

MUYE RU, PhD

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Experienced commodity analyst leveraging weather data and advanced modeling to improve supply-demand forecasts.

PROFESSIONAL EXPERIENCES

Predicative Modeling Innovation Lead, Morgan Stanley, NY, USA

Mar 2022 – present

Lead innovation, development, and enhancement of predictive modeling capabilities across commodities and equity markets. Drive application of advanced weather and fundamental modeling methodologies across Trading, Strats, and Research.

o Weather & Climate Modeling Innovation:

▪ Launching weather AI models:

- Build in-house capabilities for weather AI models (GraphCast, FourCastNet, etc.); Sent daily views on model comparisons.
- Conducted comprehensive model evaluation and backtest vs. ground truth and vendors across key ISOs/RTOs, with special focus on extreme-weather performance.
- Develop methodologies for customized model improvements, including ensembles, finetuning, and refreshed input data.

▪ Exploring market edges in systematic weather shifts related to climate and teleconnections:

- Tested how variations in short-term weather, long-term climate, and ENSO phases are “priced in” using weather futures and regressions versus realized weather. Investigate links between polar vortex weakening, February cooling, and prices.

▪ Expanding use of alternative weather datasets:

- Onboarded probabilistic storm-track forecasts for real-time hurricane monitoring; Designed backend infrastructure for flexible storage, processing, and visualization of spatial data.
- Assess value and limitations of Subseasonal-to-Seasonal forecasts across commodities and cross-asset applications.

o Fundamental Supply/Demand Model Enhancements:

▪ Developing advanced short-term load forecast model:

- Developed an hourly load forecast method using a flexible “like-days” sampling framework, improving transparency, reducing dependency on historical climate, and enhancing peak-load performance.
- Optimized model performance through a hybrid statistical-ML approach, capturing non-linearity, cross-hour dependencies, and improving accuracy under extreme-temperature conditions.
- Prototype a 2D spatial load-prediction framework incorporating high-resolution population distribution.

▪ Improving crop yield predictions:

- Integrated nonlinear temperature-extreme effects into soybean and corn yield models, capturing yield losses from extreme temperatures and improving model accuracy by 15%.

o Long-Term Power Market Scenario Analysis:

▪ Integrating DOE Power System Models

- Onboarded DOE’s long-term supply-demand model for scenarios on capacity, data centers, and extreme weather stress.
- Built an automated pipeline connecting the model to internal fundamental analytics, enabling customized scenarios experiments by Research. Awarded a patent as the primary innovator for this workflow and integration architecture.

ACADEMIC RESEARCH EXPERIENCES

Postdoctoral Research Fellow - Modeling Energy Sector, Earth Institute, Columbia University, USA

Oct 2020 – Mar 2022

- Studied behaviors of 600 oil and gas facilities in response to the methane policy lift using TROPOMI satellite retrievals.
- Simulated policy scenarios to evaluate the impacts on supply/demand, and climate. Attribution analysis of natural variability.

PhD In Atmospheric Science - Linking Energy, Climate, and Economics, Duke University, USA

Sep 2016 – Oct 2020

- Modeled relationships between atmospheric phenomena and energy demand, crop yield, and human health.
- Quantified wildfire amplification in the Pacific Northwest between 2002 to 2018 using satellite carbon monoxide retrievals.

EDUCATION

Duke University, Durham, NC, USA

PHD IN ATMOSPHERIC SCIENCE, September 2020

MASTER IN ENERGY SYSTEM, May 2016

Peking University, Beijing, China

BACHELOR OF SCIENCE IN EARTH SCIENCE / BACHELOR OF ART IN ECONOMICS, June 2013

SKILLS

Programming: Python, R, Linux, Tableau. **Statistics and Econometrics:** regression, time-series analysis, causal inference, Monte Carlo, uncertainty quantification. **Commodity and Weather:** atmospheric and climate models, emission modeling, satellite data.

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.