Hanno Kase

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OFFICE CONTACT INFORMATION

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RESEARCH INTERESTS

Quantitative Macroeconomics, Monetary Policy, Macroprudential Policy, Machine Learning

REFERENCES

Prof. David Levine
European University Institute
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Leonardo Melosi, Ph.D.
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Prof. Jesús Bueren
European University Institute
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EDUCATION

2016 - 2021	**PhD in Economics**, European University Institute Supervised by Prof. David Levine and Prof. Jesús Bueren
2016 - 2017	**MRes in Economics**, European University Institute
2011 - 2013	**MA in Finance**, Tallinn University of Technology
2008 - 2011	**BA in Economics**, Tallinn University of Technology

RESEARCH EXPERIENCE AND OTHER EMPLOYMENT

2021 - 2023	**Postdoctoral Associate**, Department of Economics, University of Minnesota
2020 - 2021	**Research Associate**, European University Institute COVID-19 Social Sciences and Humanities Data Portal
2020	**Research Assistant to Aldo Rustichini and Andrea Ichino**, European University Institute
2019 - 2021	**High Performance Computing Tutor**, European University Institute
2019	**Visiting Researcher**, Bank of Estonia, Research Department
2018 - 2019	**Research Assistant to Andrea Mattozzi**, European University Institute
2012 - 2016	**Economist**, Bank of Estonia, Financial Stability Department

PROFESSIONAL ACTIVITIES

Seminars and Conferences

2022	The Society for Nonlinear Dynamics and Econometrics (SNDE) Symposium, The Society for Economic Measurement (SEM) Annual Conference, The European Economic Association (EEA) and European meeting of the Econometric Society (ESEM) Conference, Conference on Non-traditional Data, Machine Learning and Natural Language Processing in Macroeconomics at Sveriges Riksbank, Midwest Macro Meeting
2023	ASSA

Refereeing

Baltic Journal of Economics

HONOURS, SCHOLARSHIPS, AND FELLOWSHIPS

2019-2020	PhD Completion Grant, European University Institute
2016-2020	PhD Grant, Archimedes
2014	5th Lindau Meeting on Economic Sciences

SKILLS

Research software:	Python, R, Matlab, Julia, Stata
Machine learning software	PyTorch, JAX
Computer skills:	LaTeX, Git
Language skills:	English, Estonian

JOB MARKET PAPER

Estimating Nonlinear Heterogeneous Agents Models with Neural Networks

with Leonardo Melosi and Matthias Rottner

Economists typically make simplifying assumptions to make the solution and estimation of their highly complex models feasible. These simplifications include approximating the true nonlinear dynamics of the model, disregarding aggregate uncertainty or assuming that all agents are identical. While relaxing these assumptions is well-known to give rise to complicated curse-of-dimensionality problems, it is often unclear how seriously these simplifications distort the dynamics and predictions of the model. We leverage the recent advancements in machine learning to develop a solution and estimation method based on neural networks that does not require these strong assumptions. We apply our method to a nonlinear Heterogeneous Agents New Keynesian (HANK) model with a zero lower bound (ZLB) constraint for the nominal interest rate to show that the method is much more efficient than existing global solution methods and that the estimation converges to the true parameter values. Further, this application sheds light on how effectively our method is capable to simultaneously deal with a large number of state variables and parameters, nonlinear dynamics, heterogeneity as well as aggregate uncertainty.

WORK IN PROGRESS

Nonlinear Phillips Curve and Inflation Risk

with Sebastian Rast and Matthias Rottner

How does a nonlinear Phillips curve affect inflation risk? Using a strategic surveys approach and micro price data, we establish that the price setting behaviour of firms depends nonlinearly on the inflation environment. In a high inflation environment, the share of firms that adjust their prices in response to expected inflation increases. We rationalize these dynamics using a quantitative macroeconomic model with a nonlinear Phillips curve. The model features a tractable heterogeneous firm setup with endogenous varying degrees of price flexibility. Solving the model with a machine learning approach, we demonstrate that, in this setting, contractionary supply shocks lead to higher inflation, which provides a new motive for the monetary policy to act preemptively.

Backpropagating Through Heterogeneous Agent Models

This paper explores applications of the backpropagation algorithm on heterogeneous agent models. In addition, I clarify the connection between deep learning and dynamic structural models by showing how a standard value function iteration algorithm can be viewed as a recurrent convolutional neural network. As a result, many advances in the field of machine learning can carry over to economics. This in turn makes the solution and estimation of more complex models feasible.

Limits on Mortgage Lending

This paper aims to study the impact of macroprudential limits on mortgage lending in a heterogeneous agent life-cycle model with incomplete markets, long-term mortgages, and defaults. Using data from the Household Finance and Consumption Survey, the model is calibrated for the German economy. I consider the effects of four policy instruments: loan-to-value limit, debt-to-income limit, payment-to-income limit, and maximum maturity. I find that their effect on the homeownership rate is fairly modest. Only the loan-to-value limit significantly reduces the homeownership rate among young households. At the same time, it has the most significant positive welfare effect