Slooze Take Home Challenge: Inventory, Purchase, and Sales Analysis and Optimization

This repository contains the code and analysis for the Slooze Data Science & Analytics take-home challenge. The goal was to leverage transactional data to optimize inventory control and extract valuable business insights related to purchase and sales performance.

Analysis Performed

1. **Data Preparation:** Cleaning, merging, and feature engineering across all provided CSV files.
2. **ABC Analysis:** Classification of inventory based on Gross Profit contribution (A, B, and C categories).
3. **Demand Forecasting:** Time-series forecasting (ARIMA) for a top-selling product.
4. **Inventory Optimization:** Calculation of Economic Order Quantity (EOQ) and Reorder Point (ROP).
5. **Lead Time Analysis:** Assessment of supply chain efficiency and vendor performance.
6. **Financial Insights:** Calculation of Inventory Turnover Ratio (ITR) and Gross Profit Margin (GPM) analysis.

Repository Contents

File Name	Description
`Slooze_Data_Science_Analytics_Report.md`	The final report summarizing the findings, recommendations, and next steps.
`data_preparation.py`	Script for initial data loading, cleaning, and merging.
`abc_analysis.py`	Script for performing the ABC inventory classification.
`demand_forecasting.py`	Script for time-series demand forecasting.
`inventory_optimization.py`	Script for calculating EOQ and ROP.
`lead_time_analysis.py`	Script for analyzing vendor lead times and payment lags.

additional_insights.py	Script for ITR, GPM, and city sales analysis.
demand_forecast_plot.png	Visualization of the demand forecast.

How to Run the Code Locally

Prerequisites

You need Python 3.x installed.

1. Setup Environment

Install the required Python libraries:

```bash pip install pandas numpy statsmodels matplotlib ```

2. Data Placement

Place the six original CSV files provided in the challenge into a directory named `upload/` in the same root folder as the Python scripts.

The required files are:

- 2017PurchasePricesDec.csv
- BegInvFINAL12312016.csv
- EndInvFINAL12312016.csv
- InvoicePurchases12312016.csv
- PurchasesFINAL12312016.csv
- SalesFINAL12312016.csv

3. Execution

The scripts must be run sequentially as they rely on the output (cleaned CSV files) of the previous steps.

```bash

# 1. Data Cleaning and Preparation

python3 data_preparation.py

## 2. ABC Analysis

python3 abc_analysis.py

## 3. Demand Forecasting (generates demand_forecast_plot.png)

python3 demand_forecasting.py

## 4. Inventory Optimization (EOQ/ROP)

python3 inventory_optimization.py

## 5. Lead Time Analysis

python3 lead_time_analysis.py

## 6. Additional Insights (ITR, GPM, City Sales)

python3 additional_insights.py ```

After execution, the final report and all generated artifacts will be available in the root directory.