Business Interpretation - Time Series Forecasting for Sales

The analysis looked at 5 years of monthly sales data (Jan 2018 - Dec 2022) to predict future sales and guide bus

Key Findings
1. Sales Pattern - There is steady long-term growth with predictable yearly peaks toward the end of the year and
2. Model Comparison - Prophet captured these seasonal peaks and dips more accurately than ARIMA, with a lo
3. Next Quarter Outlook - Forecasts show sales stabilizing in the low-to-mid 14,000 range per month, with an ups
4. Confidence Range - Actual sales are expected to fall within +/-6% of the forecasted values, which provides a c

Business Implications
- Inventory Planning - Stock levels can be optimized to match expected demand, reducing overstock costs and a
- Marketing & Promotions - Campaigns should be intensified before historically strong months and targeted durin
- Staffing & Operations - Staffing schedules can be aligned with forecasted demand, preventing both understaffin
- Financial Forecasting - Revenue projections for the next quarter can be set with higher confidence, enabling be
- Scenario Preparedness - A +10% growth scenario allows the business to prepare for demand surges without o

Business Interpretation Cell-by-Cell
Cell 1 - Import Libraries: Having the right technical toolkit means you can run multiple forecasting approaches an

Cell 2 - Load & Prepare Data: A clean, well-structured dataset ensures forecasts align with actual months and ev

Cell 3 - Dataset Info & Summary: Knowing the sales range and average allows businesses to set realistic targets

Cell 4 - Plot Raw Sales Data: Recognizing a year-end peak means marketing can be ramped up before holidays

Cell 5 - Decompose Time Series: Separating trend and seasonality lets the business plan for both long-term grow

Cell 6 - Check Stationarity: A stationary series produces stable, reliable forecasts. This stability translates into m

Cell 7 - ACF & PACF Plots: Identifying the dependence structure ensures the forecasting model captures the rig

Cell 8 - Train-Test Split: Testing the model on recent high-demand months validates its performance under peak

Cell 9 - ARIMA Forecast: A flat forecast suggests ARIMA in this configuration misses short-term seasonal nuanc

Cell 10 - Prophet Forecast: Prophet's ability to capture monthly fluctuations means it can guide month-specific de

Cell 11 - Forecast Accuracy Metrics: Prophet's better accuracy means fewer costly errors. For example, with a 6

Cell 12 - Plot ARIMA vs Prophet: Visual proof of Prophet's accuracy makes it easier to convince executives to ac

Cell 13 - Next Quarter Forecast: Having a forecast range allows for tiered planning: minimum staffing for the lowe

Cell 14 - Plot Next Quarter: A clear picture of steady demand gives confidence to maintain current production or

Cell 15 - Scenario Analysis (+10%): Planning for a demand surge means the business can negotiate temporary s

Cell 16 - Save Results: Storing outputs ensures transparency and repeatability, allowing other departments (like