

Chapter 17

THE MANAGEMENT OF ACCOUNTS RECEIVABLE AND INVENTORIES

ANSWERS TO QUESTIONS:

1. The marginal returns associated with a more liberal extension of credit to the firm's customers are the increased sales and gross profits. The marginal costs are the additional costs of the funds which must be invested in the higher level of receivables, additional costs of any discounts offered to customers, additional costs of checking the new credit accounts and collecting the higher level of receivables, and increased bad-debt expenses.
2. The major credit policy variables that the firm can use to control its level of receivables are:
 - a. *credit standards* --the criteria used by the firm in screening the credit worthiness of credit applicants.
 - b. *credit terms* --length of the credit period, the cash discount (if any) given for prompt payment, and any special terms such as seasonal datings.
 - c. *collection effort* --methods used by the firm in attempting to collect payments for past-due customer accounts.
3.
 - a. *average collection period* --the average number of days between when a credit sale is made and when the payment is received from the customer.
 - b. *bad-debt loss ratio* --the proportion (or percentage) of total receivables volume that is never collected by a company.
 - c. *aging of accounts* --analysis of a company's receivables by classifying the accounts into different categories based on the number of days past-due.
4. Two reasons for offering seasonal datings to customers are
 - a. to enable retailers, who might be unable to finance an inventory buildup in advance of a peak selling period, to be fully stocked with the firm's product(s) when the peak selling period begins.
 - b. to reduce the firm's inventory storage costs--these costs are transferred to the retailer by shipping the product(s) prior to the peak inventory build-up and selling period.
5.
 - a. The marginal costs are the increased costs (i.e., required return) on the higher level of receivables investment and the increased bad-debt expenses. The marginal benefits are the increased profits on the additional sales.
 - b. The marginal costs are the increased cash discount costs. The marginal benefits are the returns that can be earned on the funds freed up from the reduction in receivables.

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- c. The marginal costs are the increased costs (i.e., required return) on the higher level of receivables investment and the increased bad-debt expenses. The marginal benefits are the increased profits on the additional sales and the decrease in the firm's inventory storage costs.
- d. The marginal costs are the additional collection expenditures. The marginal benefits are the returns that can be earned on the funds freed up from the reduction in receivables and the reduction in bad-debt expenses.
6. The three steps in evaluating individual credit applicants are
- gathering relevant information on the credit applicant
 - analyzing the information obtained on the applicant
 - deciding whether to extend credit to the applicant and, if so, the amount of credit offered.
7. The primary sources of information about the creditworthiness of the applicant are
- financial statements supplied by the credit applicant
 - credit reporting organizations such as Dun & Bradstreet
 - the firm's bank
 - prior experience with the customer.
8. The "five Cs of credit" are:
- character* --the willingness on the part of the applicant to meet credit obligations
 - capacity* --the ability (i.e., liquidity and cash generation) of the applicant to meet financial obligations
 - capital* --financial strength (i.e., net worth) of the applicant
 - collateral* --assets that the applicant may pledge as security for the credit extended
 - conditions* --general economic climate and how it may affect the ability of the applicant to repay credit extended.
9. The required rate of return enters the analysis whenever a change in credit or collection policies increases or decreases the firm's investment in receivables. An increase in receivables investment generates higher costs in the form of required returns on the additional receivables investment. A decrease in receivables investment generates lower costs (i.e., benefits) in the form of returns that can be earned (elsewhere in the firm) on the funds freed up by the reduction in receivables investment. The required rate of return is an opportunity cost in that it represents the rate of return that can be earned on funds in their most profitable alternative use within the firm.
10. The firm could attempt to reduce its average collection period by instituting more stringent credit standards to reduce the number of slow-paying accounts. Alternatively, the firm could institute a cash discount to encourage customers to pay their accounts early in the credit period. Also, the firm could reduce the credit period to something less than 30 days. Finally, the firm could increase its collection effort and expenditures.
11. The objective of the firm's credit and collection policies is to maximize profits and not necessarily to minimize bad-debt losses. An optimal (i.e., profit maximizing) policy normally will require the firm to incur a certain amount of bad-debt expenses. Minimizing bad-debt losses may result in lost sales and profits.

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12. a. If the firm experiences a shortage of working capital, then it would need to reduce its investment in receivables and it probably would want to consider instituting more stringent credit standards, reducing the credit period, offering a cash discount for early payment, and/or increasing collection effort.
- b. If the firm is operating at full production capacity, then it would need to take into account any additional costs (such as costly overtime rates and/or costs of new facilities) in decisions to relax its credit standards and/or offer more liberal credit terms.
- c. If the firm's profit margin increases, then it would want to consider relaxing its credit standards and/or offering more liberal credit terms since any additional sales would generate higher additional profits.
- d. If interest rates increase, then the firm would probably want to increase the required rate of return on receivables investment to reflect the higher cost of funds and consider reducing its investment in receivables by any of the methods described in Part a., above.
13. a. Holding large raw materials inventories allows the firm to take advantage of quantity discounts offered by suppliers and avoid costly production delays caused by shortages.
- b. Holding large work-in-process inventories gives each operation in the production cycle a certain degree of independence and thus permits efficient scheduling of the various operations and helps minimize costly delays and idle time.
- c. Holding large finished goods inventories minimizes lost sales and shipment delays due to stockouts and allows the firm to keep unit production costs low by manufacturing items in large production runs.
14. Carrying costs are all the costs of holding items in inventory for a given period of time. They include storage and handling, obsolescence and deterioration, insurance, taxes, and the cost of funds invested in inventories.
15. Ordering costs for items purchased from external sources include the costs of preparing the purchase requisition, expediting the order, receiving and inspecting the shipment, and handling payment. Ordering costs for items manufactured internally within the firm consist primarily of the costs incurred in getting the plant and equipment ready for a production run of the item (i.e., production set-up costs).
16. a. The costs associated with a stockout in raw materials inventory include the costs incurred in placing special orders and expediting incoming orders and the cost of any resulting production delays.
- b. The costs associated with a stockout in work-in-process inventory include costs to reschedule and speed production within the plant and the costs of lost production if work stoppages occur.
- c. The costs associated with a stockout in finished goods inventory include the immediate loss of profits if customers purchase the product from another firm and also the potential long-term losses if customers switch their future orders to other firms.
17. The ABC inventory classification method consists of dividing inventory items into three groups—those with a relatively large dollar value but a small percentage of the total items, those with a small dollar value but a large percentage of the total items, and those items in

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between. The ABC method provides management with information which can be used to determine how closely different inventory items should be controlled. For example, management may choose to use a detailed model involving EOQ calculations for group A items, whereas its policy for group C items may consist of little more than simply keeping an ample supply on hand.

18. Assumptions underlying the basic EOQ model:
- a. Annual demand is known with certainty and is stationary or uniform throughout the year
 - b. Orders to replenish inventory are filled instantaneously (i.e., zero lead time)
 - c. The cost of placing and receiving an order is the same for each order, being independent of the number of units ordered
 - d. The annual inventory carrying cost of one unit is constant regardless of the inventory level
 - e. Total annual inventory costs are the sum of ordering and carrying costs and the objective is to find the order quantity that minimizes total annual inventory costs.
19. a. Constant (non-zero) replenishment lead time known with certainty – under this condition, the optimal order quantity is not affected. The only change is that orders should be placed “n” days prior to the time when the items will be needed, where “n” is the replenishment lead time.
- b. Demand and replenishment lead time are subject to uncertainty – under this condition, a safety stock is added to the inventory that is maintained to meet “expected” demand during the “normal” lead time required to procure additional stocks of the item.
20. The required rate of return affects inventory carrying costs since an increase (decrease) in the required rate of return increases (decreases) inventory carrying costs per unit. An increase (decrease) in inventory carrying costs decreases (increases) the optimal inventory level and investment since an inverse relationship exists between the optimal order quantity and inventory carrying costs per unit.
21. Just-in-time inventory models are based on the concept that required inventory items are supplied as needed by production. Successful implementation of just-in-time models can reduce inventory investment.
22. a. A *stockout* is the chance of not having inventory on hand when it is needed.
- b. A *deterministic inventory control model* assumes that demand and lead times are known with certainty.
 - c. A *probabilistic inventory control model* assumes that demand, lead time, or both are random variables with known probability distributions.
 - d. *Safety stock* is additional inventory that is carried to meet unexpectedly high demand during the lead time, unanticipated delays in the lead time, or both.
 - e. *Lead time* is the time between when an order is placed and when it is delivered to inventory.

SOLUTIONS TO PROBLEMS:

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1. a. Average daily credit sales = $\frac{\text{Annual sales}}{365} = \frac{\$18,000,000}{365}$

= **\$49,315**

b. Average collection period = $\frac{\text{Accounts receivable balance}}{\text{Average daily credit sales}}$

= $\frac{\$1,900,000}{\$49,315} = \mathbf{38.5 \text{ days}}$

c. Average investment in receivables = Average receivables balance
= **\$1,900,000**

2. a. Average collection period = 30 + 15 = 45 days.

Average daily sales = $\frac{\text{Annual sales}}{365} = \frac{\$20,000,000}{365} = \mathbf{\$54,794.52}$

Investment in receivables = Average daily sales x average collection period
= \$54,794.52 x 45
= **\$2,465,753**

b. Investment in receivables = $\frac{\$18,000,000}{365} \times (30 + 25)$
= **\$2,712,329**

3. (A) Additional sales \$100,000

Marginal profitability of additional sales

= Profit contribution ratio x Additional sales

= .25 x \$100,000 = \$25,000

(B) Additional investment in receivables

= Additional average daily sales x Average collection period

= Additional annual sales/365 x Average collection period

= \$100,000/365 x 90 = \$24,658

Cost of the additional investment in receivables

= Additional investment in receivables x Required pre-tax rate of return

= \$24,658 x 0.20 = \$4,932

(C) Additional bad-debt loss

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$$\begin{aligned} &= \text{Bad debt loss ratio} \times \text{Additional sales} \\ &= 0.13 \times \$100,000 = \$13,000 \end{aligned}$$

(D) Additional investment in inventory \$40,000

$$\begin{aligned} &\text{Cost of additional investment in inventory} \\ &= \text{Additional investment in inventory} \times \text{Required pretax rate of return} \\ &= \$40,000 \times 0.20 = \$8,000 \end{aligned}$$

(E) Net change in pre-tax profits

$$\begin{aligned} &= \text{Marginal returns} - \text{Marginal costs} \\ &= (A) - ((B) + (C) + (D)) \\ &= \$25,000 - (\$4,932 + \$13,000 + 8,000) = \mathbf{\$- 932} \end{aligned}$$

4. (A) Additional sales \$300,000

$$\begin{aligned} &\text{Marginal profitability of additional sales} \\ &= \text{Profit contribution ratio} \times \text{Additional sales} \\ &= (1 - 0.80) \times \$300,000 = \$60,000 \end{aligned}$$

(B) Additional investment in receivables

$$\begin{aligned} &= \text{Additional average daily sales} \times \text{Average collection period} \\ &= \text{Additional annual sales}/365 \times \text{Average collection period} \\ &= \$300,000/365 \times 60 = \$49,315 \end{aligned}$$

$$\begin{aligned} &\text{Cost of the additional investment in receivables} \\ &= \text{Additional investment in receivables} \times \text{Required pre-tax rate of return} \\ &= \$49,315 \times 0.25 = \$12,329 \end{aligned}$$

(C) Additional bad-debt loss ratio

$$\begin{aligned} &= \text{Bad debt loss ratio} \times \text{Additional sales} \\ &= .07 \times \$300,000 = \$21,000 \end{aligned}$$

(D) Additional investment in inventory \$120,000

$$\begin{aligned} &\text{Cost of additional investment in inventory} \\ &= \text{Additional investment in inventory} \times \text{Required pretax rate of return} \\ &= \$120,000 \times 0.25 = \$30,000 \end{aligned}$$

(E) Net change in pre-tax profits

$$\begin{aligned} &= \text{Marginal returns} - \text{Marginal costs} \\ &= (A) - ((B) + (C) + (D)) \\ &= \$60,000 - (\$12,329 + \$21,000 + \$30,000) = \mathbf{\$- 3,329} \end{aligned}$$

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5. a. Reduction in A/R = Old average A/R balance – New average A/R balance
= (Annual sales/365) x Old average collection period – (Annual sales/365)
x New average collection period

$$= \frac{\$6,000,000}{365} \times 150 - \frac{\$6,000,000}{365} \times 108$$

$$= \$2,465,753 - \$1,775,342 = \mathbf{\$690,411}$$

b. Net change in pre-tax profits
= Earnings on released funds – Cost of cash discounts
= Reduction in A/R x Required rate of return – Annual sales
x Percent taking discount x Percent cash discount
= (\$690,411 x .15) - (\$6,000,000 x .30 x .04)
= \$103,562 - \$72,000 = **\$31,562**

6. a. (A) Decrease in average receivables balance
= Present average balance – New average balance
= Annual sales/365 x Present average collection period
– Annual sales/365 x New average collection period
= 3,500,000/365 x 43 – 3,500,000/365 x 28 = \$143,836
Earnings on the funds released by the decrease in receivables
= \$143,836 x .14 = \$20,137

b. (B) Cost of additional cash discounts
= New cash discounts – Present cash discounts
= Annual sales x percent taking new discount x New percent discount
– Annual sales x percent taking present discount x Present
percent discount
= \$3,500,000 x .70 x .02 – \$3,500,000 x .50 x .01 = \$31,500

c. (C) Net change in pre-tax profits
= Marginal returns - Marginal costs
= (A) - (B) = \$20,137 - \$31,500 = - **\$11,363**

7. (A) Additional sales \$1,200,000

Marginal profitability of additional sales
= Additional sales x Profit contribution ratio
= \$1,200,000 x (1 - 0.70) = \$360,000

(B) Additional investment in receivables
= (Additional annual sales/365) x Average collection period
= (\$1,200,000/365) x 90 = \$295,890

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$$\begin{aligned} &\text{Cost of additional investment in receivables} \\ &= \text{Additional investment in receivables} \times \text{Required rate of return} \\ &= \$295,890 \times 0.20 = \$59,178 \end{aligned}$$

$$\begin{aligned} \text{(C) Additional bad-debt loss} \\ &= \text{Additional sales} \times \text{Bad-debt loss ratio} \\ &= \$1,200,000 \times 0.06 = \$72,000 \end{aligned}$$

$$\begin{aligned} \text{(D) Additional cash discounts} \\ &= \text{Additional sales} \times \text{Percent taking discount} \times \text{Cash discount percent} \\ &= \$1,200,000 \times 0.20 \times 0.02 = \$4,800 \end{aligned}$$

$$\text{(E) Additional investment in inventory} \quad \$350,000$$

$$\begin{aligned} &\text{Cost of additional investment in inventory} \\ &= \text{Additional investment in inventory} \times \text{Required pretax rate of return} \\ &= \$350,000 \times 0.20 = \$70,000 \end{aligned}$$

$$\begin{aligned} \text{(F) Net change in pre-tax profits} \\ &= \text{Marginal returns} - \text{Marginal costs} \\ &= \text{(A)} - (\text{(B)} + \text{(C)} + \text{(D)} + \text{(E)}) \\ &= \$360,000 - (\$59,178 + \$72,000 + \$4,800 + \$70,000) = \mathbf{\$154,022} \end{aligned}$$

$$\begin{aligned} 8. \quad \text{(A) Decrease in annual sales} \\ &= \text{Present annual sales} \times \text{Percent reduction} \\ &= \$6,500,000 \times 0.20 = \$1,300,000 \end{aligned}$$

$$\begin{aligned} &\text{Decrease in profit contribution} \\ &= \text{Decrease in sales} \times \text{Profit contribution ratio} \\ &= \$1,300,000 \times (1 - .75) = \$325,000 \end{aligned}$$

$$\begin{aligned} \text{(B) Decrease in average receivables balance} \\ &= \text{Present average balance} - \text{New average balance} \\ &= \text{Present annual sales}/365 \times \text{Present average collection period} \\ &\quad - \text{New annual sales}/365 \times \text{New average collection period} \\ &= \$6,500,000/365 \times 110 - (\$6,500,000 \times .80)/365 \times 75 = \$890,411 \end{aligned}$$

$$\begin{aligned} &\text{Earnings on the funds released by the decrease in receivables} \\ &= \text{Decrease in receivables} \times \text{Required pre-tax rate of return} \\ &= \$890,411 \times .15 = \$133,562 \end{aligned}$$

$$\begin{aligned} \text{(C) Decrease in bad-debt loss} \\ &= \text{Present bad-debt loss} - \text{New bad-debt loss} \\ &= \text{Present bad-debt loss ratio} \times \text{Present annual sales} \\ &\quad - \text{New bad-debt loss ratio} \times \text{New annual sales} \end{aligned}$$

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$$= .08 \times \$6,500,000 - .04 \times (\$6,500,000 \times .80) = \$312,000$$

(D) Decrease in inventories \$250,000

Earnings on the funds released by the decrease in inventories
 = Decrease in inventories x required pre-tax rate of return
 = \$250,000 x 0.15 = \$37,500

(E) Net change in pre-tax profits
 = Marginal returns - Marginal costs
 = ((B) + (C) + (D)) - (A)
 = \$133,562 + \$312,000 + \$37,500 - \$325,000 = **+\$158,062**

9. Days Past-Due	Accounts Receivable	Percent
Current	\$6,463	56.6%
1 - 30	1,398	12.2
31 - 60	931	8.2
61 - 90	1,248	10.9
Over 90	<u>1,377</u>	<u>12.1</u>
	\$11,417	100.0%

10. (A) Additional collection expenditures = \$20,000

(B) Decrease in average receivables balance
 = Present average balance - New average balance
 = Annual sales/365 x Present average collection period
 - Annual sales/365 x New average collection period
 = \$5,000,000/365 x 50 - \$5,000,000/365 x 45 = \$68,493

Earnings on the funds released by the decrease in receivables investment
 = Decrease in receivables investments x Required rate of return
 = \$68,493 x .18 = \$12,329

(C) Decrease in bad-debt loss
 = Present bad-debt loss - New bad-debt loss
 = (Present bad-debt loss ratio - New bad-debt loss ratio) x Annual sales
 = (.04 - .035) x \$5,000,000 = \$25,000

(D) Net change in pre-tax profits
 = Marginal returns - Marginal costs
 = ((B) + (C)) - (A)
 = (\$12,329 + \$25,000) - \$20,000 = **+\$17,329**

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11. Reduction in receivables balance:
= $(\$120,000,000/365)(65 - 40) = \$8,219,178$
- Return on reduction in receivables balance:
= $0.20(\$8,219,178) =$ **\$1,643,836**
- Cost of discount:
= $0.01(\$120,000,000)(.4) =$ **-\$480,000**
- Net gain from offering discount = **\$1,163,836**
-
12. Current receivables investment:
= $(\$50,000,000/365) \times 25 =$ **\$3,424,658**
- New receivables investment:
= $(\$65,000,000/365) \times 30 =$ **5,342,466**
- Additional receivables investment: **\$1,917,808**
- Cost of additional receivables investment:
= $\$1,917,808 \times 0.2 =$ **\$383,562**
- Cost of additional inventory investment
= $\$3,000,000 \times 0.2 =$ **\$600,000**
- Change in bad debt losses:
= $.03(\$65,000,000) - .02(\$50,000,000) =$ **\$950,000**
- Cost of cash discount:
= $.02(.2)(\$65,000,000) =$ **\$260,000**
- Profit on additional sales:
= $.2(\$15,000,000) =$ **\$3,000,000**
- Net benefit:
= $\$3,000,000 - \$260,000 - \$950,000 - \$383,562$
- $\$600,000 =$ **\$806,438**
-
13. a. i. If Websters can return to profitability in 20X4, it could become a good customer for Allied.
ii. The company normally takes cash discounts when offered.
- b. i. Company averages 30 days overdue on its payments to two suppliers.
ii. Financial ratios (measures of liquidity, profitability, and leverage) have been deteriorating over the last three years and currently are significantly worse than

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industry averages:

<u>Ratio</u>	<u>Industry Average</u>	<u>20X1</u>	<u>20X2</u>	<u>20X3</u>
C/A÷C/L	2.82	1.55	1.60	1.41
NIAT÷Sales	1.89%	3.22%	1.71%	-6.47%
NIAT÷N/W	5.65%	15.88%	9.20%	-50.57%
T/L÷N/W	1.48	2.32	2.63	4.06

- c. i. Forecasted balance sheet, income statement, and cash budget for the forthcoming year (20X4).
 ii. Additional information about the status of its payments to other suppliers.
 iii. Reasons why sales decreased in 20X3, compared to 20X2.

14. Reduction in profit contribution = \$1 million sales reduction x 0.3
 = \$300,000
- Reduction in accounts receivable = [(\$10 million/365) x 72]
 – [(\$9 million/365) x 45]
 = \$863,014
- Earnings on released funds = \$863,014 x .25
 (due to A/R reduction) = \$215,754
- Earnings on released funds = \$200,000 x 0.25
 (due to inventory reduction) = \$50,000
- Decrease in bad-debt losses = \$10 million x .05 - \$9 million x .03
 = \$230,000
- Net change in pretax profits = \$215,754 + \$50,000 + \$230,000
 – \$300,000
 = **\$195,754**
15. (A) Decrease in annual sales = Present annual sales x Percent reduction
 = \$43,800,000 x 0.10 = \$4,380,000
 Decrease in profit contribution = Decrease in sales x Profit contribution ratio
 = \$4,380,000 x (1 - 0.70) = \$1,314,000
- (B) Decrease in average receivables balance
 = Present average balance – New average balance
 = (\$43,800,000/365) x 68
 – [(\$43,800,000 x .90)/365] x 40
 = \$3,840,000
 Earnings on funds released = Decrease in receivables x Required pretax
 rate of return
 = \$3,840,000 x 0.18 = \$691,200

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(C) Decrease in bad-debt loss = Present bad-debt loss - New bad-debt loss
 = $\$43,800,000 \times 0.035 - \$43,800,000 \times 0.90 \times .025 = \$547,500$

(D) Earnings on fund released from inventories
 = Decrease in inventories x Required pretax rate of return
 = $\$1,000,000 \times 0.18 = \$180,000$

(E) **Net Change in Pretax Profits** = Marginal returns – Marginal costs
 = (B) + (C) + (D) - (A)
 = $\$691,200 + \$547,500 + \$180,000 - \$1,314,000$
 = **\\$104,700**

16. a. $S = \$20$; $D = 1,920,000$ units; $C = .15 \times 800 \div 10,000$
 = $\$0.0120/\text{unit}$

$$Q^* = [(2SD)/C]^{0.5} = [(2 \times \$20 \times 1,920,000)/\$0.0120]^{0.5} = [6,400,000,000]^{0.5}$$

= 80,000 units

Alternative solution:

$S = \$20$; $D = 1,920,000 \div 10,000 = 192$ lots

$C = 0.15 \times 800 = \$120/\text{lot}$

$$Q^* = [(2 \times 20 \times 192)/120]^{0.5} = [64]^{0.5} = 8 \text{ lots}$$

(or $8 \times 10,000 = 80,000$ units)

b. $TC = (D \times S)/Q^* + (Q^* + C)/2 = (1,920,000 \times \$20)/80,000 + (80,000 \times \$0.0120)/2$
 = $\$480 + \$480 = \mathbf{\$960}$

c. $T^* = (365 \times Q^*)/D = (365 \times 80,000)/1,920,000 = \mathbf{15.2 \text{ days}}$
 (Orders should be placed about every 15 days)

17. a. $S = \$41.25$; $D = 110,000$ reams; $C = 0.15 \times \$2.00 = \$0.30/\text{ream}$
 $Q^* = [(2SD)/C]^{0.5} = [(2 \times \$41.25 \times 110,000)/\$0.30]^{0.5} = [30,250,000]^{0.5}$
 = **5500 reams**

b. $TC = (D \times S)/Q^* + (Q^* \times C)/2 = (110,000 \times \$41.25)/5500 + (5500 \times \$0.30)/2$
 = $\$825 + \825
 = **\\$1,650**

c. $T^* = (365 \times Q^*)/D = (365 \times 5500)/110,000 = \mathbf{18.25 \text{ days}}$
 (Orders should be placed every 18.25 days)

d.

Order Quantity	Ordering Costs	Carrying Costs	Total Inventory Costs
$\frac{D}{Q}$	$110,000 \times \$41.25/Q$	$Q \times \$0.30/2$	Ordering Costs + Carrying Costs
2,000	\$2268.75	\$300.00	\$2568.75
4,000	1134.38	600.00	1734.38

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5,000	907.50	750.00	1657.50
5,500	825.00	825.00	1650.00
6,000	756.25	900.00	1656.25
7,000	648.21	1050.00	1698.21
9,000	504.17	1350.00	1854.17

The economic order quantity (Q^*) as shown in the table is 5500—the same value as obtained algebraically in part (a).

18. a. Financial management text Managerial economics text
- | | |
|---------------------------------------------------|---------------------------------------------------|
| $S = \$2,500$ | $S = \$2,000$ |
| $D = 50,000$ | $D = 22,500$ |
| $C = \$0.80$ | $C = \$0.80$ |
| $Q^* = [(2SD)/C]^{0.5}$ | $Q^* = [(2SD)/C]^{0.5}$ |
| $= [(2 \times 2,500 \times 50,000)/\$0.80]^{0.5}$ | $= [(2 \times 2,000 \times 22,500)/\$0.80]^{0.5}$ |
| $= 17,678$ | $= 10,607$ |
- b. $TC = (D/Q \times S) + (Q/2 \times C)$ $TC = (D/Q \times S) + (Q/2 \times C)$
- | | |
|-----------------------------------------------------------------|--------------------------------------------------------------------|
| $= [(50,000/17,678) \times 2,500] + [(17,678/2) \times \$0.80]$ | $= (22,500/10,607) \times 2,000 +$
$(\$10,607/2) \times \0.80 |
| $= \$7,071 + \$7,071$ | |
| $= \\$14,142$ | $= \\$4,242 + \\$4,243 = \\$8485$ |
- c. $T^* = (365 \times Q^*)/D$ $T^* = (365 \times Q^*)/D$
- | | |
|--------------------------------|--------------------------------|
| $= (365 \times 17,678)/50,000$ | $= (365 \times 10,607)/22,500$ |
| $= 129$ days | $= 172$ days |

19. a. $Q^* = 20,000$
 $D = 120,000$
 $T^* = (365 \times Q^*)/D$
 $= (365 \times 20,000)/120,000 = \mathbf{60.8 \text{ days}}$
- b. Average inventory $= Q^*/2 = 20,000/2 = \mathbf{10,000 \text{ units}}$
Annual carrying costs $= Q^*/2 \times C$
 $= 20,000/2 \times (\$10 \times 0.20)$
 $= \$20,000$
- c. $Q_r = n \times (D/365) = 18 \times (120,000/365) = \mathbf{5,918 \text{ units}}$

20. a. $D = 250,000$; $S = \$98$; $C = 0.16 \times \$3.0625 = \0.49
 $Q^* = [(2SD)/C]^{0.5} = [(2 \times \$98 \times 250,000)/\$0.49]^{0.5} = \mathbf{10,000 \text{ bushels}}$

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b. $TC = (D \times S)/Q^* + (Q^* \times C)/2 = (250,000 \times \$98)/10,000 + (10,000 \times \$0.49)/2$
= \$4,900

c. $T^* = (365 \times Q^*)/D = (365 \times 10,000)/250,000 = 14.6$ **days**

21. a. $Q^* = 30,000$; $D = 150,000$; $C = \$0.15 \times \$2 = \$0.30$; $n = 20$
 $T^* = (365 \times Q^*)/D = (365 \times 30,000)/150,000 = 73$ **days**

b. Average inventory = $Q^*/2 = 30,000/2 = 15,000$ **copies**
Average carrying costs = $(Q^* \times C)/2 = (30,000 \times \$0.30)/2 = 4,500$ **\$**

c. $Q_r = (n \times D)/365 = (20 \times 150,000)/365 = 8,219$ **copies**

d. Safety stock = $(60 \times D)/365 = (60 \times 150,000)/365 = 24,658$ **copies**

e. Average inventory = $(Q^*/2) + \text{Safety stock} = (30,000/2) + 24,658$
= 39,658 copies

Annual carrying costs = $[(Q^*/2) + \text{Safety stock}] \times C = [(30,000/2) + 24,658] \times \0.30
= \$11,897

f. $Q_r = (n \times D)/365 + \text{Safety stock} = [(20 \times 150,000)/365] + 24,658 = 32,877$ **copies**

22. No recommended solution.

23. No recommended solution.