Alireza Marahel

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SUMMARY

I am an Economics Ph.D. candidate with a focus on quantitative economics, climate policy, financial econometrics, and machine learning. My research integrates economic theory with machine learning, computational, and statistical methods for time-series forecasting, simulation, and policy evaluation. Using large datasets, I assess the predictive capabilities of various models. With my experience in coordinating collaborative research projects and communicating analytical results both verbally and in writing, I seek to apply my skills and knowledge in economic research to address complex problems in collaboration with others.

EDUCATION

Indiana University, Bloomington, IN, USA — Fall 2018 – Spring 2024 (Expected)
Doctor of Philosophy, Economics (*F1-visa, STEM certified 3-year OPT*)

Sharif University of Technology, Tehran, Iran — Fall 2013 – Spring 2018
Bachelors of Science, Mechanical Engineering (*with Minor in Economics*)

SELECTED RESEARCH PROJECTS

Specialties: Quantitative Economics, Climate Policy, Financial Econometrics, Machine Learning

Title: "Evaluating Alternative Designs for Carbon Border Adjustment Mechanisms"
Job Market Paper — Latest Draft: November 2023

• Analyzed welfare and emissions impacts of different carbon border adjustment mechanism (CBAM) designs when a country unilaterally imposes carbon pricing using a quantitative multi-country, multi-sector general equilibrium model.
• Calibrated with data on trade, production, emission, and environmental taxes from WIOD, UNCTAD, EUROSTAT, and OECD-PINE. Proposed a CBAM policy that yields 11 billion USD gains for the European Union and 246 billion globally.

Title: "Evaluating Asset Pricing Models Under Endogenous Regime Switching", *with Y. Chang and J. Y. Park*
• Developed a new approach to model panel regressions with endogenous regime switching using an autoregressive latent factor.
• Performed extensive maximum likelihood estimation and non-linear regularized regressions to identify the environmental and macroeconomic factors determining the state of the economy, captured by stock excess returns, through IU supercomputing systems, Slurm batch processing, and programming in MATLAB.

Title: "On the Effectiveness of LSTM Models in Predicting Inflation Rates", *with Y. Chang and J. Y. Park*
• Examined the predictive performance of Long-Short Term Memory (LSTM), a recurrent neural network, model to forecast the U.S. inflation rate using FRED-MD data set, from January 1960 to July 2023.
• Forecasted inflation with Principal component regression, ARIMA, Random Walk, LASSO, ALASSO, Ridge, Elastic net, and Random Forest ML models by using Python.
• Developed a set of techniques to obtain near-optimal initial values for LSTMs to improve their predictive accuracy.

EXPERIENCE

McKinney Climate Fellow, Office of Sustainability, *City of Indianapolis* — 2023
• Developed a community-wide greenhouse gas inventory for the City of Indianapolis for 2022 using ICLEI ClearPath, by identifying, categorizing, and analyzing emissions sources across sectors and scopes, in preparation for CDP (Carbon Disclosure Project) reporting.
• Coordinated sessions and streamlined communications with government agencies, industries, and local government officials to efficiently obtain relevant data.

International Monetary Fund (IMF) Fund Internship Program, *International Monetary Fund* — 2021
• Developed a framework to assess the tax capacity, identify its key determinants, and estimate tax revenue gaps/inefficiency in the Middle East and Central Asia countries, using a Stochastic Tax Frontier model for panel data with time-variant inefficiency.
• Composed report sections and presented research findings within the IMF's MCD department, thereby providing the methodological and empirical foundation for the subsequent publication.

Associate Instructor and Teaching Assistant, Department of Economics, *Indiana University* — 12 Semesters
• Courses: Business Statistics, Intro to Applied Microeconomics, Fundamentals of Economics I

SKILLS

Programming: Python (TensorFlow, Scikit-Learn, NumPy, Matplotlib, Pandas), MATLAB, R, Stata, Unix, SQL, Excel(VBA), ArcGIS, ICLEI ClearPath, LaTeX

Methods: Factor Models, Deep Learning, Supervised Machine Learning Methods (Dimension Reduction, Regularization, Ensemble, Neural Net), Quantitative General Equilibrium, Calibration, Model Evaluation, Data Visualization, Regression (Linear, Non-linear, Nonparametric), Endogenous Markov Switching, Predictive Modeling, Parallel Computing

Data Experience: World Input-Output Database Environmental Accounts; United Nations Statistical Division, Trade Analysis and Information System (UNCTAD-TRAINS); Eurostat; OECD-PINE; FRED-MD; Compiled Stock Returns Data (CRSP)

Workflow Experience: Slurm Workload Manager, Slate, Slack, Citrix, Github