# Macroeconometrics

**Lomonosov Moscow State University,** Department of Economics, Spring 2021

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## Course information

Course Website: https://on.econ.msu.ru/course/view.php?id=2447

Class Time: TBA

Instructor's Office Hours: by appointment, virtually

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Program: Master "Data Analysis in Economics"; Bachelor "Economics"

***Abstract***. In this course, we will study methods of macroeconomic modeling and forecasting. We will consider nonstructural time series models: autoregressive models, classical and Bayesian vector autoregression models, and factor models. We will learn methods of conditional and unconditional forecasting. We will also consider structural VAR models and methods of identification of macroeconomic shocks. This course will introduce a workhorse of structural macroeconomic modeling – the neoclassical growth model, or RBC model. In this approach, we will consider the theoretical counterparts of VAR "shocks". Time permitting, the course will introduce the new generation of heterogeneous agent models and explain the role of microeconomic heterogeneity in the propagation of macroeconomic shocks.

Each topic covered will be accompanied by practical TA sessions during which we will see how methods covered at lectures can be applied to actual macroeconomic data. Practical examples offered are coded in Matlab and R. As a result of taking the course, students will be able to estimate uni- and multivariate time series models, identify macroeconomic shocks and trace their effects, and develop macroeconomic forecasts. The students will also master methods of estimation of structural macroeconomic models.

### Week 1.

Lecture 1. Macroeconomic modeling and forecasting: evolution of models, structural and non-structural approaches. A review of macroeconomic modeling: 3 generations of structural models and a general overview of non-structural models.

Lecture 2. Business cycles: facts and properties. Structural approach: RBC model, solution methods, quantitative analysis.

Exercise session 1. Setting up RBC model in Dynare.

Home assignment 1. Bringing the RBC model to the data.

### Week 2.

Lecture 3. Non-structural approach: univariate time series models. Decomposition of time series into components, and filters.

Lecture 4. Multivariate time series models: vector autoregression (VAR). Estimation and forecasting. Applications and limitations of VARs.

Exercise Session 2. Automated collection of macroeconomic data, transformation, visualization. Forecasting and filtering macroeconomic series in Matlab.

Home assignment 2. Estimation of AR and VAR models and producing short-term forecasts.

**Week 3.**

Lecture 5. Multivariate time series models: Bayesian VARs. An introduction to Bayesian Econometrics.

Lecture 6. Bayesian VAR. Types of prior distributions of coefficients. Conditional and unconditional forecasting.

Exercise Session 3. Practical lesson: BVAR conditional forecasting.

Home assignment 3. Estimation and unconditional forecasting with the BVAR model of the Russian economy.

**Week 4.**

Lecture 7. Multivariate time series models: factor models. Estimation and forecasting.

Lecture 8. Structural time series models. Shock identification methods. Analysis of the effects of macroeconomic shocks. Monetary, credit supply, and external financial shocks.

Exercise Session 4. Identification and estimation of the effects of external financial shocks.

Home assignment 4. Replication of existing works on Russian data.

**Week 5*.**

Lecture 9. Structural approach: heterogeneous agents models. Consumer choice under uncertainty. Income and asset inequality.

Lecture 10. Solving heterogeneous agents models, global methods. Why do we need heterogeneity? Review of recent papers.

Exercise Session 5. Practical examples. Heterogeneous agents models in discrete and continuous time.

Homework 5. Solving heterogeneous agents model in discrete time.

* (optional, time permitting)

**Main literature (textbooks)**


1. Kilian L. Lütkepohl H. (2017). Structural Vector Autoregressive Analysis. Cambridge University Press, 2017.
2. Canova F., Methods for Applied Macroeconomic Research, Princeton University Press, 2007.
3. Blake, A., and Mumtaz, H. (2012). Applied Bayesian econometrics for central bankers". Technical Handbook, No. 4. Bank of England. Centre for Central Banking Studies.
4. Koop, G. (2003). Bayesian Econometrics. Wiley.
5. Ljungqvist L., Sargent T. (2004) Recursive Macroeconomic Theory.

6. Krueger D. (2012). Macroeconomic Theory.
7. Perri F. (2008). Macroeconomic Theory Lectures.
8. Knoop T. (2009). Recessions and depressions: understanding business cycles. 2nd ed. Praeger.

**Additional literature**

1. Giacomini R. (2015). Economic theory and forecasting: Lessons from the literature. Econometrics Journal, Vol. 18, No. 2, pp. C22—C41.
2. Qin D. (2011). Rise of VAR modelling approach. Journal of Economic Surveys, Vol. 25, No. 1, pp. 156—174.
3. Chauvet M., Potter S. (2013). Forecasting output. In: A. Timmermann, G. Elliott (eds.). Handbook of Economic Forecasting, Vol. 2A. Amsterdam: Elsevier, pp. 141—194.
4. Kehoe P., Midrigan V., and Pastorino E. (2018). Evolution of Modern Business Cycle Models: Accounting for the Great Recession. Journal of Economic Perspectives, 32(3).
5. Christiano L., Eichenbaum M., and Trabandt M. (2018). On DSGE Models. Journal of Economic Perspectives, 32(3).
6. Banbura M., Giannone D., Lenza M. (2015). Conditional forecasts and scenario analysis with vector autoregressions for large cross-sections. International Journal of Forecasting, Vol. 31, No. 3.
7. Stock J. H., Watson M. W. (2016). Factor models and structural vector autoregressions in macroeconomics. In: J. B. Taylor, H. Uhlig (eds.). Handbook of Macroeconomics, Vol. 2.
8. Ramey V. (2016). Macroeconomic shocks and their propagation. In: J. B. Taylor, H. Uhlig (eds.). Handbook of Macroeconomics, Vol. 2.
9. Kaplan G., Violante G. (2018). Microeconomic Heterogeneity and Macroeconomic Shocks. Journal of Economic Perspectives, 32(3).
10. Kaplan, G., Moll, B., Violante, G. (2018). Monetary policy according to HANK. American Economic Review 108.