Forecasting Model Description and Justification

1. Model Overview

The chosen forecasting model for this project is the **ARIMA (AutoRegressive Integrated Moving Average)** model. ARIMA is widely used for time series forecasting due to its flexibility and effectiveness in modeling temporal dependence and patterns.

2. Model Components

- **Autoregression (AR):** Utilizes dependency between current and past observations.
- **Integration (I):** Differencing of raw observations to make the time series stationary.
- **Moving Average (MA):** Models the error of the prediction as a combination of previous errors.

3. Data Preparation

Historical data spanning the last five years was collected, cleaned, and pre-processed to remove outliers and missing values. The time series was analyzed for stationarity using the Augmented Dickey-Fuller test, and differencing was applied where necessary.

4. Model Selection and Validation

The ARIMA order parameters (p, d, q) were selected based on autocorrelation and partial autocorrelation function (ACF/PACF) plots, as well as Akaike Information Criterion (AIC) minimization. The model's performance was evaluated using in-sample fit and out-of-sample forecasting accuracy (MAE, RMSE).

5. Justification

- **Interpretability:** ARIMA models provide easily interpretable parameters.
- **Data Suitability:** Best suited for univariate, stationary time series data such as sales, demand, or inventory levels.
- **Benchmarking:** ARIMA serves as a standard baseline for comparing more complex forecasting approaches.
- **Performance:** Demonstrated strong predictive accuracy on the validation data compared to alternative models.

Important Notes

- This document should be revisited as new data becomes available or business needs change.
- Model assumptions (e.g., stationarity, absence of significant exogenous variables) must be periodically tested.
- Documenting model rationale helps ensure transparency and improve future decision-making.
- Clear justification of the forecasting method supports stakeholder buy-in and effective communication.