994). Keeping up with the Joneses: Consumption externalities, portfolio choice, and asset prices. *Journal of Money, Credit and Banking*.
- Carroll, C. D., Overland, J., & Weil, D. N. (2000). Saving and growth with habit formation. *American Economic Review*.
- Gabaix, X., & Laibson, D. (2001). The 6D bias and the equity-premium puzzle. *NBER macroeconomics annual*.
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- Clark, A. E., & Oswald, A. J. (1996). Satisfaction and comparison income. *Journal of Public Economics*.
- Luttmer, E. F. (2005). Neighbors as negatives: Relative earnings and well-

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- Campbell, J., & Deaton, A. (1989). Why is consumption so smooth?. *The Review of Economic Studies*.
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- Flavin, M. (1993). The excess smoothness of consumption: identification and interpretation. *The Review of Economic Studies*, 60(3), 651-666..

### **Lecture 11. Behavioral consumption: excess sensitivity, hyperbolic discounting, and mental accounting**

- \*Shefrin, H. M., & Thaler, R. H. (1988). The behavioral life-cycle hypothesis. *Economic inquiry*.
- \*Campbell, J. Y., & Mankiw, N. G. (1989). Consumption, income, and interest rates: Reinterpreting the time series evidence. *NBER macroeconomics annual*.
- \*Thaler, R. H. (1990). Anomalies: Saving, fungibility, and mental accounts. *Journal of Economic Perspectives*.
- \*Laibson, David. (1996). "Golden eggs and hyperbolic discounting." *The Quarterly Journal of Economics*.
- \*Harris, C., & Laibson, D. (2013). Instantaneous gratification. *The Quarterly Journal of Economics*.
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- \*Kueng, L. (2018). Excess sensitivity of high-income consumers. *The Quarterly Journal of Economics*.
- \*Fagereng, A., Holm, M. B., & Natvik, G. J. J. (2020). MPC heterogeneity and household balance sheets. *Working Paper*.
- \*Di Maggio, M., Kermani, A., & Majlesi, K. (2020). Stock market returns and consumption. *The Journal of Finance*

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  - Parker, J. A. (1999). The reaction of household consumption to predictable changes in social security taxes. *American Economic Review*.
  - Johnson, D. S., Parker, J. A., & Souleles, N. S. (2006). Household expenditure and the income tax rebates of 2001. *American Economic Review*.
  - Attanasio, O. P., & Weber, G. (2010). Consumption and saving: models of intertemporal allocation and their implications for public policy. *Journal of Economic Literature*.
  - Stephens, M., & Unayama, T. (2011). The consumption response to seasonal income: Evidence from Japanese public pension benefits. *American Economic Journal: Applied Economics*.
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  - Aguiar, M., & Hurst, E. (2013). Deconstructing life cycle expenditure. *Journal of Political Economy*.
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  - Olafsson, A., & Pagel, M. (2018). The liquid hand-to-mouth: Evidence from personal finance management software. *The Review of Financial Studies*.
  - Ganong, P., & Noel, P. (2019). Consumer spending during unemployment: Positive and normative implications. *American Economic Review*.

The “rational” liquidity-constraint approach:

- Kimball, M. S. (1990). Precautionary Saving in the Small and in the Large. *Econometrica*.
- Carroll, C. D. (1997). Buffer-stock saving and the life cycle/permanent income hypothesis. *The Quarterly journal of economics*.
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- Barro, R. J. (1999). Ramsey meets Laibson in the neoclassical growth model. *The Quarterly Journal of Economics*.
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  - Maxted, P. (2020). Present Bias in Consumption-Saving Models: A Tractable Continuous-Time Approach. *Mimeo*.
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- Cochrane, J. H. (1989). The sensitivity of tests of the intertemporal allocation of consumption to near-rational alternatives. *The American Economic Review*.
- Lian, C. (2020). Mistakes in Future Consumption, High MPCs Now. *Mimeo*.
- Ilut, C. L., & Valchev, R. (2020). Economic agents as imperfect problem solvers. *NBER Working Paper*.
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- Rozsypal, F., & Schlafmann, K. (2019). Overpersistence bias in individual income expectations and its aggregate implications. *Mimeo*.

## **Lecture 12. Behavioral labor supply and wage rigidity**

- \*Kahneman, D., Knetsch, J. L., & Thaler, R. (1986). Fairness as a constraint on profit seeking: Entitlements in the market. *American Economic Review*.
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- \*Blinder, A. S., & Choi, D. H. (1990). A shred of evidence on theories of wage stickiness. *The Quarterly Journal of Economics*.
- \*Shafir, E., Diamond, P., & Tversky, A. (1997). Money illusion. *The Quarterly*

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- \*Hall, R. E. (2005). Employment fluctuations with equilibrium wage stickiness. *American economic review*.
- \*Breza, E., Kaur, S., & Shamdasani, Y. (2018). The morale effects of pay inequality. *The Quarterly Journal of Economics*.
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Efficiency wage theory and behavioral accounts of labor supply:

- Akerlof, G. A. (1982). Labor contracts as partial gift exchange. *The quarterly journal of economics*.
- Akerlof, G. A. (1984). Gift exchange and efficiency-wage theory: Four views. *The American Economic Review*.
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- Fehr, E., Goette, L., & Zehnder, C. (2009). A behavioral account of the labor market: The role of fairness concerns. *Annu. Rev. Econ.*

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- Bewley, T. F. (1999). Why wages don't fall during a recession.
- Fehr, E., & Tyran, J. R. (2001). Does money illusion matter?. *American Economic Review*.
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- Rabin, M. (1993). Incorporating fairness into game theory and economics. *The American economic review*.
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- Pissarides, C. A. (2009). The unemployment volatility puzzle: Is wage stickiness the answer?. *Econometrica*.
- Gertler, M., & Trigari, A. (2009). Unemployment fluctuations with staggered Nash wage bargaining. *Journal of Political Economy*.
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### **Lecture 13. Behavioral portfolio allocation: loss aversion, reference dependence, and narrow bracketing**

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  - \*Lian, C., Ma, Y., & Wang, C. (2019). Low interest rates and risk-taking: Evidence from individual investment decisions. *The Review of Financial Studies*.

#### Asset pricing and portfolio allocation applications:

- Mehra, R., & Prescott, E. C. (1985). The equity premium: A puzzle. *Journal of Monetary Economics*.
- Thaler, R. H., Tversky, A., Kahneman, D., & Schwartz, A. (1997). The effect of myopia and loss aversion on risk taking: An experimental test. *The Quarterly Journal of Economics*.
- Odean, T. (1998). Are investors reluctant to realize their losses?. *The Journal of finance*.
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- Frydman, C., Hartzmark, S. M., & Solomon, D. H. (2018). Rolling mental accounts. *The Review of Financial Studies*.

#### Narrow bracketing and mental accounting:

- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*.
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- Köszegi, B., & Rabin, M. (2007). Reference-dependent risk attitudes. *American Economic Review*.
- Köszegi, B., & Rabin, M. (2009). Reference-dependent consumption plans. *American Economic Review*.
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