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**Project Portfolio**

**Retail Giant Sales Forecasting Case Study**

**Project Title:**

Forecasting Sales and Managing Inventory for Global Market Online Supergiant Store

**Problem Statement:**

Global Market Online Supergiant Store operates across seven global regions with product categories spanning consumer, corporate, and home office segments. The challenge is to accurately forecast sales for the next 6 months across these segments to optimize inventory management and ensure revenue stability.

**Project Description:**

**Objective:**

The objective is to identify the most profitable and consistent market segments and forecast sales and demand for these segments over the next 6 months.

**Scope:**

The project involves data understanding, preparation, model building using time series forecasting techniques, and evaluating various models to select the best performing ones.

**Deliverables:**

The deliverables include a detailed analysis report, sales forecasts for the identified market segments, and recommendations for inventory management strategies.

**Methodology:**

**Tools and Technologies Used:**

Python (libraries: pandas, NumPy, matplotlib, stats models), Jupyter Notebooks for coding and analysis.

**Process:**

* **Data Understanding and Preparation:** Aggregate and clean data, identify unique market segments, perform train-test split.
* **Finding the Most Profitable Segments:** Calculate Coefficient of Variation (CoV) to identify stable market segments.
* **Model Building and Evaluation:** Apply smoothing techniques (Simple Exponential Smoothing, Holt’s Exponential Smoothing, Holt-Winters’ methods) and ARIMA set of techniques (AR, MA, ARMA, ARIMA, SARIMA) to forecast sales. Evaluate models based on MAPE (Mean Absolute Percentage Error).
* **Forecasting:** Use the best performing models to forecast sales for the next 6 months.

**Role and Responsibilities:**

* Individual Project
* **Data Preparation:** Clean and aggregate data, perform train-test split.
* **Model Building:** Implement and evaluate time series forecasting models.
* **Analysis and Reporting:** Compile results, interpret findings, and prepare recommendations for inventory management.

**Results and Impact:**

**Outcome:**

Identified 'APAC\_Consumer' as the most profitable market segment. Developed and evaluated 12 forecasting models, with Holt Winters’ Additive Method and SARIMA showing the highest accuracy.

**Impact:**

Improved sales forecasting accuracy will enable better inventory management, leading to optimized stock levels and improved revenue stability for Global Market Online Supergiant Store.

**Challenges and Solution:**

**Challenges Faced:**

* Handling non-stationary data for time series modeling.
* Selecting the most appropriate forecasting model among various options.

**Solutions Implemented:**

* Applied Box Cox transformation and differencing to make data stationary.
* Utilized statistical tests (ADF, KPSS) to validate stationarity.
* Evaluated multiple models and selected the best performing ones based on MAPE.

**Conclusion and Learnings:**

**Summary:**

Successfully identified and forecasted sales for the most profitable market segment. Holt Winters’ Additive Method and SARIMA demonstrated superior forecasting accuracy.

**Learning Experience:**

Enhanced understanding of time series forecasting techniques, improved proficiency in Python for data analysis, and gained insights into effective inventory management strategies.

**Link for the file:**

<https://drive.google.com/drive/folders/1qXqK2UPHC8xQd9cfkm2YksDeHEQJtRu0?usp=sharing>