Time Series Forecasting Study: Denmark Energy

This project, encapsulated in a comprehensive Jupyter notebook, is a two-part exploration into the energy consumption patterns of Denmark, with a keen focus on renewable energy trends and predictive modeling.

Part One: Exploratory Data Analysis (EDA) and Renewable Energy Trends

The first section delves into an Exploratory Data Analysis (EDA) of Denmark's energy consumption data. Here, the primary objective is to unearth underlying patterns, seasonal trends, and any anomalies present in the energy usage data. This part is crucial for gaining a deep understanding of the data characteristics before any modeling is attempted.

The EDA process involves a series of steps including data cleaning, dealing with missing values, and normalizing the data to ensure consistency. Visual representations, such as time series plots, heat maps, and histograms, are extensively used to provide a clear visual understanding of the data trends. Key features like seasonality, trends over years, and peak consumption periods are identified and analyzed.

A significant portion of this section is dedicated to examining the trends in renewable energy within Denmark. Given the country's commitment to sustainability and renewable energy, this analysis provides valuable insights into how renewable energy consumption has evolved over the years and its implications for future energy policies.

Part Two: Predictive Modeling of Energy Consumption

In the second part, the focus shifts to predictive modeling, utilizing advanced statistical techniques to forecast future energy consumption patterns in Denmark. This section employs several time series forecasting models, each chosen for its suitability to the specific characteristics of the data.

The models used include:
- Exponential Smoothing: To capture trends and seasonality in energy consumption data.
- Autoregression (AR): This model is applied to understand and predict future values based on past values of the time series.
- ARIMA (AutoRegressive Integrated Moving Average): A more complex model that combines autoregression with moving averages, providing a nuanced approach to forecasting.
- SARIMA (Seasonal ARIMA) with Exogenous Parameters: An extension of ARIMA, this model is adept at handling seasonal variations in the data, crucial for accurately predicting energy consumption patterns which often exhibit strong seasonal traits.