

Module 03 – Production Modeling

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 a table of average demand, production capacity, and costs for each quarter, are there differences between quarters?*
- *Since we have temporal data (i.e. year and quarter), see if you can make a yearly and/or quarterly chart showing these metrics over time.*

Row Labels	Average of capacity	Average of demand	Average of production_cost	Safety Stock
1	476.00	277.00	52.90	27.70004167
2	485.00	705.00	50.61	70.49991667
3	530.00	751.00	48.08	75.09991667
4	495.00	515.00	45.62	51.49995833

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

Min: $52.90P_1 + 50.61P_2 + 48.08P_3 + 45.62P_4 + 1.05(B_1 + B_2)/2 + 1.05(B_2 + B_3)/2 + 1.05(B_3 + B_4)/2 + 1.05(B_4 + B_5)/2$

Constraints:

$P_1 \leq 476$

$P_2 \leq 485$

$P_3 \leq 530$

$P_4 \leq 495$

$28 \leq B_1 + P_1 - 277$

$70 \leq B_2 + P_2 - 705$

$75 \leq B_3 + P_3 - 751$

$51 \leq B_4 + P_4 - 515$

Model Optimized for Cost Reduction

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)*

Quarter	1	2	3	4
Beg Inventory	350	516	296	75
Units produced	443	485	530	491
Units Demanded	277	705	751	515
Ending inventory	516	296	75	51
Max Production	476	485	530	495
Min Inventory	28	70	75	51
Average Inventory	433	406	186	63
Unit production cost	\$ 52.90	\$ 50.61	\$ 48.08	\$ 45.62
Unit carrying cost	1.05	1.05	1.05	1.05
Quarterly Production cost	\$23,434.72	\$24,545.65	\$25,482.60	\$ 22,399.42
Quarterly Carrying cost	\$ 454.65	\$ 426.30	\$ 194.78	\$ 66.15
			Total Cost	\$ 97,004.27

- A text explanation of what your model is recommending
 - o My model is recommending that

Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution. If we remove the production capacity constraint from the model & we removed the carrying cost, what do you think will happen? Try it out and see if it matches your expectation. Try to explain what is happening and talk a bit about fallbacks of models.

I think that if we remove the carrying cost, it will make it cheaper for us. This is because it will cost us nothing to hold the inventory. As for the capacity constraint, it should also lower because that means that we can hold as much inventory as we want

When I did run the test, it did lower the costs as expected. The production costs, however, increased but the carrying cost was 0. This makes sense because it costs us nothing to hold the inventory.