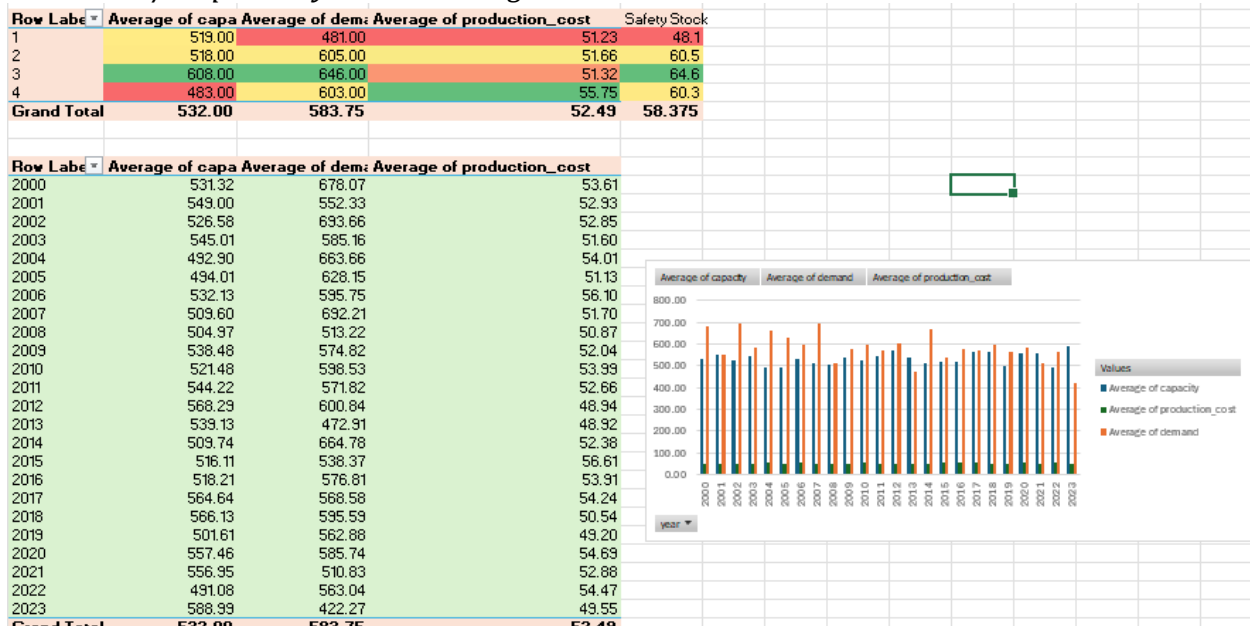


# Module 03 – Production Modeling

## 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.



## 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

$$\text{MIN: } 51.23P_1 + 51.66P_2 + 51.32P_3 + 55.75P_4 + 1.34(B_1 + B_2) + 1.34(B_2 + B_3) + 1.34(B_3 + B_4) + 1.34(B_4 + B_5)$$

$$P_1 \leq 519$$

$$P_2 \leq 518$$

$$P_3 \leq 608$$

$$P_4 \leq 483$$

$$48.1 \leq B_2$$

$$60.5 \leq B_3$$

$$64.6 \leq B_4$$

$$60.3 \leq B_5$$

### 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)
- A text explanation of what your model is recommending

	1	2	3	4
<b>Beginning Inventory</b>	300	338	251	213
<b>Units Produced</b>	519	518	608	450
<b>Units Demanded</b>	481	605	646	603
<b>Ending Inventory</b>	338	251	213	60
<b>Maximum Production</b>	519	518	608	483
<b>Minimum Inventory</b>	48.1	60.5	64.6	60.3
<b>Average Inventory</b>	319	295	232	137
<b>Unit Production Cost</b>	\$51.23	\$51.66	\$51.32	\$55.75
<b>Unit Carrying Cost</b>	\$1.34	\$1.34	\$1.34	\$1.34
<b>Monthly Production Cost</b>	\$26,588	\$26,760	\$31,203	\$25,104
<b>Monthly Carrying Cost</b>	\$427	\$395	\$311	\$183
			<b>Total Cost</b>	<b>\$110,971</b>

This model is showing me the amount of product produced per quarter and how much will be sold, including the different costs that play into production and carrying the product to the coming quarters.

### 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.

	1	2	3	4
Beginning Inventory	300	1,914	1,309	663
Units Produced	2,095	0	0	0
Units Demanded	481	605	646	603
Ending Inventory	1,914	1,309	663	60
Maximum Production	519	518	608	483
Minimum Inventory	48.1	60.5	64.6	60.3
Average Inventory	1,107	1,612	986	362
Unit Production Cost	\$51.23	\$51.66	\$51.32	\$55.75
Unit Carrying Cost	\$1.34	\$1.34	\$1.34	\$1.34
Monthly Production Cost	\$107,342	\$0	\$0	\$0
Monthly Carrying Cost	\$1,484	\$2,160	\$1,322	\$485
			Total Cost	\$107,342

When we delete the production capacity constraint from the model what ends up happening is everything being produced in quarter 1 and none being produced in the ones after. Also when you remove the carrying costs it makes the production costs increase by a lot in quarter 1. Also it makes the carrying costs increase tremendously.