Work Sample 2: Time Series Forecasting of Electricity Usage

Objective

Forecast the monthly electricity generated through net metering in Florida to support better energy planning and grid management. The goal is to build a reliable model that captures seasonal patterns and provides accurate future estimates.

Methods

I analyzed monthly net metering data from 2016 to 2023 using a combination of time series forecasting models. The primary model was SARIMA, which effectively captured seasonal patterns in Florida's electricity usage and delivered strong accuracy, with a MAPE of 3.65%. To explore how neighboring states might influence Florida's trends, I also applied a Vector AutoRegression (VAR) model using data from Georgia and Mississippi. While this model captured regional dynamics, it was less accurate due to variability and irregularities in cross-state data.

To incorporate broader, unobservable drivers of electricity usage, I extended the analysis using a Dynamic Factor Model (DFM). This model uses latent variables—hidden factors inferred from multiple time series—to identify common patterns across different states. The inclusion of these latent factors provided deeper insight into underlying trends such as climate influence, policy effects, and infrastructure differences that are not explicitly captured in individual state data.

Visual Summary

The plot below shows the actual electricity usage (black), predicted values (red), and the 95% confidence intervals (shaded area). The model captures both the seasonal peaks and long-term trend, providing a clear picture of expected net metering activity in the coming months. The narrow confidence band and close alignment with actual values indicate that the SARIMA model is both accurate and stable — making it a practical tool for energy planners, utility companies, and policymakers aiming to manage demand and promote renewable energy adoption in Florida.