MUYE RU, PhD

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Commodity analyst specializing in weather-driven fundamentals, translating advanced modeling into actionable trading insights.

PROFESSIONAL EXPERIENCES

Weather Predicative Modeling Lead, Morgan Stanley, NY, USA **Mar 2022 – present**

Lead development, enhancement, and innovation of weather-driven fundamental models used across commodities and equity trading. Partner with Trading, Strats, and Research to translate weather and climate signals into actionable market insights.

- **Weather & Climate Modeling:**
  - **Lead in-house weather AI capability build-out**:
    - Built and productionized in-house AI weather models (GraphCast, FourCastNet, etc.); delivering daily trading-focused comparative views versus vendor forecasts.
    - Designed and executed systematic backtests across ISOs/RTOs, focused on peak demand and extreme weather.
    - Developed model enhancement frameworks (ensembles, fine-tuning, refreshed inputs) to improve reliability and interpretability in market-critical conditions.
  - **Analyze structural weather price-in:**
    - 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.
  - **Expand alternative weather datasets:**
    - Applied and developed probabilistic hurricane-track forecasts with real-spatial infrastructure.
    - Evalauted value and limitations of Subseasonal-to-Seasonal forecasts across commodities and cross-asset applications.
- **Fundamental Supply - Demand Modeling:**
  - **Developing an advanced short-term load forecast framework:**
    - Using a "like-days" sampling approach, improving peak-load accuracy and interpretability under extreme temperatures.
    - Enhanced model performance through a hybrid statistical-ML design, capturing nonlinear effects and cross-hour dependencies for intraday and day-ahead markets.
    - Prototyped a spatial load prediction model incorporating high-resolution population distribution to better capture regional demand drivers.
  - **Improved crop yield forecasting**:
    - Integrated nonlinear temperature-extreme effects into soybean and corn yield models, capturing yield losses from extreme temperatures and improving model accuracy by 15%.
- **Long-Term Power Market Scenario**:
  - **Integrated DOE power system models** into internal analytics to assess capacity expansion, data-center growth, and extreme-weather stress scenarios.
  - **Built an automated pipeline** enabling Research to run customized long-term supply–demand scenarios.
  - **Primary inventor** on awarded patent covering the system scenario modeling integration architecture and workflow.

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.