

BAR-ILAN UNIVERSITY

TOPICS IN SUPPLY CHAIN MANAGEMENT

SESSION 3

OPTIMAL PRODUCT AVAILABILITY: **APPLICATIONS**

Problem 1:

Green Thumb, a manufacturer of lawn care equipment, has introduced a new product. The anticipated demand is normally distributed with a mean $\mu = 2000$ and a standard deviation of $\sigma = 500$. Each unit costs \$100 to manufacture and the introductory price is to be \$250 to achieve this level of sales. Any unsold units at the end of the season are unlikely to be valuable and will be disposed of in a fire sale of \$80 each. It costs \$10 to hold a unit in inventory for the entire season.

1. How many units should Green Thumb manufacture for sale?
2. What is the expected profit from this policy?
3. On average, how many customers does Green Thumb expect to turn away because of stocking out?

Problem 2:

The manager at Goodstone Tires, a distributor of tires in Illinois, uses a continuous review policy to manage their inventory. The manager currently order 4 000 tires when the inventory drops to 3 000 units. Weekly demand for tires is normally distributed with a mean $\mu = 750$ and a standard deviation $\sigma = 200$. The replenishment lead time for tires is two weeks. Each tire costs Goodstone \$100 and the company sells each tire for \$200. Goodstone incurs a holding cost of 20%.

1. How much safety inventory does Goodstone currently carry?
2. At what cost of understocking is the manager's current policy justified?
3. How much safety inventory should Goodstone carry if the cost of understocking is \$100 per tire in lost current and future margin?

Problem 3:

AnyLogo supplies firms with apparel containing their logo to be used for promotional purposes. Currently, AnyLogo has four major customers: IBM, AT&T, HP and Cisco. During the holiday season, the logos are adorned with a Christmas motif. Demand from each firm for apparel with the Christmas motif is normally distributed as shown below.

	IBM	AT&T	HP	CISCO
Mean	7 000	7 000	4 000	3 000
Standard deviation	2 500	2 000	1 000	1 000

AnyLogo currently produces all the apparel including the logo embroidery in Sri Lanka in advance of the holiday season. Each unit costs \$10 and is sold by AnyLogo for \$30. Any leftover inventory at the end of the holiday season is essentially worthless and is donated by AnyLogo to charity. Holding the apparel in inventory adds another \$2 to the cost per unit donated to inventory. However, the donation allows AnyLogo to recover \$3 per unit in tax savings.

1. What production quantities do you recommend for AnyLogo?
2. What is the expected profit from this policy?
3. On average, how much does AnyLogo expect to donate to charity each year?

The manager at AnyLogo is considering the purchase of high-speed embroidery machines that will allow them to embroider on demand. In this case, the apparel will be made in Sri Lanka without any logo; the logo embroidery is postponed and will be done in the United States on demand. This will raise the cost per unit to \$13. However, AnyLogo will not have any holiday or company-specific apparel to be disposed of at the end of the season. The apparel without logos can be sold \$15 a unit to retailers. The cost of holding inventory and shipping adds \$2 to the cost of any apparel left over after the holiday season.

4. Do you recommend that the manager at AnyLogo implement postponement? What will the impact of postponement be on profits and inventories?

Problem 4:

Before the spring, the company Cycle produces a single model of bicycle at a unit cost of 50 \$. Cycle sells each unit to Summertime at a wholesale price of 200 \$. Summertime resells each unit to final demand at 400 \$. At this price, the final demand of Summertime is supposed to be normal with a mean of 3 000 units and a standard deviation of 750 units. At the end of the summer, the salvage value of unsold units of Summertime is 60 \$. The transportation and inventory holding costs for each unit is 20 \$.

1. Determine the optimal service rate, the optimal order, the optimal expected overstocking and understocking at Summertime, as well as the optimal profit of the two companies.
2. Determine the optimal service rate, the optimal order, the optimal expected overstocking and understocking at Summertime, as well as the optimal profit of the centralized supply chain.
3. Given that the salvage value of unsold units of Bicycle is also 60 \$, suggest a buy-back contract that maximizes the profits of Bicycle and Summertime for a wholesale price of 200 \$.
4. Suggest a revenue sharing contract that maximizes the profits of Bicycle and Summertime. What do you conclude?