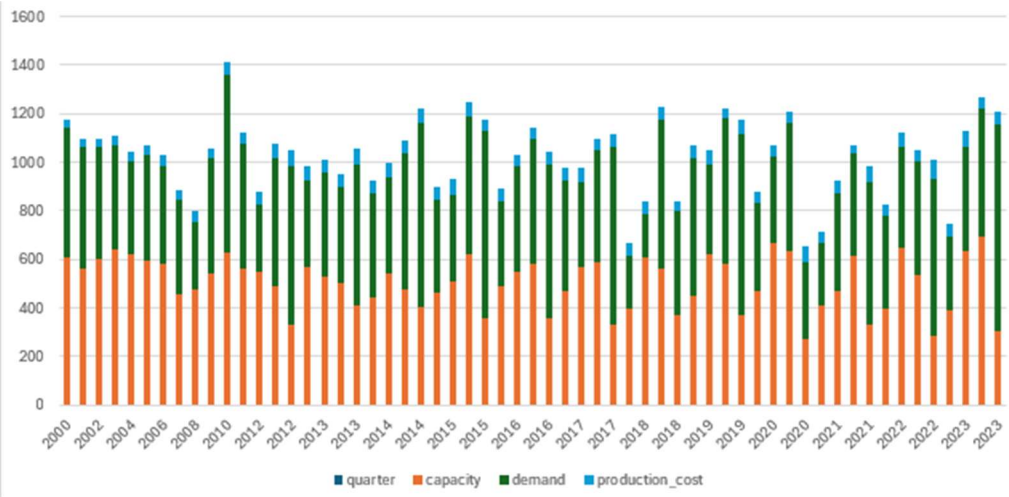
Module 03 – Production Modeling

Exploratory Data Analysis

Quarter	Capacity	Demand	Saftey Stock	Production Cost
1	515.00	410.00	41.00	46.42
2	504.00	334.00	33.40	49.87
3	504.00	449.00	44.90	54.36
4	400.00	568.00	56.80	52.03



Model Formulation

MIN:
46.42P_1+49.87P_2+54.36P_3+52.02P_4+
1.31(B_1+B_2)/2 + 1.31(B_2+B_3)/2 + 1.31(B_3+B+4)/2 + 1.31(B_4+B_5)

Subject to:

P_1<=515
P_2<=504
P_3<=504
P_4<=400

B_1 + P_1 >= 41
B_2 + P_2 >= 33
B_3 + P_3 >= 45
B_4 + P_4 >= 57

Where:
B_2 = B_1 + P_1 - 410
B_3 = B_2 + P_2 - 334
B_4 = B_3 + P_3 – 449
B_5 = B_4 + P_4 – 568

Objective Function = Monthly Production Cost + Monthly Carrying Cost

Model Optimized for Cost Reduction

		1	2	3	4
Beginning Inventory		**200**	305	475	225
Units Produced		**515**	**504**	**199**	**400**
Units Demanded		410.00	334.00	449.00	568.00
Ending Inventory		**305**	**475**	**225**	**57**
	10.0%				
Maximum Production		**515**	**504**	**504**	**400**
Minimum Inventory		41	33	45	57
Average Inventory		253	390	350	141
Unit Production Cost		**$46.42**	**$49.87**	**$54.36**	**$52.03**
Unit Carrying Cost		$1.31	$1.31	$1.31	$1.31
Monthly Production Cost		$23,906	$25,134	$10,807	$20,812
Monthly Carrying Cost		$675	$660	$260	$524
			Total Cos	**$82,779**	

Model with Stipulation
If we remove the production capacity constraint from the model & we removed the carrying cost, what do you think will happen?

		1	2	3	4
Beginning Inventory		**200**	1,408	1,074	625
Units Produced		**1,618**	**0**	**0**	**0**
Units Demanded		410.00	334.00	449.00	568.00
Ending Inventory		**1,408**	**1,074**	**625**	**57**
	10.0%				
Maximum Production		**515**	**504**	**504**	**400**
Minimum Inventory		41	33	45	57
Average Inventory		804	1,241	849	341
Unit Production Cost		**$46.42**	**$49.87**	**$54.36**	**$52.03**
Unit Carrying Cost		$0.00	$0.00	$0.00	$0.00
Monthly Production Cost		$75,098	$0	$0	$0
Monthly Carrying Cost					
			Total Cost	**$75,098**	

When the production capacity and carrying cost stipulations are removed, all production defaults to the month where the cost of production is the lowest, in this case, that happens to be month #1.