Module 5: Inventory Management with Initial Inventory

Module Lecture

One Order/Production Opportunity

Module Four presented how the manufacturer can decide how many units of a seasonal product to produce for the upcoming season. However, it was assumed that there was no initial inventory. Here, that assumption is relaxed and the following example shows what happens.

Example

The initial inventory is 1,000 units, and the manufacturer is trying to decide whether to produce 2,000 additional units or zero additional units for the upcoming season.

The demand from the distribution center to the manufacturer could be any of the following with the given probabilities:

Demand from distribution center	Probability
1,000	0.25
2,000	0.35
3,000	0.15
4,000	0.25

The following information is also given:

- Fixed cost of production = $10,000
- Variable cost of production = $50 per unit
- Selling price = $150 per unit
- Salvage value of unsold products = $25 per unit

If the manufacturer is considering production quantities of 2,000 additional units or zero additional units, which of these two options should the manufacturer choose?

If 2,000 additional units are produced, regardless of the demand from the distribution center, the production cost incurred by the manufacturer will be fixed cost + variable cost = $10,000 + (2,000 * $50) = $110,000.

The revenue, however, may be different for different demands from the distribution center. For example, if the demand is 1,000 units, the manufacturer will sell 1,000 units to the distribution center, and the remaining 2,000 units will be salvaged. Revenue = (1,000 * $125) + (2,000 * $25) = $175,000. The profit will be Revenue - Cost = $175,000 - $110,000 = $65,000.

If the demand is 2,000 units, the manufacturer will sell 2,000 units to the distribution center, and the remaining 1,000 units will be salvaged. Revenue = (2,000 * $125) + (1,000 * $25) = $275,000. The profit will be Revenue - Cost = $275,000 - $110,000 = $165,000.

If the demand is 3,000 units or 4,000 units, the manufacturer will sell all of the 3,000 units on hand. Revenue = 3,000 * $125 = $375,000. The profit will be Revenue - Cost = $375,000 - $110,000 = $265,000.

Demand	Probability	Revenue	Profit
1,000	0.25	$175,000	$65,000
2,000	0.35	$275,000	$165,000
3,000	0.15	$375,000	$265,000
4,000	0.25	$375,000	$265,000

The expected profit of the manufacturer is the *sum-product* of the profits and the respective probabilities. In other words, expected profit if the manufacturer produces 2,000 additional units = (0.25 * $65,000) + (0.35 * $165,000) + (0.15 * $265,000) + (0.25 * $265,000) = $180,000.

If zero additional units are produced, regardless of the demand from the distribution center, the production cost incurred by the manufacturer will be $0.

In this case, the revenue too will be the same for different demands from the distribution center. For example, if the demand is 1,000 units or 2,000 units or 3,000 units or 4,000 units, the manufacturer will sell all of the 1,000 units on hand. Revenue = 1,000 * $125 = $125,000. The profit will be Revenue - Cost = $125,000 - $0 = $125,000.

Demand	Probability	Revenue	Profit
1,000	0.25	$125,000	$125,000
2,000	0.35	$125,000	$125,000
3,000	0.15	$125,000	$125,000
4,000	0.25	$125,000	$125,000

The expected profit of the manufacturer is the *sum-product* of the profits and the respective probabilities. In other words, expected profit for the production quantity of zero additional units = (0.25 * $125,000) + (0.35 * $125,000) + (0.15 * $125,000) + (0.25 * $125,000) = $125,000.

Since the expected profit is higher for production quantity of 2,000 additional units, the manufacturer should be recommended to produce 2,000 additional units for the season.