

ECONOMIC ORDER QUANTITY (EOQ) MODEL WITH SEASONAL DEMAND ADJUSTMENT IN EXCEL

1. Background and Problem Statement:

A mid-sized retail company specializing in home appliances faced frequent overstocking during low-demand months and stockouts during peak seasons. Their traditional EOQ approach assumed constant demand throughout the year, which led to inefficient inventory levels. The company wanted a simple, Excel-based EOQ model that incorporates seasonal demand variations to ensure more accurate ordering decisions.

2. Objectives:

- Develop a dynamic EOQ model using Excel
- Integrate monthly seasonality adjustments into the EOQ formula
- Minimize total inventory costs (holding + ordering)
- Create a dashboard view to guide monthly purchase planning

3. Methodology:

3.1 Data Collection

- **Time Frame:** Jan 2022 – Dec 2023 (24 months)
- **Product Focus:** 5 high-selling SKUs
- **Inputs Collected:**
 - Monthly demand data
 - Holding cost per unit per month
 - Ordering cost per order
 - Lead time in days
 - Supplier batch size limits

3.2 EOQ Formula Used

$$EOQ = \sqrt{\frac{2DS}{H}}$$

Where:

- D = Monthly adjusted demand
- S = Ordering cost per order
- H = Holding cost per unit per month

3.3 Seasonal Demand Adjustment

- Calculated **seasonal index** for each month using 2-year average
- Adjusted base demand per product by monthly index using:

$$\text{Adjusted Demand} = \text{Average Monthly Demand} \times \text{Seasonal Index}$$

3.4 Excel Model Structure

- **Input Sheet:** Basic product-level parameters (costs, lead time, base demand)
- **Seasonal Index Sheet:** Computed monthly indexes per product
- **EOQ Calculation Sheet:** Real-time EOQ calculation adjusted monthly
- **Dashboard Sheet:** Visuals for cost breakdown, monthly order quantity, reorder triggers

4. Key Features of the Excel Model

- Monthly EOQ suggestions that vary with seasonal demand
- Conditional formatting to highlight months with overstock or understock risk
- Graphs showing EOQ vs actual demand for validation
- Automated alerts for batch size or minimum order constraints

5. Results and Benefits

- Reduced stockouts during high-demand months by 70%
- 18% decrease in average holding cost across the year
- Improved order planning accuracy and supplier coordination
- Staff with basic Excel knowledge could maintain and update the model monthly

6. Deliverables

- .xlsx file with full EOQ model and seasonal index automation

- A one-page usage guide with step-by-step model updating instructions
- A summary report showing annual savings and monthly performance metrics

7. Stakeholder Relevance

Academic:

- Demonstrates how EOQ can be adapted for non-constant demand scenarios
- Useful for courses on operations, supply chain, and applied Excel modeling

Corporate:

- Directly implementable in small and medium-sized inventory operations
- Easily modifiable for more products or different cost structures