Exponential smoothening Model

ES Model: Exponential smoothing is a technique that can also be used to generate new time series data based on an existing time series. We then fit a Holt-Winters model to the training data using the **ExponentialSmoothing**.

The Holt-Winters model, also known as the triple exponential smoothing model, is a popular time series forecasting method that extends simple exponential smoothing to capture seasonality and trend in the data.

The Holt-Winters model uses three smoothing parameters to generate forecasts: alpha (level smoothing parameter), beta (trend smoothing parameter), and gamma (seasonal smoothing parameter). The model also uses three equations to calculate the level, trend, and seasonal components of the data:

Level equation: l\_t = alpha \* y\_t + (1 - alpha) \* (l\_{t-1} + b\_{t-1})

Trend equation: b\_t = beta \* (l\_t - l\_{t-1}) + (1 - beta) \* b\_{t-1}

Seasonal equation: s\_t = gamma \* (y\_t - l\_t) + (1 - gamma) \* s\_{t-m}

where:

* y\_t is the actual value of the time series at time t.
* l\_t is the level component of the time series at time t.
* b\_t is the trend component of the time series at time t.
* s\_t is the seasonal component of the time series at time t, with m being the number of periods in a season (e.g. 12 for monthly data).
* alpha, beta, and gamma are the smoothing parameters, with values between 0 and 1.

The forecast for time t+h is then given by:

y\_{t+h} = l\_t + h \* b\_t + s\_{t-m+h(mod m)}

where:

* h is the forecast horizon.

The Holt-Winters model is typically used for short-term forecasting, with a forecast horizon of a few periods. It is also important to note that the model assumes that the data is stationary, and may not perform well on non-stationary data.