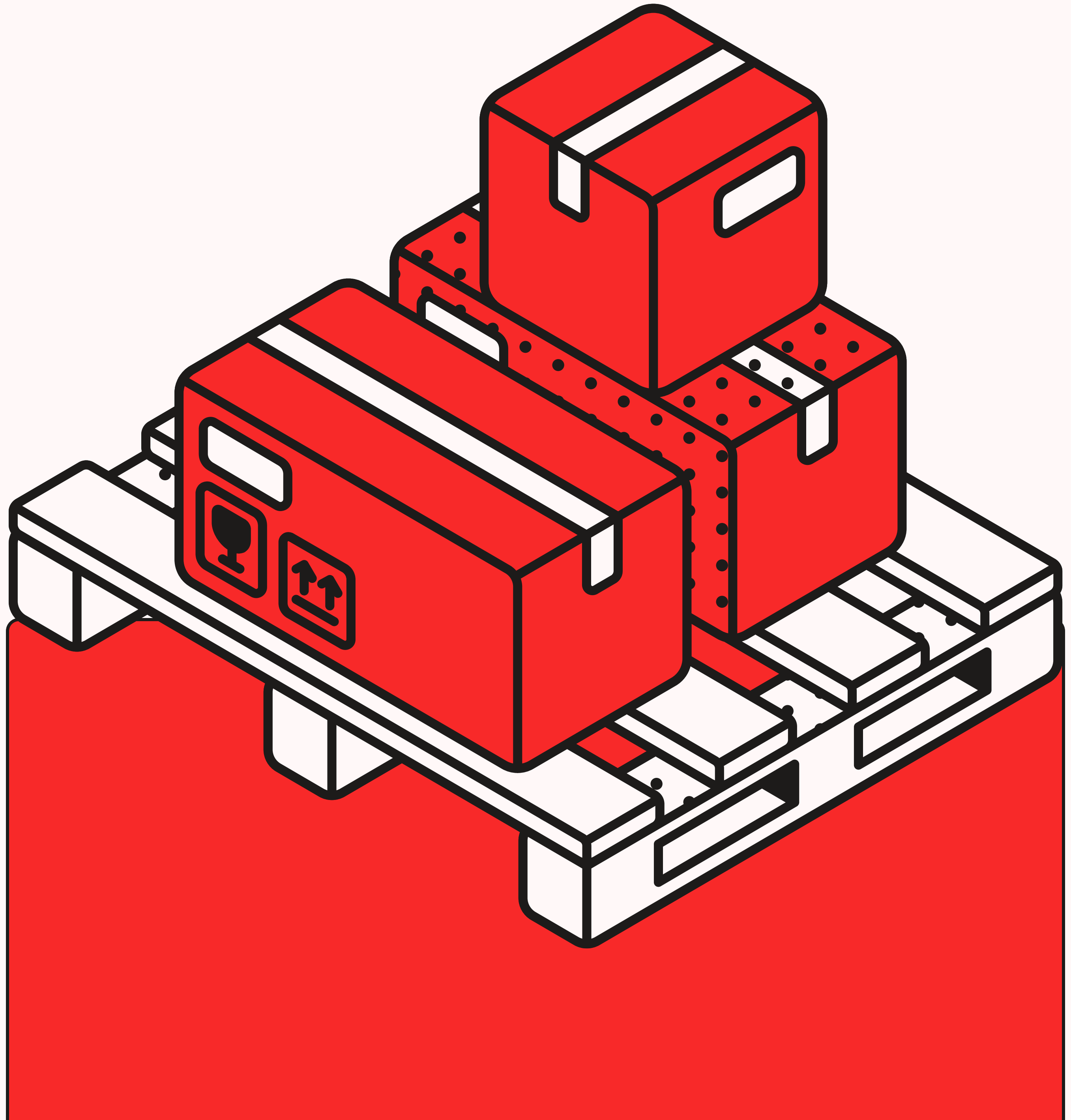
INVENTORY

CONTROL MANAGEMENT



INTRODUCTION

WHAT?

Inventory control balances having enough product to meet demand without tying up excess cash

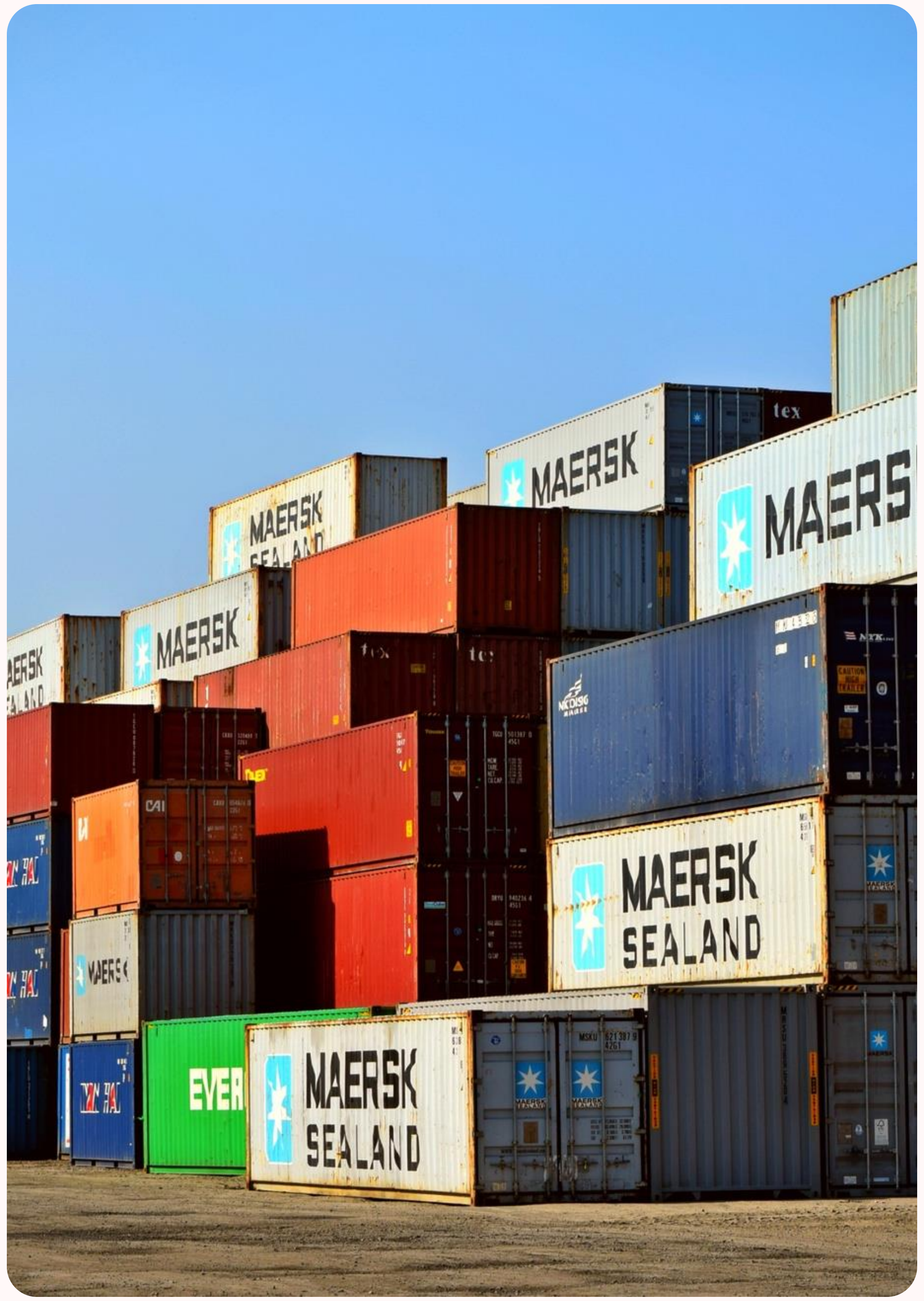
WHY?

Stock-outs lose revenue and erode customer trust; overstock inflates holding costs and hides obsolete items

PROBLEM STATEMENT

The dataset captures operational details across a wide range of SKUs, covering product types, pricing, stock levels, order quantities, lead times (both shipping and manufacturing), supplier and logistics data, and basic customer demographics.

However, the company lacks a structured inventory strategy. SKUs may be **understocked**, leading to lost sales, or **overstocked**, resulting in increased holding costs. There's also no formal system to determine **when to reorder** or **how much** to order.



Project Aim

SKU Risk Flagging

Cost Quantification

Reorder Optimization

Demand Simulation

Capital Efficiency

DATA PREPROCESSING

Data Description

- Product type
- SKU
- Price
- Availability
- Number of products sold
- Revenue generated
- Customer demographics
- Stock levels
- Lead times
- Order quantities
- Shipping times
- Shipping carriers
- Shipping costs
- Supplier name
- Location
- Lead time
- Production volumes
- Manufacturing lead time
- Manufacturing costs
- Inspection results
- Defect rates
- Transportation modes
- Routes
- Costs

Data Cleaning & Transformation

- Fixed data types for each column (e.g., float for costs, int for counts)
- Removed duplicates
- Standardized column names
- Merged lead time fields
- Checked for null or inconsistent entries

Feature Engineering

annual_sales_value

= price × units sold

avg_daily_demand

= units sold ÷ 365

annual_holding_cost

= stock × price × 20% holding rate

days_of_supply

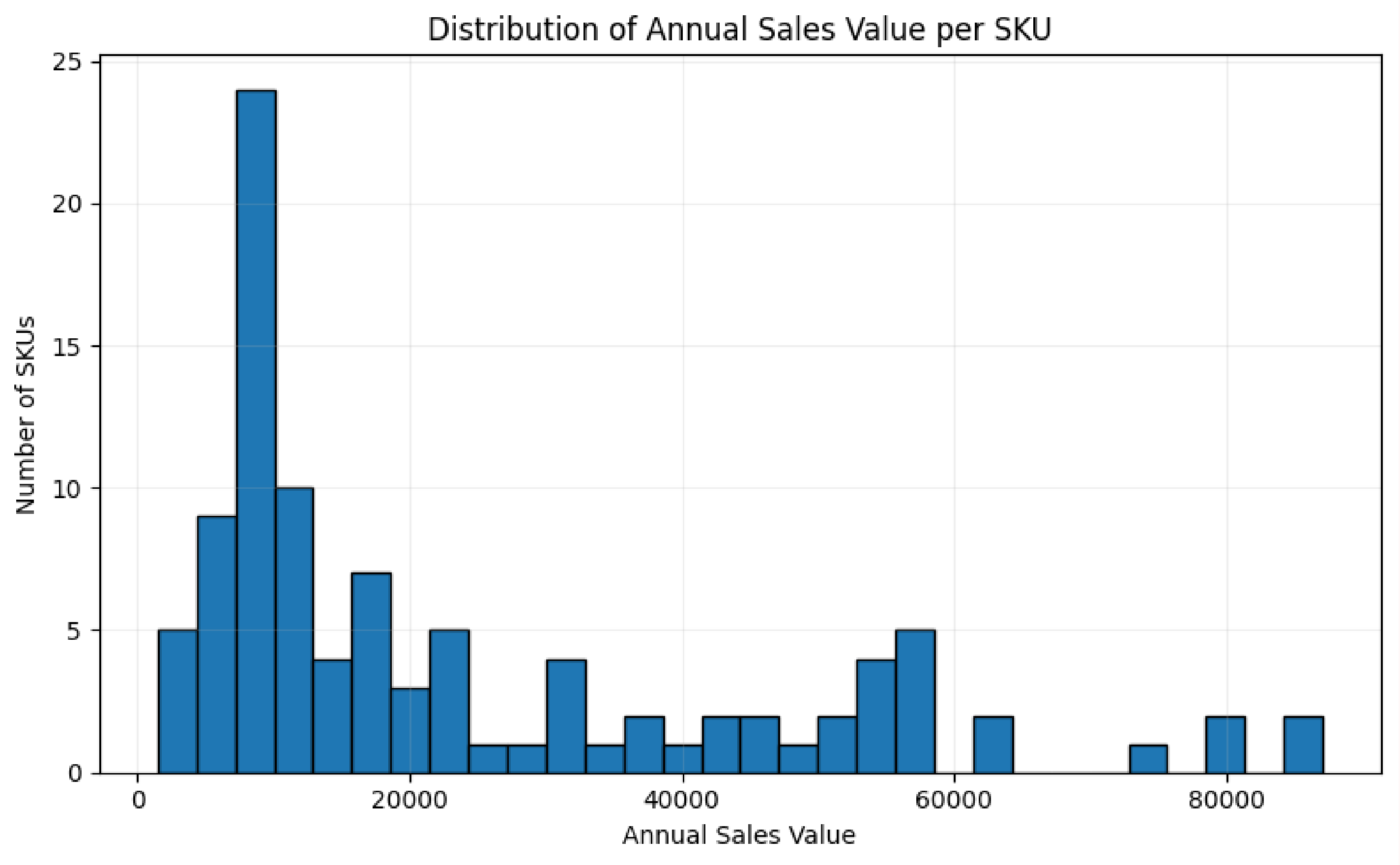
= stock levels ÷ daily demand

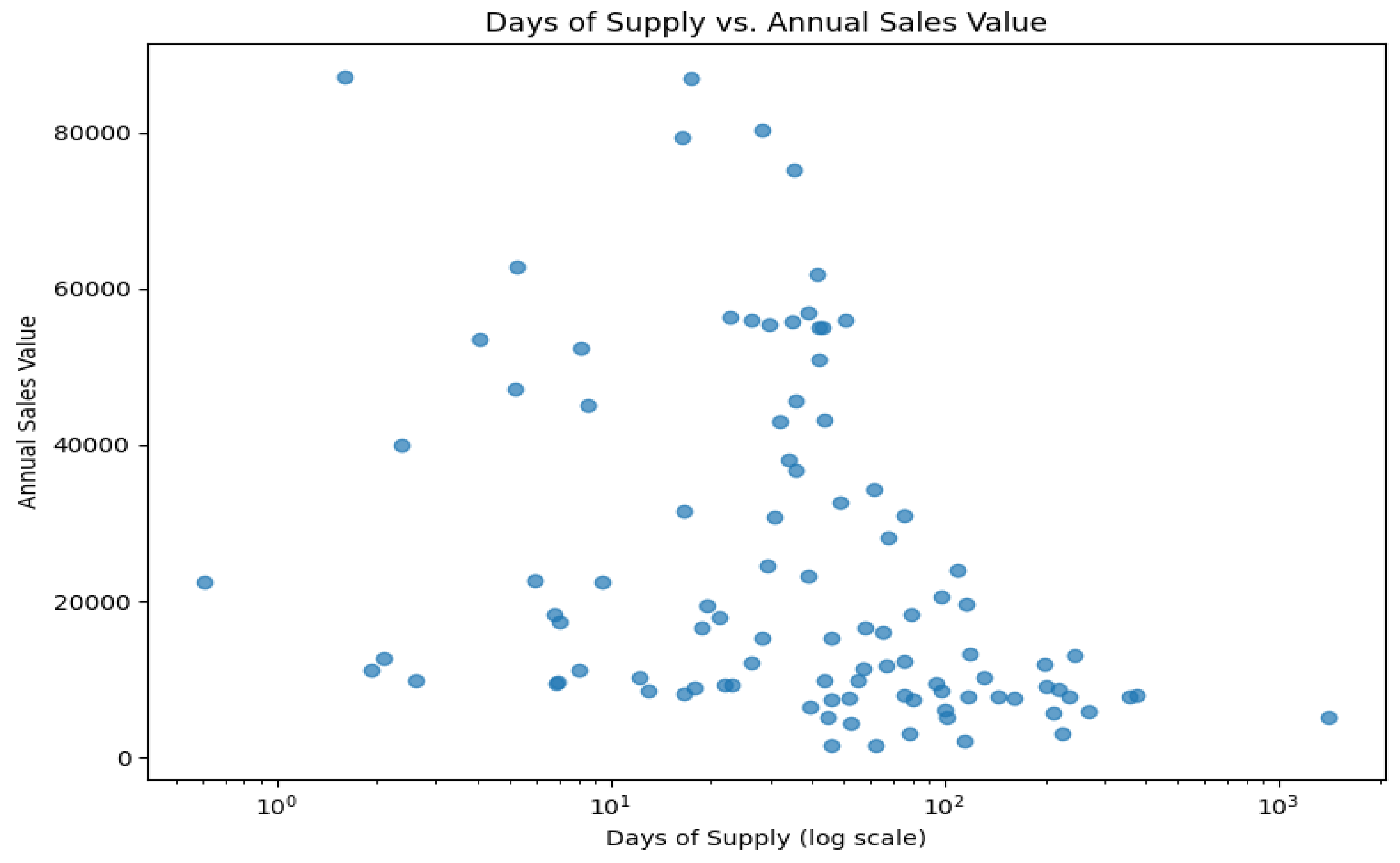
gross_margin

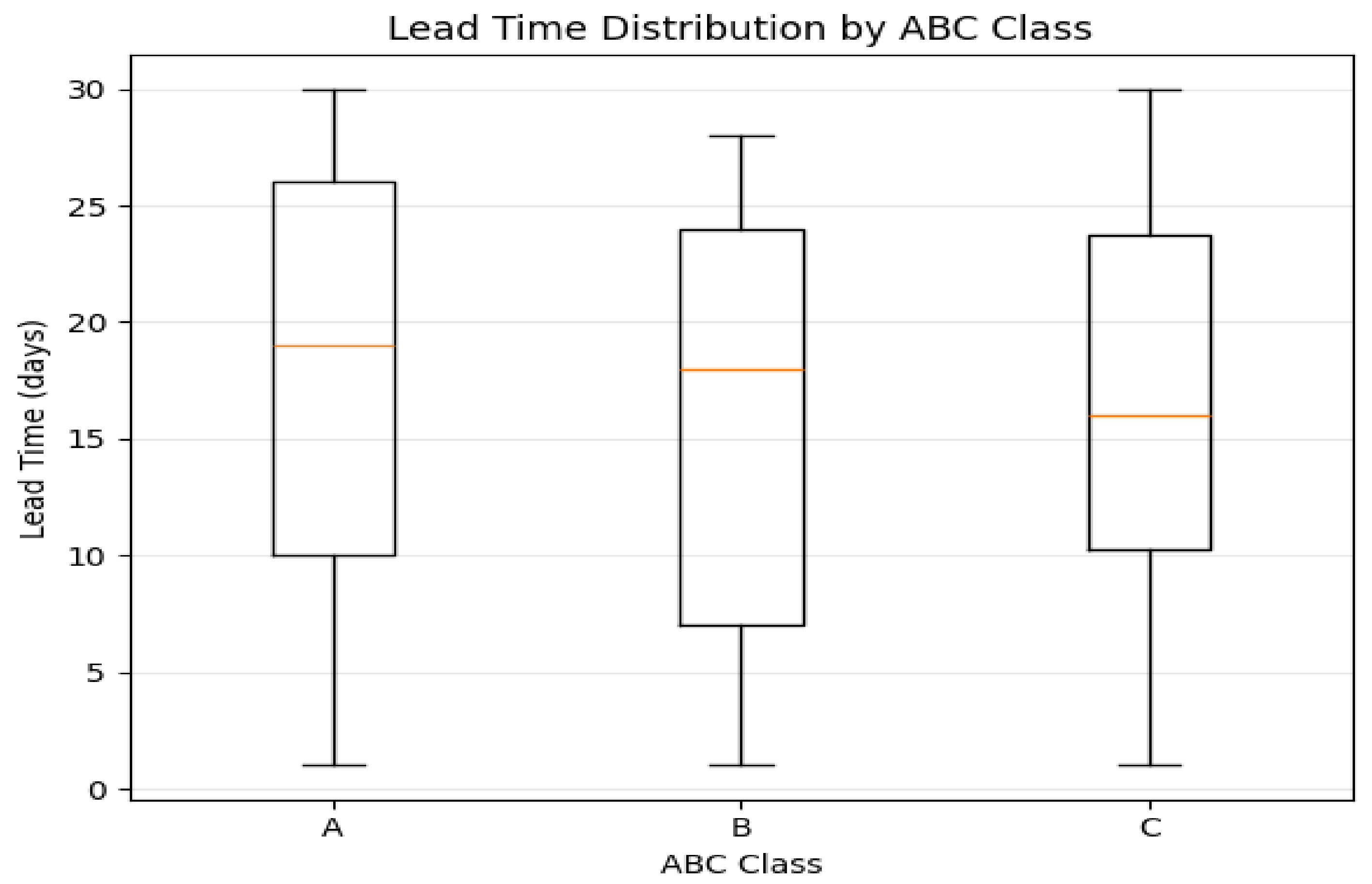
*= revenue − cost * # of products*

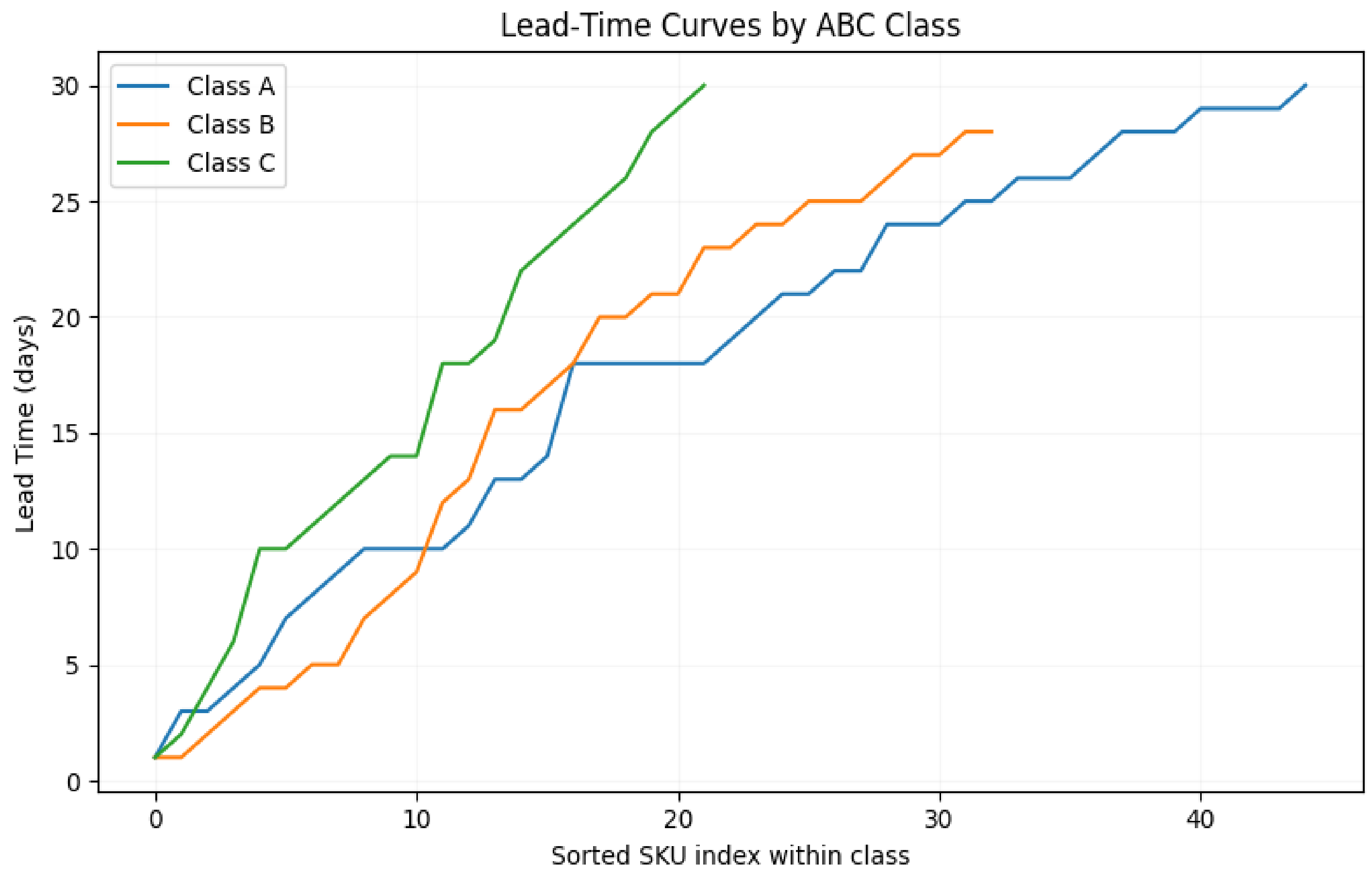
abc_segment

Exploratory Data Analysis









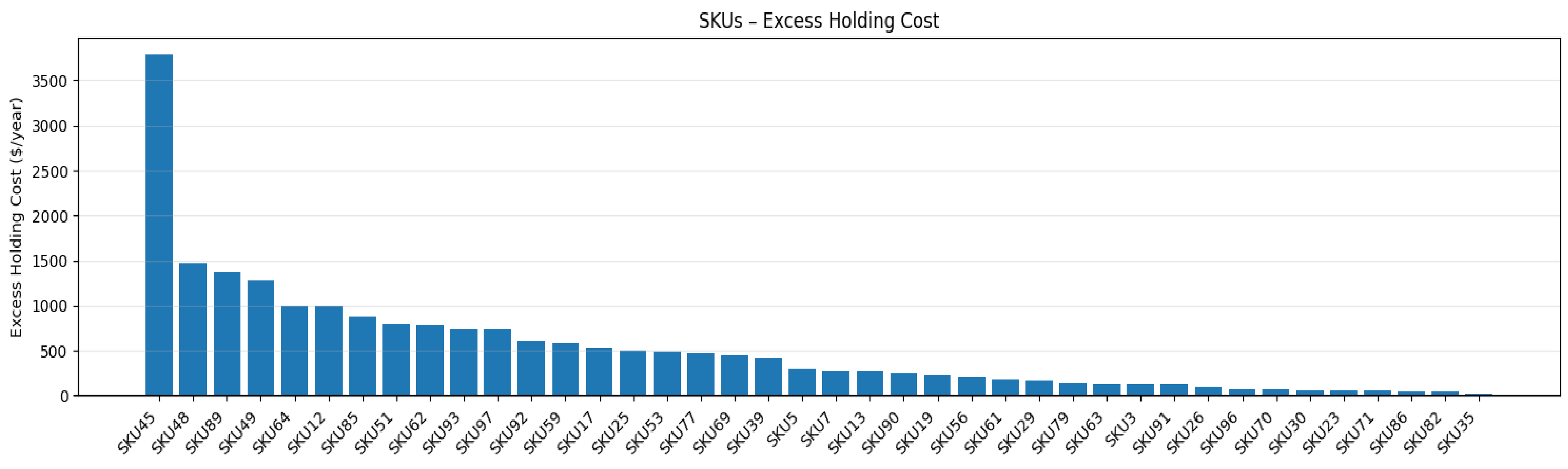
Key Findings

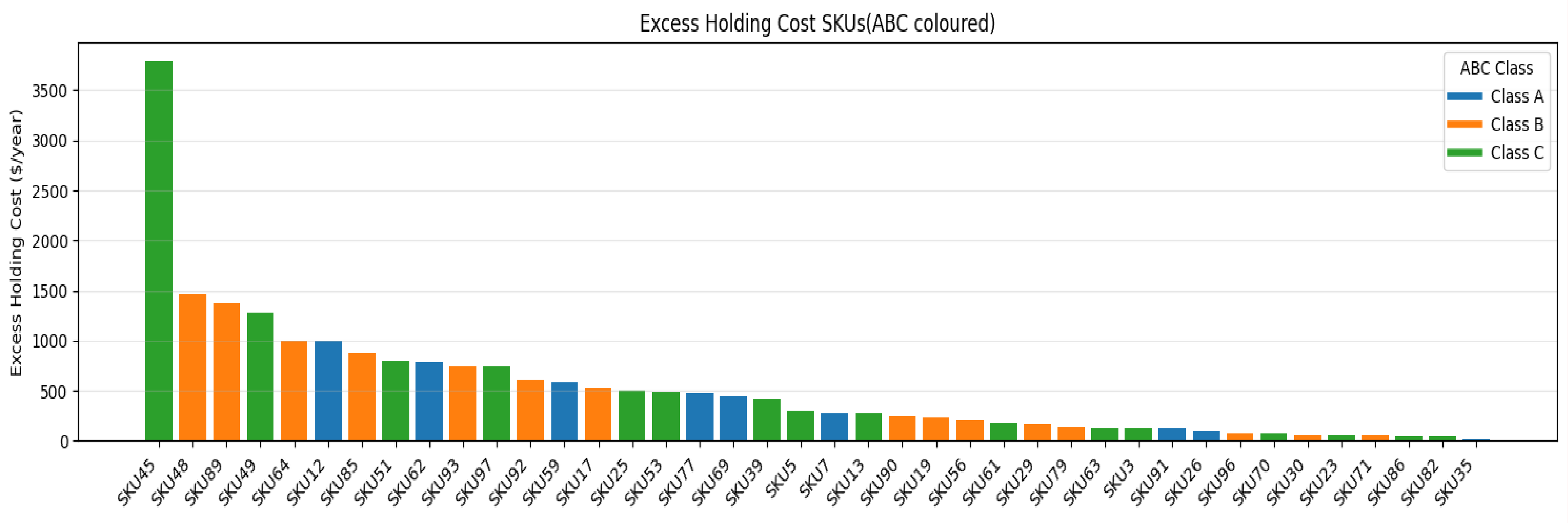
Sales concentration – 20 % of SKUs (ABC "A") generate roughly 80 % of annual sales value, while "C" items contribute < 5 % but occupy the bulk of catalogue space.

Days-of-supply spread – Median DoS is ~18 days, but the long right tail (many SKUs > 150 days) signals dormant stock and locked-up cash.

Lead-time disparities – Box plots show that A-class items have slightly longer lead times than B/C, and scatter jitter confirms that several "A" SKUs exceed 25 days.

Risk & Cost Quantification





Key Findings

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Opportunity cost

= (demand when stock = 0) × gross margin

Excess holding cost

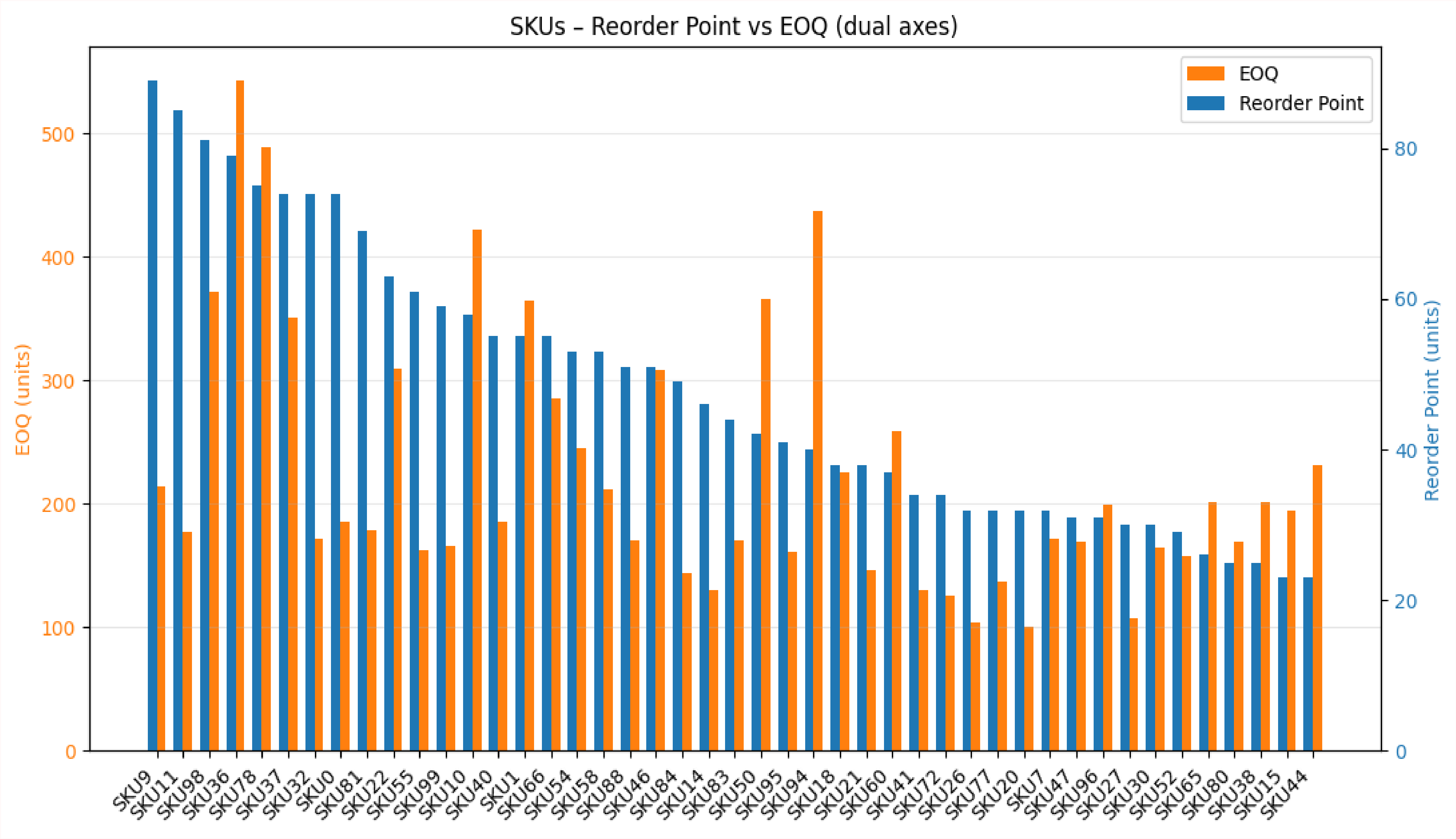
= excess inventory × price × holding rate

The data reveals that there are no opportunity costs due to stockouts in the inventory.

Excess-holding bars, on the other hand, reveal > $50K per year tied up in slow movers.

Color-coding by ABC shows that most of that cash sits in **B and C-class inventory**.

Inventory Policy Optimization



Key Findings

Service Level = 0.90, *We aim to have stock available 90% of the time, since there is an overstocking problem*
Ordering Cost = 300, *$ per purchase order (standard)*
Holding Rate = 0.20, *20 % per year cost (standard)*

Safety Stock *is calculated by assuming a Poisson Variance ($\sigma \approx \sqrt{\mu}$) at a 90% service level*
Reorder point *= average daily demand × lead-time + safety stock*
EOQ (Economic Order Quantity) *using the standard formula with estimated ordering and holding costs*

Dual-axis bars make it clear that EOQs are **3-10 × larger than their reorder points**.

The system is **re-ordering** only when stock is **low**, then **buying big lots** because ordering cost is assumed at $300/PO, resulting in **overstocking**.

Recommendations & Limitations

Protect the cash-cow SKUs

Any **A-class item whose Days-of-Supply is below its supplier lead time** should have its reorder point raised immediately, or the lead time shortened via expedited or dual sourcing.

Drain the overstock

Freeze new orders on **C-class SKUs with DoS > 90 days** and run targeted markdowns or kits to sell through excess units.

Re-estimate ordering cost

The model uses a **$300** fixed ordering cost; a quick time-and-cost audit of recent POs will likely show a lower **figure (often $100-$150)**.

Lower ordering cost ⇒ smaller EOQ ⇒ 10-15 % less average inventory without harming service

Service levels by ABC class

Keep **95 %** cycle-service for "A", "B" to **90 %** and "C" to **85 %**.

Re-compute safety stock accordingly, which might trim another **10 %** of tied-up capital in B/C items

Stabilize lead time

Use the lead-time box-plot to identify outlier vendors; set a target that no SKU's lead time exceeds the 75th percentile of its class.

Even a 5-day reduction on erratic SKUs cuts their safety-stock requirement by ≈10 %.

Collecting daily demand going forward

Save a daily sales extract per SKU.

This unlocks statistically robust safety-stock sizing and seasonality insight, and forecasting demands

THANK YOU