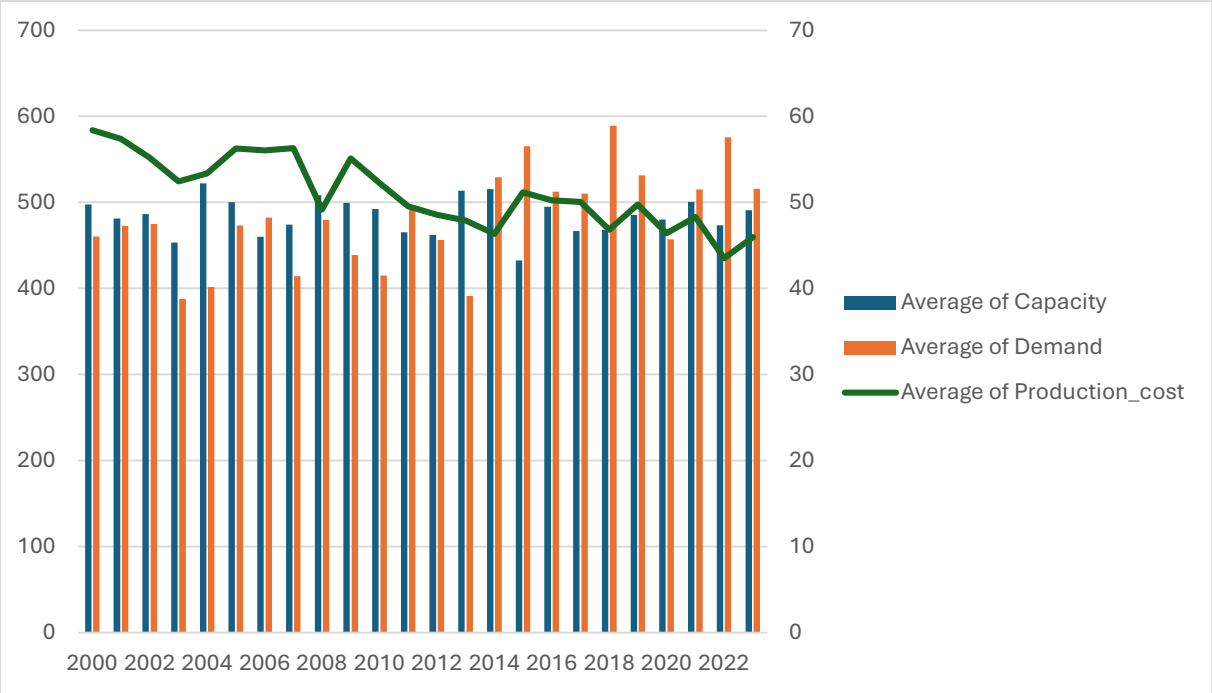
Module 03 – Production Modeling

Exploratory Data Analysis

Row Labels	Average of Capacity	Average of Demand	Average of Production_cost	Average of Safety Stock
1	506	572	51.53041667	57.2
2	498.9995833	420.99875	50.51958333	42.099875
3	402.0008333	632.0004167	53.59041667	63.20004167
4	530.0004167	297.9991667	48.72958333	29.79991667
Grand Total	**484.2502083**	**480.7495833**	**51.0925**	**48.07495833**



Model Formulation

MIN: 51.53P1 + 50.52P2 + 53.59P3 + 48.73P4
+ 1.35 (B1 + B2)/2 + 1.35 (B2 + B3)/2 + 1.35 (B3 + B4)/2 + 1.35 (B4 + B5)/2

Subject to:

P1 <= 487
P2 <= 499
P3 <= 402
P4 <= 265

B1 + P1 >= 52.7
B2 + P2 >= 42.09
B3 + P3 >= 63.02
B4 + P4 >= 29.79

Where:
B2 = B1 + P1 – 572
B3 = B2 + P2 – 420.99
B4 = B3 + P3 – 632.00
B5 = B4 + P4 – 297.99

Objective function:
Monthly production costs + monthly carrying costs

Model Optimized for Cost Reduction

		1	2	3	4		
Beginning Inventory		300	215	293	63		
Units Produced		487	499	402	265		
Units Demanded		572	420.9988	632.0004	297.9992		
Ending Inventory		215	293	63	30		
Maximum Production		506	498.9996	402.0008	530.0004		
Minimum Inventory (capacity)		52.7	42.09988	63.20004	29.79992		
Average Inventory		258	254	178	46		
Unit Production Cost		$ 51.53	$ 50.52	$ 53.59	$ 48.73		
Unit Carrying Cost	$ 1.35	$ 1.35	$ 1.35	$ 1.35	$ 1.35		
Monthly Production Cost		$25,106	$25,209	$21,543	$12,894		
Monthly Carrying Cost		$348	$343	$241	$63		
						Total Cost	$85,746

The total cost for the optimal solution is $85,746.

Model with Stipulation

	1	2	3	4		
Beginning Inventory	300	53	695	63		
Units Produced	325	1,063	0	265		
Units Demanded	572	420.9988	632.0004	297.9992		
Ending Inventory	53	695	63	30		
Maximum Production	506	498.9996	402.0008	530.0004		
Minimum Inventory (capacity)	52.7	42.09988	63.20004	29.79992		
Average Inventory	176	374	379	46		
Unit Production Cost	$ 51.53	$ 50.52	$ 53.59	$ 48.73		
Unit Carrying Cost						
Monthly Production Cost	$16,732	$53,728	$0	$12,894		
Monthly Carrying Cost	$0	$0	$0	$0		
					Total Cost	$83,353

In this case the units produced, ending inventory, and the monthly production cost would all be affected by this. The total cost though does not change that much, and it still gave a feasible solution. Some of the fallbacks of this model are that you could easily forget the carrying cost and it would not affect the model that much. Another fallback is that it gives you a feasible solution even when you remove the production capacity constraint.