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# 19

## Accounts Receivable and Inventory

*“Everybody likes a kidder, but nobody lends him money.”*

*—Arthur Miller*

### Accounts Receivable and Inventory: Necessary Evils?

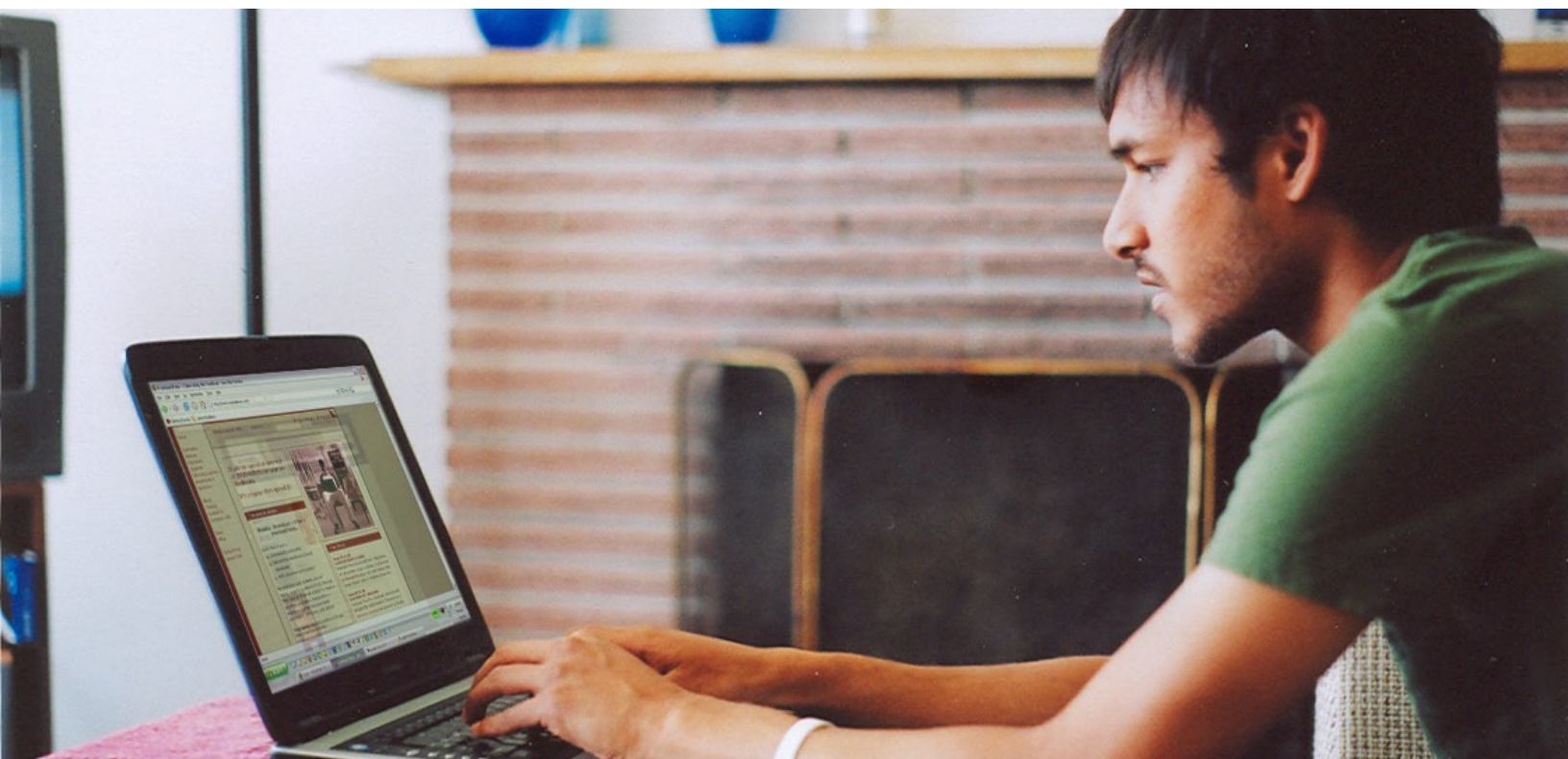
Have you ever driven by one of those large motor home dealerships? Some have hundreds of vehicles that sell from \$250,000 to \$2,000,000 sitting on the lot. Put yourself in the dealer’s shoes. Wouldn’t it be nice if customers came to your dealerships, sat down across from your desk, and looked at pictures of expensive motor homes? They could pick out the picture of the motor home they liked, put down a large deposit, sign the sales papers, and then wait patiently for months until that motor home was delivered by the manufacturer to your lot, where customers would pick it up.

The real world isn’t like that, of course. Customers want to see, touch, and test drive lots of different motor homes before committing to a large purchase such as this. If you are going to be in the motor home business, you’re going to have to maintain a large amount of expensive inventory.

Wouldn’t it also be nice if every one of those customers came with cash to cover the full cost of these expensive motor homes? Your life as the dealer would be much easier if every potential customer had all the cash needed to purchase your product. This isn’t the real world either. Buying on credit is the norm for certain kinds of products. Extending trade credit and carrying accounts receivable on your balance sheet come with the territory for many different types of businesses.

In this chapter we look at how inventory and accounts receivable are managed. For some companies a huge amount of capital is tied up in these assets. This capital needs to be invested wisely.

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## Chapter Overview

A key component of working capital policy is managing accounts receivable and inventory. In this chapter we see that accounts receivable and inventory are necessary investments that affect a firm's profitability and liquidity. Then we investigate how financial managers determine the optimal level of these current assets. Finally, we examine inventory management techniques and collection policies.

## Why Firms Accumulate Accounts Receivable and Inventory

As we saw in Chapter 4, accounts receivable represent money that customers owe to the firm because they have purchased goods or services on credit. Accounts receivable, therefore, are assets that have value.<sup>1</sup> Nonetheless, any time a firm accumulates accounts receivable, it suffers opportunity costs because it is unable to invest or otherwise use the money owed until customers pay. A firm may also incur a direct cost when it grants credit because some customers may not pay their bills at all. The ideal situation, from a firm's point of view, is to have customers pay cash at the time of the purchase.<sup>2</sup>

<sup>1</sup>In fact, firms sometimes sell their customers' "IOUs" to other businesses for cash. This process, known as *factoring* accounts receivable, is discussed later in this chapter.

<sup>2</sup>Individuals are the same way. For example, if you sell your bicycle to another student, which would you prefer—to be paid in cash at the time of sale or to let the buyer pay you a little bit each month?

## Learning Objectives

After reading this chapter, you should be able to:

1. Describe how and why firms must manage accounts receivable and inventory as investments.
2. Compute the optimal levels of accounts receivable and inventory.
3. Describe alternative inventory management approaches.
4. Explain how firms make credit decisions and create collection policies.



In the real world, of course, it's unrealistic to expect customers always to pay cash for products and services. Who would buy lumber from a firm that insisted that all its customers pay cash if other lumber companies offered credit? Like it or not, for most firms, granting credit is an essential business practice. The real question managers must answer is, how much credit should the firm grant and to whom? Offering more credit enhances sales but also increases costs. At some point the cost of granting credit outweighs the benefits. Financial managers must manage accounts receivable carefully to make sure this asset adds to, rather than subtracts from, a firm's value.

The situation with inventory is similar. Inventory is costly to accumulate and maintain, so firms generally want to hold as few products in inventory as possible. For most firms, however, operating without any inventory is impractical—can you imagine a grocery store with no food on display? Most firms that sell products accumulate some inventory. Financial managers must find the best level of inventory. They do this by weighing the risk of losing sales due to unavailable products against the cost savings produced by reducing inventory.

Accounts receivable and inventory are investments because both tie up funds and have opportunity costs, but both can add to the firm's value. Be careful not to be confused by the term *investment*. Investment usually implies something desirable—a long-term venture specifically planned and implemented for profit. Instead, accounts receivable and inventory may be viewed as necessary evils. Most firms need accounts receivable and inventory to do business, but less is generally better. Managing accounts receivable and inventory, then, ought to be done with an eye toward reducing these assets to the lowest level possible consistent with the firm's goal of maximizing value.

## How Accounts Receivable and Inventory Affect Profitability and Liquidity

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Holding different levels of accounts receivable and inventory can affect a company's profitability and liquidity. To illustrate, consider Firms A and B in Table 19-1. Firm A sells all its products for cash and keeps no inventory. Firm B gives its customers 30 days to pay and maintains a large product inventory. Assuming every other factor is equal, including the firms' capital structures, Firm A can earn more than twice the return on its stockholders' equity as Firm B simply by eliminating accounts receivable and inventory (and any associated current liabilities and long-term debt).

The comparison between Firms A and B in Table 19-1 illustrates the liquidity, profitability, and risk of each firm. Observe that although Firm A is more *profitable* than Firm B as measured by return on equity (14.3 percent versus 7.1 percent), it is much less *liquid*, as measured by the current ratio<sup>3</sup> (2.0 versus 7.0). If the managers of Firm A needed to raise more than \$100,000 cash in a hurry, they would have no recourse but to seek outside financing or sell some of their fixed assets. The managers of Firm B, however, could collect cash from customers, draw down inventory, or both.

However, Firm B's business practice of accumulating inventory adds risk to the firm if the inventory is hard to liquidate. Some inventory may not be sold, or it may be sold for a low value. Note how, when using the quick ratio<sup>4</sup> to compare firm liquidity,

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<sup>3</sup>The Current Ratio =  $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

<sup>4</sup>The Quick Ratio =  $\frac{\text{Current Assets less Inventory}}{\text{Current Liabilities}}$

**Table 19-1** Comparison of Accounts Receivable and Inventory Policies

Data as of December 31	Selected Financial Data for Firms A and B (in 000's)	
	Firm A Sells Products for Cash and Holds No Inventory	Firm B Sells Products for Credit and Accumulates Inventory
Cash	\$ 100	\$ 100
Accounts Receivable	0	200
Inventory	0	400
Fixed Assets	500	500
Total Assets	<u>\$ 600</u>	<u>\$1,200</u>
Current Liabilities	<u>\$ 50</u>	<u>\$ 100</u>
Long-Term Debt	200	400
Stockholders' Equity	350	700
Total Liabilities and Equity	<u>\$ 600</u>	<u>\$1,200</u>
Sales	\$2,433	\$2,433
Expenses	2,383	2,383
Net Income for the Year	\$ 50	\$ 50
Current Ratio	2.0	7.0
Quick Ratio	2.0	3.0
Return on Equity	14.3%	7.1%

we see that Firm A's quick ratio is the same as its current ratio (2.0), but Firm B's quick ratio is 3.0 compared with its current ratio of 7.0. When using the quick ratio, then, we see that Firm A is less liquid than Firm B (2.0 versus 3.0), but how much less depends on the liquidity of the inventory.

Most firms accumulate some accounts receivable and inventory. Because these current assets can affect the profitability and liquidity of the firm, financial managers try to find the amounts of both assets that maximize firm value. In the following section, we examine how to find the optimal level of these current assets.

## Finding Optimal Levels of Accounts Receivable and Inventory

The conclusions drawn from Table 19-1 assumed that sales for both firms were \$2,433,000. That may not be a reasonable assumption. Firm B may have greater sales than Firm A because it grants credit and has inventory immediately available for purchase. Depending on how well customers respond to Firm B's decision to grant credit and maintain inventory, the resulting increase in sales and net income might boost Firm B's return on equity beyond that of Firm A.

However, bad debts and inventory costs are likely to drive up Firm B's expenses, possibly causing its net income to fall. The net result could be a decrease in Firm B's return on equity.

Conflicting forces make it more difficult to assess the situation. For accounts receivable, the forces are sales that increase as more generous credit terms are offered, versus costs that increase with collections, bad debts, and opportunity costs from foregone investments. For inventory, the conflicting forces are sales that increase as more products are made available, versus storage costs that increase as more inventory is accumulated and opportunity costs from foregone investments.

In the following sections, we discuss how to find a balance between these conflicting forces in order to determine the optimal levels of accounts receivable and inventory.

## The Optimal Level of Accounts Receivable

To find the best level of accounts receivable, financial managers must review the firm's credit policies, any proposed changes in those policies, and the incremental cash flows of each proposed credit policy. We must then compute the net present value of each policy.

**Credit Policy** A firm's credit terms and credit standards make up the firm's credit policy. Remember, accounts receivable are created by customers taking advantage of the firm's credit terms. These terms generally offer a discount to credit customers who pay off their accounts within a short time, and they specify a maximum number of days that credit customers have to pay off the total amount of their accounts. An example of such terms is "2/10, n30." This means that credit customers will receive a 2 percent discount if they pay off their accounts within 10 days of the invoice date, and the full net amount is due within 30 days if the discount is not taken.

For example, suppose you purchase \$1,000 worth of camping supplies on credit July 1. If you pay the bill before July 11, you receive a 2 percent discount and the equipment will only cost you \$980. If you pay the bill between July 11 and July 31, you'll owe the full amount—\$1,000. The bill is past due if you don't pay it by July 31.

Some firms offer credit without a discount feature, simply giving their customers so many days to pay. An example would be "n90"—net 90, pay the invoice amount within 90 days.

Individual customers receive credit from the firm if they meet the firm's credit standards for character, payment history, and so on.<sup>5</sup> Taken together, the credit terms and credit standards constitute the firm's credit policy.

A firm that wishes to change its level of accounts receivable does so by changing its credit policy. *Relaxing* the credit policy—by adopting less stringent credit standards or extending the net due period—will tend to cause accounts receivable to increase. *Tightening* the credit policy—by adopting more stringent credit standards or shortening the net due period—will tend to cause accounts receivable to decrease. The discount percent or time period could also be changed. This may either increase or decrease accounts receivable, depending on the reaction of customers to competing influences. Table 19-2 summarizes the effects of tightening credit policy on accounts receivable.

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<sup>5</sup>We'll discuss credit standards more fully later in this chapter.

**Table 19-2** The Effects of Tightening Credit Policy

Action	Effect on Accounts Receivable
Raise standards for granting credit	Fewer credit customers Fewer people owing money to the firm at any given time Accounts receivable goes down
Shorten net due period	Accounts paid off sooner Less money owed to the firm at any given time Accounts receivable goes down
Reduce discount percent	Fewer credit customers, <i>but</i> Some customers who previously took discount now do not Net effect on accounts receivable depends on whether the number of customers lost will be more than the number of those now forgoing the discount and paying the higher net amount
Shorten discount	Same as above; some credit customers will leave, others will forgo the discount and pay the higher net amount; net effect on accounts receivable is indeterminate

**Analyzing Accounts Receivable Levels** To decide what level of accounts receivable is best for the firm, we follow this three-step process:

1. Develop *pro forma* financial statements for each credit policy under consideration.
2. Use the *pro forma* financial statements to estimate the incremental cash flows of the proposed credit policy and compare them to the current policy cash flows.
3. Use the incremental cash flows and calculate the net present value (NPV) of each policy change proposal. Select the credit policy with the highest NPV.

To demonstrate how the three-step credit policy evaluation works, let's analyze a proposed credit policy for a fictional firm, Bulldog Batteries. Assume Bulldog Batteries currently offers credit terms of 2/10, n30, and Jackie Russell, the vice president for marketing, thinks the terms should be changed to 2/10, n40. Doing so, she says, will result in a 10 percent increase in sales, but only a small increase in bad debts. Should Bulldog make the change?

After doing some research, we make the following assumptions:

- Ms. Russell is correct that sales will increase by 10 percent if the new credit policy is implemented.
- Cost of goods sold and other operating expenses on the firm's income statement, and all current accounts on the balance sheet, will vary directly with sales. Each of these accounts will increase by 10 percent with the change in credit policy.
- All of Bulldog's sales are made on credit.

#### Take Note

In real life, the firm's credit policy may be limited by marketplace constraints. A new, small firm attempting to sell to large, well-established customers may have to offer credit terms that match those of competitors in the industry.



Suppose further that Ms. Russell produced the following data on Bulldog's customers' historical payment patterns:

- 45 percent of Bulldog's customers take advantage of the discount and pay off their accounts in 10 days.
- 53 percent of Bulldog's customers forgo the discount, but pay off their accounts in 30 days.
- The remaining 2 percent of Bulldog's customers pay off their accounts in 100 days.<sup>6</sup>

Ms. Russell expects that under the new credit policy:

- 43 percent of Bulldog's customers will take advantage of the discount and pay off their accounts in 10 days. This percentage is expected to drop since a few customers who had paid during the discount period will not do so when an extra 10 days is offered in the net period.
- 53 percent of Bulldog's customers will forgo the discount and pay off their accounts in 40 days. Some existing customers who had paid within the discount period will no longer do so and will pay within the new more generous net period. Some sales will be made to new customers who are now attracted to Bulldog due to its more generous credit terms.
- 4 percent of Bulldog's customers will pay off their accounts in 100 days. With a longer net period, more customers will forget to pay on time.<sup>7</sup>

With this information, we calculate the weighted average of the customers' payment periods (average collection period, or ACP) under the old and new credit policies. We weight the averages for each scenario by multiplying the percentage of customers who pay times the number of days they take to pay. Then we total each scenario result, as follows:

Under the old credit policy:

$$\begin{aligned} \text{ACP} &= (.45 \times 10 \text{ days}) + (.53 \times 30 \text{ days}) + (.02 \times 100 \text{ days}) \\ &= 22.4 \text{ days} \end{aligned}$$

Under the new credit policy:

$$\begin{aligned} \text{ACP} &= (.43 \times 10 \text{ days}) + (.53 \times 40 \text{ days}) + (.04 \times 100 \text{ days}) \\ &= 29.5 \text{ days} \end{aligned}$$

Based on Ms. Russell's information, we know that under the current credit policy, bad debt expenses are 2 percent of sales; under the new policy, they will climb to 4 percent of sales. Bulldog's CFO has informed us that any increases in current assets

<sup>6</sup>In real life, many of these customers will never pay off their accounts, creating bad debts. Assume here, however, that they do pay off their accounts eventually. If we do not make that assumption, our mathematical average will include a certain percentage of customers taking an infinite amount of time to pay. As a result, we get an infinite average collection period (ACP), and that won't provide usable information.

<sup>7</sup>It is difficult to generalize how current and new customers will react to credit terms changes. Each case is fact specific. The analyst would have to estimate the reaction of the customers of the specific company making the changes. An example of one possible set of reactions is presented here.

resulting from the policy change will be financed from short-term notes at an interest rate of 6 percent. The CFO also tells us that the firm's effective tax rate is 40 percent, and that the cost of capital is 10 percent. The long-term interest rate is 8 percent.

**Step 1: Develop the Pro forma Financial Statements.** The first step is to develop the *pro forma* financial statements that reflect the effects of the proposed credit policy change. We begin by reviewing the firm's current income statement and balance sheet, and then we create new statements that incorporate the changes. The statements for Bulldog Batteries are shown in Figure 19-1. The left-hand column shows Bulldog's financial statements before the credit policy change, the middle column shows them after the change, and the right-hand column shows how the new figures were calculated, given our assumptions.

**Step 2: Compute the Incremental Cash Flows.** Now it's time to compute the incremental cash flows that occur as a result of the credit policy change. Table 19-3 contains these cash flows. Table 19-3 shows that Bulldog's initial investment cash flow is \$10,083, and its net incremental cash flows from  $t_1$  through infinity are \$1,499 per year.

**Step 3: Compute the NPV of the Credit Policy Change.** Now that we have all the incremental cash flows, we can calculate the NPV of the proposed credit terms change. We learned in Chapter 10 that NPV is calculated by summing the present value (PV) of all a project's projected cash flows and then subtracting the amount of the initial investment.<sup>8</sup> In our example, we have a net incremental cash outflow (the initial investment) that occurs at time  $t_0$  of \$10,083, followed by net incremental cash inflows occurring from time  $t_1$  through infinity of \$1,499 per year. The PV of the \$1,499 per year from time  $t_1$  through infinity can be found using the formula in Chapter 8 for the present value of a perpetuity (PVP):

$$PVP = PMT \times \frac{\$1}{k}$$

where:  $PMT =$  Cash flow per period  
 $k =$  Required rate of return

According to our assumptions, Bulldog Batteries' cost of capital is 10 percent. Applying Equation 8-5, we find the PV of an endless stream of payments of \$1,499 discounted at 10 percent as follows:

$$\begin{aligned} PVP &= PMT \times \frac{\$1}{k} \\ &= \$1,499 \times \frac{\$1}{.10} \\ &= \$14,990 \end{aligned}$$

<sup>8</sup>See Equation 10-1a in Chapter 10.

## Income Statements

	With old credit terms: 2/10, n30	With new credit terms: 2/10, n40	Remarks
Sales (all on credit)	\$201,734	\$221,907	10% increase assumed
Cost of Goods Sold	107,280	\$118,008	Increase in proportion with sales (10%)
Gross Profit	94,454	103,899	
Bad Debt Expenses	4,035	6,657	Old: 2% of sales. New: 3% of sales
Other Operating Expenses	43,229	47,552	Increase in proportion with sales (10%)
Operating Income	47,190	49,690	
Interest Expense	1,221	1,223	(Notes Payable × .06) + (LTD × .08)
Before-Tax Income	45,969	48,467	
Income Taxes (rate = 40%)	18,388	19,387	
Net Income and Cash Flow	\$ 27,581	\$ 29,080	

## Balance Sheets, as of Dec. 31

	With old credit terms: 2/10, n30	With new credit terms: 2/10, n40	Remarks
<b>Assets</b>			
Current Assets:			
Cash and Marketable Securities	\$ 65,313	\$ 71,844	Increase in proportion with sales (10%)
Accounts Receivable	12,380	17,935	See Note 1
Inventory	21,453	23,598	Increase in proportion with sales (10%)
Total Current Assets	99,146	113,377	
Property, Plant and Equip, Net	92,983	92,983	No change
Total Assets	\$192,129	\$206,360	
<b>Liabilities and Equity</b>			
Current Liabilities:			
Accounts Payable	\$ 26,186	\$ 28,805	Increase in proportion with sales (10%)
Notes Payable	302	\$ 332	Increase in proportion with sales (10%)
Total Current Liabilities	26,488	29,137	
Long-Term Debt	15,034	15,034	No change
Total Liabilities	41,522	44,171	
Common Stock	35,000	35,000	No change
Capital in Excess of Par	32,100	32,100	No change
Retained Earnings	83,507	85,006	Old RE + 1,499 net income difference
Total Stockholders' Equity	150,607	152,106	
Total Liabilities and Equity	\$192,129	\$196,277	
Additional Funds Needed		\$ 10,083	See Notes 2 and 3
		\$206,360	

Note 1: Accounts Receivable (AR) = Credit Sales per day × ACP  
 Under the old credit policy: AR = (\$201,734/365) × 22.4 = \$12,380  
 Under the new credit policy: AR = (\$221,907/365) × 29.5 = \$17,935

Note 2: \$10,083 is the amount of additional financing needed (AFN) to balance the balance sheet. It is the amount that must be obtained from outside sources to undertake the proposed credit policy change. Therefore, \$10,083 may be viewed as the net investment required at time zero for the project.

Note 3: If \$10,083 is borrowed to make up for AFN, Bulldog will incur new interest charges. If included in the income statement these will reduce the net income and retained earnings—throwing the balance sheet off balance again and changing the amount of AFN. If the problem is solved using an electronic spreadsheet, the financial statements can be recast several times until the additional interest expense becomes negligible. Here, however, we will use the original interest rate to simplify the calculations.

### Figure 19-1 Bulldog Batteries, Financial Statements before and after a Credit Policy Change

Figure 19-1 shows the *pro forma* financial statements for Bulldog Batteries with the current collection policy and with the proposed collection policy.

**Table 19-3** Incremental Cash Flows Associated with Changing Bulldog Batteries' Credit Policy from 2/10, n30 to 2/10, n40

1. Net Incremental Cash Outflow at Time Zero ( $t_0$ )	
External Financing Required from the Projected Balance Sheet	\$10,083
2. Incremental Cash Flows Occurring in the Future	
Incremental Cash Inflow:	
Increase in Sales	\$20,173
Incremental Cash Outflows:	
Increase in Cost of Goods Sold	\$10,728
Increase in Bad Debt Expenses	2,622
Increase in Other Operating Expenses	4,323
Increase in Interest Expense	2
Increase in Taxes	999
Total Incremental Cash Outflows:	\$18,674
Net Incremental Cash Flows Occurring from Time $t_1$ through Infinity: $\$20,173 - \$18,674 =$	\$ 1,499 per year

We see that the present value of the \$1,499 perpetuity with a 10 percent required rate of return is \$14,990.

To complete the NPV calculation, we now need to subtract the \$10,083 net cash outflow that occurs at time  $t_0$ —the initial investment—from the present value of the \$14,990 perpetuity, as shown next:

$$\begin{aligned} \text{NPV} &= \$14,990 - \$10,083 \\ &= \$4,907 \end{aligned}$$

We find that the net present value of the credit policy change is \$4,907. Because the NPV is positive, the credit terms change proposal should be accepted. Doing so will increase the value of Bulldog Batteries by \$4,907.<sup>9</sup>

Any credit policy change proposal can be evaluated using this framework. Managers may try any number of discount amounts, discount periods, and net due periods, until they discover that combination with the greatest NPV.

## The Optimal Level of Inventory

Firms may be able to stimulate sales by maintaining more inventory, but they may drive up costs as well. The financial manager's task is to figure out what level of inventory produces the greatest benefit to the firm. Financial managers first estimate the costs that are associated with inventory.

<sup>9</sup>Given all the information presented so far, we could also calculate the internal rate of return (IRR) of the credit terms proposal. We simply solve the PV of a perpetuity formula for  $k$ , which represents the IRR:

$$\begin{aligned} k, \text{ or IRR} &= \text{PMT} / \text{PVP} \\ \text{In our example: IRR} &= \$1,499 / \$10,083 \\ &= .1487, \text{ or } 14.87\% \end{aligned}$$

Because 14.87 percent exceeds Bulldog's cost of capital of 10 percent, the credit terms change proposal should be accepted.

### Take Note

Remember that this analysis depends on the accuracy of our assumptions. In this case, we assumed that sales would increase 10 percent, that bad debts would increase to 4 percent of sales, and that customers would pay according to the pattern described. If these assumptions are invalid, the credit policy analysis will also be invalid.

**The Costs of Maintaining Inventory** The two main costs associated with inventory are carrying costs and ordering costs. *Carrying costs* are those costs associated with keeping inventory on hand—warehouse rent, insurance, security expenses, utility bills, and so on. Carrying costs are generally expressed in dollars per unit per year.

*Ordering costs* are those costs incurred each time an order for inventory materials is placed—clerical expense, telephone calls, management time, and so on. Ordering costs tend to be fixed no matter what the size of the order, so they are generally expressed in dollars per order.

Although you would think financial managers would like to minimize these two costs, it's not so easy. Carrying costs tend to rise as the level of inventory rises, but ordering costs tend to fall as inventory rises (because less ordering is necessary). Firms that minimize carrying costs by keeping no inventory have to order materials every time they want to produce an item, so they actually maximize ordering costs. Likewise, firms that minimize ordering costs by ordering all materials at once have sky-high carrying costs.

Complicating the situation is the possibility that a larger stock of inventory might increase sales. More inventory on display means more opportunities to catch the customer's eye, and more inventory on hand means fewer sales lost due to not having the correct size or model available. The fact that more inventory might translate into more sales means the lowest-cost level of inventory might not be the optimal level of inventory. To find the optimal level, managers have to balance the costs and benefits of various inventory levels.

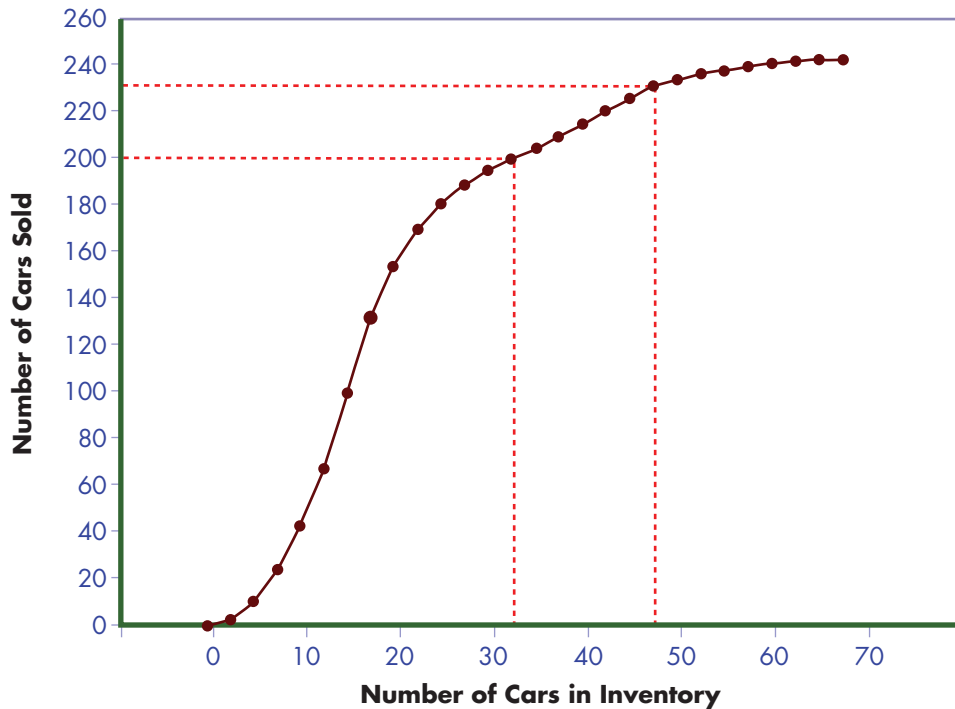
**Analyzing Inventory Levels** To maximize the value created from the firm's investment in inventory, use a three-step process similar to the one used to find accounts receivable levels. First, generate *pro forma* income statements and balance sheets for each proposed inventory level. Second, observe the incremental cash flows that occur with the change. Third, compute the NPV of the incremental cash flows. The following example illustrates the three-step process.

Dealin' Dan, the owner of Cream Puff Used Cars, wants to determine the optimal number of cars to display on his lot. Dan knows that increasing the number of cars on display will probably cause sales to increase, but it would also increase his inventory carrying costs. Dan also knows that decreasing the number of cars on display will save him inventory costs but might also cost him sales. As a result, Dan is not sure how a change in his planned average inventory level from 32 cars to 48 cars will affect the value of his firm.

We'll make the following assumptions about Cream Puff's financial condition:

1. Cream Puff's inventory ordering costs are \$100 per order. (Each time Dealin' Dan takes action to obtain cars, whether from other dealers, or from trade-ins, he incurs \$100 in processing costs.)
2. Inventory carrying costs are \$500 per car per year.
3. Because Dealin' Dan does not expect to keep cars on the lot more than a few weeks, he finances all the firm's inventory with short-term debt. The short-term interest rate available to Cream Puff is 6 percent.
4. Cream Puff pays \$5,000, on average, for each car it purchases for resale. The firm's average selling price per car is \$6,000.





**Figure 19-2** Cream Puff Used Cars Inventory versus Number of Cars Sold

Figure 19-2 shows the direct relationship between inventory and sales. As inventory increases, sales increase; as inventory decreases, sales decrease.

5. Cream Puff displays, on average, about 32 cars on its lot. Sales occur regularly throughout the year, and Dan expects to sell 200 cars this year.
6. Based on his business experience, Dan believes that the relationship between inventory and Cream Puff's car sales is direct, as shown in Figure 19-2. According to the graph, an increase in inventory from 32 to 48 cars should produce an increase in the number of cars sold per year from 200 to 232.

Dan uses the economic order quantity (EOQ) model to compute the number of cars to order from wholesale dealers when he replenishes his inventory.<sup>10</sup> According to the EOQ model, the optimal order size follows:

$$\text{EOQ} = \sqrt{\frac{2 \text{ ¥ } S \text{ ¥ } \text{OC}}{\text{CC}}} \quad (19-1)$$

where:

OQ = Order quantity

S = Annual sales volume in units

OC = Ordering costs, per order

CC = Carrying costs, per unit per year

<sup>10</sup>The EOQ model computes the inventory order size that, if certain other conditions are met, will minimize total inventory costs for the year. For a complete discussion of the model, refer to a production management text.

We may use the model to see what order size Cream Puff should have. We know that sales are 200 cars per year, ordering costs are \$100 per order, and the carrying costs are \$500 per year. According to Equation 19-1, the ordering quantity for Cream Puff is as follows:

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2 \text{ ¥ } 200 \text{ ¥ } 100}{500}} \\ &= \sqrt{80} \\ &= 8.94 \text{ (round to 9)} \end{aligned}$$

We find that the ordering quantity that minimizes inventory costs is nine cars per order. Cream Puff's sales occur regularly, so Dan orders nine replacement cars at even intervals throughout the year. The sales forecast calls for 200 cars to be sold this year, so the number of orders for replacement cars will be  $200/9 = 22.22$  (round to 22).<sup>11</sup> Each order for replacement cars costs \$100, so Cream Puff's total ordering cost—assuming 22 orders are made—is \$2,200.

Under the current inventory policy, Cream Puff's average inventory level is 32 cars. Carrying costs are \$500 per car per year, so total carrying costs are  $32 \times \$500 = \$16,000$ . We sum the ordering and carrying costs to find the total inventory costs for Cream Puff. The total costs are  $\$2,200 + \$16,000 = \$18,200$ .

We assume in our example that other operating expenses on Cream Puff's income statement and all current accounts on the balance sheet vary directly with sales, so each of these accounts will increase (or decrease) proportionally with sales. We also assume that the interest rate on short-term debt is 6 percent and the rate on long-term debt is 8 percent. Finally, assume that Cream Puff's effective tax rate is 40 percent, and the firm's cost of capital is 10 percent.

Now we're ready to apply the three-step process to determine the optimal level of inventory for Cream Puff Used Cars.

**Step 1: Develop Pro forma Financial Statements.** Let's see how Dealin' Dan's proposed inventory change from 32 cars to 48 cars will affect the business. The left-hand column in Figure 19-3 shows Cream Puff's projected 2007 income statement and balance sheet. It also shows selected financial ratios, given our assumptions, current inventory policy of 32 cars, and the total inventory costs of \$18,200. The right-hand column contains revised statements and ratios assuming average inventory is raised to 48 cars. The remarks column explains how the various numbers were computed.

If Dealin' Dan's assumptions are correct, increasing the number of cars on display at the Cream Puff used car lot to 48 will produce a \$192,000 increase in sales (32 extra cars). Inventory costs and other expenses will increase too, of course, but only by a total of \$186,534, so profits should rise by \$5,466. On the surface it looks like Dan should go ahead with the inventory change, doesn't it? Perhaps, but let's see how the change will affect the value of Dan's firm by computing the incremental cash flows associated with the change and the NPV of those incremental cash flows.

<sup>11</sup>Astute readers will note that, after rounding,  $22 \times 9 = 198$ . So Dealin' Dan will not actually order the exact number of cars he expects to sell this year. However, this small discrepancy will not materially affect our analysis.

### Income Statements

	Current Inventory Policy	New Inventory Policy	Remarks
Sales	\$ 1,200,000	\$ 1,392,000	32 car increase × \$6,000 each
Cost of Goods Sold	<u>1,000,000</u>	<u>1,160,000</u>	32 car increase × \$5,000 each
Gross Profit	200,000	232,000	
Inventory Costs	18,200	26,300	See Note 1
Other Operating Expenses	<u>85,000</u>	<u>98,600</u>	Change in proportion with sales (16% increase)
Operating Income	96,800	107,100	
Interest Expense	<u>11,040</u>	<u>12,230</u>	(CL × .06) + (LTD × .08)
Before-Tax Income	85,760	94,870	
Income Taxes (rate = 40%)	<u>34,304</u>	<u>37,948</u>	
Net Income	<u>\$ 51,456</u>	<u>\$ 56,922</u>	

### Balance Sheets, as of Dec. 31

	Current Inventory Policy	New Inventory Policy	Remarks
<b>Assets</b>			
Current Assets:			
Cash and Marketable Securities	\$ 47,000	54,520	Change in proportion with sales (16% increase)
Accounts Receivable	63,000	73,080	Change in proportion with sales (16% increase)
Inventory	<u>160,000</u>	<u>240,000</u>	16 car increase (48 – 32) × \$5,000 each
Total Current Assets	270,000	367,600	
Property, Plant and Equip, Net	<u>72,000</u>	<u>72,000</u>	No change
Total Assets	<u>\$ 342,000</u>	<u>\$ 439,600</u>	
<b>Liabilities and Equity</b>			
Current Liabilities:			
Accounts Payable	\$ 50,000	58,000	Change in proportion with sales (16% increase)
Notes Payable	<u>74,000</u>	<u>85,840</u>	Change in proportion with sales (16% increase)
Total Current Liabilities	124,000	143,840	
Long-Term Debt	<u>45,000</u>	<u>45,000</u>	No change
Total Liabilities	169,000	188,840	
Common Stock	35,000	35,000	No change
Capital in Excess of Par	34,000	34,000	No change
Retained Earnings	<u>104,000</u>	<u>109,466</u>	Old RE + \$5,466 net income difference
Total Stockholders' Equity	173,000	178,466	
Total Liabilities and Equity	<u>\$ 342,000</u>	<u>367,306</u>	
Additional Funds Needed		<u>72,294</u>	To be obtained from external sources
		<u>\$ 439,600</u>	

Note 1: The new total inventory costs were computed as follows:

$$\text{New Order Quantity per the EOQ} = \sqrt{\frac{2 \times 232 \times 100}{500}}$$

$$= 9.63 \text{ (round to 10)}$$

Number of orders this year = 232/10 = 23.2 (round to 23)

New total ordering cost = 23 × \$100 = \$2,300

New average inventory level = 48

New total carrying cost = 48 × \$500 = \$24,000

New total inventory cost = \$2,300 + \$24,000 = \$26,300

\$8,100 increase

**Figure 19-3** Dealin' Dan's Cream Puff Used Cars Inventory Analysis

Figure 19-3 shows the *pro forma* financial statements with Cream Puffs current average inventory policy of 32 cars and with the new inventory policy of 48 cars.

**Table 19-4** Incremental Cash Flows If Cream Puff Changes Inventory Level from 32 to 48 Cars

1. Incremental Cash Outflows at $t_0$	
Additional Funds Needed from the Projected Balance Sheet	\$ 72,294
2. Incremental Cash Flows Occurring in the Future	
Incremental Cash Inflows:	
Increase in Sales	\$ 192,000
Incremental Cash Outflows:	
Increase in Cost of Goods Sold	\$ 160,000
Increase in Inventory Costs	8,100
Increase in Other Operating Expenses	13,600
Increase in Interest Expense	1,190
Increase in Taxes	3,644
Total Incremental Cash Outflows:	\$ 186,534
Net Incremental Cash Flows Occurring from Time $t_1$ through Infinity: $\$192,000 - \$186,534 =$	\$ 5,466 per year

**Step 2: Compute the Incremental Cash Flows.** Drawing the necessary information from the *pro forma* statements shown in Figure 19-3, Table 19-4 lists the incremental cash flows of changing the average inventory level from 32 cars to 48 cars.

We see in Table 19-4 that the initial investment cash flows of changing Dealin' Dan's inventory policy are \$72,294. We also find that the net cash flows associated with changing the average inventory level are \$5,466 per year.

**Step 3: Compute the NPV of the Inventory Policy Change.** We are ready now to calculate the NPV of the inventory policy change just as we did for accounts receivable. First, we compute the present value of the net cash inflows occurring from time  $t_1$  through infinity from Table 19-4 (\$5,466 per year) using Equation 8-5, the formula for the present value of a perpetuity:

$$\begin{aligned}
 PVP &= PMT \times \frac{\$1}{\$.10} \\
 &= \$5,466 \times \frac{\$1}{\$.10} \\
 &= \$54,660
 \end{aligned}$$

We find that the present value of the net cash flow perpetuity is \$54,660.

Next, we subtract the present value of the net cash outflows at  $t_0$  (the initial investment) to find the NPV of the inventory policy change. From Table 19-4 we see the net cash outflow that occurs at  $t_0$  is \$72,294. So, the NPV of Dealin' Dan's Cream Puff Used Cars inventory change proposal is as follows:

$$\begin{aligned}\text{NPV} &= \$54,660 - \$72,294 \\ &= \$(17,634)\end{aligned}$$

We find that the net present value of the inventory change proposal is  $-\$17,634$ . Because the NPV is negative, the inventory change proposal should be rejected. Accepting it would decrease the value of the Cream Puff Used Cars company by \$17,634.<sup>12</sup>

In the preceding analysis, we used one possible inventory level and observed the effect on the value of the Cream Puff firm. By repeating this procedure a number of times, we could eventually find one inventory level, or a range of levels, at which the firm's value was maximized. We would then have found the true optimal level of inventory for the firm.

## Inventory Management Approaches

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Managing inventory is more than just determining the optimal level of items to keep on hand. Remember, the task is to hold down inventory costs without sacrificing sales too much. Techniques for doing this abound, but two approaches deserve special mention: the ABC classification system and the just-in-time (JIT) system.

### The ABC Inventory Classification System

The ABC system of inventory classification is a tool used to lower inventory carrying costs. The system classifies inventory according to value. In many firms, inventory items may range in value from relatively expensive to relatively cheap. Generally, firms have fewer expensive items and more inexpensive items. In such a situation, it doesn't make sense to use one inventory control system to manage all inventory items because the firm would waste a lot of time and effort monitoring the relatively cheap items. For example, imagine the inventory system of a bicycle store. Its inventory would probably include several custom-designed racing bicycles; standard 10-speed and mountain bikes; and cycling helmets, water bottles, and other cycling equipment. Wouldn't it waste time and effort to assign serial numbers to all items in inventory and keep them all locked up in glass cases?

Under the ABC system, firm managers classify the relatively few, very expensive items as group A, the larger number of less expensive items as group B, and the rest of the relatively cheap items as group C.<sup>13</sup> Then different inventory control systems are designed for each group, appropriate for the value of that group. For example, the owner

<sup>12</sup>The internal rate of return (IRR) of the inventory proposal is

$$\begin{aligned}k, \text{ or IRR} &= \text{Pmt} / \text{PV (initial investment)} \\ \text{IRR} &= 5,466 / 72,294 \\ &= .0756, \text{ or } 7.56\%\end{aligned}$$

Because 7.56 percent is less than Dealin' Dan's cost of capital of 10 percent, the inventory change proposal should be rejected.

<sup>13</sup>Of course, the classifications are not limited to just A, B, and C. Depending on the firm's product lines, some companies might have D, E, and F as well. However, the guiding principle is the same.



of a bicycle shop might assign custom-designed racing bikes to group A, less expensive standard bicycles to group B, and the rest of the inventory to group C. Then the owner could apply inventory control techniques appropriate for each group, as follows:

- **Group A:** Assign serial numbers to each item. Keep in secure storage. Check inventory daily. Keep fixed number on display, ordering replacements as each is sold.
- **Group B:** Assign serial numbers to each item. Keep in secure storage. Check inventory monthly. Manage levels of each type per the EOQ model.
- **Group C:** Check inventory annually. Reorder when visual checks of shelves indicate need.

This technique allows the bicycle storeowner to concentrate his or her time and effort on those items that deserve it. Unnecessary carrying costs on the rest of the inventory items are thus avoided.

### **Just-in-Time Inventory Control (JIT)**

The **just-in-time (JIT)** inventory system, developed in Japan, is useful when storage space is limited and inventory-carrying costs are high. The system attempts to operate the firm on little or no inventory.

Here is an example of how JIT works. A firm that makes kitchen cabinets needs wood, brass handles and knobs, screws, and varnish. All these items constitute the firm's raw materials inventory. On the one hand, the firm could order these raw materials once a month and keep them in storage areas until needed in the manufacturing process (incurring inventory carrying costs as a result). On the other hand, the firm might strike a deal with its raw materials suppliers to deliver just the number of items needed immediately upon request. The items would thus arrive just in time to be used. The firm would not need to store materials, and inventory-carrying costs would be eliminated.<sup>14</sup>

In addition to lowering inventory carrying costs, just-in-time systems tend to force quality into the manufacturing process. Any defect in materials will force the entire production line to shut down until the firm can obtain replacement materials.

Carrying little or no inventory can have drawbacks, however. Suppliers that are late or produce poor-quality products jeopardize the firm's customer relations. Little or no inventory means that the business does not have a buffer when a work slowdown occurs due to illness, natural disaster, or a labor dispute.

For instance, General Motors had an inventory system similar to JIT. When 3,000 workers at two brake plants in Dayton, Ohio, went on strike in early 1996, the ripple effects were staggering. Without the brake parts in inventory, workers at other GM plants could not complete car assembly, so eventually 177,775 GM workers were idled. The labor dispute virtually shut down GM's North American operations.<sup>15</sup>

Recall that the JIT inventory system was developed in Japan, where labor unions do not exist. Clearly, firms that employ organized labor should carefully consider the risks of JIT, as evidenced by the GM strike.

<sup>14</sup>You can see that, in effect, the requirement to store materials (and the attendant carrying costs) are passed on to the suppliers. Presumably, the suppliers would adopt such systems as well, until a closely coordinated chain from original suppliers to final customers developed.

<sup>15</sup>Rebecca Blumenstein and Nichole Christian, "Parts Dispute to Remain Despite GM-UAW Accord," *The Wall Street Journal* (March 25, 1996): A3; John Byrne, "Has Outsourcing Gone Too Far?" *Business Week* (April 1, 1996): 26.

## Making Credit Decisions

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Earlier in this chapter, we said that individual customers receive credit from the firm if they meet the firm's credit standards. Credit standards are those requirements each individual customer must satisfy in order to receive credit from the firm. They are tests, in other words, of a person's creditworthiness.

Firms often base their credit standards on the Five Cs of Credit: character, capacity, capital, collateral, and conditions.

1. *Character*: the borrower's *willingness to pay*. Lenders evaluate character by looking at borrower's past payment patterns. A good payment record in the past implies willingness to pay debts in the future.
2. *Capacity*: the borrower's *ability to pay*, as indicated by forecasts of future cash flows. The more confidence a lender has that a borrower is going to receive cash in the future, the more willing the lender will be to grant credit now.
3. *Capital*: how much wealth a borrower has to fall back on, in case the expected future cash flows with which the borrower plans to pay debts don't materialize. Lenders feel more comfortable if borrowers have something they could liquidate if necessary to pay their debts.
4. *Collateral*: what the lender gets if capacity and capital fail, and the borrower defaults on a loan. Collateral is usually some form of tangible asset, such as the firm's inventory, buildings, manufacturing equipment, and so on that has been pledged as security by the borrower.
5. *Conditions*: the business conditions the borrower is expected to face. The more favorable business conditions appear to be for the borrower, the more willing lenders are to grant credit.

To evaluate potential credit customers (in terms of the Five Cs of Credit, or any other criteria), firms find some way to quantify how well the customers compare to the measurement criteria. Some firms use a method known as credit scoring. Credit scoring works by assigning points according to how well customers meet indicators of creditworthiness. For example, statisticians have determined that established businesses tend to pay their debts more faithfully than new businesses. So, a credit applicant might be awarded points for each year that the applicant's firm has been in business. A sample of a simplified credit score sheet is shown in Figure 19-4 for Wishful Thinking Company.

We cannot overemphasize the importance of investigating creditworthiness carefully before granting credit. Not doing so is a quick way to end up with lots of accounts receivable and no cash!



### Interactive Module

Go to Downloadable Companion Material, chapter 19. Follow the instructions there. What is credit scoring? What can you do to improve your score?

## Collection Policies to Handle Bad Debts

---

Sometimes, despite precautions, a firm ends up with customers who don't pay their bills. You thought your firm did a good job of scoring customers. But some of them are not paying their bills on time, and a few haven't paid at all. Now what?

<b>Criteria</b>	<b>Score</b>
1. Length of time since missing a payment on any loan	_____
More than four years	4 points
Three to four years	3 points
Two to three years	2 points
One to two years	1 point
Less than one year	0 points
2. Length of time in business	_____
More than four years	4 points
Three to four years	3 points
Two to three years	2 points
One to two years	1 point
Less than one year	0 points
3. Net income	_____
More than \$200,000	4 points
100,000 to \$200,000	3 points
\$50,000 to \$100,000	2 points
\$25,000 to \$50,000	1 point
Less than \$25,000	0 points
4. Net worth	_____
More than \$1,000,000	4 points
\$500,000 to \$1,000,000	3 points
\$100,000 to \$500,000	2 points
\$50,000 to \$100,000	1 point
Less than \$50,000	0 points
5. Market value of tangible assets	_____
More than \$1,000,000	4 points
\$500,000 to \$1,000,000	3 points
\$100,000 to \$500,000	2 points
\$50,000 to \$100,000	1 point
Less than \$50,000	0 points
6. Expected business growth in next five years	_____
More than 20 percent	4 points
15 to 20 percent	3 points
10 to 15 percent	2 points
5 to 10 percent	1 point
Less than 5 percent	0 points

Total Score: \_\_\_\_\_

**Approved for credit if score = 12 or more**

**Figure 19-4** Sample Items on a Credit Scoring Worksheet for Wishful Thinking Company

Slow or no payment is bound to happen to any credit-granting business. Firms establish a collection policy to cope with the problem. For instance, what do you do if one of your long-time customers fails to pay a bill on the due date? Send it to a collection agency the next day? Ignore the situation and hope for the best? Send a reminder notice? Start charging interest? It helps to have a collection policy in place. That way, both the firm and its customers know what to expect once credit has been granted.

No one-collection policy will be best for all firms and for all customers. The best policy depends on the business situation, the firm's tolerance for abuse, and the relationship it has with customers. However, most firms consider one or more of the following collection policies:

- *Send reminder letters.* Send one or more letters, each one becoming less friendly in tone. Certainly, the first letter should not sound threatening. (How often have you simply misplaced a bill and not realized it until you received a reminder notice?)
- *Make telephone calls.* If gentle reminders in the mail don't produce results, call the customer to see what the problem is. If there is a good reason why the customer hasn't paid the bill, you may choose to take no action or make accommodating arrangements. Make sure that any alternative payment plan is specific so that the firm can follow up early if the customer fails to pay again.
- *Hire collection agencies.* When all efforts to collect are unsuccessful, you may want to turn to professional collection agencies. This action should be used sparingly for two reasons. First, it will probably cost the firm any future business from this customer. Second, the price of the collection agency service may be very high, often 50 percent of the uncollected debt.
- *Sue the customer.* Legal action is a last resort. A lawsuit is even more expensive than using a collection agency, so firms should determine whether the court action is worth the trouble. Remember the "lawyers first" rule: Lawyers almost always get paid first.
- *Settle for a reduced amount.* A firm should keep in mind that trying too hard to collect from a customer may force the customer into bankruptcy. Once the client is in bankruptcy, the firm may not receive any money. In such a case, settling for a reduced amount, or a stretched-out payment schedule, may be the firm's best option.
- *Write off the bill as a loss.* In other words, forget it. This may be a firm's best alternative if the amount owed is relatively small or too costly to collect. Firms may have to write off all or part of the bill as a loss anyway, if efforts to collect are unsuccessful.
- *Sell accounts receivable to factors.* Selling accounts receivable to some other person or business is known as factoring. Businesses that make money by buying accounts receivable from other firms, at less than their face value, are called factors. Suppose your firm had 100 customers who owed you a total of \$10,000. Rather than wait for the customers to pay, you might sell the "IOUs" to a factor for \$9,000 in cash. The factor discounts the accounts by an amount that both generates a return and compensates for the risk that some customers won't pay. Your firm no longer has to manage the accounts, plus it has cash to put to use elsewhere.

When granting credit to customers, it is best to remember the old saying, "An ounce of prevention is worth a pound of cure." In other words, crafting credit standards that avoid frequent collections can save a firm time and money.

**Take Note**

A firm that frequently writes off uncollected amounts needs to tighten its standards for granting credit.



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## What's Next

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In this chapter we have explored how and why firms manage inventory and accounts receivable. We have examined methods for finding the optimal levels of both categories of current assets and have explored additional management techniques. In Chapter 20, we'll look at short-term financing.

## Summary

---

1. Describe how and why firms must manage accounts receivable and inventory as investments.

Granting credit and maintaining inventory are necessary business practices. Offering more credit and increasing inventory enhance sales. However, both accounts receivable and inventory tie up cash and incur opportunity costs—the cost of not having funds that could generate returns. The financial manager's task is to balance (1) the risk of losing sales due to not granting credit or having products available against (2) the savings produced by collecting cash immediately or maintaining inventory at a reduced level.

2. Compute the optimal levels of accounts receivable and inventory.

The optimal level of accounts receivable or inventory may be found by using a three-step process: (1) create *pro forma* financial statements for alternative credit or inventory policies; (2) use the *pro forma* data to estimate the incremental cash flows associated with the proposed changes; and (3) compute the net present value of each alternative. When this process is complete, managers compare the NPVs of each alternative to see which policy produces the most favorable effect on the value of the firm.

3. Describe alternative inventory management approaches.

Two popular inventory management approaches are the ABC and just-in-time (JIT) inventory systems. The ABC system classifies inventory items into categories according to their relative value. Management's time, money, and effort can then be directed to those inventory items in the proportions that they deserve.

The JIT inventory system calls for close coordination between manufacturers and suppliers to ensure that parts and materials used in the manufacturing process arrive just in time to be used. If the coordination is close enough, raw materials inventories at the manufacturing firm can be eliminated.

4. Explain how firms make credit decisions and create credit policies.

Firms evaluate the creditworthiness of their customers by applying the following Five Cs of Credit:

- Character—a borrower's willingness to pay
- Capacity—a borrower's ability to pay
- Capital—how much wealth a borrower has to fall back on, in case the expected future cash flows with which the borrower plans to pay debts don't materialize
- Collateral—what the lender gets if capacity and capital fail and the borrower defaults on a loan
- Conditions—the business conditions a borrower is expected to face

To evaluate potential credit customers, firms use a credit scoring procedure that assigns numerical values to the various indicators of creditworthiness.

A firm's collection policy includes the actions the firm plans to take in the event that credit customers don't pay their bills on time. Policy actions include reminder letters, telephone calls, use of collection agencies, court action, settling for partial payment, factoring the accounts, and writing off the bills as a loss.

## Equations Introduced in This Chapter

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**Equation 19-1.** The Economic Order Quantity for Inventory:

$$EOQ = \sqrt{\frac{2 \text{ ¥ } S \text{ ¥ } OC}{CC}}$$

where: OQ = Order quantity  
 S = Annual sales volume in units  
 OC = Ordering costs, per order  
 CC = Carrying costs, per unit per year

## Self-Test

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**ST-1.** Assume that Cash & Carry, Inc., is considering offering credit to its customers. Management estimates that if it does so, sales will increase 10 percent, expenses will increase 5 percent, accounts receivable will increase to \$200,000, cash will decrease by \$50,000, and current liabilities will increase to \$300,000. No other accounts on the financial statements will be affected. Compute the company's return on equity (ROE) ratio and current ratio if it adopts the proposal. Base your calculations on Cash & Carry's latest financial statements, shown here.

### Selected Financial Data for Cash & Carry, Inc. (in 000's)

	Prior to Granting Credit	After Granting Credit
Cash	\$ 100	
Accounts Receivable	0	
Total Current Assets	\$ 100	
Current Liabilities	\$ 50	
Total Equity	\$2,000	
Sales	\$2,500	
Expenses	2,300	
Net Income for the Year	\$ 200	



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- ST-2.** Your firm sells inventory at an even rate throughout the year. Sales volume this year is expected to be 100,000 units. Inventory ordering costs are \$30 per order, and inventory carrying costs are \$60 per unit per year. Given these conditions, what is the most economical inventory order quantity (EOQ)?
- ST-3.** Refer again to the Dealin' Dan's Cream Puff Used Cars example in the text. Continue with the assumptions given and compute the NPV of raising the company's average inventory level of cars to 60. Assume the inventory change would cause unit sales to increase to 240 per year.
- ST-4.** Your firm uses the credit scoring worksheet in Figure 19-4 to evaluate potential credit customers. If an applicant has never missed a loan payment, has been in business for two and a half years, has net income of \$75,000, has a net worth of \$90,000, has tangible assets worth \$120,000, and has an expected business growth rate of 12 percent a year, will the applicant be granted credit?

## Review Questions

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1. Accounts receivable are sometimes not collected. Why do companies extend trade credit when they could insist on cash for all sales?
2. Inventory is sometimes thought of as a necessary evil. Explain.
3. What are the primary variables being balanced in the EOQ inventory model? Explain.
4. What are the benefits of the JIT inventory control system?
5. What are the primary requirements for a successful JIT inventory control system?
6. Can a company have a default rate on its accounts receivable that is too low? Explain.
7. How does accounts receivable factoring work? What are the benefits to the two parties involved? What are the risks?

## Build Your Communication Skills

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- CS-1.** The three-step process of evaluating the NPV of a proposed credit policy or inventory level change can intimidate some managers. Prepare an oral presentation to explain how to measure the value of the credit policy change analysis presented in this chapter. Lead a study group through the process.
- CS-2.** Evaluate the creditworthiness of a business in your local community using the credit scoring worksheet in Figure 19-4. To collect information, you may want to research local business publications, conduct interviews, or contact the local chamber of commerce. Prepare a brief written report of the results and include your credit scoring worksheet as an exhibit.



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## Problems

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- 19-1.** Compu-Chip Co. had annual credit sales of \$8,030,000 and an average collection period (ACP) of 22 days in 2006. What is the amount of the company's accounts receivable for the year? Assume 365 days in a year.  **Accounts Receivable, ACP**
- 19-2.** If Compu-Chip Co. of problem 19-1 is expected to have annual credit sales of \$7,600,000 and an average collection period of 26 days in 2007, what would be the company's accounts receivable? Do you think that the company is relaxing or tightening its credit policy in 2007, compared to its policy in 2006?  **Accounts Receivable, ACP**
- 19-3.** Fitzgerald Company has credit terms of 2/15, n60. The historical payment patterns of its customers are as follows:
- 40 percent of customers pay in 15 days.
  - 57 percent of customers pay in 60 days.
  - 3 percent of customers pay in 100 days.
- Annual sales are \$730,000. Assume there are 365 days in a year.
- a.** Calculate the average collection period (ACP).
- b.** What is the accounts receivable (AR) assuming all goods are sold on credit?  **Accounts Receivable, ACP Credit Policy**
- 19-4.** If Fitzgerald in problem 19-3 decides to adopt more stringent credit terms of 2/10, n30, sales are expected to drop by 10 percent, but the following improved payment pattern of its customers is expected:
- 40 percent of customers will pay in 10 days.
  - 58 percent of customers will pay in 30 days.
  - 2 percent of customers will pay in 100 days.
- Calculate the new average collection period (ACP) and accounts receivable (AR) assuming all goods are sold on credit.  **Accounts Receivable, ACP Credit Policy**
- 19-5.** Tuscany Style, a furniture company, has a current credit policy of 2/10, n20. It estimates under this policy that 25 percent of its customers will take advantage of the discount, 60 percent will pay within 20 days, and the remaining customers will pay within 30 days. What is its average collection period (ACP)?  **Accounts Receivable, ACP**
- 19-6.** Tuscany Style, described in problem 19-5, is planning on revising its credit policy in an attempt to shorten its average collection period. Its new policy is 3/10, n30. Under this new policy, 32 percent of customers are expected to take advantage of the discount, 67 percent will pay within 30 days, and 1 percent will pay within 45 days. Calculate the new ACP. Should Tuscany Style adopt the new policy or keep the old one? Explain.  **Accounts Receivable, ACP**

## Effect of Change in Credit Policy



**19-7.** Elwood Blues, vice president of sales for East-West Trading, Inc., wants to change the firm's credit policy from 2/15, n40 to 2/15, n60, effective January 1, 2007. He is confident that the proposed relaxation will result in a 20 percent increase over the otherwise expected annual sales of \$350,000 with the old policy. All sales are made on credit. The historical payment pattern under the present credit terms are as follows:

Under the old policy:

- 40 percent of the customers take advantage of the discount and pay in 15 days.
- 58 percent of the customers forgo the discount and pay in 40 days.
- The remaining 2 percent pay in 100 days.

Under the new credit policy, the payment pattern is expected to be as follows:

- 40 percent of the customers will take advantage of the discount and pay in 15 days.
- 57 percent of the customers will forgo the discount and pay in 60 days.
- The remaining 3 percent will pay in 100 days.

Bad debt expenses are expected to rise from 2 percent to 3 percent with the change in credit policy. Assume (i) any increase in current assets will be financed by short-term notes at an interest rate of 7 percent; (ii) long-term interest rate is 10 percent; (iii) income tax rate is 40 percent; (iv) cost of capital for East-West is 11 percent; (v) cost of goods sold is 80 percent of sales; (vi) other operating expenses is \$10,000 under the old policy.

The *pro forma* balance sheet items of the company under the old policy would be as follows:

Cash and Securities	\$ 15,000	Accounts Payable	\$ 14,918
Inventory	50,000	Notes Payable	35,000
Plant and Equipment	120,000	Long-Term Debt	30,000
Common Stock	25,000	Capital in Excess of Par	60,000
Retained Earnings	50,000		

Also assume that the cost of goods sold and other operating expenses in the income statement and all current asset and current liability items, except accounts receivable, vary directly with sales.

- a. Calculate average collection periods and accounts receivable under the old and the new policies.
- b. Develop *pro forma* income statements and balance sheets under the old and the new policies.
- c. Calculate the incremental cash flows for 2003 and the subsequent years.
- d. Advise Mr. Blues if he should adopt the new policy.

- 19-8.** Use the same information given in problem 19-7 with the following changes. Mr. Blues asked Mr. Scott Hayward, the general manager of sales of East-West, to recheck the payment patterns and credit history of East-West's customers to be absolutely sure that the change in credit policy would indeed be beneficial to the company. A strict scrutiny by Mr. Hayward resulted in the following changes in expected payment pattern and bad debts:

Under the old policy:

- 40 percent of the customers take advantage of the discount and pay in 15 days.
- 58 percent of the customers forgo the discount and pay in 40 days.
- The remaining 2 percent pay in 100 days.

Under the new credit policy, the payment pattern is expected to be as follows:

- 30 percent of the customers will take advantage of the discount and pay in 15 days.
- 60 percent of the customers will forgo the discount and pay in 60 days.
- The remaining 10 percent will pay in 100 days.

Bad debt expenses are expected to rise from 2 percent to 4 percent with the change in credit policy. Under this changed scenario, is adoption of the new credit policy advisable?

- 19-9.** Tom Jackson, the vice president of sales for A-Z Trading, Inc., wants to change the firm's credit policy from 3/10, n40 to 3/15, n30, effective January 1, 2007. He is confident that though the proposed tightening will result in a 10 percent decrease over the otherwise expected annual sales of \$2 million with the old policy, it will increase profitability and value of the firm. All sales are made on credit. The historical payment pattern under the present credit terms is as follows:

Under the old policy:

- 30 percent of the customers take advantage of the discount and pay in 10 days.
- 60 percent of the customers forgo the discount and pay in 40 days.
- The remaining 10 percent pay in 100 days.

Under the new credit policy, the payment pattern is expected to be as follows:

- 42 percent of the customers will take advantage of the discount and pay in 15 days.
- 57 percent of the customers will forgo the discount and pay in 30 days.
- The remaining 1 percent will pay in 100 days.

 **Effect of Change in Credit Policy**



 **Challenge Problem**



Bad debt expenses are expected to decrease from 3 percent to 1 percent with the change in credit policy. Assume (i) any decrease in the current assets will be used to pay off short-term notes currently outstanding at an interest rate of 8 percent; (ii) long-term interest rate is 11 percent; (iii) income tax rate is 40 percent; (iv) cost of capital for A—Z is 13 percent; (v) cost of goods sold is 80 percent of sales; and (vi) other operating expenses is \$60,000 under the old policy.

The *pro forma* balance sheet items of the company under the old policy would be as follows:

Cash and Securities	\$ 86,000	Accounts Payable	\$ 85,000
Inventory	285,000	Notes Payable	200,000
Plant and Equipment	652,000	Long-Term Debt	171,000
Common Stock	143,000	Capital in Excess of Par	342,000
Retained Earnings	285,000		

Also assume that the cost of goods sold and other operating expenses in the income statement and all current account items in the balance sheet vary directly with sales.

- Calculate average collection periods and accounts receivable under the old and the new policies.
- Develop *pro forma* income statements and balance sheets under the old and the new policies.
- Calculate the incremental cash flows for 2007 and the subsequent years.
- Advise Mr. Jackson if he should adopt the new policy.

### Economic Order Quantity

- 19-10.** Windhome and Drake Co., a dealer in building products, has the following costs associated with its business in 2006:

Ordering Cost	\$250 per Order
Carrying Cost	\$300 per Unit per Year
Annual Sales	500 Units

Calculate the EOQ and the number of orders placed per year.

### Economic Order Quantity

- 19-11.** Use the same data for problem 19-10, except that the carrying cost is expected to increase by 10 percent in 2007 due to increase in rentals of warehouse space. Recalculate the EOQ, number of orders placed per year, and total ordering cost for 2007.

### Economic Order Quantity

- 19-12.** TrailCrazer is updating its ordering strategy. Business has been increasing dramatically and it can't keep up with its current strategy. Executives have decided to implement the EOQ model to determine its ordering quantities and cycles. In 2006, TrailCrazer had the following costs:

Annual Sales	1,200 units
Carrying Costs	\$100 per unit
Ordering Costs	\$250 per unit per year

Calculate:

- The EOQ
- Number of orders to be placed each year

- 19-13.** Jamison Electronics is forecasting next year's optimal order size. In 2006, annual sales are 200 units, with a carrying cost of \$150 per unit and ordering costs of \$50. However, its 2007 forecast is that annual unit sales will increase by 25 percent and that both ordering and carrying costs will increase by 10 percent. What will their optimal order size be for 2007, if these numbers are correct?
- 19-14.** Mr. Danny Fisher's firm uses the credit scoring sheet in Figure 19-4 to evaluate the creditworthiness of its customers. An applicant missed a loan payment three and a half years back, has been in business for six years, has a net income of \$143,000, a net worth of \$1.5 million, a market value of \$550,000 in tangible assets, and a business growth rate of 14 percent. Would Mr. Fisher approve credit to the applicant?
- 19-15.** Kierna Jesup is the financial manager for Rummer International. She determines which customers are extended credit and how much. The following is a sample-scoring sheet that her company uses to grant credit:

 **Economic Order Quantity**

 **Credit Scoring**

 **Credit Scoring**



Criteria	Points	Score
Length of time since last delinquent payment:		_____
Greater than 2.5 years	4	
2–2.5 years	3	
1.5–2 years	2	
1–1.5 years	1	
Less than 1 year	0	
Length of Time in Business		_____
Greater than 5 years	4	
4–5 years	3	
3–4 years	2	
2–3 years	1	
Less than 2 years	0	
Net Income		_____
Greater than \$100,000	4	
\$75,000–\$100,000	3	
\$50,000–\$75,000	2	
\$25,000–\$50,000	1	
Less than \$25,000	0	

### Approved with a score above 8

*Companies will receive the following credit with a score of*

*8 = 10% total assets*

*9 = 20% total assets*

*10 = 30% total assets*

*11 = 40% total assets*

*12 = 50% total assets*



TWI has sent in an application for credit. It has been in business since 1992 and has never had a late payment. In 2006, its assets were \$1.2 million, EBT was \$100,000, and its tax rate was 40 percent. Will Kierna approve TWI for credit? If so, for how much?

### Effect of Change in Inventory Policy



- 19-16.** Mr. Homer Smith is the vice president of sales for Sunrise Corporation, which buys and sells mobile homes. He is sure that increasing the number of homes on display will cause sales to increase. He thinks that an increase in inventory effective January 1, 2007, from the present level of 60 units to 100 units will boost sales from 350 units per year to 450 units per year. Assume ordering cost to be \$200 per order, carrying cost to be \$600 per unit per year, unit sales price to be \$10,000, unit purchase price to be \$8,000, and applicable income tax rate to be 40 percent. Also assume that any increase in the current assets will be financed by short-term notes at an interest rate of 7 percent, long-term interest rate is 10 percent, cost of capital for Sunrise is 11 percent, cost of goods sold is 80 percent of sales, and other operating expenses is \$100,000 under the old policy. The *pro forma* balance sheet items of the company under the old policy would be as follows:

Cash and Securities	\$ 55,000	Accounts Payable	\$ 100,000
Accounts Receivable	105,000	Notes Payable	95,000
Plant and Equipment	100,000	Long-Term Debt	65,000
Common Stock	60,000	Capital in Excess of Par	220,000
Retained Earnings	200,000		

Also assume that the cost of goods sold and other operating expenses in the income statement and all current asset and current liability items vary directly with sales.

- Calculate the EOQ, number of orders issued per year, and inventory cost.
- Develop pro forma income statements and balance sheets under the old and the new policies.
- Calculate the incremental cash flows for 2003 and the subsequent years.
- Advise Mr. Smith if he should adopt the new policy.

### Effect of Change in Inventory Policy



- 19-17.** Use the same information given in problem 19-16, except that Ms. Judy Benjamin, the general manager of sales for Sunrise, thinks that increasing the inventory level from 60 to 90 will increase sales from 350 to 390 units per year. With other assumptions remaining the same as in problem 19-16, evaluate this change in the inventory policy.

- 19-18.** Ms. Terry McKay is the vice president of sales for Windermere Corporation, which sells hot air balloons. She is sure that increasing the number of balloons on display will cause sales to increase. She thinks that an increase in inventory effective January 1, 2007, from the present level will boost sales to higher levels in 2007 as shown:

 **Comprehensive Problem**



<b>Inventory Level (Units)</b>		<b>Sales (Units)</b>
Present	70	340
Future (2007)	(1) 80	375
	(2) 90	390
	(3) 100	400

Assume ordering costs are \$160 per order, carrying costs are \$400 per unit per year, unit sales price is \$16,000, unit purchase price is \$12,800, and applicable income tax rate is 40 percent. Also assume that any increase in the current assets will be financed by short-term notes at an interest rate of 7 percent, the long-term interest rate is 11 percent, cost of capital for Windermere is 13 percent, cost of goods sold is 80 percent of sales, and other operating expenses are \$130,000 under the present policy. The *pro forma* balance sheet items of the company under the present policy would be as follows:

Cash and Securities	\$ 65,000	Accounts Payable	\$ 110,000
Accounts Receivable	114,000	Notes Payable	95,000
Plant and Equipment	113,000	Long-Term Debt	65,000
Common Stock	80,000	Capital in Excess of Par	320,000
Retained Earnings	518,000		

Also assume that the cost of goods sold and other operating expenses in the income statement and all current account items in the balance sheet vary directly with sales.

Find out for Ms. McKay what level of inventory maximizes value of the firm by doing the following and comparing the net present values of the cash flows associated with each level of inventory:

- Calculate the EOQ, number of orders issued per year, and inventory cost.
- Develop *pro forma* income statements and balance sheets under the present and the future policies.
- Calculate the incremental cash flows for 2007 and the subsequent years.
- Advise Ms. McKay whether she should change the present inventory policy. If so, which inventory level should she adopt?

# Campfire queen Cycling champion Sentimental geologist\*

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## Answers to Self-Test

ST-1.

### Selected Financial Data for Cash & Carry, Inc. (in 000's)

	Prior to Granting Credit	After Granting Credit
Cash	\$ 100	\$ 50
Accounts Receivable	0	20
Total Current Assets	\$ 100	\$ 250
Current Liabilities	\$ 50	\$ 300
Total Equity	\$2,000	\$2,000
Sales	\$2,500	\$2,750
Expenses	2,300	2,415
Net Income for the Year	<u>\$ 200</u>	<u>\$ 335</u>
Current Ratio	$\$100/\$50 = 2.0$	$\$250/\$300 = .833$
Return on Equity	$\$200/\$2,000 = .10$	$\$335/\$2,000 = .1675$

ST-2. Per Equation 19-1, the EOQ model:

$$\begin{aligned}
 \text{EOQ} &= \sqrt{\frac{2 \text{ ¥ } 100,000 \text{ ¥ } 30}{60}} \\
 &= \sqrt{100,000} \\
 &= 316.228 \text{ (round to 316)}
 \end{aligned}$$

ST-3. Use the three-step process to compute the NPV of raising the average inventory to 60 cars:

*Step 1: Create pro forma financial statements for the new inventory policy:*

### Dealin' Dan's Cream Puff Used Cars Inventory Analysis

#### Income Statements

	Current Inventory Policy	New Inventory Policy	Remarks
Sales	\$ 1,200,000	\$ 1,440,000	Unit sales × price each, from assumptions
Cost of Goods Sold	1,000,000	1,200,000	Unit sales × cost each, from assumptions
Gross Profit	200,000	240,000	
Inventory Costs	18,200	32,400	See Note 1
Other Operating Expenses	85,000	102,000	Increase in proportion with sales
Operating Income	96,800	105,600	
Interest Expense	11,040	12,528	ST & LT Debt × Costs of Debt
Before-Tax Income	85,760	93,072	
Income Taxes (rate = 40%)	34,304	37,229	
Net Income	<u>\$ 51,456</u>	<u>\$ 55,843</u>	

**Balance Sheets, as of Dec. 31**

	<b>Current Inventory Policy</b>	<b>New Inventory Policy</b>	<b>Remarks</b>
<b>Assets</b>			
Current Assets:			
Cash and Securities	\$ 47,000	\$ 56,400	Change in proportion with sales
Accounts Receivable	63,000	75,600	Change in proportion with sales
Inventory	<u>160,000</u>	<u>300,000</u>	Average inventory × cost each, from assumptions
Total Current Assets	270,000	432,000	
Prop, Plant, and Equip, Net	<u>72,000</u>	<u>72,000</u>	No change
Total Assets	<u><u>\$ 342,000</u></u>	<u><u>\$ 504,000</u></u>	
<b>Liabilities and Equity</b>			
Current Liabilities:			
Accounts Payable	\$ 50,000	\$ 60,000	Change in proportion with sales
Notes Payable	<u>74,000</u>	<u>88,800</u>	Change in proportion with sales
Total Current Liabilities	124,000	148,800	
Long-Term Debt	<u>45,000</u>	<u>45,000</u>	No change
Total Liabilities	169,000	193,800	
Common Stock	35,000	35,000	No change
Capital in Excess of Par	34,000	34,000	No change
Retained Earnings	<u>104,000</u>	<u>108,387</u>	Old RE + net income change
Total Stockholders' Equity	173,000	177,387	
Total Liabilities and Equity	<u><u>\$ 342,000</u></u>	<u><u>\$ 371,187</u></u>	
Additional Funds Needed		132,813	Obtained from external sources
		<u><u>\$ 504,000</u></u>	

Note 1: The new total inventory costs were computed as follows:

$$\text{New Order Quantity per the EOQ} = \sqrt{\frac{2 \times 240 \times 100}{500}}$$

$$= 9.8 \text{ (round to 10)}$$

Number of orders this year =  $24/10 = 2.4$

New total ordering cost =  $2.4 \times \$100 = \$240$

New average inventory level = 60

New total carrying cost =  $60 \times \$500 = \$30,000$

New total inventory cost =  $\$240 + \$30,000 = \underline{\underline{\$30,240}}$



*Step 2:* Compute the incremental cash flows:

**Incremental Cash Flows Associated with Changing  
Cream Puff Used Cars Inventory Level from 32 Cars to 60 Cars**

1. Incremental Cash Outflows at Time Zero ( $t_0$ ):		
Additional Funds Needed from the Projected Balance Sheet	\$ 132,813	
2. Incremental Cash Flows Occurring in the Future		
Incremental Cash Inflows:		
Increase in Sales	\$ 240,000	
Incremental Cash Outflows:		
Increase in Cost of Goods Sold	\$ 200,000	
Increase in Inventory Costs	14,200	
Increase in Other Operating Expenses	17,000	
Increase in Interest Expense	1,488	
Increase in Taxes	2,925	
Total Incremental Cash Outflows:	\$ 235,613	
Net Incremental Cash Flows Occurring from Time $t_1$ through Infinity:	\$4,387 per year	

*Step 3:* Compute the NPV of the inventory policy change:

PV of the net cash inflows occurring from time  $t_1$  through infinity (\$4,387 per year) using Equation 8-5:

$$\begin{aligned}
 PVP &= PMT \times \frac{\$1}{\$.10} \\
 &= \$4,387 \times \frac{\$1}{\$.10} \\
 &= \$43,870
 \end{aligned}$$

Subtract the PV of the net cash outflows at  $t_0$  (\$132,813) to obtain the NPV of the inventory policy change:

$$\begin{aligned}
 NPV &= \$43,870 - \$132,813 \\
 &= (\$88,943)
 \end{aligned}$$

Because the NPV is negative, the inventory change proposal should be rejected.

**ST-4.** The applicant's completed credit scoring worksheet from Figure 19-4 is shown next.

<b>Credit Scoring Worksheet for</b> _____		<b>(applicant)</b>
<b>Criteria</b>		<b>Score</b>
1. Length of time since missing a payment on any loan		4
More than four years	4 points	
Three to four years	3 points	
Two to three years	2 points	
One to two years	1 point	
Less than one year	0 points	
2. Length of time in business		2
More than four years	4 points	
Three to four years	3 points	
Two to three years	2 points	
One to two years	1 point	
Less than one year	0 points	
3. Net income		2
More than \$200,000	4 points	
100,000 to \$200,000	3 points	
\$50,000 to \$100,000	2 points	
\$25,000 to \$50,000	1 point	
Less than \$25,000	0 points	
4. Net worth		1
More than \$1,000,000	4 points	
\$500,000 to \$1,000,000	3 points	
\$100,000 to \$500,000	2 points	
\$50,000 to \$100,000	1 point	
Less than \$50,000	0 points	
5. Market value of tangible assets		2
More than \$1,000,000	4 points	
\$500,000 to \$1,000,000	3 points	
\$100,000 to \$500,000	2 points	
\$50,000 to \$100,000	1 point	
Less than \$50,000	0 points	
6. Expected business growth in next five years		2
More than 20 percent	4 points	
15 to 20 percent	3 points	
10 to 15 percent	2 points	
5 to 10 percent	1 point	
Less than 5 percent	0 points	
	Total Score:	13

**Approved for credit if score = 12 or more**  
**Result for applicant: Approved**

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