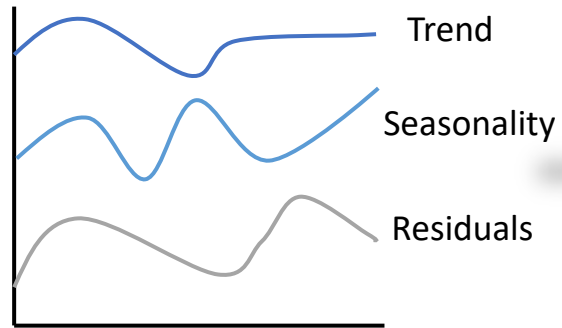


Analytical Workflow



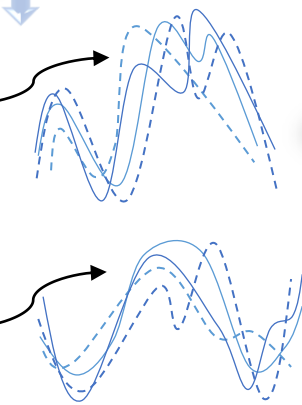
Time Series Decomposition



Applied **Seasonal-Trend decomposition using LOESS (STL)** separately to each country's electricity price and generation data. Extracted three components from each time series: **trend, seasonality, and residuals**

Seasonality of Electricity price

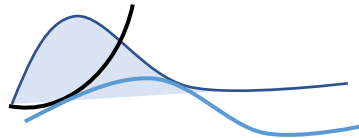
Seasonality of Energy generation



Seasonality Analysis

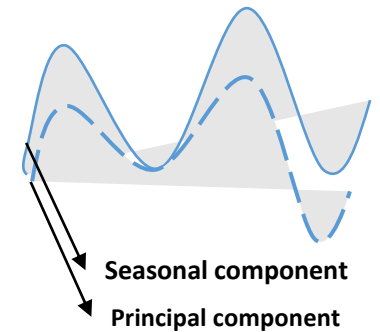
Observed that the seasonal components of electricity prices and generation by energy type exhibit **consistent and interpretable seasonal patterns**, making them suitable for functional data analysis (FDA).

Functional Response Analysis



Performed functional regression using the `fRegress` function from the `fda` package. Regressed seasonal electricity prices on seasonal generation by type for each country. Obtained coefficient functions, representing how the seasonal variation in generation by energy type influences the seasonal variation in electricity prices.

Functional Principal Component Analysis



Conducted FPCA on the seasonal component of electricity prices for each country. Extracted functional principal components that summarize the **main modes of seasonal variation** in electricity prices

Cross-country Comparison