Module 03 – Production Modeling

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

- *Formulation → Objective Function*

Min: 47.86P_1$+ 55.98P_2$+ 48.55P_3$+ 46.09P_4$ +1.41(B_1+ B_2)/2 +1.41(B_2+ B_3)/2 +1.41(B_3+ B_4)/2 +1.41(B_4+ B_5)/2

- *Decision Variables*
  - *Variables P_1 to P_4 is the production during each quarter*
  - *Variable B_1 to B_4 is the number of inventory during each quarter*

- *Constraints*
  - *Units Produced >= 0*
    - *P_1 + P_2 + P_3 + P_4 >= 0*
  - *Units Produced <= Maximum Production*
    - *P_1 <= 483*
    - *P_2 <= 444*
    - *P_3 <= 568*
    - *P_4 <= 473*
  - *Ending Inventory >= Minimum Inventory*
    - *B_1+ P_1 >= 37.20*
    - *B_2+ P_2 >= 30.10*
    - *B_3+ P_3 >= 49.00*
    - *B_4+ P_4 >= 43.30*

Model Optimized for Cost Reduction

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

Quarter	1	2	3	4
Beginning Inventory	200	311	49	49
Units Produced	483	182	568	467
Units Demanded	372	444	568	473
Ending Inventory	311	49	49	43
Maximum Production	483	444	568	473
Minimum Inventory	37.20	30.10	49.00	43.30
Average Inventory	256	180	49	46
Unit Production Cost	$47.86	$55.98	$48.55	$46.09
Unit Carrying Cost	$1.41	$1.41	$1.41	$1.41
Quartly Production Cost	$23,116	$10,188	$27,576	$21,538
Quartly Carrying Cost	$360	$254	$69	$65
			Total Cost	$83,167

- *My model for Cost Reduction is recommending a production plan which minimizes the production and inventory cost while balancing the demand and supply so that there are no shortages or overproduction.*

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.

Quarter	1	2	3	4
Beginning Inventory	200	1,061	617	49
Units Produced	1,233	0	0	467
Units Demanded	372	444	568	473
Ending Inventory	1,061	617	49	43
Maximum Production	483	444	568	473
Minimum Inventory	37.20	30.10	49.00	43.30
Average Inventory	631	839	333	46
Unit Production Cost	$47.86	$55.98	$48.55	$46.09
Unit Carrying Cost				
Quartly Production Cost	$59,011	$0	$0	$21,538
Quartly Carrying Cost	$0	$0	$0	$0
			Total Cost	$80,549

- *When I removed the Production Capacity and the carrying cost and to be honest, I really didn't know how that was going to change the model. So, when I saw that it lowered the total cost, I didn't really understand why but as I was thinking about it, I would say it could be because of the Carrying Cost because isn't that like the cost of holding inventory over time? As well as removing the Production Capacity I think would remove some fixed cost (?) however it would bring some risk like shortages etc.*