

# Alireza Marahel

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## SUMMARY

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I am an Economics Ph.D. candidate at Indiana University in Bloomington, Indiana, where I am defending my dissertation and graduating in the spring of 2024. My research in applied econometrics, environmental economics, and machine learning combines theory with the use of quantitative methods and large data sets. I seek to apply my skills and experience in economic analysis and problem-solving toward new challenges in collaboration with others.

## SKILLS

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

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

**Programming:** Python (NumPy, Scikit-Learn, Matplotlib, Pandas, TensorFlow), MATLAB, R, Stata, High-performance Computing (Linux), SQL, MS Excel, L<sup>A</sup>T<sub>E</sub>X

**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, GIS, ICLEI ClearPath, Microsoft Teams, Slack, Citrix, Github

## SELECTED RESEARCH PROJECTS

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**Title: “Navigating Carbon Border Adjustments: Quantifying the Tradeoffs of Unilateral Climate Policy”**

*Job Market Paper*

Latest Draft: September 2023

- Analyzed welfare and emissions impacts of different carbon border adjustment mechanism (CBAM) designs when a country unilaterally imposes carbon pricing using a multi-sector computational general equilibrium model
- Calibrated the model with data on trade, production, emissions, and environmental taxes from WIOD, UNCTAD, EUROSTAT, and OECD.

**Title: “Panel Regression with Endogenous Regime Switching”**

*Co-authors: Yoosoon Chang, Joon Y. Park*

- Constructed a new approach to model panel regressions with endogenous regime switching using an autoregressive latent factor, compatible to all asset pricing factor model.
- Performed extensive maximum likelihood estimation and non-linear regularized regressions to detect the environmental factors influencing the state of the economy, captured by stock prices, 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 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 libraries and MATLAB.

**Title: “Revenue Mobilization for a Resilient and Inclusive Recovery in the Middle East and Central Asia”,**

*In Collaboration With the Fiscal Policy Group, Middle East and Central Asia Department, International Monetary Fund (IMF)*

- Assessed tax capacity, identified key determinants, and estimated tax revenue gaps and inefficiencies in MCD countries, using a stochastic tax frontier model for panel data with time-variant inefficiency, primarily using R and Stata.

## EDUCATION

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**Indiana University**, Bloomington, IN, USA

Fall 2018 – Spring 2024 (Expected)

Doctor of Philosophy, Economics (*F1-visa, STEM certified 3-year OPT*)

Master of Arts, Economics

**Sharif University of Technology**, Tehran, Iran

Fall 2013 – Spring 2018

Bachelors of Science, Mechanical Engineering (*with Minor in Economics*)

## EXPERIENCE

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**McKinney Climate Fellow, Office of Sustainability, City of Indianapolis**

Summer 2023

- Development of a community-wide greenhouse gas inventory and preparing CDP reporting for Marion County for 2022.

**Associate Instructor for Business Statistics Coursework, Indiana University**

8 Semesters

- Taught as sole instructor for in-person and hybrid mode, Designed curriculum, presentation materials, assessments, etc.

**Teaching Assistant, Department of Economics, Indiana University**

4 Semesters

- Courses: Business Statistics, Intro to Applied Microeconomics, Fundamentals of Economics I