6. Inventory types. We described the different inventory types and how they differ in terms of liquidity and demand.

7. Inventory costs. The two basic inventory costs are carrying and restocking costs; we discussed how inventory management involves a trade-off between these two costs.

8. Inventory management techniques. We described the ABC approach and the EOQ model approach to inventory management. We also briefly touched on materials requirements planning, MRP, and just-in-time, or JIT, inventory management.

Chapter Review and Self-Test Problems

21.1 **Credit Policy** The Cold Fusion Corp. (manufacturer of the Mr. Fusion home power plant) is considering a new credit policy. The current policy is cash only. The new policy would involve extending credit for one period. Based on the following information, determine if a switch is advisable. The interest rate is 2.0 percent per period.

	Current Policy	New Policy
Price per unit	$ 175	$ 175
Cost per unit	$ 130	$ 130
Sales per period in units	1,000	1,100

21.2 **Credit Where Credit Is Due** You are trying to decide whether or not to extend credit to a particular customer. Your variable cost is $15 per unit; the selling price is $22. This customer wants to buy 1,000 units today and pay in 30 days. You think there is a 15 percent chance of default. The required return is 3 percent per 30 days. Should you extend credit? Assume that this is a one-time sale and that the customer will not buy if credit is not extended.

21.3 **The EOQ** Annondale Manufacturing starts each period with 10,000 "Long John" golf clubs in stock. This stock is depleted each month and reordered. If the carrying cost per golf club is $1, and the fixed order cost is $5, is Annondale following an economically advisable strategy?

Answers to Chapter Review and Self-Test Problems

21.1 If the switch is made, an extra 100 units per period will be sold at a gross profit of $175 − 130 = $45 each. The total benefit is thus $45 × 100 = $4,500 per period. At 2.0 percent per period forever, the PV is $4,500/.02 = $225,000.

The cost of the switch is equal to this period's revenue of $175 × 1,000 units = $175,000 plus the cost of producing the extra 100 units, 100 × $130 = $13,000. The total cost is thus $188,000, and the NPV is $225,000 − 188,000 = $37,000. The switch should be made.

21.2 If the customer pays in 30 days, then you will collect $22 × 1,000 = $22,000. There's only an 85 percent chance of collecting this; so you expect to get $22,000 × .85 = $18,700 in 30 days. The present value of this is $18,700/1.03 = $18,155.34. Your cost is $15 × 1,000 = $15,000; so the NPV is $18,155.34 − 15,000 = $3,155.34. Credit should be extended.

21.3 We can answer by first calculating Annondale's carrying and restocking costs. The average inventory is 5,000 clubs, and, because the carrying costs are $1 per club, total carrying costs are $5,000. Annondale restocks every month at a fixed order cost of $5, so the total restocking costs are $60. What we see is that carrying costs are large relative to reorder costs, so Annondale is carrying too much inventory.

To determine the optimal inventory policy, we can use the EOQ model. Because Annondale orders 10,000 golf clubs 12 times per year, total needs (T) are 120,000 golf clubs. The fixed order cost is $5, and the carrying cost per unit (CC) is $1. The EOQ is therefore:

$$
\begin{aligned}
EOQ &= \sqrt{\frac{2T \times F}{CC}} \\
&= \sqrt{\frac{(2 \times 120{,}000) \times \$5}{1}} \\
&= \sqrt{1{,}200{,}000} \\
&= 1{,}095.45 \text{ units}
\end{aligned}
$$

We can check this by noting that the average inventory is about 550 clubs, so the carrying cost is $550. Annondale will have to reorder $120{,}000/1{,}095.45 = 109.54 \approx 110$ times. The fixed order cost is $5, so the total restocking cost is also $550.

Concepts Review and Critical Thinking Questions

1. **Credit Instruments** Describe each of the following:
   a. Sight draft
   b. Time draft
   c. Banker's acceptance
   d. Promissory note
   e. Trade acceptance
2. **Trade Credit Forms** In what form is trade credit most commonly offered? What is the credit instrument in this case?
3. **Receivables Costs** What are the costs associated with carrying receivables? What are the costs associated with not granting credit? What do we call the sum of the costs for different levels of receivables?
4. **Five *C*s of Credit** What are the five Cs of credit? Explain why each is important.
5. **Credit Period Length** What are some of the factors that determine the length of the credit period? Why is the length of the buyer's operating cycle often considered an upper bound on the length of the credit period?
6. **Credit Period Length** In each of the following pairings, indicate which firm would probably have a longer credit period and explain your reasoning.
   a. Firm A sells a miracle cure for baldness; Firm B sells toupees.
   b. Firm A specializes in products for landlords; Firm B specializes in products for renters.
   c. Firm A sells to customers with an inventory turnover of 10 times; Firm B sells to customers with an inventory turnover of 20 times.
   d. Firm A sells fresh fruit; Firm B sells canned fruit.
   e. Firm A sells and installs carpeting; Firm B sells rugs.

7.   **Inventory Types**   What are the different inventory types? How do the types differ? Why are some types said to have dependent demand whereas other types are said to have independent demand?

8.   **Just-in-Time Inventory**   If a company moves to a JIT inventory management system, what will happen to inventory turnover? What will happen to total asset turnover? What will happen to return on equity, ROE? (Hint: remember the Du Pont equation from Chapter 3.)

9.   **Inventory Costs**   If a company's inventory carrying costs are $5 million per year and its fixed order costs are $8 million per year, do you think the firm keeps too much inventory on hand or too little? Why?

10.   **Inventory Period**   At least part of Dell Computer's corporate profits can be traced to its inventory management. In 1998, Compaq, IBM, and Hewlett-Packard all attempted to emulate Dell's business model, but their inventory targets were about four weeks. That hardly makes them competitive with Dell, which maintained an inventory of just eight days. With the price of PC components dropping at the rate of 1 percent per week, Dell clearly had a competitive advantage. Why would you say that it is to Dell's advantage to have such a short inventory period? If doing this is so valuable, why don't all other PC manufacturers simply switch to Dell's approach?

Questions and Problems

Basic
(Questions 1–12)

1.   **Cash Discounts**   You place an order for 200 units of inventory at a unit price of $60. The supplier offers terms of 3/10, net 30.
      a.   How long do you have to pay before the account is overdue? If you take the full period, how much should you remit?
      b.   What is the discount being offered? How quickly must you pay to get the discount? If you do take the discount, how much should you remit?
      c.   If you don't take the discount, how much interest are you paying implicitly? How many days' credit are you receiving?

2.   **Size of Accounts Receivable**   The Graham Corporation has annual sales of $90 million. The average collection period is 70 days. What is Graham's average investment in accounts receivable as shown on the balance sheet?

3.   **ACP and Accounts Receivable**   Kyoto Joe, Inc., sells earnings forecasts for Japanese securities. Its credit terms are 3/10, net 30. Based on experience, 60 percent of all customers will take the discount.
      a.   What is the average collection period for Kyoto Joe?
      b.   If Kyoto Joe sells 1,200 forecasts every month at a price of $2,200 each, what is its average balance sheet amount in accounts receivable?

4.   **Size of Accounts Receivable**   Vitale, Baby!, Inc., has weekly credit sales of $20,000, and the average collection period is 35 days. The cost of production is 80 percent of the selling price. What is Vitale's average accounts receivable figure?

5.   **Terms of Sale**   A firm offers terms of 2/8, net 45. What effective annual interest rate does the firm earn when a customer does not take the discount? Without doing any calculations, explain what will happen to this effective rate if:
      a.   The discount is changed to 3 percent.
      b.   The credit period is increased to 60 days.
      c.   The discount period is increased to 15 days.

6. **ACP and Receivables Turnover** Ya'll-Who, Inc., has an average collection period of 61 days. Its average daily investment in receivables is $40,000. What are annual credit sales? What is the receivables turnover?

7. **Size of Accounts Receivable** Essence of Skunk Fragrances, Ltd., sells 3,000 units of its perfume collection each year at a price per unit of $400. All sales are on credit with terms of 2/10, net 30. The discount is taken by 50 percent of the customers. What is the amount of the company's accounts receivable? In reaction to sales by its main competitor, Sewage Spray, Essence of Skunk is considering a change in its credit policy to terms of 4/10, net 30 to preserve its market share. How will this change in policy affect accounts receivable?

8. **Size of Accounts Receivable** The Staind Corporation sells on credit terms of net 20. Its accounts are, on average, 12 days past due. If annual credit sales are $6 million, what is the company's balance sheet amount in accounts receivable?

9. **Evaluating Credit Policy** Air Spares is a wholesaler that stocks engine components and test equipment for the commercial aircraft industry. A new customer has placed an order for 10 high-bypass turbine engines, which increase fuel economy. The variable cost is $1.4 million per unit, and the credit price is $1.8 million each. Credit is extended for one period, and based on historical experience, payment for about 1 out of every 200 such orders is never collected. The required return is 3 percent per period.
   a. Assuming that this is a one-time order, should it be filled? The customer will not buy if credit is not extended.
   b. What is the break-even probability of default in part (*a*)?
   c. Suppose that customers who don't default become repeat customers and place the same order every period forever. Further assume that repeat customers never default. Should the order be filled? What is the break-even probability of default?
   d. Describe in general terms why credit terms will be more liberal when repeat orders are a possibility.

10. **Credit Policy Evaluation** Ebbert, Inc., is considering a change in its cash-only sales policy. The new terms of sale would be net one month. Based on the following information, determine if Ebbert should proceed or not. Describe the buildup of receivables in this case. The required return is 1.5 percent per month.

	Current Policy	New Policy
Price per unit	$ 750	$ 750
Cost per unit	$ 400	$ 400
Unit sales per month	1,100	1,220

11. **EOQ** Clapper Manufacturing uses 2,000 switch assemblies per week and then reorders another 2,000. If the relevant carrying cost per switch assembly is $40, and the fixed order cost is $1,100, is Clapper's inventory policy optimal? Why or why not?

12. **EOQ** The Trektronics store begins each week with 170 phasers in stock. This stock is depleted each week and reordered. If the carrying cost per phaser is $45 per year and the fixed order cost is $48, what is the total carrying cost? What is the restocking cost? Should Trektronics increase or decrease its order size? Describe an optimal inventory policy for Trektronics in terms of order size and order frequency.

13.   **EOQ Derivation**   Prove that when carrying costs and restocking costs are as described in the chapter, the EOQ must occur at the point where the carrying costs and restocking costs are equal.

14.   **Credit Policy Evaluation**   The Killarney Corporation is considering a change in its cash-only policy. The new terms would be net one period. Based on the following information, determine if Killarney should proceed or not. The required return is 3 percent per period.

	Current Policy	New Policy
Price per unit	$ 70	$ 75
Cost per unit	$ 40	$ 40
Unit sales per month	3,200	3,500

15.   **Credit Policy Evaluation**   Gorillaz Systems currently has an all-cash credit policy. It is considering making a change in the credit policy by going to terms of net 30 days. Based on the following information, what do you recommend? The required return is 2 percent per month.

|	Current Policy	New Policy
Price per unit	$ 315	$ 320
Cost per unit	$ 240	$ 245
Unit sales per month	3,000	3,100

16.   **Break-Even Quantity**   In Problem 14, what is the break-even quantity for the new credit policy?

17.   **Credit Markup**   In Problem 14, what is the break-even price per unit that should be charged under the new credit policy? Assume that the sales figure under the new policy is 3,300 units and all other values remain the same.

18.   **Credit Markup**   In Problem 15, what is the break-even price per unit under the new credit policy? Assume all other values remain the same.

19.   **Safety Stocks and Order Points**   Saché, Inc., expects to sell 700 of its designer suits every week. The store is open seven days a week and expects to sell the same number of suits every day. The company has an EOQ of 500 suits and a safety stock of 100 suits. Once an order is placed, it takes three days for Saché to get the suits in. How many orders does the company place per year? Assume that it is Monday morning before the store opens, and a shipment of suits has just arrived. When will Saché place its next order?

What's On the Web?

21.1   **Banker's Acceptance Rates**   What are the highest and lowest historical interest rates for banker's acceptances? Go to www.economagic.com and follow the "Interest Rates" link. Find the highest and lowest interest rates for one-, two- and three-month banker's acceptances over the time reported. When did they occur?

Spreadsheet Templates 21–4, 21–7, 21–9, 21–10, 21–11, 21–16, 21–18
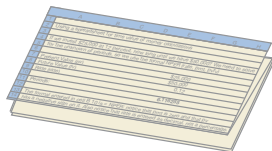
MORE ON CREDIT POLICY ANALYSIS

21A

This appendix takes a closer look at credit policy analysis by investigating some alternative approaches and by examining the effect of cash discounts and the possibility of nonpayment.

Two Alternative Approaches

From our chapter discussion, we know how to analyze the NPV of a proposed credit policy switch. We now discuss two alternative approaches: the one-shot approach and the accounts receivable approach. These are very common means of analysis; our goal is to show that these two and our NPV approach are all the same. Afterwards, we will use whichever of the three is most convenient.

The One-Shot Approach   Looking back at our example for Locust Software (in Section 21.3), we see that if the switch is not made, Locust will have a net cash flow this month of $(P - v)Q = \$29 \times 100 = \$2,900$. If the switch is made, Locust will invest $vQ' = \$20 \times 110 = \$2,200$ this month and will receive $PQ' = \$49 \times 110 = \$5,390$ next month. Suppose we ignore all other months and cash flows and view this as a one-shot investment. Is Locust better off with $2,900 in cash this month, or should Locust invest the $2,200 to get $5,390 next month?

The present value of the $5,390 to be received next month is $\$5,390/1.02 = \$5,284.31$; the cost is $2,200, so the net benefit is $\$5,284.31 - 2,200 = \$3,084.31$. If we compare this to the net cash flow of $2,900 under the current policy, then we see that Locust should switch. The NPV is $\$3,084.31 - 2,900 = \$184.31$.

In effect, Locust can repeat this one-shot investment every month and thereby generate an NPV of $184.31 every month (including the current one). The PV of this series of NPVs is:

Present value = $\$184.31 + 184.31/.02 = \$9,400$

This PV is the same as our answer in Section 21.3.

The Accounts Receivable Approach   Our second approach is the one that is most commonly discussed and is very useful. By extending credit, the firm increases its cash flow through increased gross profits. However, the firm must increase its investment in receivables and bear the carrying cost of doing so. The accounts receivable approach focuses on the expense of the incremental investment in receivables as compared to the increased gross profit.

As we have seen, the monthly benefit from extending credit is given by the gross profit per unit $(P - v)$ multiplied by the increase in quantity sold $(Q' - Q)$. For Locust, this benefit is $(\$49 - 20) \times (110 - 100) = \$290$ per month.

If Locust makes the switch, then receivables will rise from zero (because there are currently no credit sales) to PQ', so Locust must invest in receivables. The necessary investment has two components. The first part is what Locust would have collected under the old policy (PQ). Locust must carry this amount in receivables each month because collections are delayed by 30 days.

The second part is related to the increase in receivables that results from the increase in sales. Because unit sales increase from Q to Q', Locust must produce the latter quantity today even though it won't collect for 30 days. The actual cost to Locust of

producing the extra quantity is equal to v per unit, so the investment necessary to provide the extra quantity sold is $v(Q' - Q)$.

In sum, if Locust switches, its investment in receivables will be equal to the $P \times Q$ in revenues plus an additional $v(Q' - Q)$ in production costs:

Incremental investment in receivables $= PQ + v(Q' - Q)$

The required return on this investment (the carrying cost of the receivables) is R per month; so, for Locust, the accounts receivable carrying cost is:

$$
\begin{aligned}
\text{Carrying cost} &= [PQ + v(Q' - Q)] \times R \\
&= (\$4{,}900 + 200) \times .02 \\
&= \$102 \text{ per month}
\end{aligned}
$$

Because the monthly benefit is $290 and the cost per month is only $102, the net benefit is $290 - 102 = $188 per month. Locust earns this $188 every month, so the PV of the switch is:

$$
\begin{aligned}
\text{Present value} &= \$188/.02 \\
&= \$9{,}400
\end{aligned}
$$

Again, this is the same figure we previously calculated.

One of the advantages of looking at the accounts receivable approach is that it helps us interpret our earlier NPV calculation. As we have seen, the investment in receivables necessary to make the switch is $PQ + v(Q' - Q)$. If you take a look back at our original NPV calculation, you'll see that this is precisely what we had as the cost to Locust of making the switch. Our earlier NPV calculation thus amounts to a comparison of the incremental investment in receivables to the PV of the increased future cash flows.

There is one final thing to notice. The increase in accounts receivable is PQ', and this amount corresponds to the amount of receivables shown on the balance sheet. However, the incremental investment in receivables is $PQ + v(Q' - Q)$. It is straightforward to verify that this second quantity is smaller by $(P - v)(Q' - Q)$. This difference is the gross profit on the new sales, which Locust does not actually have to put up in order to switch credit policies.

Put another way, whenever we extend credit to a new customer who would not otherwise buy, all we risk is our cost, not the full sales price. This is the same issue that we discussed in Section 21.5.

EXAMPLE 21A.1

Extra Credit

Looking back at Locust Software, determine the NPV of the switch if the quantity sold is projected to increase by only 5 units instead of 10. What will be the investment in receivables? What is the carrying cost? What is the monthly net benefit from switching?

If the switch is made, Locust gives up $P \times Q = \$4{,}900$ today. An extra five units have to be produced at a cost of $20 each, so the cost of switching is $\$4{,}900 + 5 \times 20 = \$5{,}000$. The benefit each month of selling the extra five units is $5 \times (\$49 - 20) = \$145$. The NPV of the switch is $-\$5{,}000 + 145/.02 = \$2{,}250$, so the switch is still profitable.

The $5,000 cost of switching can be interpreted as the investment in receivables. At 2 percent per month, the carrying cost is $.02 \times \$5{,}000 = \$100$. Because the benefit each month is $145, the net benefit from switching is $45 per month ($145 - 100$). Notice that the PV of $45 per month forever at 2 percent is $\$45/.02 = \$2{,}250$, as we calculated.

Discounts and Default Risk

We now take a look at cash discounts, default risk, and the relationship between the two. To get started, we define the following:

π = Percentage of credit sales that go uncollected

d = Percentage discount allowed for cash customers

P' = Credit price (the no-discount price)

Notice that the cash price, P, is equal to the credit price, P', multiplied by $(1 - d)$: $P = P'(1 - d)$, or, equivalently, $P' = P/(1 - d)$.

The situation at Locust is now a little more complicated. If a switch is made from the current policy of no credit, then the benefit from the switch will come from both the higher price (P') and, potentially, the increased quantity sold (Q').

Furthermore, in our previous case, it was reasonable to assume that all customers took the credit, because it was free. Now, not all customers will take the credit because a discount is offered. In addition, of the customers who do take the credit offered, a certain percentage (π) will not pay.

To simplify the discussion that follows, we will assume that the quantity sold (Q) is not affected by the switch. This assumption isn't crucial, but it does cut down on the work (see Problem 5 at the end of the appendix). We will also assume that all customers take the credit terms. This assumption isn't crucial either. It actually doesn't matter what percentage of the customers take the offered credit.[4]

NPV of the Credit Decision   Currently, Locust sells Q units at a price of P = \$49. Locust is considering a new policy that involves 30 days' credit and an increase in price to P' = \$50 on credit sales. The cash price will remain at \$49, so Locust is effectively allowing a discount of ($50 - 49)/50 = 2\%$ for cash.

What is the NPV to Locust of extending credit? To answer, note that Locust is already receiving $(P - v)Q$ every month. With the new, higher price, this will rise to $(P' - v)Q$, assuming that everybody pays. However, because π percent of sales will not be collected, Locust will only collect on $(1 - \pi) \times P'Q$; so net receipts will be $[(1 - \pi)P' - v] \times Q$.

The net effect of the switch for Locust is thus the difference between the cash flows under the new policy and those under the old policy:

Net incremental cash flow = $[(1 - \pi)P' - v] \times Q - (P - v) \times Q$

Because $P = P' \times (1 - d)$, this simplifies to:[5]

Net incremental cash flow = $P'Q \times (d - \pi)$ **[21A.1]**

---

[4]The reason is that all customers are offered the same terms. If the NPV of offering credit is \$100, assuming that all customers switch, then it will be \$50 if only 50 percent of our customers switch. The hidden assumption is that the default rate is a constant percentage of credit sales.

[5]To see this, note that the net incremental cash flow is:

Net incremental cash flow = $[(1 - \pi)P' - v] \times Q - (P - v) \times Q$

$\qquad\qquad\qquad\qquad\quad = [(1 - \pi)P' - P] \times Q$

Because $P = P' \times (1 - d)$, this can be written as:

Net incremental cash flow = $[(1 - \pi)P' - (1 - d)P'] \times Q$

$\qquad\qquad\qquad\qquad\quad = P'Q \times (d - \pi)$

If Locust does make the switch, then the cost in terms of the investment in receivables is just $P \times Q$ since $Q = Q'$. The NPV of the switch is thus:

$$\text{NPV} = -PQ + P'Q \times (d - \pi)/R \qquad \qquad \text{[21A.2]}$$

For example, suppose that, based on industry experience, the percentage of "deadbeats" (π) is expected to be 1 percent. What is the NPV of changing credit terms for Locust? We can plug in the relevant numbers as follows:

$$
\begin{aligned}
\text{NPV} &= -PQ + P'Q \times (d - \pi)/R \\
&= -\$49 \times 100 + 50 \times 100 \times (.02 - .01)/.02 \\
&= -\$2,400
\end{aligned}
$$

Because the NPV of the change is negative, Locust shouldn't switch.

In our expression for NPV, the key elements are the cash discount percentage (d) and the default rate (π). One thing we see immediately is that, if the percentage of sales that goes uncollected exceeds the discount percentage, then $d - \pi$ is negative. Obviously, the NPV of the switch would then be negative as well. More generally, our result tells us that the decision to grant credit here is a trade-off between getting a higher price, thereby increasing sales revenues, and not collecting on some fraction of those sales.

With this in mind, note that $P'Q \times (d - \pi)$ is the increase in sales less the portion of that increase that won't be collected. This is the incremental cash inflow from the switch in credit policy. If d is 5 percent and π is 2 percent, for example, then, loosely speaking, revenues are increasing by 5 percent because of the higher price, but collections only rise by 3 percent because the default rate is 2 percent. Unless $d > \pi$, we will actually have a decrease in cash inflows from the switch.

A Break-Even Application Because the discount percentage (d) is controlled by the firm, the key unknown in this case is the default rate (π). What is the break-even default rate for Locust Software?

We can answer by finding the default rate that makes the NPV equal to zero:

$$\text{NPV} = 0 = -PQ + P'Q \times (d - \pi)/R$$

Rearranging things a bit, we have:

$$
\begin{aligned}
PR &= P'(d - \pi) \\
\pi &= d - R \times (1 - d)
\end{aligned}
$$

For Locust, the break-even default rate works out to be:

$$
\begin{aligned}
\pi &= .02 - .02 \times (.98) \\
&= .0004 \\
&= .04\%
\end{aligned}
$$

This is quite small because the implicit interest rate Locust will be charging its credit customers (2 percent discount interest per month, or about $.02/.98 = 2.0408\%$) is only slightly greater than the required return of 2 percent per month. As a result, there's not much room for defaults if the switch is going to make sense.

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CONCEPT QUESTIONS

21A.1a What is the incremental investment that a firm must make in receivables if credit is extended?

21A.1b Describe the trade-off between the default rate and the cash discount.

</div>

Appendix Review and Self-Test Problems

21A.1 Credit Policy   Rework Chapter Review and Self-Test Problem 21.1 using the one-shot and accounts receivable approaches. As before, the required return is 2.0 percent per period, and there will be no defaults. The basic information is:

	Current Policy	New Policy
Price per unit	$ 175	$ 175
Cost per unit	$ 130	$ 130
Sales per period in units	1,000	1,100

21A.2 Discounts and Default Risk   The De Long Corporation is considering a change in credit policy. The current policy is cash only, and sales per period are 2,000 units at a price of $110. If credit is offered, the new price will be $120 per unit and the credit will be extended for one period. Unit sales are not expected to change, and all customers are expected to take the credit. De Long anticipates that 4 percent of its customers will default. If the required return is 2 percent per period, is the change a good idea? What if only half the customers take the offered credit?

Answers to Appendix Review and Self-Test Problems

21A.1   As we saw earlier, if the switch is made, an extra 100 units per period will be sold at a gross profit of $175 − 130 = $45 each. The total benefit is thus $45 × 100 = $4,500 per period. At 2.0 percent per period forever, the PV is $4,500/.02 = $225,000.

   The cost of the switch is equal to this period's revenue of $175 × 1,000 units = $175,000 plus the cost of producing the extra 100 units, 100 × $130 = $13,000. The total cost is thus $188,000, and the NPV is $225,000 − 188,000 = $37,000. The switch should be made.

   For the accounts receivable approach, we interpret the $188,000 cost as the investment in receivables. At 2.0 percent per period, the carrying cost is $188,000 × .02 = $3,760 per period. The benefit per period we calculated as $4,500; so the net gain per period is $4,500 − 3,760 = $740. At 2.0 percent per period, the PV of this is $740/.02 = $37,000.

   Finally, for the one-shot approach, if credit is not granted, the firm will generate ($175 − 130) × 1,000 = $45,000 this period. If credit is extended, the firm will invest $130 × 1,100 = $143,000 today and receive $175 × 1,100 = $192,500 in one period. The NPV of this second option is $192,500/1.02 − 143,000 = $45,725.49. The firm is $45,725.49 − 45,000 = $725.49 better off today and in each future period because of granting credit. The PV of this stream is $725.49 + 725.49/.02 = $37,000 (allowing for a rounding error).

21A.2   The costs per period are the same whether or not credit is offered; so we can ignore the production costs. The firm currently has sales of, and collects, $110 × 2,000 = $220,000 per period. If credit is offered, sales will rise to $120 × 2,000 = $240,000.

   Defaults will be 4 percent of sales, so the cash inflow under the new policy will be .96 × $240,000 = $230,400. This amounts to an extra $10,400 every period. At 2 percent per period, the PV is $10,400/.02 = $520,000. If the switch is

made, De Long will give up this month's revenues of $220,000; so the NPV of the switch is $300,000. If only half of the customers take the credit, then the NPV is half as large: $150,000. So, regardless of what percentage of customers take the credit, the NPV is positive. Thus, the change is a good idea.

Questions and Problems

1. **Evaluating Credit Policy**   Bismark Co. is in the process of considering a change in its terms of sale. The current policy is cash only; the new policy will involve one period's credit. Sales are 60,000 units per period at a price of $500 per unit. If credit is offered, the new price will be $540. Unit sales are not expected to change, and all customers are expected to take the credit. Bismark estimates that 4 percent of credit sales will be uncollectible. If the required return is 3 percent per period, is the change a good idea?

2. **Credit Policy Evaluation**   The Air Walker Company sells 2,000 pairs of running shoes per month at a cash price of $105 per pair. The firm is considering a new policy that involves 45 days' credit and an increase in price to $108.25 per pair on credit sales. The cash price will remain at $105, and the new policy is not expected to affect the quantity sold. The discount period will be 15 days. The required return is 1 percent per month.
   a. How would the new credit terms be quoted?
   b. What is the investment in receivables required under the new policy?
   c. Explain why the variable cost of manufacturing the shoes is not relevant here.
   d. If the default rate is anticipated to be 10 percent, should the switch be made? What is the break-even credit price? The break-even cash discount?

3. **Credit Analysis**   Silicon Wafers, Inc. (SWI), is debating whether or not to extend credit to a particular customer. SWI's products, primarily used in the manufacture of semiconductors, currently sell for $1,800 per unit. The variable cost is $1,100 per unit. The order under consideration is for 15 units today; payment is promised in 30 days.
   a. If there is a 20 percent chance of default, should SWI fill the order? The required return is 2 percent per month. This is a one-time sale, and the customer will not buy if credit is not extended.
   b. What is the break-even probability in part (a)?
   c. This part is a little harder. In general terms, how do you think your answer to part (a) will be affected if the customer will purchase the merchandise for cash if the credit is refused? The cash price is $1,550 per unit.

4. **Credit Analysis**   Consider the following information on two alternative credit strategies:

	Refuse Credit	Grant Credit
Price per unit	$ 42	$ 45
Cost per unit	$ 22	$ 25
Quantity sold per quarter	3,300	3,500
Probability of payment	1.0	.90

The higher cost per unit reflects the expense associated with credit orders, and the higher price per unit reflects the existence of a cash discount. The credit period will be 90 days, and the cost of debt is .75 percent per month.

    a. Based on this information, should credit be granted?

    b. In part (*a*), what does the credit price per unit have to be to break even?

    c. In part (*a*), suppose we can obtain a credit report for $2 per customer. Assuming that each customer buys one unit and that the credit report correctly identifies all customers who will not pay, should credit be extended?

5.   **NPV of Credit Policy Switch**   Suppose a corporation currently sells Q units per month for a cash-only price of P. Under a new credit policy that allows one month's credit, the quantity sold will be Q' and the price per unit will be P'. Defaults will be π percent of credit sales. The variable cost is v per unit and is not expected to change. The percentage of customers who will take the credit is α, and the required return is R per month. What is the NPV of the decision to switch? Interpret the various parts of your answer.