

# MUYE RU, PhD

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A former academic with 10 years of training and quant research experience in modeling of commodities and climate. Currently, I develop an automated system of models and datasets to forecast commodities, macroeconomic indicators, and company metrics at Morgan Stanley. I look to use my analytical skills in discovering edges in commodities and macro strategies.

## PROFESSIONAL AND ACADEMIC EXPERIENCES

**Energy-Climate-Macro Quant Analyst**, Morgan Stanley, NY, USA

**Mar 2022 – present**

- Built a coupled automated system, including a commodity market equilibrium model, a climate/weather model, a macroeconomic model, and various self-developed algorithms and functions, used to develop strategies across trading desks/investment teams by:
  - Understand supply and demand of energy and agricultural commodities given market and environmental changes:

### **Weather / Climate data and models:**

- Deriving response functions on how weather/climate impacts energy and agricultural commodities. E.g. Estimated the relationship between daily temperature extremes and crop yield using two weather datasets, significantly improving the average temperature model. Predicted corn and soybean yields.
- Testing the relationship between weather / climate data and prices of commodity derivatives. E.g. Tested what variabilities in weather data, climate projections, and ENSO events have been priced-in in weather futures.

### **Supply and demand simulations:**

- Designing scenarios regarding key uncertainties in technology and regulation, simulating using the commodity market equilibrium model, validating and calibrating to empirical data. **E.g.** 1) Simulated technology options (natural gas, fuel cells, diesel) to fill the power demand for supercomputers and data centers and the supply demand impacts. 2) Estimated demand for sustainable aviation fuel under IATA's rule on emissions, quantified the capacity gap and the impacts on the jet fuel market.

### **Developing quantitative methods for emerging commodities:**

- Derive methods to evaluate opportunities in new areas. Evaluate vendor datasets. Explore alternative datasets (satellite, sensor data). E.g. 1) Derived region-specific marginal abatement cost curve for 17 CCS technologies, used to forecast profits for CCS projects in the voluntary carbon market and price impacts on the energy market. 2) Simulated EU's Carbon Border Adjustment Mechanism to examine impacts on international trade and the EU Allowances, UK Allowances markets.
- Incorporating climate factors to macroeconomic models and sectoral impacts, conducting attribution analysis:
  - Incorporated asset-location-based climate risk metrics to improve Automated Valuation Model for residential buildings.
  - Estimated net operating income (NOI) in 10 years across climate damage scenarios and evaluated REITs.
- Built company-level ML models to estimate sensitivity to energy transition and climate impacts for fundamentals. Conducted feature reduction and model selection from multiple algorithms (GLM, Random Forest, XGBoost, CatBoost, etc.) at different timescales, used to calculate exposure and identify mispricing of stocks.
- Engaged with clients and teams via 50+ demos, 2 webcasts, and multiple beta-user trials for asset managers and hedge funds.
- Productionized the model system with three patents (1 awarded, 2 pending). Published 3 research papers.

**Postdoctoral Research Fellow**, The Earth Institute, Columbia University, NY, USA

**Oct 2020 – Mar 2022**

- Examined the oil and gas stock price responses to the policy lift on methane emissions. Studied emitting behaviors of 600 oil and gas facilities before and after the policy using TROPOMI satellite retrievals.
- Simulated the U.S. energy sector without the Clean Air Act; Estimated the climate and economic impacts.

**Independent Consultant**, International Institute for Applied Systems Analysis, Austria

**June 2019 – June 2022**

- Conducted climate model simulations. Analyzed climate model data across space and time. Attributed model uncertainty from natural variability. Results published in PNAS.

## EDUCATION

**Duke University**, Durham, NC, USA

**PHD IN GEOPHYSICS AND CLIMATE SCIENCE**, September 2020

**MASTER IN ENERGY ENGINEERING**, May 2016

**Peking University**, Beijing, China

**BACHELOR OF SCIENCE IN ATMOSPHERIC SCIENCE**, June 2013

**BACHELOR OF ART IN ECONOMICS**, June 2013

## SKILLS

**Programming:** Python, R, Linux. **Statistics and Econometrics:** statistical modeling, time-series analysis, spatial analysis, causal inference, Machine Learning, Monte Carlo and numerical methods. **Commodity and Climate:** energy system model, climate model, agriculture and land model, carbon market modeling. **Datasets:** satellite data, LLM-derived sentiment data, large 3-dimensional spatiotemporal data, survey data, compilation of first-hand or secondary data in published papers.

## SELECTED PUBLICATIONS

- Du, X., **Ru, M.**, Almond, D., 2024. Rapid Increases in Methane Emissions from the Oil and Gas Industry. *AEA Conference Paper*.
- Derived O&G activities using satellite data. Compared O&G stock prices before and after a policy lift. Conducted causal inference.
- Tao, S., **Ru, M.**, et al., 2018. Quantifying the residential energy transition in China through a national survey. *Nature Energy*, 3(7), 567.
- Reconstructed spatial-temporal patterns over 30 years from 30,000 samples. Derived residential energy demand model for China.