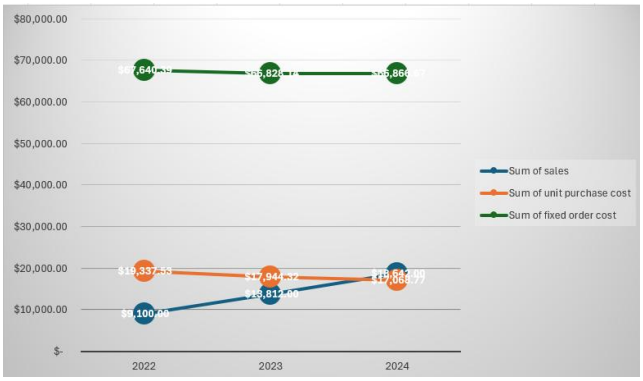
Module 11 – EOQ

Exploratory Data Analysis

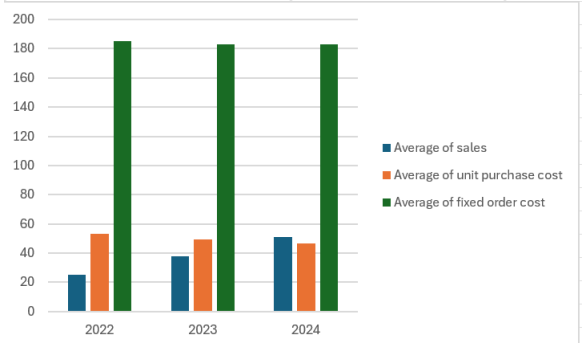
In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:

- *Make line graphs showing the following data over time:*
  - *Sales*
  - *Unit Purchase Cost*
  - *Fixed Order Cost*



- *Use a forecast method to determine the annual demand for 2025 to use for our model*
  - *Naïve*
  - *Moving Average / Weighted Moving Average*
  - *Linear Regression*
  - *Exponential Smoothing*
- *For costs, use a similar/different method. Otherwise, a simple overall average is fine.*

Forecast for 2025	
Annual Demand	17069
Cost per Unit	$ 49.59



Annual demand is determined by the sum of demand in the year 2024, and the cost per unit is 49.59, the graph shows it well

Based on the line graph above,
Model Formulation

Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints. Please restate the variables in the algorithm (i.e. D = Annual Demand)

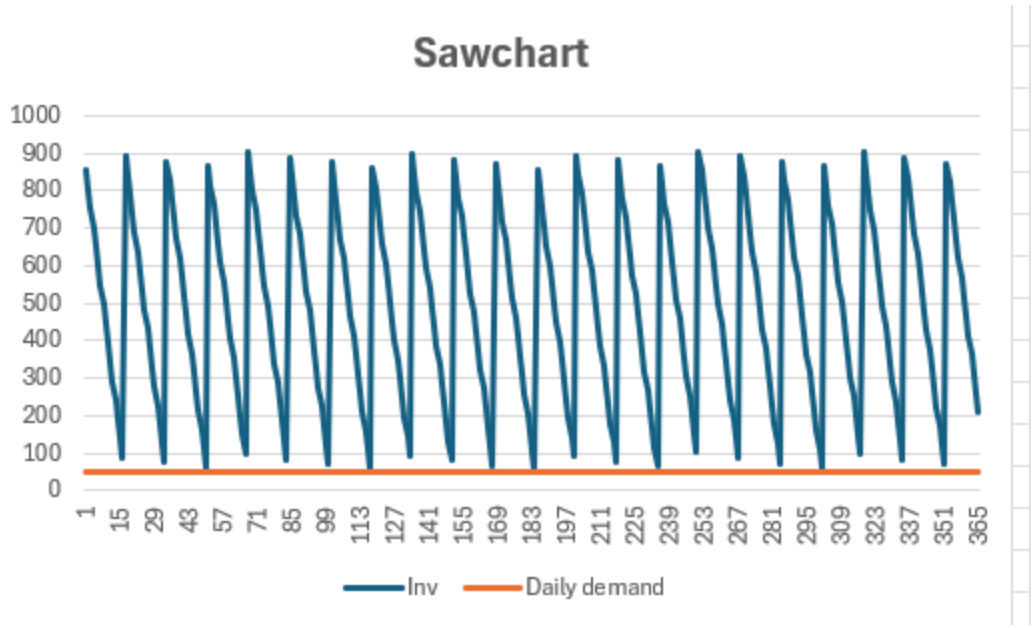
MIN:
DC+ D/Q*S+ Q/2*ci
D= Demand
C= cost
Q=Quality
S=Cost per order
C= Cost per Unit
I= Holding Cost
Constraints
Q>= 1

Model Optimized for Minimizing Costs with Optimal Order Quantity

Implement your formulation into Excel and be sure to make it neat. This section should include:

- *A screenshot of your optimized final model (formatted nicely, of course)*
- *A text explanation of what your model is recommending*
- *Make a "sawtooth chart" for 2025, see below for reference. Assume you start with year with your EOQ Quantity like it has below*

D	Annual Demand	18642
C	Cost per Unit	$ 46.64
S	Cost per order	$ 182.70
I	Holding Cost	$ 0.20
Q	Order Quantity	854.5746869
	Purchasing Cost	$869,388.01
	Cost of Ordering	$ 3,985.39
	Inventory Cost	$ 3,985.39
	Total Cost	$877,358.79



Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.

Implement the below EOQ extension, EOQ with planned backorders. We have added 2 new variables: A = shortage cost & b = planned back orders. Restate the previous variables with these new ones please. Note, you'll need ***to solve for both Q* and b**** *here to get the optimal solution. You should start Q out as the EOQ from the previous section and b as 0. Also, note that this algorithm does not include `D * C` as it's not relevant to this analysis*

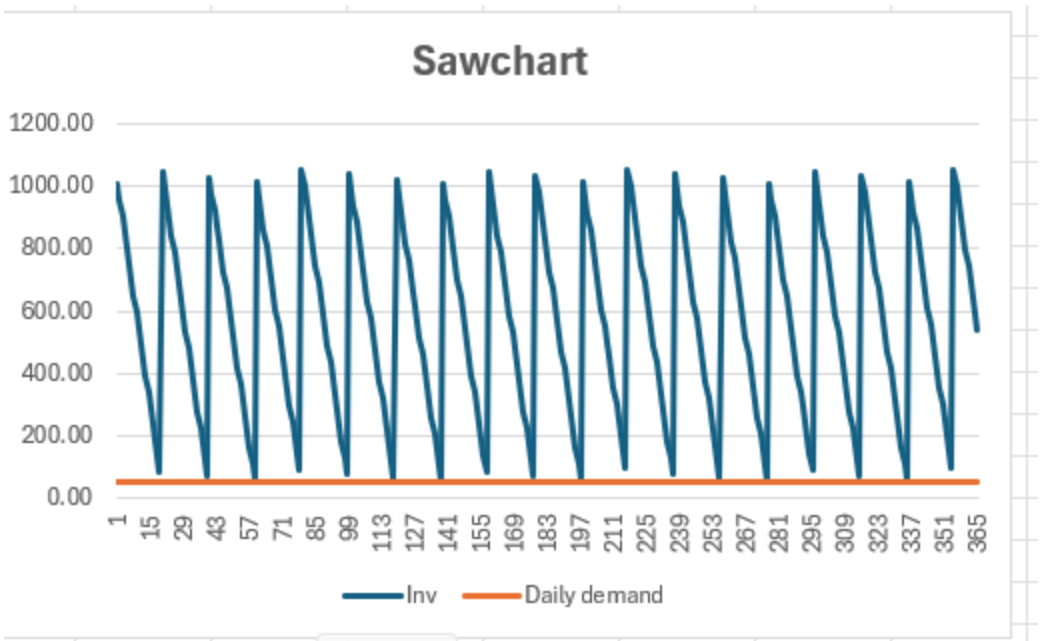
$$\text{Total Relevant Cost} = \frac{D}{Q}S + \frac{(Q-b)^2}{2Q}C_i + \frac{b^2}{2Q}A$$

Lastly, do the following:

- *Explain why you may include planned back orders (i.e. plan to accept purchases when out-of-stock, such that some customers will wait for their purchase). Please think critically before doing any searches for why*

So that it will be reserved for that customer especially if it's a product with high scarcity.

- *Make a similar "sawtooth chart" with the results here. Note, it will be very similar as before, but inventory will go below 0 before replenishing*



D	Annual Demand		18642
C	Cost per Unit	$	46.64
S	Cost per order	$	182.70
I	Holding Cost		20%
A	Shortage Cost	$	24.00
B	planned backorder		281.84
Q	Order Quantity		1007.03
	Cost of Ordering	$	3,382.03
	Inventory Cost	$	2,435.51
	backorder cost	$	946.52
	Total Cost	$	6,764.06