Alireza Marahel, Ph.D.

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SUMMARY

Economics Ph.D. experienced in quantitative research with expertise in financial econometrics and machine learning; adept at leveraging large datasets for forecasting and policy analysis. I am seeking research or analysis roles in the finance sector where I can apply my advanced quantitative and programming skills to add great value.

EDUCATION

Indiana University, Bloomington, IN, USA — Sep 2018 – May 2024 (Expected)
Doctor of Philosophy, Economics
• Dissertation: "Bridging Econometrics and Machine Learning: Essays on Finance and Macroeconomics"

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

EXPERIENCE

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

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, 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.

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 CAPM with endogenous Markov 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 and Python.

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, LASSO, Random Forest, and other supervised machine learning techniques and compared their out-of-sample forecasting accuracy to LSTMs using Python libraries such as TensorFlow and PyTorch.
• 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.

SKILLS SUMMARY

Programming: Python (TensorFlow, PyTorch, Scikit-Learn), MATLAB, R, Stata, Parallel Computing, High-Performance Computing (HPC), Unix, C/C++, SQL, PySpark, Excel (VBA)

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: Jupyter Notebook, Slurm Workload Manager, Slate, Github, AWS, Hugging Face