Operations Analytics: Demand and supply forecast

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Abstract

This document provides insights into operations analytics, specifically focusing on demand and supply forecasting using historical data. The process involves cleansing data, applying statistical methods, and presenting results in a dashboard. Forecasted results indicate an increase in product sales, prompting recommendations for strategic actions. Suggestions include selling in high-demand locations, expanding the distributor network, and implementing promotions based on visual analysis. The importance of a dashboard with real-time insights for decision-making is emphasized. Overall, this document highlights the practical application of operational analytics for effective business planning and management.

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Operations Analytics

Operations analytics involves delving into data to comprehend issues, irregularities, or trends (Feigin, 2011). Through the examination of historical data, market trends, and even weather patterns, it predicts future demand. This enables strategic stocking of popular items, preventing overstock and optimizing delivery routes. The process aims to minimize transportation expenses and guarantee the most efficient and cost-effective journey for goods from the manufacturer to the distributor and finally to the retailer as shown in Figure 1.

Figure 1

End-to-end supply chain diagram

Raw Materials → Supplier → Manufacturer → Distributor → Retailer → Consumer
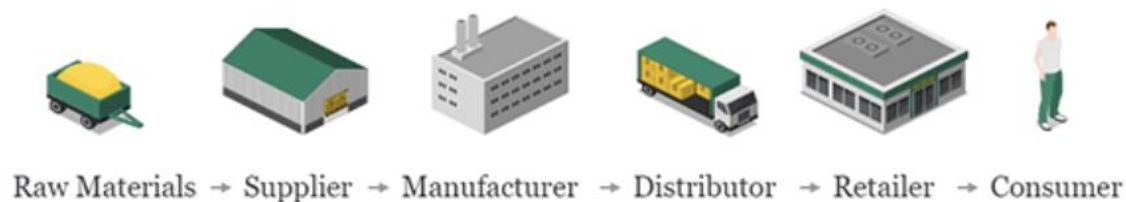
Note: From Forecast Your Products' Demand with Machine Learning, by Lara. S, 2021.

Create Demand and Supply Forecasting

Predicting demand is a vital concern for manufacturers, influencing critical areas like production scaling, inventory optimization, and customer contentment. The advancement of quantitative forecasting, driven by historical data and propelled by statistical or machine learning

approaches, seeks to enhance the accuracy of predicting product demand. To illustrate,

contemplate the complexity of estimating the daily units of a product, such as shampoo, that a

distributor will order in the upcoming 10 weeks. In the process of forecasting the future demand

for a specific stock-keeping unit (SKU), the prediction involves the following steps (Lara, 2021):

1. Acquire or revise the historical sales data (in units) of the product.

2. Clean the historical sales data and address any issues related to data quality.

3. Employ a statistical approach on the historical sales data to generate a forecast.

4. Evaluate the forecasted outcomes and metrics.

5. Present the results through a dashboard.

6. Offer recommendations to the leadership team based on the findings.

Utilizing Microsoft Excel, I examined historical data and projected future sales for a

product in Store_california_4, focusing on forecasting trends, particularly in the context of

product sales (units) over recent weeks. Developing a demand and supply forecast model in

Excel involves creating a visual representation of historical data through a line chart.

Subsequently, a trend line, specifically opting for an exponential growth trend line, is

incorporated into the chart as depicted in Figure 2. The selection of the trend line type is pivotal,

aiming for a close match with the data to ensure more accurate forecasting.

Several alternatives for trend lines, such as exponential, logarithmic, linear, power and

polynomial are available, and the selection should closely correspond to the data at hand. The

coefficient of determination, or "R squared (R^2)" value, aids in evaluating how well the chosen

trend line aligns with the data. In this instance, an exponential growth trend line appears to be

more suitable for predicting future product sales compared to other options. The confidence

value, derived by multiplying the R^2 value by 100, indicates the model's fitting accuracy to the

available data. A higher confidence value signifies a better fit, with a model having an R^2 of 0.8 or 80% confidence being preferable over one with 0.4 or 40% confidence (Feigin, 2011).

Figure 2

Exponential Trend Line
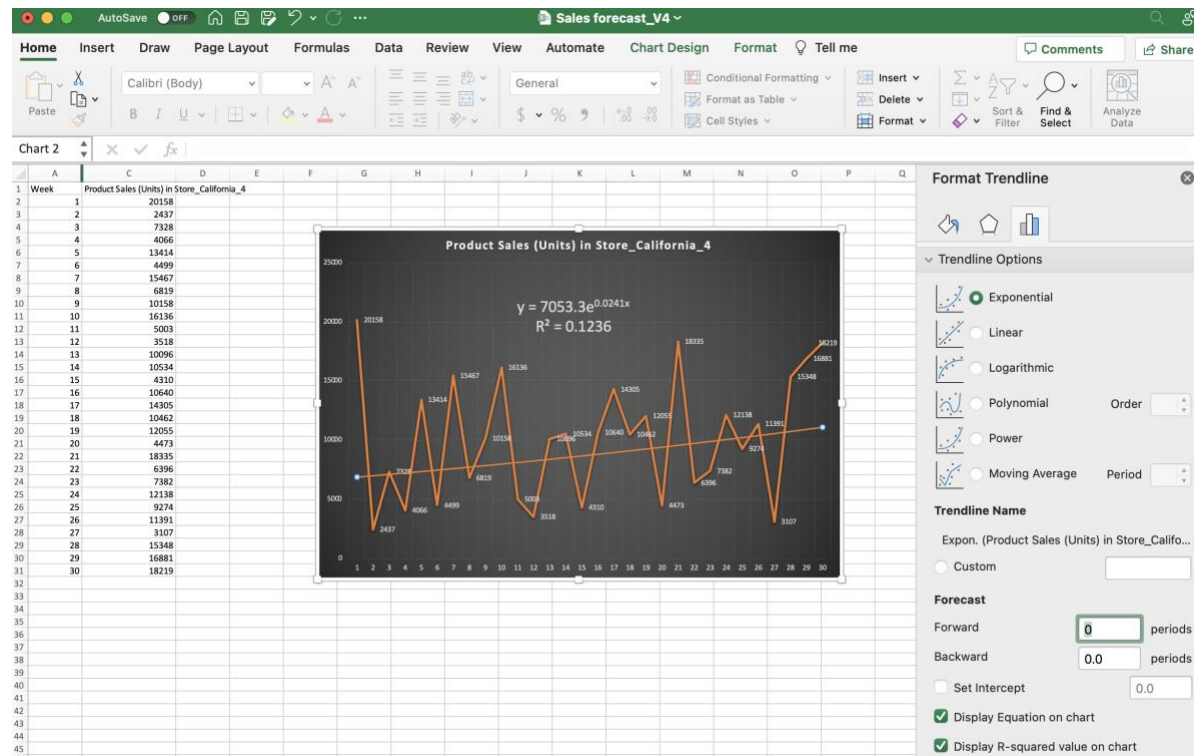
Forecasted Results

Upon configuring the trend line, the next step involves forecasting and predicting future sales values by selecting a future period, specifically the next 10 weeks. To achieve this, input the value 10 into the forward textbox on the established trend line using Excel's built-in forecasting feature, as illustrated in Figure 3. This process yields an estimated projection of future sales based on the historical sales data provided. Additionally, inserting the x value (for the 40th week) into the exponential trend line equation allows us to predict the y value (sales) for the week 40.

The prediction indicates an anticipated increase in product sales in the upcoming weeks. The subsequent action involves offering recommendations to the senior leadership team based on our forecasted results. This allows the leadership team to align their demand and supply planning strategies more effectively.

Figure 3

Visualization of Forecasted Values
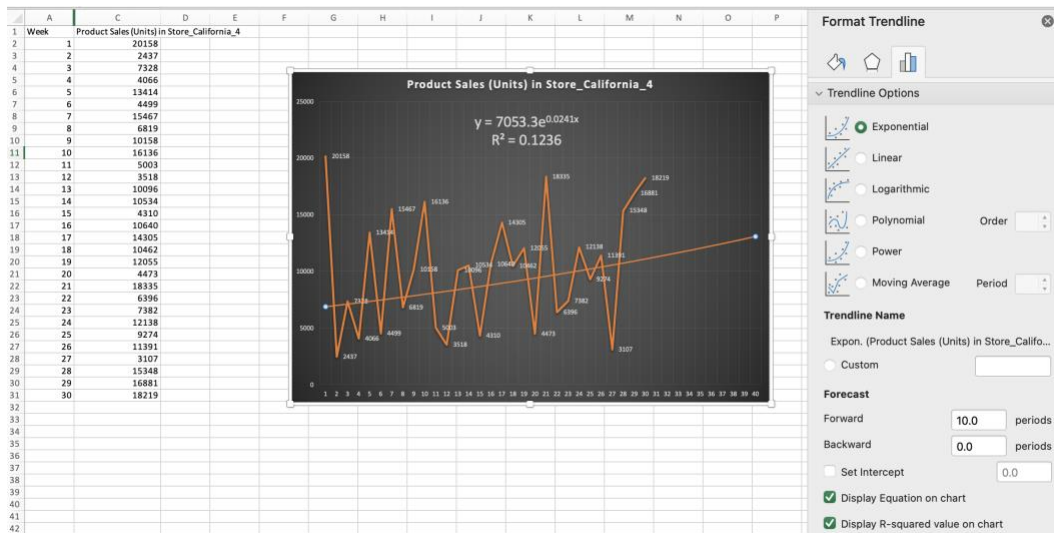
Recommendations

Operations Analytics underscores the importance of utilizing a dashboard with diverse visualizations and numeric metrics to provide real-time insights. This facilitates interactive analysis for both technical and non-technical users, aiding in understanding and addressing data-related challenges (Feigin, 2011). Building on our preceding analysis and forecasts, certain recommendations to the management include

Strategic Selling

    Utilize the locations table joined with the product_sales table by the primary key of Product_id. Load the final table into a Business Intelligence tool, such as Cognos, to present results interactively in a dashboard (see Figure 4).

    Observe global monthly product sales on the left graph and monthly sales across California and Texas store locations on the right. Notably, Store_california_3 consistently demonstrates higher product sales compared to Store_california_4.

Figure 4

Dashboard of Product Sales
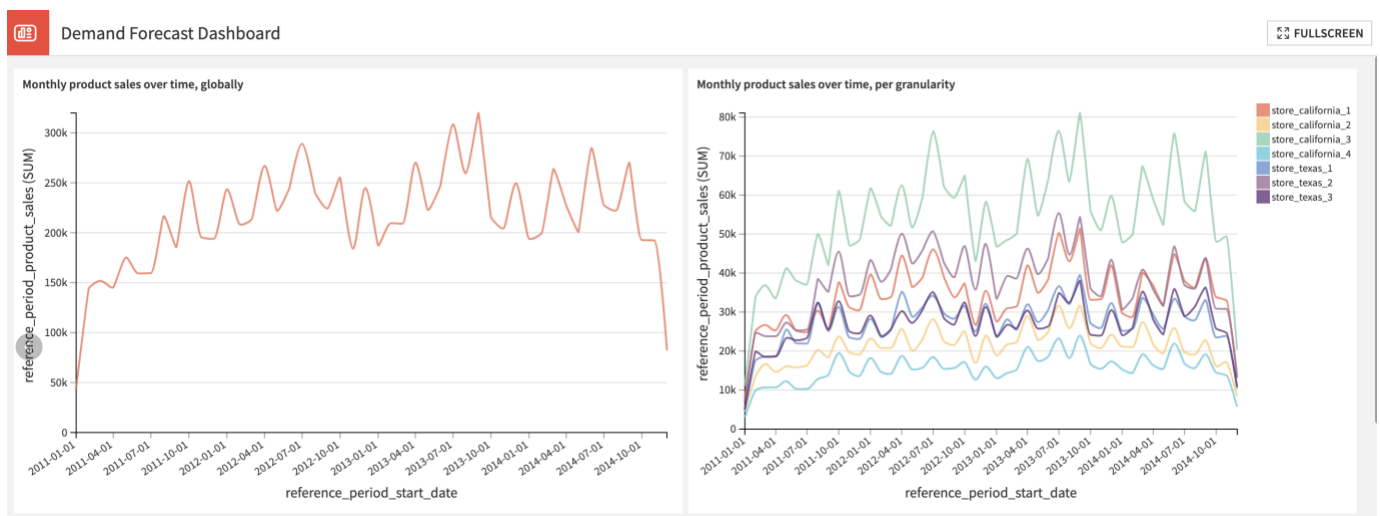
Promotions

    Further analyze results visually, as illustrated in Figure 5, showcasing peak product sales for Store_california_3 during ongoing promotions. Ensure real-time updates by integrating datastores collecting recent data with the BI tool for ongoing insights and dashboard/report updates.

Figure 5

Visual Analysis of Sales Report during Promotions Time
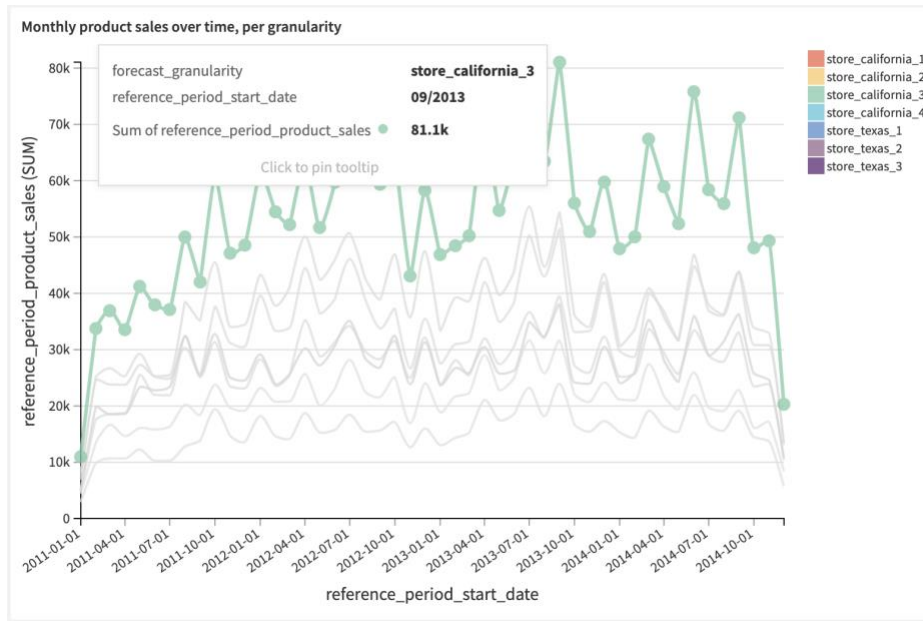
Expanding distributor network

      Increase product sales by expanding the existing distributor network through advertising and fairs, enticing distributors with competitive rates.

Additional recommendations

1. Establishing an online presence and enhance market visibility.

2. Analyzing customer purchasing habits.

3. Launching new products at different times, considering seasonality.

4. Gathering more data and train the model on factors beyond sales, including inventory, product price, market trends, product uniqueness, and weather data (Lara, 2021).

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