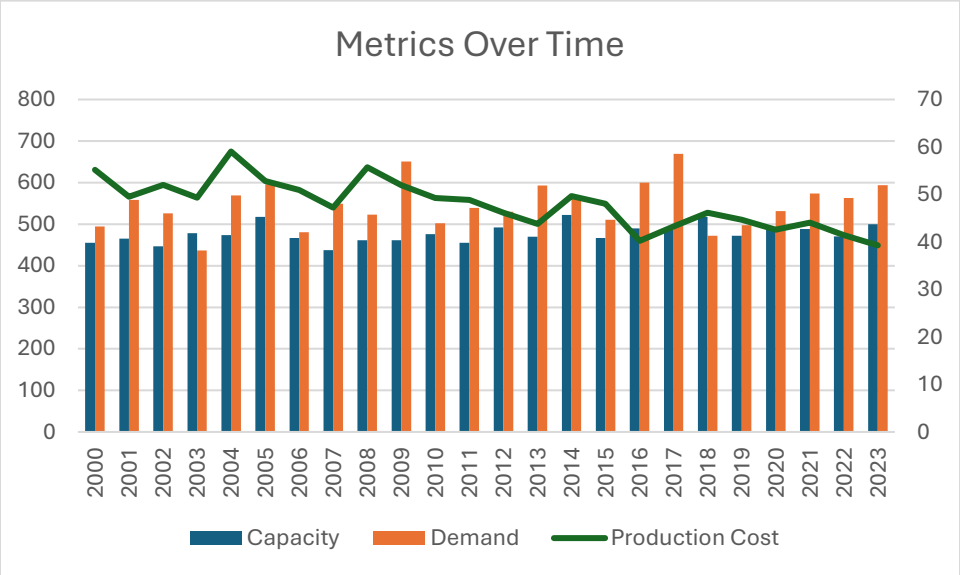
Module 03 – Production Modeling

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:

Quarter	Capacity	Demand	Safety Stock	Production Cost
1	497.00	693.00	69.30	$ 46.51
2	539.00	496.00	49.60	$ 48.50
3	422.00	564.00	56.40	$ 49.45
4	452.00	435.00	43.50	

Quarter	Capaci



Model Formulation

Min: 46.51X1+48.50X2+49.45X3+47.41X4+ 1.35(B1+B2)/2 +1.35(B2+B3)/2 +1.35(B3+B4)/2 + 1.35(B4+B5)/2

Subject to:

X1<=497] Production level for Quarter 1
X2<=539] Production level for Quarter 2
X3<=422] Production level for Quarter 3
X4<=452] Production level for Quarter 4
B1>=69.3] Ending Inventory for Quarter 1
B2>=49.6] Ending Inventory for Quarter 2
B3>=56.4] Ending Inventory for Quarter 3
B4>=43.5] Ending Inventory for Quarter 4

Nonnegativity Constraint:

Xi>=0, Bi>=0

Model Optimized for Cost Reduction

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

		1	2	3	4		
Beginning Inventory		**400.00**	204.00	198.40	56.40		
Units Produced		**497.00**	**490.40**	**422.00**	**422.10**		
Units Demanded		**693.00**	**496.00**	**564.00**	**435.00**		
Ending Inventory		**204.00**	**198.40**	**56.40**	**43.50**		
Maximum Production		**497.00**	**539.00**	**422.00**	**452.00**		
Minimum Inventory		69.30	49.60	56.40	43.50		
Average Inventory		302.00	201.20	127.40	49.95		
Unit Production Cost		**46.51**	**48.50**	**49.45**	**47.41**		
Unit Carrying Cost		1.35	1.35	1.35	1.35		
Quarterly Carrying Cost		$408	$272	$172	$67		
Quarterfly Production Cost		$23,116	$23,784	$20,868	$20,012		
						Total Cos	**$88,698**

The solver finds the lowest total cost while ensuring inventory levels remain feasible and demand is met. This total cost includes:

- Quarterly production costs (dependent on the number of units produced and their per-unit costs).
- Quarterly carrying costs (dependent on the average inventory).

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		**400.00**	204.00	247.00	105.00		
Units Produced		**497.00**	**539.00**	**422.00**	**452.00**		
Units Demanded		**693.00**	**496.00**	**564.00**	**435.00**		
Ending Inventory		**204.00**	**247.00**	**105.00**	**122.00**		
Maximum Production		**497.00**	**539.00**	**422.00**	**452.00**		
Minimum Inventory		69.30	49.60	56.40	43.50		
Average Inventory		302.00	225.50	176.00	113.50		
Unit Production Cost		**46.51**	**48.50**	**49.45**	**47.41**		
Unit Carrying Cost		1.35	1.35	1.35	1.35		
Quarterly Carrying Cost		$408	$304	$238	$153		
Quarterfly Production Cost		$23,116	$26,141	$20,868	$21,429		
						Total Cos	**$92,657**

The model shows that the total cost is about $2000 more when not optimized to be less than or equal to the maximum production.