Alireza Marahel

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SUMMARY

An Economics Ph.D. candidate with several years of experience in Quantitative Research, specializing in financial econometrics, machine learning, and quantitative economics. My research integrates economic theory with machine learning, computational, and statistical methods, using large data sets for time-series forecasting, simulation, and policy evaluation. With my experience in leading research projects and communicating analytical results both verbally and in writing, I seek to apply my skills and knowledge in the commercial world to address complex problems in collaboration with others.

EDUCATION

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

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

SELECTED RESEARCH PROJECTS

Specialties: Financial Econometrics, Machine Learning, Quantitative Economics

Title: "Evaluating Asset Pricing Models Under Endogenous Regime Switching"
• 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 macroeconomic risk factors determining the state of the market, captured by constructing portfolios using 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"
• Examined the predictive performance of Long-Short Term Memory (LSTM), a recurrent neural network model, to forecast the U.S. inflation rate using the FRED-MD data set, from January 1960 to July 2023, by employing parallel computing techniques to enhance computational efficiency and manage the extensive data analysis.
• Forecasted inflation using Principal Component Regression, Bayesian VAR, ARIMA, GARCH, Random Walk, LASSO, ALASSO, Ridge, Elastic Net, Random Forest, and other supervised machine learning techniques and compared their out-of-sample forecasting accuracy to LSTMs using Python.
• Developed an algorithm to obtain near-optimal initial values for LSTMs that significantly enhances their predictive accuracy.

Title: "Evaluating Alternative Designs for Carbon Border Adjustment Mechanisms"
• 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 in MATLAB.
• 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.

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 and Excel, by identifying, categorizing, and analyzing emissions sources across sectors and scopes, and employed data visualization techniques to effectively present findings in preparation for CDP (Carbon Disclosure Project) reporting.
• Led and coordinated sessions and streamlined communications with government agencies, industries, and local government officials, ensuring the efficient acquisition of relevant data and fostering collaborative relationships.

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, contributing to the methodological and empirical foundation that, through collaborative efforts with a team of economists, led to the subsequent publication.

Associate Instructor and Teaching Assistant, Department of Economics, *Indiana University*   2019 – Present
• Courses: Business Statistics, Intro to Applied Microeconomics, Fundamentals of Economics I & II

SKILLS SUMMARY

Programming: Python (TensorFlow, PyTorch, Scikit-Learn, NumPy, Matplotlib, Pandas), MATLAB, R, Stata, Unix, Parallel Computing, C/C++, SQL, PySpark, Excel(VBA), MS word, LaTeX

Methods: Time-Series Econometrics, Deep Learning, Supervised Machine Learning, LSTM, Equity Factor Models, Dimension Reduction, Regularization, Ensemble, Regression (Linear, Non-linear, Nonparametric), Quantitative General Equilibrium, Calibration, Markov Switching, Stochastic Gradient Descent, PCA

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, AWS, Hugging Face