Marlon Azinović

Postdoctoral Visiting scholar in economics

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Professional Experience

University of Pennsylvania *Philadelphia, USA*
Postdoctoral Visiting Scholar *09.2022 - now*
Sponsor: Prof. Jesús Fernández-Villaverde

University of Zurich *Zurich, Switzerland*
Postdoctoral Researcher *09.2021 - 08.2022*
Advisor: Prof. Nir Jaimovich

Education

University of Zurich *Zurich, Switzerland*
PhD in Finance *08.2016 - 08.2021*
Dissertation committee: Prof. Felix Kübler (chair), Prof. Nir Jaimovich, Prof. Simon Scheidegger, Prof. Harold Linh Cole

ETH Zurich *Zurich, Switzerland*
Bachelor and Master of Science in Physics *09.2010 - 06.2016*
Advisor: Prof. Matthias Troyer

References

Prof. Felix Kübler, University of Zurich, email: felix.kuebler@bf.uzh.ch

Prof. Nir Jaimovich, UC San Diego, email: nijaimovich@ucsd.edu

Prof. Simon Scheidegger, University of Lausanne, email: simon.scheidegger@unil.ch

Prof. Harold Linh Cole, University of Pennsylvania, email: colehl@upenn.edu

Research

Working Papers

Intergenerational Consequences of Rare Disasters. **Job market paper**. With Jan Žemlička. 2023. Link to paper.

Abstract: We analyze the intergenerational consequences of rare disasters in a calibrated overlapping generations model featuring realistic household portfolios and equilibrium asset prices. Households own houses and trade in bonds and equity. In a disaster, young households suffer from reduced labor income and tightened borrowing constraints. Older households lose a large portion of their savings invested in risky assets. The relative winners are households shortly before retirement, who have a more stable labor income, are not borrowing constrained, and are young enough to benefit from large returns of assets purchased during the disaster at depressed prices. In order to solve the model, we advance contemporary deep learning based solution methods along two complementary dimensions. First, we introduce an economics-inspired neural network architecture that, by construction, ensures that market clearing conditions are always satisfied. Second, we illustrate how to solve models with multiple assets by introducing them step-wise into the economy. These two innovations enable us to reduce the number of equilibrium conditions, that are not fulfilled exactly, and to substantially improve the stability of the training algorithm.

Asset Pricing in a Low Rate Environment. With Harold L. Cole and Felix Kubler. 2023. NBER working paper.

Abstract: We examine asset prices in environments where the risk-free rate lies considerably below the growth rate. To do so, we introduce a tractable model of a production economy featuring heterogeneous trading technologies, as well as idiosyncratic and aggregate risk. We show that allowing for the possibility of firms exiting is crucial for matching key macroeconomic moments and, simultaneously, the risk-free rate, the market price of risk, and price-earnings ratios. In particular, our model allows us to consider calibrations that match the high observed market price of risk and average interest rates as low as 2-3.5 percent below the average growth rate. High values for risk aversion or non-standard preferences are not necessary for this. We use the model to examine the wealth distribution and asset prices in economies with very low real rates. We also examine under which conditions realistic calibrations allow for an infinite rollover of government debt. For our benchmark calibration, rollover is impossible even if the average risk-free rate lies 3.5 percent below the average growth rate.

Publications

Deep Equilibrium Nets. With Luca Gaegauf and Simon Scheidegger. **International Economic Review**, 2022. Link to paper.
Abstract: We introduce deep equilibrium nets (DEQNs)—a deep learning-based method to compute approximate functional rational expectations equilibria of economic models featuring a significant amount of heterogeneity, uncertainty, and occasionally binding constraints. DEQNs are neural networks trained in an unsupervised fashion to satisfy all equilibrium conditions along simulated paths of the economy. Since DEQNs approximate the equilibrium functions directly, simulating the economy is computationally cheap, and training data can be generated at virtually zero cost. We demonstrate that DEQNs can accurately solve economically relevant models by applying them to two challenging life-cycle models and a Bewley-style model with aggregate risk.

Assessment of Quantum Annealing for the Construction of Satisfiability Filters. With Daniel Herr, Bettina Heim, Ethan Brown, and Matthias Troyer. **SciPost Physics**, 2017. Link to paper. Publication in physics.

Work in progress

Aging, the Aggregate MPC, and Business Cycle Volatility in OLGNK

Teaching

Spring 2023	**Econometric Society Summer School in Dynamic Structural Econometrics on Deep Learning for Solving and Estimating Dynamic Models**, Invited Lecturer	*University of Lausanne*
Spring 2020	**Advanced Financial Economics**, Teaching Assistant	*University of Zurich*
July 2019	**Open Source Economics Laboratory**, Teaching Assistant	*University of Chicago*
Spring 2019	**Advanced Financial Economics**, Teaching Assistant	*University of Zurich*
Spring 2018	**Advanced Financial Economics**, Teaching Assistant	*University of Zurich*
Fall 2013	**Complex Analysis**, Teaching Assistant	*ETH Zurich*

Service

Refereeing: Review of Economic Studies, Journal of Economic Theory

Presentations

2023: Bristol Macro Workshop, University of Bristol; EEA-ESEM Conference, Barcelona; DSE Conference on Deep Learning, Lausanne; Brown Bag Seminar, John Hopkins University.

2022: Advances in Computational Economics and Finance, UZH; AI and Economics Seminar, Peking University; Labor, Firms, and Macro Seminar, UPenn.

Before: Computational Economics Workshop, UZH; Advances in Computational Economics and Finance, UZH; Brown Bag Lunch Seminar, UZH; SFI Research Days, Study Center Gerzensee; PASC (Poster), ETH Zurich; CEF, Carleton University; Open Source Economics Laboratory, University of Chicago.

Awards, fellowships, and grants

09.2022 - 08.2024	**PostDoc.Mobility grant to visit the University of Pennsylvania**, Swiss National Science Foundation	*chf 111'000*
Intended: 09.2020 - 08.2021	**Given back due to the Covid 19 pandemic: Doc.Mobility grant to visit MIT**, Swiss National Science Foundation	*chf 48'700*
04.2020 - 03.2021	**Production project *Using deep equilibrium nets to solve large-scale dynamic stochastic overlapping generation models* (joint with Felix Kübler and Simon Scheidegger)**, Swiss National Supercomputing Centre	*49'600 node hours on the PizDaint supercomputer*
06.2019	**SFI best discussant award**, Swiss Finance Institute	*chf 500*
06.2019	**3rd place best poster award**, Platform for Advanced Scientific Computing	

Languages

Programming: Python (NumPy, Numba, TensorFlow, PyTorch, JAX), Julia, Matlab, C++, Latex, CUDA

Other: German (native), English (fluent), Croatian (basic), Chinese (basic), Afrikaans (basic), French (basic)