**Objective**

Forecast Procter & Gamble’s quarterly sales for six upcoming periods (Q3 2023–Q2 2025) using 9½ years of historical data (38 quarters from FY 2014‑15 to Q2 2023‑24) to support production, supply‑chain planning, and competitive strategy.

**Method**

* **Data & Preprocessing:** Quarterly sales (in million USD); held out the last four quarters for validation.
* **Exploratory Analysis:** Time‑series plots, scatter, ACF/PACF showed both trend and clear seasonality (Q2 peaks, Q3 dips).
* **Models Tested:**
  + **Moving Averages (MA2–MA4, PMA2–PMA4)** for smoothing and trend estimation
  + **Holt’s Linear** for trend
  + **Winters’ Multiplicative** for trend + seasonality
  + **ARIMA (p,d,q)** variants after seasonal decomposition and stationarity checks
* **Diagnostics & Selection:** Compared R‑Squared, RMSE, MAPE, BIC, significance (p‑values), Durbin–Watson, and residual autocorrelations.

Tools used: **SPSS, Excel**

**Findings**

* **MA3** delivered strong fit (R²≈0.975, MAPE≈1.17 %, RMSE≈271).
* **Holt’s Linear** underperformed (R²≈0.78, MAPE≈4.04 %).
* **Winters’ Multiplicative** balanced accuracy and complexity (R²≈0.93, MAPE≈1.99 %, BIC lowest).
* **ARIMA(0,1,1)** offered similar accuracy to Winters (R²≈0.91, MAPE≈1.95 %, BIC competitive).

**Results**

* **Final Model:** Winters’ Multiplicative chosen for its lowest BIC & solid accuracy on hold‑out data.
* **Forecasts (Winters vs. ARIMA):**
  + Q3 2023: 20,096 vs 20,601 (actual 20,195)
  + Q4 2023–Q2 2025: projected within a narrow band around 20,350–21,650 (× seasonal indices).

**Implications**

* **Supply‑Chain Alignment:** Allows P&G to pre‑position raw materials and adjust distributor alerts ahead of Q2 peaks and Q3 troughs.
* **Resource Planning:** Informs manufacturing schedules, labor planning, and inventory buffers.
* **Strategic Response:** Highlights persistent Q3 slowdowns—opportunity for targeted promotions or product launches.
* **Limitations:** Relies solely on past sales; external drivers (marketing spend, macroeconomic shifts) were not modeled. Future work could integrate exogenous variables for enhanced accuracy.