
ASSESSING LIQUIDITY AND OPERATIONAL EFFICIENCY

A firm that can no longer pay its creditors—its bankers and suppliers—is illiquid and technically bankrupt, a situation that no manager wishes to face. Managers must make decisions that do not endanger their firm's liquidity—a term that refers to the firm's ability to meet its *recurrent* cash obligations towards various creditors. A firm's liquidity is driven by the structure of its balance sheet, namely, by the nature and composition of its assets and the way they are financed.

It is easier to understand and measure a firm's liquidity if its standard balance sheet is restructured to emphasize the concerns of its operating and financial managers rather than those of its accountant and auditors. In this restructured balance sheet, called the *managerial balance sheet*, the firm's investments are classified into three categories: (1) cash and cash-equivalent assets; (2) assets required to support the firm's *operating* activities, such as inventories and trade receivables, less the firm's operating liabilities, such as trade payables; and (3) fixed assets, such as plant and equipment.

To finance these investments, the firm uses a combination of short-term and long-term sources of funds. One way a firm can manage its balance sheet and enhance its liquidity is by using the *matching strategy*. This strategy requires that long-term investments be financed with long-term funds and short-term investments with short-term funds. The matching principle helps explain how a firm's liquidity should be measured and how liquidity is affected by managerial decisions.

This chapter explains the managerial balance sheet and the matching strategy and discusses how liquidity can be measured. New concepts and terms, such as *working capital requirement*, *net short-term financing*, and *net long-term financing*, are introduced, and then we show how they can be combined to construct a reliable measure of a firm's liquidity. Other, more traditional indicators of liquidity, such as the *current ratio* and the *acid test ratio*, are also presented and compared with our suggested measure. To illustrate these concepts, we use OS Distributors, the company whose balance sheets and income statements for the years 1998 to

2000 are described in Chapter 2. After reading this chapter, you should understand:

- How to restructure a standard balance sheet into a managerial balance sheet.
- The meaning of working capital requirement, net long-term financing, net short-term financing, net working capital, current ratio, acid test ratio, and other ratios used to measure, analyze, and manage liquidity.
- How to measure a firm's investment in its operating activities using information drawn from its balance sheet.
- The meaning of interest-rate risk and funding risk.
- How a firm's operating decisions affect the firm's liquidity.
- How to improve a firm's liquidity through better management of the firm's operating cycle.

THE MANAGERIAL BALANCE SHEET

Recall that the purpose of the firm's standard balance sheet is to determine the investment made by the firm's owners—its shareholders—in their firm at a specific date. The investment, called owners' equity, is the difference between the firm's assets and liabilities, where assets are items owned by shareholders and liabilities are debts owed to creditors, suppliers, employees, and other entities. This type of balance sheet, shown in Exhibit 3.1 for OS Distributors, emphasizes the accounting view in determining the owners' investment in the firm.

For managers of a firm's operating activities, the standard balance sheet may not be the most appropriate tool for assessing their contribution to the firm's financial performance. To illustrate this point, consider trade payables. They are correctly recorded in the balance sheet as a liability because they represent cash owed to suppliers. Most operating managers, however, would consider trade payables an account under their full responsibility, much like trade receivables (cash owed by customers) and inventories, both of which are recorded on the asset side of the balance sheet. It makes more managerial sense to associate trade payables with trade receivables and inventories rather than to combine them with other liabilities—such as short-term borrowings and long-term debt—that are primarily the responsibility of the financial manager.

In the following sections, we show how to restructure the standard balance sheet into the **managerial balance sheet**, a variation that we believe provides a more appropriate tool to identify the links between managerial decisions and financial performance. The managerial balance sheet is shown and contrasted with the standard one in Exhibit 3.2. On the left side of the managerial balance sheet, three items are grouped under the heading **invested capital**, which is also referred to as **net assets**. These are cash and cash-equivalent holdings, **working capital** requirement (the difference between the firm's **operating assets** and its **operating liabilities**), and net fixed assets:

$$\begin{aligned}\text{Invested capital} &= \text{Net assets} && (3.1) \\ &= \text{Cash} + \text{Working capital requirement} + \text{Net fixed assets}\end{aligned}$$

EXHIBIT 3.1 OS Distributors' Balance Sheets.

Figures in millions of dollars

	December 31, 1998	December 31, 1999	December 31, 2000
Assets			
• Current assets			
Cash ¹	\$6.0	\$12.0	\$8.0
Accounts receivable	44.0	48.0	56.0
Inventories	52.0	57.0	72.0
Prepaid expenses ²	2.0	2.0	1.0
Total current assets	104.0	119.0	137.0
• Noncurrent assets			
Financial assets and intangibles	0.0	0.0	0.0
Property, plant, and equipment			
Gross value ³	\$90.0	\$90.0	\$93.0
Less: Accumulated depreciation	(34.0)	(39.0)	(40.0)
Total noncurrent assets	56.0	51.0	53.0
Total assets	\$160.0	\$170.0	\$190.0
Liabilities and owners' equity			
• Current liabilities			
Short-term debt	\$15.0	\$22.0	\$23.0
Owed to banks	\$7.0	\$14.0	\$15.0
Current portion of long-term debt	8.0	8.0	8.0
Accounts payable	37.0	40.0	48.0
Accrued expenses ⁴	2.0	4.0	4.0
Total current liabilities	54.0	66.0	75.0
• Noncurrent liabilities			
Long-term debt ⁵	\$42.0	34.0	38.0
Total noncurrent liabilities	42.0	34.0	38.0
• Owners' equity⁶			
	64.0	70.0	77.0
Total liabilities and owners' equity	\$160.0	\$170.0	\$190.0

¹Consists of cash in hand and checking accounts held to facilitate operating activities.²Prepaid expenses is rent paid in advance (when recognized in the income statement, rent is included in selling, general, and administrative expenses).³In 1999, there was no disposal of existing fixed assets or acquisition of new fixed assets. However, during 2000, a warehouse was enlarged at a cost of \$12 million and existing fixed assets, bought for \$9 million in the past, were sold at their net book value of \$2 million.⁴Accrued expenses consist of wages and taxes payable.⁵Long-term debt is repaid at the rate of \$8 million per year. No new long-term debt was incurred during 1999, but during 2000 a mortgage loan was obtained from the bank to finance the extension of a warehouse (see Note 3).⁶During the three years, no new shares were issued and none were repurchased.

EXHIBIT 3.2 The Managerial Balance Sheet Versus the Standard Balance Sheet.**The Managerial Balance Sheet**

Invested Capital or Net Assets	Capital Employed
Cash	Short-term debt
Working capital requirement (WCR) <i>Operating assets less Operating liabilities</i>	Long-term financing <i>Long-term debt plus Owners' equity</i>
Net fixed assets	

The Standard Balance Sheet

Assets	Liabilities and Owners' Equity
Cash	Short-term debt
Operating assets <i>Accounts receivable plus Inventories plus Prepaid expenses</i>	Operating liabilities <i>Accounts payable plus Accrued expenses</i>
Net fixed assets	Long-term financing <i>Long-term debt plus Owners' equity</i>

On the right side of the managerial balance sheet, two items are grouped under the heading **capital employed**. These are short-term debt and long-term financing, the latter consisting of long-term debt and equity capital (as in previous chapters, we use the terms *financing*, *funding*, and *capital* interchangeably):¹

$$\text{Capital employed} = \text{Short-term debt} + \text{Long-term debt} + \text{Equity capital} \quad (3.2)$$

The managerial balance sheet provides a snapshot of the total capital the firm has available at a point in time (the capital employed shown on the right side) and the way that capital is invested in the firm's net assets (the invested capital shown on the left side). The following sections examine the structure of the managerial balance sheet and its relevance to the measurement of the firm's liquidity.

THE THREE COMPONENTS OF A FIRM'S INVESTED CAPITAL

A firm's capital is used to finance investments in (1) cash and cash-equivalent assets; (2) working capital requirement, the difference between operating assets and operating liabilities; and (3) fixed assets, such as property, plant, and equipment. We begin with a brief review of cash and fixed assets and then analyze working capital requirement in more detail.

Cash and Cash-Equivalent Assets

Firms hold cash and cash-equivalent assets (also called **liquid assets**) for at least two reasons: (1) as a precautionary measure to allow the firm to pay its bills promptly and meet unexpected expenses, if any; and (2) to acquire potentially valuable assets on short notice. Also, firms sometimes hold cash because banks require their corporate clients to maintain some **compensating balances** for services they provide to the firm. We use the generic word *cash* to refer not only to cash in hand but also to any cash-equivalent assets.

As shown in Exhibit 3.1, OS Distributors does not hold any cash-equivalent assets, such as marketable securities (securities that can be sold rapidly without a significant loss of value). The firm held \$6 million in cash at the end of 1998, \$12 million at the end of 1999, and \$8 million at the end of 2000. Note 1 explains that this cash was mostly used to facilitate its operating activities. The changes in the firm's cash position between 1998 and 2000 are explained in the next chapter.

Investment in Fixed Assets

Investments in fixed assets include items such as property, plant, and equipment. Their book value is recorded in the balance sheet as net fixed assets, which is

¹Some financial analysts define capital employed as the sum of equity capital and debt (short-term and long-term) minus the amount of cash held by the firm. These analysts implicitly assume that cash is a transitory investment which does not contribute to the firm's recurrent activities, and, as a consequence, should not be accounted for in estimating the amount of capital employed to generate those activities.

their purchase price less accumulated depreciation. Exhibit 3.1 indicates that the book value of OS Distributors' fixed assets was \$56 million in 1998, \$51 million in 1999, and \$53 million in 2000. Decisions regarding the acquisition and disposal of long-term assets are part of the firm's strategic activities, which are analyzed in detail in Chapters 6 through 8. The focus of this and the following two chapters is the firm's operating activities.

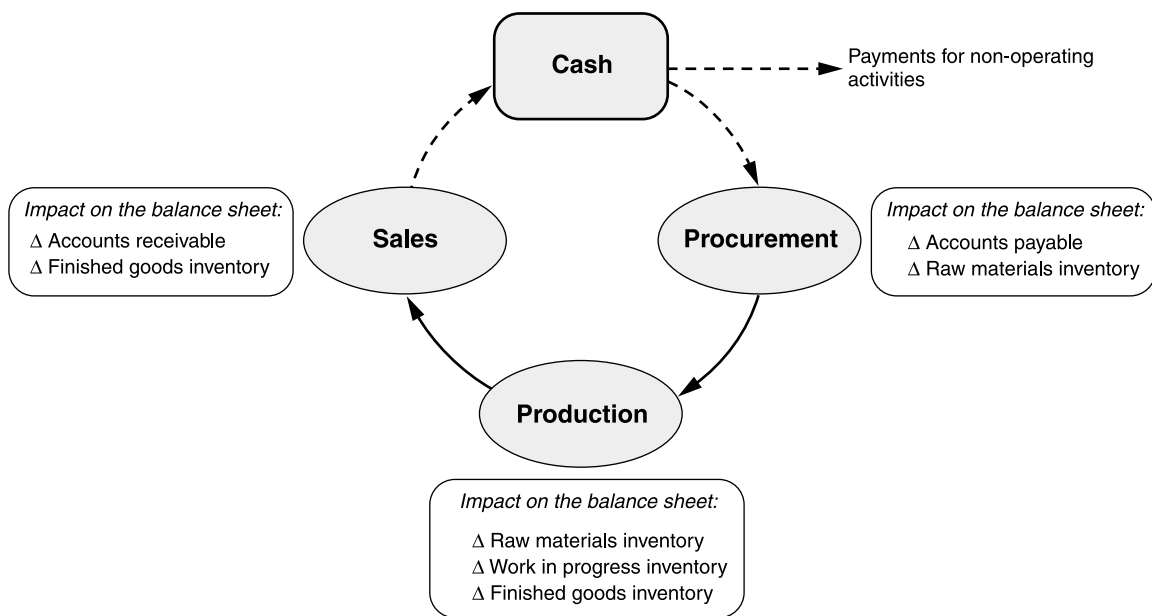
Working Capital Requirement

Fixed assets alone cannot generate sales and profits. The managerial activities required to operate these assets in order to generate sales and profit are referred to as the firm's **operating activities**. These activities require investments in the form of inventories and trade receivables that are generated by the firm's **operating cycle**, described in Exhibit 3.3 for a manufacturing company.

The cycle starts on the right side with *procurement*, the act of acquiring raw materials. It is followed by *production*, during which the raw materials are transformed into finished goods. The cycle continues with the *sales* of these goods, ending when *cash* is collected from customers. The cycle repeats itself as long as the firm's production activity continues.

EXHIBIT 3.3 The Firm's Operating Cycle and Its Impact on the Firm's Balance Sheet.

Δ = change in the balance sheet account



Each stage in the operating cycle affects the firm's balance sheet. Exhibit 3.3 shows the balance sheet accounts that change at each stage of the cycle. For example, when the firm buys raw materials (procurement), both inventories and accounts payable increase by the same amount—the former to reflect the purchase of the raw materials and the latter to acknowledge a debt to the firm's suppliers.

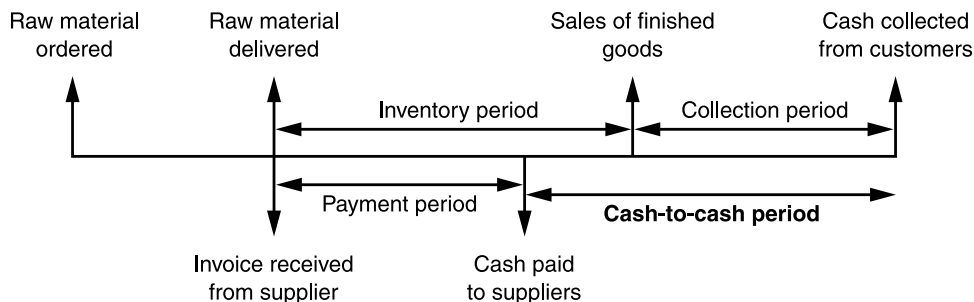
An alternative way of describing the operating cycle is shown in Exhibit 3.4. Note that the firm pays its suppliers *before* receiving cash from its customers because it must hold inventories (of raw materials, work in process, and final goods) and accounts receivable over a period of time that is *longer* than its payment period. The period between the date the firm pays its suppliers and the date it collects its invoices is called the **cash-to-cash period** (or **cycle**) or the **cash conversion period** (or **cycle**).

What is the *net* investment (at the date of the balance sheet) that the firm must make to support its operating cycle? It is simply the sum of its inventories and accounts receivable less its accounts payable. If prepaid expenses are included in the firm's operating assets and accrued expenses are included in its operating liabilities, then the firm's net investment in its operating cycle is measured (at the date of the balance sheet) by the difference between its operating assets and operating liabilities. This difference is called the firm's **working capital requirement** or **WCR**:

$$\begin{aligned} \text{Working capital requirement (WCR)} = & \\ & [\text{Accounts receivable} + \text{Inventories} + \text{Prepaid expenses}] \\ & - [\text{Accounts payable} + \text{Accrued expenses}] \end{aligned} \quad (3.3)$$

Working capital requirement does not include the firm's cash holdings because the cash account in a balance sheet represents the amount of cash left when *all* the investments made by the firm, including working capital requirement, have been paid for. Cash is affected by the way a firm runs its operating cycle but, strictly speaking, is not part of it. Also, working capital requirement does not include the firm's short-term debt. Short-term debt is used to *finance* the firm's investments, including its working capital requirement. It may contribute to the financing of the firm's operating cycle, but it is not a component of it.

EXHIBIT 3.4 The Firm's Operating Cycle, Showing Cash-to-Cash Period.



For most firms, operating assets exceed operating liabilities and working capital requirement is *positive*. When the opposite occurs, working capital requirement is *negative* and the firm's operating cycle becomes a *source of cash* rather than a use of funds. Firms with a negative working capital requirement are found in the retail and service sectors of the economy. Such firms collect cash from their customers before they pay their suppliers and carry small inventories relative to their sales. Large supermarkets are a typical example. They sell mostly for cash and, thus, have few receivables. And, because their inventories move rapidly, they are usually low relative to the sales they generate. The amount of money they owe their suppliers, however, can be very large because big supermarket chains often manage to extract very generous credit terms from their suppliers. Few receivables, low inventories, and large amounts of payables is the perfect recipe for turning the firm's operating cycle into a source of cash.

For example, consider Carrefour, one of Europe's biggest chains of very large supermarkets. Exhibit 3.5 shows some figures taken from the company's 1998 and 1999 balance sheets. The amounts are converted into U.S. dollars at the rate of six French francs to the dollar. The firm has almost no prepaid expenses, so its working capital requirement is equal to the sum of the company's receivables and inventories less its payables and accrued expenses. Note the negative sign and the magnitude of WCR. At the end of 1999, WCR was worth \$5.4 billion. This negative working capital requirement is a major *source of cash* to the company. Other firms with a negative working capital requirement are in industries such as publishing (you pay for your subscription before you receive your magazine) and air transportation (you pay for your trip before your departure).

With the information in the balance sheets in Exhibit 3.1, we can calculate OS Distributors' working capital requirement on December 31, 1998, 1999, and 2000, using equation 3.3:

$$\begin{aligned} \text{WCR}_{12/31/98} &= \$44 \text{ million} + \$52 \text{ million} + \$2 \text{ million} \\ &\quad - \$37 \text{ million} - \$2 \text{ million} = \$59 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{WCR}_{12/31/99} &= \$48 \text{ million} + \$57 \text{ million} + \$2 \text{ million} \\ &\quad - \$40 \text{ million} - \$4 \text{ million} = \$63 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{WCR}_{12/31/00} &= \$56 \text{ million} + \$72 \text{ million} + \$1 \text{ million} \\ &\quad - \$48 \text{ million} + \$4 \text{ million} = \$77 \text{ million} \end{aligned}$$

EXHIBIT 3.5 Extracts from Carrefour's Balance Sheets and Income Statements.

Figures in millions of dollars

Year	Accounts Receivable	Inventories	Accounts Payable	Accrued Expenses	WCR ¹	Cash
1998	\$904	4,777	9,990	3,976	-8,285	2,405
1999	1,068	5,389	11,012	5,158	-9,713	2,835

Sources: Company's Annual Reports.

¹WCR = Working capital requirement = Receivables + Inventories - Payables - Accrued expenses

These are the figures reported in OS Distributors' managerial balance sheets shown in Exhibit 3.6. OS Distributors' WCR has risen from \$59 million in 1998 to \$77 million in 2000. How can we explain this growth? We examine this issue later in the chapter.

THE COMPONENTS OF CAPITAL EMPLOYED

How should the firm's net assets be financed? There are two primary sources of capital available to firms: the equity capital provided by owners and the debt capital provided by debtholders. Debt can be *short term* (due to be repaid within one year) or *long term* (due to be repaid after one year.)² Thus, a firm's total capital employed can be classified either as equity and debt capital or as **long-term financing** (equity plus long-term debt) and **short-term financing** (short-term debt). The first approach distinguishes the *nature* of the firm's capital employed while the second distinguishes its *duration*.

EXHIBIT 3.6 OS Distributors' Managerial Balance Sheets.

All data from the balance sheets in Exhibit 3.1; figures in millions of dollars

	December 31, 1998	December 31, 1999	December 31, 2000
Invested capital or net assets			
• Cash	\$6.0 5%	\$12.0 10%	\$8.0 6%
• Working capital requirement (WCR) ¹	59.0 49%	63.0 50%	77.0 56%
• Net fixed assets	<u>56.0</u> 46%	<u>51.0</u> 40%	<u>53.0</u> 38%
Total invested capital or net assets	<u>\$121.0</u> 100%	<u>\$126.0</u> 100%	<u>\$138.0</u> 100%
Capital employed			
• Short-term debt	\$15.0 12%	\$22.0 17%	\$23.0 17%
• Long-term financing			
Long-term debt	\$42.0	\$34.0	\$38.0
Owners' equity	64.0 <u>106.0</u> 88%	70.0 <u>104.0</u> 83%	77.0 <u>115.0</u> 83%
Total capital employed	<u>\$121.0</u> 100%	<u>\$126.0</u> 100%	<u>\$138.0</u> 100%

¹ WCR = (Accounts receivable + Inventories + Prepaid expenses) – (Accounts payable + Accrued expenses).

²This distinction is somewhat arbitrary, but it is the one used in standard accounting models. In practice, there is a "gray area" of medium-term debt, due to be repaid after one year but less than, say, three years.

Given these alternative sources of capital, the firm's managers must answer two questions in deciding what strategy should be adopted to fund the firm's net assets:

1. What is the best combination of equity capital and debt capital?
2. What proportion of borrowed funds should be in the form of long-term debt and what proportion in the form of short-term debt?

The answer to the first question affects the firm's profitability and financial risk. It is examined in detail in Chapters 5 and 11. The answer to the second question affects primarily the firm's liquidity.³ It is examined later in this chapter.

THE STRUCTURE OF THE MANAGERIAL BALANCE SHEET

Exhibit 3.2 compares the structure of the standard balance sheet to that of the managerial balance sheet. The two statements differ in the way operating assets and operating liabilities are handled. In the standard balance sheet, operating liabilities are part of the firm's total liabilities. In the managerial balance sheet, operating liabilities are deducted from operating assets in order to determine the net investment required to support the firm's operations, in other words, its working capital requirement. Adding the cash and net fixed assets accounts to working capital requirement gives the firm's net assets or invested capital. What remains on the liability side of the balance sheet after the operating liabilities are removed are the sources of funds needed to finance net assets: short-term debt, long-term debt, and owners' equity. The sum of these sources of funds is the total capital employed.

Now consider Exhibit 3.6, which shows OS Distributors' managerial balance sheets. At the end of 2000, the firm's net assets or invested capital of \$138 million were funded with \$23 million of short-term borrowings and \$115 million of long-term financing (\$38 million of long-term debt plus \$77 million of owners' equity). The managerial balance sheets show that the proportion of cash held by the firm fluctuated between 5 and 10 percent of total invested capital. The proportion of working capital requirement fluctuated between 49 and 56 percent and that of net fixed assets between 38 and 46 percent. The relatively large amount of working capital requirement is not surprising given that OS Distributors is a wholesale distribution company. Compared with typical manufacturing companies, firms in the wholesale distribution business have a significant amount of capital invested in their operating cycle. Turning to the structure of capital employed, notice that 83 to 88 percent of OS Distributors' investments were financed with long-term funds compared with 12 to 17 percent with short-term debt.

³A distinction needs to be made between liquidity and **solvency**. Liquidity refers to the firm's ability to meet its cash obligations in the short term while solvency refers to the same concept but from a long-term perspective. In the case of solvency, the issue is whether the firm can raise the funds required to sustain its long-term growth, service its long-term debt, and distribute a regular stream of dividends to its shareholders. The issue of solvency is dealt with in Chapter 5 in conjunction with the analysis of profitability.

THE MATCHING STRATEGY

In deciding how much of the firm's investments should be financed with long-term funds and how much with short-term debt, most firms try to apply the **matching strategy**. According to this strategy, long-term investments should be financed with long-term funds and short-term investments should be financed with short-term funds. By matching the life of an asset and the duration of its financing source, a firm can minimize the risk of *not* being able to finance the asset over its entire useful life.

Consider a piece of equipment with a useful life of five years. Its purchase price can be financed either with a five-year loan (a matched financing strategy) or with a one-year renewable loan (a mismatched financing strategy), both at the same interest rate. Which of the two strategies is riskier?

The mismatched strategy is riskier for two reasons. First, the interest rate, and thus the cost of financing the equipment, may change during the following four years. Second, the lender may be unwilling to renew the one-year loan, thus forcing the firm to repay its loan after one year. This situation may require the sale of the equipment and the early termination of the investment. These two types of risk, called **interest-rate risk** and **funding risk**, respectively, are much lower under the matching strategy.

However, matching the maturity structure of the firm's sources of financing with the maturity of its assets is not necessarily the *optimal* financing strategy for every firm at all times. Some firms, at times, may be willing to carry some interest-rate and funding risks if they expect short-term interest rates to go down.⁴ On the other hand, firms that are more risk-averse may choose to carry more long-term funds than necessary under the matching strategy. Appendix 3.1 provides an illustration of matched and mismatched financing strategies for firms with growing and seasonal sales.

We can use the managerial balance sheets in Exhibit 3.6 to find out whether OS Distributors has been applying the matching strategy during the period 1998 to 2000. We examine each of the three investments and their financing. Cash, a short-term asset, has been fully funded with short-term debt at the end of each year and was thus matched. Similarly, net fixed assets, which are long-term investments, have been fully funded with long-term financing and were thus also matched. The matching strategy applied in both cases. Does it also apply to working capital requirement?

Before we can answer this question, we need to know if working capital requirement is a short-term or a long-term investment. At first glance, it may seem that WCR is a short-term investment because it is made up of current assets, which will become cash within a year, and current liabilities, which will decrease the firm's

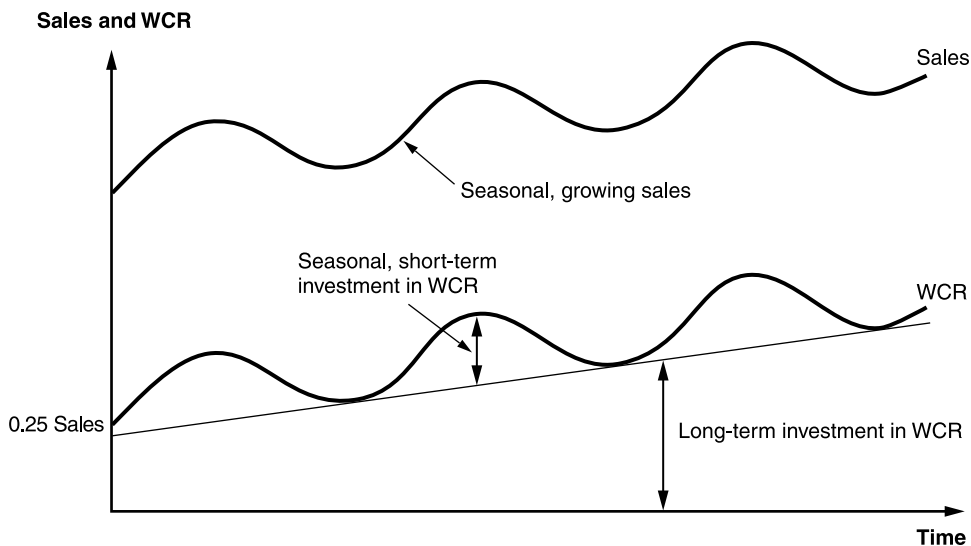
⁴If the short-term interest rate is expected to go down, then a short-term loan that is renewable over the life of the asset would be cheaper than a long-term loan that matches the life of the asset.

cash holdings within a year. But, the answer is not that simple. Although these assets and liabilities are classified as current, or short-term, they will be replaced by *new* current assets and *new* current liabilities as the operating cycle repeats. So, as long as the firm stays in business, working capital requirement will remain in its (managerial) balance sheet and, hence, is more *permanent* than transient in nature. In other words, working capital requirement is essentially a long-term investment. Under a matching strategy, it should be financed with long-term funds. Exhibit 3.6 indicates that a small proportion of OS Distributors' working capital requirement was financed with short-term funds, implying that the firm did not adhere strictly to the matching strategy.⁵

There is one type of firm that can adhere to the matching strategy but not entirely finance working capital requirement with long-term funds. Consider a firm that has growing but *seasonal* sales. If the firm maintains a constant ratio of working capital requirement to sales over time, then its working capital requirement will also display a seasonal growth behavior. Exhibit 3.7 illustrates this situation for WCR equal to 25 percent of sales. In this case, working capital requirement has a *long-term growth component* and a *short-term seasonal component*. According to the matching strategy, the long-term growth component

EXHIBIT 3.7 The Behavior of Working Capital Requirement (WCR) over Time for a Firm with Seasonal Sales.

WCR is assumed to be set at 25 percent of sales



⁵The firm had more short-term debt than cash in 1998, 1999, and 2000. The difference went to finance part of its investment in working capital.

should be financed with long-term funds and the seasonal component with short-term funds. Applying this funding strategy should minimize both interest-rate and funding risks.

A MEASURE OF LIQUIDITY BASED ON THE FUNDING STRUCTURE OF WORKING CAPITAL REQUIREMENT

For most firms that adopt it, the matching strategy is an objective rather than a day-to-day reality. The goal of management is for long-term funds to match the firm's long-term investments (net fixed assets and most of the working capital requirement) and for short-term funds to match the firm's short-term investments (cash and marketable securities) *over time*. This objective may not be easily achieved in practice and, at times, the firm may find itself in a mismatched situation where a *significant* portion of its working capital is funded with short-term debt. This situation can create a liquidity problem. This section presents a measure of liquidity that managers can use to monitor their firm's liquidity position. This measure is based on the funding structure of working capital requirement—more precisely, on the portion of WCR that is funded with long-term financing.

How much long-term financing is available to fund the firm's working capital requirement? Because net fixed assets are funded with long-term financing, any long-term financing in *excess* of net fixed assets can be used to fund working capital requirement. These excess long-term funds are called **net long-term financing** or **NLF**:

$$\text{Net long-term financing (NLF)} = \text{Long-term financing} - \text{Net fixed assets} \quad (3.4)$$

Net long-term financing is the portion of the firm's long-term financing available to finance the firm's other two fundamental investments, its working capital requirement and cash. Exhibit 3.8 shows that OS Distributors' NLF at the end of 2000 was \$62 million. It is equal to the firm's \$115 million of long-term financing (\$38 million of long-term debt plus \$77 million of equity) less the \$53 million of net fixed assets.

How much short-term financing is used to fund the firm's working capital requirement? It is simply the amount of short-term debt that is not used to finance the firm's remaining assets, that is, cash. The amount of short-term debt in excess of cash is called **net short-term financing** or **NSF**:

$$\text{Net short-term financing (NSF)} = \text{Short-term debt} - \text{Cash} \quad (3.5)$$

As shown in Exhibit 3.8, OS Distributors' working capital requirement of \$77 million at the end of 2000 was financed with \$62 million of long-term funds (NLF \$62 million) and \$15 million of short-term funds (NSF \$15 million). Thus, in 2000, 80.5 percent of WCR was funded with long-term financing and 19.5 percent was

EXHIBIT 3.8 OS Distributors' Net Investment in Its Operating Cycle and Its Financing.

All data from the balance sheets in Exhibit 3.1; figures in millions of dollars

December 31, 1998	December 31, 1999	December 31, 2000
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Net Investment in the Operating Cycle or Working Capital Requirement (WCR)

WCR = [Accounts receivable + Inventories + Prepaid expenses] – [Accounts payable + Accrued expenses]

[\$44 + \$52 + \$2] – [\$37 + \$2] = **\$59** | [\$48 + \$57 + \$2] – [\$40 + \$4] = **\$63** | [\$56 + \$72 + \$1] – [\$48 + \$4] = **\$77**

The Financing of the Operating Cycle

Net long-term financing (NLF) = Long-term debt + Owners' equity – Net fixed assets

\$42 + \$64 – \$56 = **\$50** | \$34 + \$70 – \$51 = **\$53** | \$38 + \$77 – \$53 = **\$62**

Net short-term financing (NSF) = Short-term debt – Cash

\$15 – \$6 = **\$9** | \$22 – \$12 = **\$10** | \$23 – \$8 = **\$15**

Net long-term financing / Working capital requirement

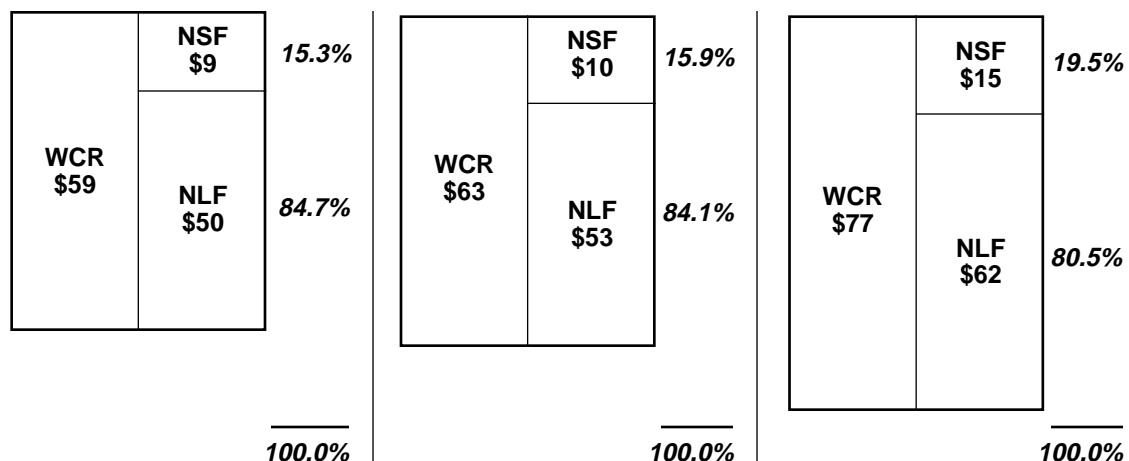
Percentage of working capital requirement financed long term

\$50/\$59 = **84.7%** | \$53/\$63 = **84.1%** | \$62/\$77 = **80.5%**

Net short-term financing / Working capital requirement

Percentage of working capital requirement financed short term

\$9/\$59 = **15.3%** | \$10/\$63 = **15.9%** | \$15/\$77 = **19.5%**

Working Capital Requirement and Its Financing

funded with short-term debt, as illustrated at the bottom of Exhibit 3.8. The ratio of net long-term financing to WCR is the firm's **liquidity ratio**:

$$\begin{aligned} \text{Liquidity ratio} &= \frac{\text{Long-term financing} - \text{Net fixed assets}}{\text{Working capital requirement}} \\ &= \frac{\text{Net long-term financing}}{\text{WCR}} = \frac{\text{NLF}}{\text{WCR}} \end{aligned} \quad (3.6)$$

OS Distributors' liquidity ratio dropped from 84.7 percent in 1998 to 80.5 percent in 2000, indicating a slight deterioration in the firm's liquidity position. In general, all else the same, the higher the proportion of working capital requirement financed with long-term funds, the more liquid is the firm. This is the case because working capital is essentially a long-term investment; financing it with higher proportions of short-term funds creates a mismatch between investment and funding durations that could lead to a liquidity problem. In other words, the higher the liquidity ratio, the more liquid is the firm.

If we deduct net long-term financing from working capital requirement, we get the portion of WCR that is financed with short-term funds, in other words, net short-term financing:

$$\begin{aligned} &\text{Working capital requirement} - \text{Net long-term financing} \\ &= \text{Net short-term financing} \end{aligned}$$

This equation clearly shows that the amount of *net* short-term financing depends on the relative amounts of working capital and *net* long-term financing. As the amount of long-term funds used to finance working capital requirement (net long-term financing) increases, the firm's liquidity ratio rises (see equation 3.6). Simultaneously, the amount of short-term funds used to finance working capital requirement (net short-term financing) decreases. In other words, when the firm increases its liquidity ratio, it is also reducing its net short-term financing.

IMPROVING LIQUIDITY THROUGH BETTER MANAGEMENT OF THE OPERATING CYCLE

What drives a firm's liquidity? The answer to this question is given by the liquidity ratio in equation 3.6: A firm's liquidity is the consequence of decisions that affect its net long-term financing (the numerator of the liquidity ratio) and its working capital requirement (the denominator of the liquidity ratio). A firm's liquidity position will improve if its liquidity ratio rises. According to equation 3.6, this will happen if:

1. Long-term financing increases, and/or
2. Net fixed assets decrease, and/or
3. Working capital requirement decreases.

Decisions related to the management of long-term financing and net fixed assets are *strategic* in nature. Long-term financing will increase if the firm (1) issues long-term debt, (2) raises new equity capital (issues new shares), or (3) increases retained earnings (reduces dividend payments). Net fixed assets will decrease if the firm sells property and other fixed assets. Generally, both these decisions are infrequent and involve large amounts of cash. They are also prepared well in advance so that the firm's financial manager, who actively participates in this decision-making process, can easily forecast their impact on the firm's liquidity.

Decisions affecting the firm's working capital requirement are related to the management of the firm's *operating* cycle. They determine the amount of receivables, inventories, prepaid expenses, payables, and accrued expenses in the firm's balance sheet. Contrary to strategic decisions, operating decisions are made frequently (a company receives payments from its customers many times a day), they involve relatively small amounts of cash, and, often, they do *not* directly involve the firm's financial manager. They affect the firm's liquidity continuously and are difficult to forecast in the aggregate. It is through them that a firm's *operating* managers influence the firm's liquidity. The lower the firm's investment in its operating cycle, the lower its working capital requirement and the higher the firm's liquidity. Furthermore, the lower the frequency of unexpected changes in the firm's working capital requirement, the less volatile the firm's liquidity position and the easier it is to manage. Clearly, *the control of the amount and fluctuations of a firm's working capital requirement is the key to the sound management of the firm's liquidity.*

Controlling working capital requirement requires identifying and understanding the factors that affect its size. Five items make up a firm's working capital requirement: receivables, inventories, prepaid expenses, payables, and accrued expenses. The size of these five items depends on the following three basic factors:

1. The nature of the *economic sector* in which the firm operates
2. The *degree of efficiency* with which the firm manages its operating cycle
3. The *level and growth of sales.*

THE IMPACT OF THE FIRM'S ECONOMIC SECTOR ON ITS WORKING CAPITAL REQUIREMENT

The nature of a business, the technology it uses, and the economic sector in which it operates affect the amount of working capital requirement it needs to support a given level of sales. For example, an equipment manufacturer needs more working capital than a chain of grocery stores does to support the *same* level of sales. The business system underlying a chain of grocery stores allows it to operate with significantly lower amounts of receivables and inventories than those of a manufacturing company with the same amount of sales. As mentioned earlier, some firms, such as large supermarket chains, have a negative working capital requirement; in this case, the firm's operating cycle is a source of cash rather than a use of capital.

The sectorial effect on working capital requirement can be measured by computing the ratio of WCR to sales for a sample of firms in the same sector. Exhibit 3.9 reports this ratio for a number of U.S. industries. Firms in sectors with higher ratios require larger investments in their operating cycles to generate a dollar of sales. This indicates a longer operating cycle for firms in those industries. For example, in 1999, a typical firm in the machinery and equipment needed, on average, to invest in its operating cycle an amount of capital equal to 25 percent of its sales. A grocery store had, on average, *no* net investment in its operating cycle because the average WCR-to-sales ratio for the sector was zero in 1999. This difference simply reflects the fact that the operating cycle of a typical company in the electronic components industry is significantly longer than that of a typical grocery store.

Exhibit 3.10 shows that OS Distributors' ratio of WCR to sales rose from 15 percent in 1998 to 16 percent in 2000, indicating a slight deterioration in the management of its operating cycle during that period. Also, OS Distributors' WCR-to-sales ratio is significantly higher than its sector average of 10 percent reported in Exhibit 3.9 (wholesale durables), indicating a less efficient use of working capital than the average U.S. wholesaler.

THE IMPACT OF MANAGERIAL EFFICIENCY ON WORKING CAPITAL REQUIREMENT

Firms in the same sector do not necessarily have the same ratio of WCR to sales. Even though they face similar constraints, some are able to manage their working

EXHIBIT 3.9 Some Benchmark Ratios of Working Capital Requirement to Sales for a Sample of U.S. Economic Sectors in 1999¹

Working Capital Requirement as Percentage of Sales			
Sector		Sector	
Machinery & equipment	25%	Beverages	10%
Apparel products	24%	Food	9%
Textile	22%	Wood products and buildings	9%
Aircraft	21%	Publishing	9%
Wholesale: Durables	19%	Soap & perfumes	6%
Department stores	18%	Electric services	4%
Steel works	16%	Retail: Nongrocery stores	4%
Plastic products	13%	Natural gas distribution	2%
Paper	13%	Wholesale: Nondurables	0%
Computer equipment	12%	Grocery stores	0%
Motor vehicles	12%	Air transport	-3%
Average all sectors: 11%			

¹Source: Calculated by the authors using *Compustat* data.

EXHIBIT 3.10 OS Distributors' Management of Its Operating Cycle.

All data from the balance sheets in Exhibit 3.1 and the income statements in Exhibit 2.2;
figures in millions of dollars

Ratio	Objective	December 31, 1998	December 31, 1999	December 31, 2000
$\frac{\text{Working capital requirement (WCR)}^1}{\text{Sales}}$	To evaluate the overall efficiency with which the firm's operating cycle is managed	$\frac{\$59}{\$390} = 15\%$	$\frac{\$63}{\$420} = 15\%$	$\frac{\$77}{\$480} = 16\%$
$\frac{\text{Cost of goods sold (COGS)}}{\text{Inventories}}$	To evaluate the efficiency with which inventories are managed	$\frac{\$328}{\$52} = 6.3 \text{ times}$	$\frac{\$353}{\$57} = 6.2 \text{ times}$	$\frac{\$400}{\$72} = 5.6 \text{ times}$
$\frac{\text{Accounts receivable}}{\text{Average daily sales}^2}$	To evaluate the efficiency with which accounts receivable are managed	$\frac{\$44}{\$390/365} = 41 \text{ days}$	$\frac{\$48}{\$420/365} = 42 \text{ days}$	$\frac{\$56}{\$480/365} = 43 \text{ days}$
$\frac{\text{Accounts payable}}{\text{Average daily purchases}^{2,3}}$	To evaluate the efficiency with which accounts payable are managed	$\frac{\$37}{\$332/365} = 41 \text{ days}$	$\frac{\$40}{\$358/365} = 42 \text{ days}$	$\frac{\$48}{\$415/365} = 43 \text{ days}$

¹ WCR is found in Exhibit 3.6.

² We assume the year has 365 days.

³ Purchases are equal to COGS plus the *change* in inventories (see equation 3.11). In 1997, inventories were \$48, thus purchases (1998) = \$328 + (\$52 - \$48) = \$332. Purchases (1999) = \$353 + (\$57 - \$52) = \$358; and purchases (2000) = \$400 + (\$72 - \$57) = \$415.

capital better than others. For example, if a firm does not control its inventories and receivables as well as its sector's average, its WCR-to-sales ratio will be higher than that of its sector.

Several ratios can be used to estimate the efficiency with which a firm manages the components of its working capital requirement. They have the advantages of being simple and of requiring data readily available in balance sheets and income statements. These ratios, discussed in the following sections, provide managers and analysts with good signals regarding both changes in a firms' managerial efficiency over time and differences across firms in the same sector.

Inventory Turnover

A firm's **inventory turnover**, or **inventory turn**, is generally defined as the ratio of its cost of goods sold to its end-of-period inventories:

$$\text{Inventory turnover} = \frac{\text{Cost of good sold}}{\text{Ending inventories}} \quad (3.7)$$

For a distribution company, an inventory turnover of, say, six means that, on average, items in inventory turn over six times per year. Or, to put it another way, an item stays on the firm's shelves for two months, on average. The *higher* the inventory turnover, the *lower* the firm's investment in inventories and the *higher* the efficiency with which the firm manages its inventories.

When cost of goods sold is not available, the level of sales is often used as a substitute in computing inventory turnover. Sometimes, inventories at the end of the period are replaced by average inventories during the period. Strictly speaking, the definition of inventory turnover given in equation 3.7 applies only to finished goods. To obtain the turnover for raw material inventory, the cost of goods sold in equation 3.7 is replaced by the amount of purchases.

The ratios reported in Exhibit 3.10 indicate that OS Distributors' inventory turnover deteriorated slightly, dropping from 6.3 times at the end of 1998 to 5.6 times at the end of 2000.

Average Collection Period

Also called the **average age of accounts receivable**, or **days of sales outstanding (DSO)**, the **average collection period**, expressed in days, is defined as accounts receivable at the end of the period divided by the average daily sales during that period:

$$\text{Average collection period} = \frac{\text{Receivables}_{\text{end}}}{\text{Average daily sales}} \quad (3.8)$$

The average collection period is the number of days' worth of sales that have not yet been collected at the date of the balance sheet. It is an estimate of the *average* numbers of days the firm must wait from the time it ships its goods or delivers its service until its customers pay their bills. The faster the bills are collected, the *lower* the firm's receivables, the *higher* the efficiency with which the firm manages its receivables, and the *lower* its working capital requirement.

This ratio is just an average; it does not represent the actual number of days a firm must wait between when a sale is made and when payment for it is collected. Not all customers settle their invoices after the same number of days. Some pay earlier than the average collection period and others pay later. If there is a group of customers that is often late in paying its bills, the firm should monitor that group separately.

OS Distributors' average collection periods, reported in Exhibit 3.10, indicate a slight lengthening of its collection period from 41 days at the end of 1998 to 43 days at the end of 2000.

Average Payment Period

The **average payment period** is to purchases what the average collection period is to sales. It is defined as the ratio of accounts payable at the end of the period to the average daily purchases during that period:

$$\text{Average payment period} = \frac{\text{Payables}_{\text{end}}}{\text{Average daily purchases}} \quad (3.9)$$

The average payment period is the number of days' worth of purchases that have not yet been paid at the date of the balance sheet. The *longer* the average payment period, the *higher* the firm's payables and the *lower* its working capital requirement.

To compute the average daily purchases, you need to know the amount of purchases made during the accounting period ending at the date of the balance sheet. Although this information is not directly reported in the firm's financial statements, purchases made during the accounting period can be obtained indirectly from data provided in balance sheets and income statements.

First, we consider a manufacturing firm. The cost of the goods manufactured during the accounting period equals the cost of purchases plus the cost of production. We add this sum to the beginning of the period's inventories account (raw material, work in process, and finished goods inventories). As the firm sells its finished goods, inventories decrease by the cost of goods sold (COGS). The net effect of these transactions is the ending inventories:

$$\text{Beginning inventories} + \text{Purchases} + \text{Production costs} - \text{COGS} = \text{Ending inventories}$$

We can rearrange the terms in the above equation to calculate the firm's purchases during the accounting period as a function of COGS, production costs, and the change in inventories:

$$\text{Purchases} = \text{COGS} + \text{Change in inventories} - \text{Production costs} \quad (3.10)$$

where the change in inventories equals the firm's ending inventories less its beginning inventories during the accounting period.

For a trading firm with no production costs, such as OS Distributors, equation 3.10 simplifies to:

$$\text{Purchases} = \text{COGS} + \text{Change in inventories} \quad (3.11)$$

Equation 3.11 could have been obtained directly because, for a distributor, if the amount of goods purchased during the accounting period exceeds the amount of goods sold during that period, the inventories account will increase by the difference. If a distributor sells more goods than it buys during the accounting period, the inventories account will decrease by the difference.

The purchases of OS Distributors reported in Exhibit 3.10 are computed according to equation 3.11. These purchases are divided by 365 to obtain the average daily purchases for each year. Notice that the average payment period rose slightly from 41 to 42 days of purchases.

THE IMPACT OF SALES GROWTH ON WORKING CAPITAL REQUIREMENT

Suppose a firm's sales are expected to grow by 10 percent next year. How would the firm's working capital requirement be affected if there is *no change in the efficiency* with which its operating cycle is managed (same inventory turnover and same collection and payment periods)? Even though efficiency remains the same, higher sales will require additional investments in the firm's operating cycle because the firm will need more receivables, more inventories, and more payables to support its additional sales. As a consequence, the firm's working capital requirement will increase. As a first approximation, you can expect WCR to grow at the same rate as sales, that is, at 10 percent.

Consider the case of OS Distributors. At the end of 2000, its WCR was equal to \$77 million. If sales are expected to grow by 10 percent in 2001 and the WCR-to-sales ratio is expected to remain the same as in 2000, then we can expect OS Distributors' working capital requirement also to grow by 10 percent, or \$7.7 million, in 2001. Thus, OS Distributors will need \$7.7 million of cash to finance the anticipated growth of its WCR. If OS Distributors does not have or cannot obtain \$7.7 million of cash, it may face a liquidity problem.

As this example illustrates, an unplanned or unexpected growth in sales may create liquidity problems. These problems can be alleviated if management maintains a tight control over the firm's operating cycle and anticipates the funding needs that will result from future changes in the firm's working capital requirement. How far can managers try to squeeze working capital requirement to release the cash tied up by the firm's operating cycle? An increasing number of *manufacturing firms* have set themselves the ambitious goal of operating with close to *zero* WCR. The article reproduced in Exhibit 3.11 explains how this can be achieved.

Inflation also puts pressure on the firm's working capital requirement. When the price level rises, the nominal value of the firm's sales will rise even though the number of units sold may not change. Inflated sales figures require higher levels of receivables; thus the firm's investment in its operating cycle will increase unless management becomes more efficient.

EXHIBIT 3.11 Raiding a Company's Hidden Cash*

Reducing working capital yields two powerful benefits. First, every dollar freed from inventories or receivables rings up a one-time \$1 contribution to cash flow. Second, the quest for zero working capital permanently raises earnings. Like all capital, working capital costs money, so reducing it yields savings. In addition, cutting working capital forces companies to produce and deliver faster than the competition, enabling them to win new business and charge premium prices for filling rush orders. As inventories evaporate, warehouses disappear. Companies no longer need forklift drivers or schedulers to plan production months in advance.

Over the 12 months that ended May 1996, Campbell Soup pared working capital by \$80 million. It used the cash to develop new products and buy companies in Britain, Australia, and other countries. But Campbell also expects to harvest an *extra* \$50 million in profits over the next few years by lowering overtime, storage costs, and other expenses—savings that will persist year after year.

The most important discipline that zero working capital necessitates is speed. Many companies today produce elaborate long-term forecasts of orders. They then manufacture their product weeks or months in advance, creating big inventories; eventually they fill orders from the bulging stocks.

Minimizing working capital forces organizations to demolish that system. Scrapping forecasts, companies manufacture goods as they are ordered. The best companies start producing an auto braking system or cereal flavor after receiving an order and yet still manage to deliver just when the customer needs it.

The system, known as demand flow or demand-based management, builds on the familiar idea of just-in-time inventories but is far broader. Most companies achieve just-in-time in one or two areas. They demand daily shipments from suppliers, for example, or dispatch finished products the hour the customer wants them. But just-in-time deliveries don't guarantee efficiency. To meet the rapid schedule, many companies simply ship from huge inventories. They still manufacture weeks or months in advance.

Achieving zero working capital requires that every order and part move at maximum pace, never stopping. Orders streak from the processing department to the plant. Flexible factories manufacture each product every day. Finished goods flow from the assembly line onto waiting trucks. Manufacturers press suppliers to cut inventories as well, since minimal stocks translate into lower raw materials prices to the manufacturer. Instead of cluttering plants or warehouses, parts and products hurtle through the pipeline. As velocity rises, inventory—working capital—dwindles. That's why working capital levels are such a useful yardstick for efficiency and why, in the 1990s, manufacturers with the least working capital per dollar of sales will reign as the world's best-run companies.

* Extracted from an article by Shawn Tally in *Fortune*, August 22, 1996.

TRADITIONAL MEASURES OF LIQUIDITY

Some of the traditional measures of a firm's liquidity are reviewed in this section. We also explain why these measures are often *not* reliable indicators of the firm's liquidity.

NET WORKING CAPITAL

The traditional definition of a firm's **net working capital (NWC)** is the difference between its current assets and its current liabilities. The rationale for this definition is that the higher the firm's net working capital, the easier it would be in the case of default to meet the firm's current liabilities by selling its current assets. However, we are interested in estimating a company's ability to meet its cash obligation on a *continual* basis as opposed to its ability to meet the same obligations only in the case of default. Thus, this definition of NWC is of limited value.

There is an alternative, and in our opinion superior, way to interpret net working capital. We write the balance sheet identity as follows:

$$\text{Current assets} + \text{Net fixed assets} = \text{Current liabilities} + \text{Long-term financing}$$

Rearranging the terms in this equation, we get:

$$\text{Current assets} - \text{Current liabilities} = \text{Long-term financing} - \text{Net fixed assets}$$

which, using the definition of net working capital, can be written as:

$$\text{Net working capital} = \text{Long-term financing} - \text{Net fixed assets} \quad (3.12)$$

Now compare equation 3.12 with equation 3.4, which measures the net long-term funds available to finance working capital requirement. *Net working capital* given by equation 3.12 and *net long-term financing* given by equation 3.4 are the same. In other words, net working capital can be interpreted in the same way as net long-term financing. The definition of net working capital as long-term financing less net fixed assets has a clear economic meaning. It says that net working capital is the net result of the firm's long-term strategic decisions, whereas the traditional definition of net working capital has no particular managerial meaning. Furthermore, using the traditional definition of net working capital may lead to the conclusion that net working capital is determined by the firm's short-term, operating decisions, which we know is not the case.

Exhibit 3.12 reports OS Distributors' net working capital at the end of 1998, 1999, and 2000, using the two definitions presented above. Net working capital grew from \$50 million at the end of 1998 to \$62 million at the end of 2000.

EXHIBIT 3.12 OS Distributors' Net Working Capital and Current and Quick Ratios.

All data from the balance sheets in Exhibit 3.1; figures in millions of dollars

	December 31, 1998	December 31, 1999	December 31, 2000
• Net working capital = [Current assets – Current liabilities] ¹	\$104 – \$54 = \$50	\$119 – \$66 = \$53	\$137 – \$75 = \$62
• Net working capital = [Long-term financing ² – Net fixed assets] ³	(\$42 + \$64) – \$56 = \$50	(\$34 + \$70) – \$51 = \$53	(\$38 + \$77) – \$53 = \$62
• Current ratio = $\frac{\text{Current assets}}{\text{Current liabilities}}$	$\frac{\$104}{\$54} = 1.93$	$\frac{\$119}{\$66} = 1.80$	$\frac{\$137}{\$75} = 1.83$
• Quick ratio = $\frac{\text{Cash + Accounts receivable}}{\text{Current liabilities}}$	$\frac{\$6 + \$44}{\$54} = 0.93$	$\frac{\$12 + \$48}{\$66} = 0.91$	$\frac{\$8 + \$56}{\$75} = 0.85$

¹This is the traditional definition of net working capital.²Long-term financing = Long-term debt + Owners' equity.³According to this definition, net working capital is the same as net long-term financing (see equation 3.4).**THE CURRENT RATIO**

The **current ratio** is obtained by dividing the firm's current assets by its current liabilities:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} \quad (3.13)$$

It is often said that the larger the current ratio, the more liquid the firm and that the ratio should be at least greater than one and preferably close to two. This reasoning, similar to that used for the traditional definition of net working capital, is based on the notion that the higher the current ratio, the easier it would be for the firm to repay its short-term liabilities with the cash raised from the sale of its short-term assets. For this to be possible, the firm's current assets should be at least equal to its current liabilities. In other words, its current ratio should be at least equal to one.

But if liquidity increases when the current ratio increases, why not have clients pay as late as possible in order to increase the firm's accounts receivable, why not keep as many goods as possible in stock, and why not pay the firm's suppliers as

soon as possible? The first two decisions will significantly increase the firm's current assets and the third decision will substantially reduce its current liabilities. As a result, the firm's current ratio will go sky-high. But, has the firm's liquidity increased? Certainly not. The current ratio is definitely not a reliable measure of the firm's liquidity.

The value of OS Distributors' current ratio at the end of 1998, 1999, and 2000 is given in Exhibit 3.12. It varied from a low of 1.80 in 1999 to a high of 1.93 in 1998.

THE ACID TEST OR QUICK RATIO

Sometimes, analysts modify the current ratio by eliminating the relatively illiquid inventories and prepaid expenses from the firm's current assets. What remains is simply the sum of cash and receivables, the two most liquid current assets, also called **quick assets**. The result is called the **acid test** or **quick ratio**:

$$\text{Acid test or quick ratio} = \frac{\text{Cash} + \text{Accounts receivable}}{\text{Current liabilities}} \quad (3.14)$$

The quick ratio is an improvement over the current ratio, but it still emphasizes a *liquidation view* of the firm as opposed to a *going-concern approach* to liquidity analysis. Furthermore, a firm's inventories are not always less liquid than its accounts receivable.

The value of OS Distributors' quick ratio is reported in Exhibit 3.12. It varied from a low of 0.85 in 2000 to a high of 0.93 in 1998. Creditors usually prefer a ratio close to one for most manufacturing firms.

SUMMARY

A firm's liquidity is driven by the structure of its balance sheet, that is, by the nature and composition of its assets and the way they are financed. Liquidity is easier to analyze if the standard balance sheet is restructured into the managerial balance sheet. This alternative presentation identifies the three components of the firm's invested capital: (1) cash, (2) working capital requirement, and (3) net fixed assets; and it identifies the three sources of capital employed to finance them: (1) short-term debt, (2) long-term debt, and (3) equity capital. Working capital requirement, which measures the firm's investment in its operating cycle, is equal to the difference between operating assets (accounts receivable, inventories, and prepaid expenses) and operating liabilities (accounts payable and accrued expenses).

A firm's liquidity, which refers to its ability to meet its recurrent cash obligations, should be measured with the ratio of its net long-term financing to working capital requirement, where net long-term financing is the sum of equity capital and long-term debt minus net fixed assets. The higher that ratio, the higher the proportion of working capital that is financed with long-term funds and the higher the firm's liquidity.

The relatively smaller portion of working capital that is not financed with long-term funds is obviously financed with short-term debt. These short-term borrowings in *excess* of cash are called net short-term financing. In order to minimize the effect of both interest-rate risk (unexpected changes in short-term interest rates) and funding risk (unexpected cuts in the availability of short-term debt), most firms should limit the short-term financing of their working capital to its seasonal short-term component while financing the permanent long-term component with long-term funds. This approach to funding is known as the matching strategy.

The key to good liquidity management is good management of the firm's working capital cycle; a liquidity crisis is often the symptom of a mismanaged working capital cycle. If a firm's working capital requirement grows out of control and is not properly financed, liquidity problems appear immediately. Broadly speaking, good management of the working capital cycle means two things. First, accounts receivable and inventories, the two major components of working capital, must be held at their *minimum* levels relative to sales. This will allow the firm to save the cash it would have needed to fund a larger amount of receivables and inventories. Second, because working capital requirement is essentially a long-term investment, a firm's liquidity will rise as higher proportions of its working capital are financed with long-term funds.

Finally, the ratio of net long-term financing to working capital requirement is a superior indicator of a firm's liquidity position than the traditional benchmarks of net working capital, current ratio, or quick ratio. These last two ratios may be good indicators of a firm's ability to rapidly repay its current liabilities with the cash raised from the sale of its current assets, but they are not reliable measures of its capacity to meet its cash obligations on a *recurrent* basis.

3.1 FINANCING STRATEGIES

Firms may choose different financial strategies regarding the maturity structure of the funds used to finance their invested capital (cash, working capital requirement, and net fixed assets). The matching strategy, examined in this chapter, is the most common strategy and calls for matching the duration of the sources of funds with that of the investments. Some firms, however, may adopt other financing strategies, depending on the level of risk they are willing to take. They can adopt a **conservative strategy** if they want less risk or an **aggressive strategy** if they are prepared to accept more risk. This appendix examines the three strategies for a firm with seasonal and growing sales. The three strategies are illustrated in Exhibits A3.1, A3.2, and A3.3.

EXHIBIT A3.1.1 Financing Investments Using a Matching Strategy.

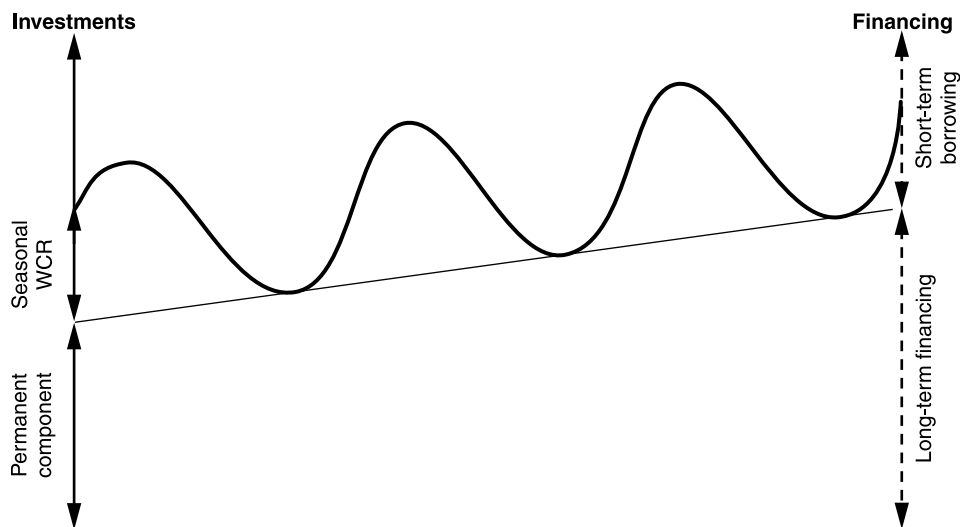
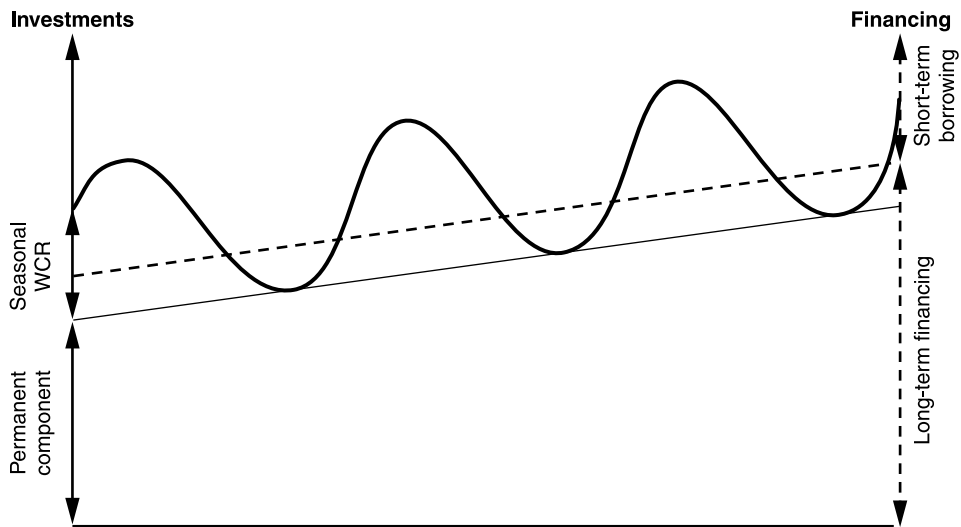
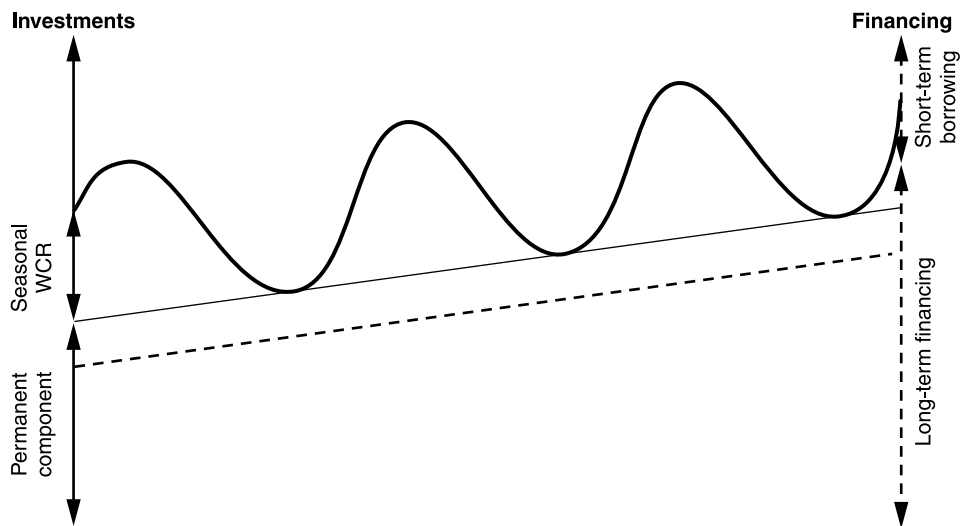


EXHIBIT A3.1.2 Financing Investments Using a Conservative Strategy.**EXHIBIT A3.1.3 Financing Investments Using an Aggressive Strategy.**

A firm with seasonal sales experiences changes in its working capital requirement during the seasonal cycle. Working capital requirement increases as sales increase and decreases as sales decrease. This is shown in Exhibit 3.7, where the behavior of working capital requirement is structured into a long-term, nonseasonal growth component and a short-term seasonal component. This short-term component of WCR is usually the only component of the firm's three fundamental investments that is directly linked to changes in sales during the seasonal cycle. The sum of net fixed assets, cash, and the long-term component of WCR makes up the firm's *permanent* nonseasonal investments. These investments are not significantly affected by seasonality in sales. Seasonal and permanent components of the firm's investments are shown on the left side of Exhibits A3.1 to A3.3. The right side shows the two components of the financing policy: long-term financing (owners' equity plus long-term debt) and short-term borrowing.

Exhibit A3.1 illustrates the matching strategy. Permanent investment is financed with long-term funds and seasonal investment with short-term funds. The objective of this strategy is to minimize (but not completely eliminate) the risk resulting from having a mismatched balance sheet.

Exhibit A3.2 shows the effect of adopting a conservative strategy. Permanent needs and some seasonal needs are financed with long-term funds. In this case, short-term borrowing covers only a portion of the firm's seasonal needs. At times, near the cyclical trough, the firm would have some excess cash (negative short-term financing). This "margin of safety" can be used to meet unforeseen cash needs that would have to be financed by an increase in short-term borrowing under the matching strategy.

The aggressive strategy, illustrated in Exhibit A3.3, implies that the firm uses short-term funds to finance a portion of the permanent component of its investments. This strategy is riskier than either of the other two strategies because the firm would bear more interest-rate risk and more funding risk. The interest-rate risk originates from possible variations in the level of interest rates during the useful life of the investments; the funding risk refers to the possibility that the firm may not be able to renew the short-term loans needed to finance a portion of the permanent component of the firm's investments. A firm may choose to bear more interest-rate and funding risks if it expects the short-term interest rate to decrease and, on average, to be lower than the current long-term rate over the useful life of the investment. In some instances, a firm may be forced to adopt an aggressive strategy. This situation happens when firms have limited access to long-term financial markets and must rely heavily on short-term financing.

3.2

POLO RALPH LAUREN'S LIQUIDITY AND OPERATIONAL EFFICIENCY

In order to analyze Polo Ralph Lauren (RL)'s liquidity, we first restructure the firm's standard balance sheets into managerial balance sheets. These balance sheets, which were presented in Appendix 2.1 to Chapter 2, cover the three-year period from the end of fiscal year 1998 to the end of year 2000. Then we apply the approach taken in the chapter to examine the company's liquidity and the management of its operating cycle. For comparison purposes, we also show the results of the same analysis applied to Tommy Hilfiger Corporation, RL's major competitor in the design and distribution of lifestyle products.

RL MANAGERIAL BALANCE SHEETS

Exhibit A3.2.1 presents RL's balance sheets at the end of the fiscal years 1998, 1999, and 2000 taken from the firm's annual reports; Exhibit A3.2.2 shows how we allocated the accounts from the balance sheets to the invested capital and capital employed accounts in the firm's managerial balance sheets. Generally, as is the case with RL, this allocation is rather straightforward. When in doubt, we suggest that you refer to the notes accompanying the financial statements to identify the transactions recorded in the particular account that has no obvious allocation. With this information, you should be able to assign the account to the relevant component of the managerial balance sheet.

For example, we learned from a note in RL's annual reports that the \$44.217 million of restricted cash on April 3, 1999, represents cash in escrow for an acquisition that was not yet completed (see Appendix 2.1 in Chapter 2). The \$44.217 million should be allocated to the fixed asset component of invested capital, and not in the cash component, since this amount was earmarked for an investment in fixed assets soon to be completed. Note also that we allocated the long-term component of the deferred tax assets to RL's working capital requirement, as we did for the short-term component. Since both components represent the amount of tax refundable in the future (see Appendix 2.1 in Chapter 2), they should be considered as prepaid expenses, and as such be allocated to working capital requirement.

EXHIBIT A3.2.1 Polo Ralph Lauren Corporation's Consolidated Balance Sheets.

From the company annual report on fiscal year 2000; Figures in thousands of dollars

	March 28, 1998	April 3, 1999	April 1, 2000
Assets			
Current assets			
Cash and cash equivalents	\$ 58,755	\$ 44,458	\$ 164,571
Accounts receivable, net of allowances	149,120	157,203	204,447
Inventories	298,485	376,860	390,953
Deferred tax assets	24,448	51,939	40,378
Prepaid expenses and other	25,656	48,994	52,542
Total current assets	556,464	679,454	852,891
Property and equipment, net	175,348	261,799	372,977
Deferred tax assets	14,213	12,493	11,068
Goodwill, net	—	27,464	277,822
Other assets, net	79,105	79,157	105,804
Restricted cash	—	44,217	—
	\$825,130	\$1,104,584	\$1,620,562
Liabilities and stockholders' equity			
Current liabilities			
Notes and acceptances payable-banks	\$ —	\$ 115,500	\$ 86,131
Accounts payable	100,126	88,898	151,281
Income taxes payable	2,554	17,432	—
Accrued expenses and other	99,578	126,142	168,816
	202,258	347,972	406,228
Long-term debt	—	44,217	342,707
Other noncurrent liabilities	38,546	53,490	99,190
Stockholders' equity			
Common stock	1,003	1,004	1,004
Additional paid-in capital	447,918	450,030	450,030
Retained earnings	136,738	227,288	370,785
Treasury stock	—	(16,084)	(57,346)
Accumulated other comprehensive income	—	—	9,655
Unearned compensation	(1,333)	(3,333)	(1,691)
Total stockholders' equity	584,326	658,905	772,437
	\$825,130	\$1,104,584	\$1,620,562

**EXHIBIT A3.2.2 From the Standard to the Managerial Balance Sheets of
Polo Ralph Lauren Corporation.**

STANDARD BALANCE SHEET	MANAGERIAL BALANCE SHEET
Assets	
Current assets	
Cash and cash equivalents	Cash
Accounts receivable, net of allowances	Working capital requirement
Inventories	Working capital requirement
Deferred tax assets	Working capital requirement
Prepaid expenses and other	Working capital requirement
Property and equipment, net	Net fixed assets
Deferred tax assets	Working capital requirement
Goodwill, net	Net fixed assets
Other assets, net	Net fixed assets
Restricted cash	Net fixed assets
Liabilities and stockholders' equity	
Current liabilities	
Notes and acceptances payable-banks	Short-term debt
Accounts payable	Working capital requirement (-)
Income taxes payable	Working capital requirement (-)
Accrued expenses and other	Working capital requirement (-)
Long-term debt	Long-term financing
Other noncurrent liabilities	Long-term financing
Stockholders' equity	Owners' equity

RL'S LIQUIDITY POSITION

Four observations can be made from examining RL's managerial balance sheets in Exhibit A3.2.3.

First, the size of the balance sheets increased dramatically over the three-year period, from \$622.872 million at fiscal year-end 1998 to \$1,300.465 million at year-end 2000, or at a compounded growth rate of 44.5 percent per annum. Most of this growth comes from business acquisitions, as can be inferred from the high level of goodwill at fiscal year end 2000 (\$277.822 million) compared to the end of the previous years.

Second, the proportion of capital invested in the operating cycle went down significantly in fiscal year 2000. At the end of that year, only thirty percent of RL's

EXHIBIT A3.2.3 Polo Ralph Lauren's Managerial Balance Sheets.

All data from the balance sheets in Exhibit A3.2.1; Figures in thousands of dollars

	March 28, 1998		April 3, 1999		April 1, 2000	
Invested capital						
• Cash	\$58,755	9%	\$44,458	5%	\$164,571	5%
• Working capital requirement	309,664	50%	415,017	47%	379,291	47%
• Net fixed assets	<u>254,453</u>	41%	<u>412,637</u>	48%	<u>756,603</u>	48%
Total invested capital	<u>\$622,872</u>	100%	<u>\$872,112</u>	100%	<u>\$1,300,465</u>	100%
Capital employed						
• Short-term debt	\$ —	0%	\$115,500	17%	\$86,131	12%
• Long-term financing	622,872	100%	756,612	83%	1,214,334	88%
Long-term debt	—		\$ 44,217		\$342,707	
Other long-term liabilities	\$ 38,546		\$ 53,490		99,190	
Owners' equity	<u>584,326</u>		<u>658,905</u>		<u>772,437</u>	
Total capital employed	<u>\$622,872</u>	100%	<u>\$872,112</u>	100%	<u>\$1,300,465</u>	100%
Net long-term financing	\$368,419		\$343,975		\$ 457,731	
<u>Net long-term financing</u>	1.19	119%	0.83	83%	1.21	121%
Working capital requirement						

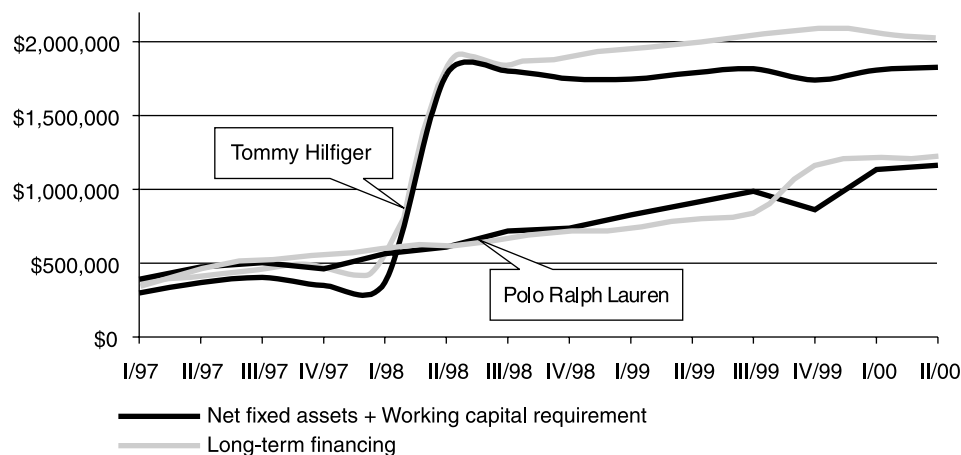
invested capital was taken by the working capital requirement, as opposed to around fifty percent at the end of years 1999 and 1998.

Third, the drastic increase in the firm's invested capital was financed through long-term financing, mainly in the form of long-term debt, which increased from zero at the end of fiscal year 1998 to \$342.707 million at the end of year 2000.

Finally, notice that the liquidity ratio (net long-term financing divided by working capital requirement) at the end of years 2000 and 1998 was around 1.20. At those dates the liquidity position of RL was rather excellent. Indeed, RL's financing strategy appears to be rather conservative (as defined in Appendix 3.1). This observation is confirmed when we compare RL's investment in net fixed assets and in working capital requirement to available long-term financing (owners' equity plus long-term debt plus other long-term liabilities) on a quarterly basis. As shown on Exhibit A3.2.4,⁶ from the first quarter of 1997 to the second quarter of 2000, the firm's long-term funding was, except for a few months in 1998, large enough to ensure that the two investments were not financed on a short-term basis.⁷ As the graph also shows, Tommy Hilfiger also follows a conservative financing strategy, with no short-term funding of its net fixed assets and working capital requirement over the same period. It appears that both companies had limited funding risk up from the end of fiscal year 1998 to the end of year 2000.

EXHIBIT A3.2.4 Polo Ralph Lauren and Tommy Hilfiger Corporations' Financing Strategies.

Figures of thousands of dollars



⁶Quarterly data was obtained from RL's 10-Q (quarterly) reports which are available on most financial web sites.

⁷Note the seasonality of RL's investment needs. This seasonality is driven by the firm's working capital requirement. Not surprisingly, RL's businesses are affected by seasonal trends, which result in seasonal variation in sales and in working capital requirement.

RL'S MANAGEMENT OF THE OPERATING CYCLE

Exhibit A3.2.5 shows the operating cycle management ratios for Polo Ralph Lauren and Tommy Hilfiger corporations, over the three-year period from the end of fiscal 1998 to the end of year 2000.

The working-capital-requirement-to-net-revenues ratio of RL has improved significantly during fiscal year 2000, from 24 percent to 19.4 percent. This improvement is probably the result of the application of a "strategic initiative" mentioned in the firm's year 2000 report, with the objective to reduce inventory levels and to lengthen payments to vendors. Note that the 4.6 percent decrease in the working-capital-to-net-revenues ratio represents savings of nearly \$90 million (4.6 percent of the \$1,955.528 million of net revenues in year 2000) in the amount of capital invested in the operating cycle. At the end of fiscal year 2000 this \$90 million makes up more than 50 percent of the amount of cash held by RL at that date (\$164.571 million).⁸ A

EXHIBIT A3.2.5 Polo Ralph Lauren and Tommy Hilfiger Corporations' Operating Cycle Management.

	Polo Ralph Lauren			Tommy Hilfiger		
	FYE98	FYE99	FYE00	FYE98	FYE99	FYE00
$\frac{\text{Working capital requirement}^1}{\text{Net revenues}}$	21.1%	24.0%	19.4%	22.3%	14.8%	14.1%
$\frac{\text{Cost of goods sold}^1}{\text{Inventories}}$	2.5	2.4	2.6	3.0	3.9	5.0
$\frac{\text{Accounts receivable}^{1,2}}{\text{Average daily sales}}$	37 days	33 days	38 days	45 days	42 days	41 days
$\frac{\text{Accounts payable}^{2,3}}{\text{Average daily purchases}}$	44 days	33 days	54 days	—	—	—

FYE = Fiscal Year End

¹ RL's revenues (sales) and cost of goods are from the income statements presented in Appendix 2.1, Chapter 2.

² Daily averages are computed on the basis of 365 days a year.

³ Purchases are computed as the sum of cost of goods sold plus change in inventories. In the case of Tommy Hilfiger Corp. the computed average payment period, around 10 days over the three-year period, is too low to be meaningful. We attribute this low value to the fact that the company records some of its foreign suppliers' credit as accrued expenses and not as accounts payable.

⁸The working-capital-requirement-to-net-revenues ratio of 19.4 percent at fiscal year-end 2000 is probably higher than the value of the ratio which should be used for comparison purposes. According to a note in the year 2000 annual report, the year 2000 revenues of an acquisition made during that year were not accounted for in the year 2000 consolidated income statement. Since the ratio of 19.4 percent was computed using data from the year end 2000 balance sheet in which the assets of the acquisition are consolidated, it must overestimate the relevant ratio.

better management of the operating cycle has significantly contributed to the improvement in RL's liquidity position in fiscal year 2000.

Tommy Hilfiger's working-capital-requirement-to-net-revenues ratio has constantly been lower than that of RL over the same three-year period. Does this mean that Tommy Hilfiger manages its operating cycle better than Polo Ralph Lauren? Not necessarily. Both companies are active in three segments: wholesale, licensing, and retail, but in different proportions. For example, the wholesale business made up 83 percent of Tommy Hilfiger net revenues in fiscal years 1999 and 2000, and only 49 percent and 45 percent, respectively, for RL.⁹ The period between the time RL or Tommy Hilfiger Corp. purchases its garments and is paid by its customers (the cash conversion period) is not the same in the wholesale business as in the retail or licensing businesses. Thus, some of the difference in the working-capital-requirement-to-net-revenues ratio between the two companies is certainly related to the fact that both sell the same type of products to a different mix of market segments.

As Exhibit A3.2.5 shows, some of the improvement in the working-capital-requirement-to-net-revenues ratio of RL during year 2000 can be attributed to a higher inventory turnover (from 2.4 to 2.6) and to an important increase in the average payment period (from 33 to 54 days). During the same period, RL's average collection period also went up but much less than the average payment period (from 33 to 38 days). Note that Tommy Hilfiger has an inventory turnover higher than RL but also a higher collection period. Again, some of the differences can be attributed to the fact that the two companies serve a different mix of market segments.

FURTHER READING

1. Brealey, Richard, and Stewart Myers. *Principles of Corporate Finance*. 6th ed. McGraw-Hill, 2000. See Chapters 29 to 31.
2. Damodaran, Aswath. *Corporate Finance: Theory and Practice*. 2nd ed. John Wiley & Sons, 2001. See Chapter 14.
3. Ross, Stephen, Randolph Westerfield, and Jeffrey Jaffe. *Corporate Finance*. 5th ed. Irwin, 1999. See Chapters 26, 28, and 29.

REVIEW PROBLEMS

3.1. Evaluating managerial performance.

Allied & Consolidated Clothier (ACC), a manufacturer of coats and other garments, launched an aggressive marketing program aimed at raising the growth rate in sales in 2000 by at least 50 percent compared to the growth rate achieved in 1999. The company's financial statements from 1998 to 2000 are shown on the following page. The income statements span a calendar

⁹Data obtained from the firms' annual reports.

Balance Sheet (in millions)

Year Ended	1998	1999	2000		1998	1999	2000
Cash	\$100	\$90	\$50	Short-term debt	\$80	\$90	\$135
Trade receivables	200	230	290	Trade payables	170	180	220
Inventories	160	170	300	Accrued expenses	40	45	50
Prepaid expenses	30	30	35	Long-term debt	140	120	100
Net fixed assets	390	390	365	Owners' equity	450	475	535
Total assets	<u>\$880</u>	<u>\$910</u>	<u>\$1,040</u>	Total liabilities & owners' equity	<u>\$880</u>	<u>\$910</u>	<u>\$1,040</u>

Income Statement (in millions)

	1998	1999	2000
• Net sales	\$1,200	\$1,350	\$1,600
Cost of goods sold	860	970	1,160
Selling, general, and administrative expenses	150	165	200
Depreciation expenses	40	50	55
• Earnings before interest and tax (EBIT)	150	165	185
Net interest expenses	20	20	25
• Earnings before tax (EBT)	130	145	160
Income tax expense	40	45	50
• Earnings after tax (EAT)	<u>\$90</u>	<u>\$100</u>	<u>\$110</u>
Dividends	\$75	\$75	\$50
• Retained earnings	\$15	\$25	\$60

year and balance sheets are dated December 31. All figures are in millions of dollars.

- Has ACC achieved its marketing objective?
- Restate ACC's balance sheets in their managerial form. What does working capital requirement measure? Is it a long-term or a short-term investment?

- c. Examine the structures of invested capital and capital employed in the managerial balance sheets prepared in the previous question (state each component as a percentage of the total). What do you observe?
- d. Compare the 1998 balance sheet to the 2000 balance sheet. Are these balance sheets matched or unmatched?
- e. Analyze ACC's operational efficiency from 1998 to 2000. Calculate and compare the following efficiency ratios for the three-year period. What can you conclude?
 - 1. Working-capital-requirement-to-sales ratio
 - 2. Average collection period
 - 3. Inventory turnover
 - 4. Average payment period (use cost of goods sold)
- f. Analyze ACC's liquidity position from 1998 to 2000. Calculate and compare the following liquidity ratios over the three-year period. What can you conclude?
 - 1. The liquidity ratio (net long-term financing to working capital requirement)
 - 2. The current ratio
 - 3. The quick ratio
- g. What general conclusion can you draw from your analysis?

3.2. Working capital management for a retailer.

The consolidated financial statements of Carrefour, the French retailer, for the years 1998 and 1999, are shown on the following page.

- a. Calculate working capital requirement at year-end 1998 and 1999. Interpret your results.
- b. Calculate the ratio of working capital requirement to sales. What is the impact of faster growth on Carrefour's liquidity position?
- c. What were Carrefour's average collection periods, inventory turnover, and average payment periods (based on cost of sales) in 1998 and 1999? What can you conclude regarding the impact of these parameters on the magnitude of Carrefour's working capital requirement?
- d. Calculate Carrefour's current ratios and quick ratios. What can you conclude as to the reliability of these liquidity ratios for the case of retailers such as Carrefour?

 Balance Sheet (in millions of French Francs)

Year ended	1998	1999		1998	1999
Current assets			Liabilities		
Cash and securities	FRF14,427	FRF17,007	Accounts payable	FRF59,939	FRF66,070
Trade receivables	5,422	6,407	Short-term debt borrowing	18,965	22,679
Inventories	28,664	32,332	Other current liabilities ²	23,857	30,949
Other receivables ¹	20,108	25,218	Long-term borrowings	37,233	44,163
			Other long-term liabilities	6,750	7,882
Capital assets			Stockholders' equity	42,322	49,646
Fixed assets	68,411	79,454			
Intangible assets	40,661	49,135			
Financial assets	11,382	11,836			
Total assets	<u>FRF189,075</u>	<u>FRF221,389</u>	Total liabilities and owners' equity	<u>FRF189,075</u>	<u>FRF221,389</u>

¹Mostly loans to other companies, including loans to nonconsolidated affiliated companies.

²Short-term liabilities and accruals, other than accounts payable.

 Income Statements (in millions of French Francs)

Year	1998	1999
• Net sales	FRF324,219	FRF340,757
Cost of goods sold	(254,416)	(263,963)
Selling, general, and administrative expenses	(51,264)	(55,621)
Depreciation, amortization, and provisions	(7,887)	(9,375)
Financial income, net of expenses	(557)	(1,783)
Net profit of affiliated companies	509	659
Non-recurring income/expenses	112	(96)
Income taxes	(3,571)	(3,929)
• Net income	<u>FRF 7,145</u>	<u>FRF 6,649</u>
