

ADVANCED TOPICS IN FINANCIAL MANAGEMENT

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VIEW SECTION 3

Advanced Topics in Financial Management

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DEDICATION

This text is dedicated to our families and to our current and former students.

PREFACE

We are pleased to present *Advanced Topics in Financial Management*. This text represents the culminating course in the Finance major for undergraduate students at the University of Phoenix. The text integrates financial and accounting concepts and practice using contemporary case analysis. The goal of the text is to examine real-world financial management practices and to apply them so that firm value increases.

Advanced Topics in Financial Management focuses on decision making that a financial manager would make in the course of growing a business. Thus, the first step is an understanding of financial planning. Good managers recognize where the business has come from, but, more importantly, focus on where the business is going. Therefore, they need to translate their vision into practical terms as presented in the financial statements. Following the development of a financial plan, the manager next must evaluate the plan to determine if it meets the organization's goals and objectives. If not, then the plan must be altered. The decisions that define the plan involve both short-term and long-term investing and financing decisions. We present techniques to analyze working capital decisions, capital budgeting decisions, and capital structure decisions. Finally, we discuss techniques to better communicate financial information within the firm. An important aspect of the

text is a cumulative case study of Desert Coffee Roasters, Inc., a wholesale coffee roaster and distributor. After each section, students are presented with a challenge faced by the company and are asked to apply the analytical techniques presented in the section to construct a possible solution. Extensive spreadsheets are provided to help students.

The text is comprised of the following five sections:

- Section 1: Overview of Advanced Financial Planning
- Section 2: Financial Plan Implementation and Evaluation
- Section 3: Cash Flow and Capital Management
- Section 4: Optimal Capital Structure
- Section 5: Financial Communication and Planning Within the Organization

Features

Several features are found in each section of the text, in addition to the pedagogy of topics and information presented. These features include Learning Objectives, Section Summary, Glossary, Questions and Problems, Mini-Case Studies, and the Cumulative Case Study.

Learning Objectives

Each section opens with a statement of its action-oriented learning objectives. This statement enhances learning by previewing and guiding the reader's understanding of the materials that will be encountered in the section.

Section Summary

At the conclusion of each section is a summary of the important concepts, ideas, and techniques discussed in the section.

Glossary

Glossaries, appearing at the end of each section, define all the key terms appearing in the text.

Questions and Problems

A variety of realistic end-of-section questions and problems offer practice in applying the concepts and techniques being taught.

Mini-Case Studies

These case studies expand on the techniques presented in the sections and illustrated through the problems. Spreadsheets are provided to help guide the student.

Cumulative Case Study

The cumulative case study is intended to be a realistic portrayal of decisions faced by Desert Coffee Roasters, Inc. It is cumulative in the sense that the students' solutions in the early part of the case will affect their analysis in later parts of the case. Spreadsheets are provided for each part of the case.

Acknowledgements

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Thanks to our families for their sacrifices of our time and energy on behalf of this project.

—Dan French

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**SECTION THREE: CASH FLOW
AND CAPITAL MANAGEMENT**

❖ Learning Objectives

- Make working capital decisions utilizing financial tools and concepts.
- Make optimal capital budgeting decisions using financial tools and concepts.
- Assess cash budgeting to working capital needs.
- Revise financial plans to meet desired internal cash flow objectives.

❖ Introduction

This section addresses issues of managing a company's capital from both a short-term and a long-term view. Management of working capital is management of a firm's short-term capital. Management and decisions regarding fixed assets is the management of a firm's long-term investments. These decisions involve issues such as

- What types of assets should the firm acquire?
- How should the firm finance its current assets?
- How should a firm evaluate a proposed long-term investment?
- Why are financial analysts so concerned with cash flows rather than profits?

❖ Working Capital Management

The typical financial manager dedicates a large portion of time managing the firm's **working capital**. Working capital is the firm's total current assets used in operations.

$$\textit{working capital} = \textit{total current assets} \quad (3.1)$$

These current assets include cash, marketable securities, prepaid expenses, accounts receivable, inventory, and other current assets. The term *working capital* is certainly appropriate because working capital provides the resources for the everyday operations of the firm. Without cash, the firm cannot pay its bills. Without receivables, the company would have difficulty selling merchandise. Without inventory, the firm would be unable to make immediate delivery of goods.

- How should the company manage its cash?
- How much inventory should the firm keep available?
- What should be the elements of the firm's credit policy?
- How should the firm structure its current debt?

The Nature of Working Capital

Working capital represents the liquid portion of the firm. Liquid (current) assets and liquid (current) liabilities are both important in working capital management. We can view the liquidity of the firm as the cash and near-cash resources (current assets) that are available to cover near-term

obligations (current liabilities). Therefore, all current accounts are important for the analysis of working capital.

Net Working Capital

Net working capital is equal to the firm's current assets less the current liabilities:

$$\text{net working capital} = \text{current assets} - \text{current liabilities} \quad (3.2)$$

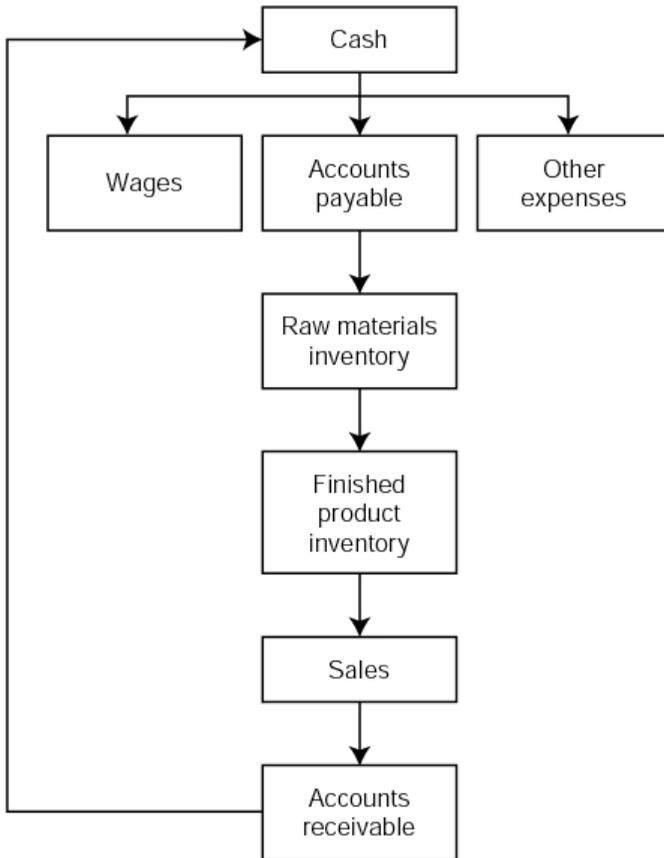
Circulating Working Capital

Working capital circulates among its component current assets. [Figure 3-1](#) illustrates this observation. The firm uses cash to pay labor, accounts payable, and other expenses. Accounts payable purchased raw materials that labor used to produce the finished product inventory. The firm sells its finished product for cash and on account, which the creditor ultimately pays in cash, and the circulation of cash through current assets is complete.

The circulating nature of working capital is an important concept in working capital management because some current assets are converted to cash faster than others; they are more liquid. Cash and marketable securities are the most liquid of current assets, receivables are next, and inventory is the least liquid category of current asset.

FIGURE 3-1:

Illustration of the Circulating Nature of Working Capital



Permanent and Variable Working Capital

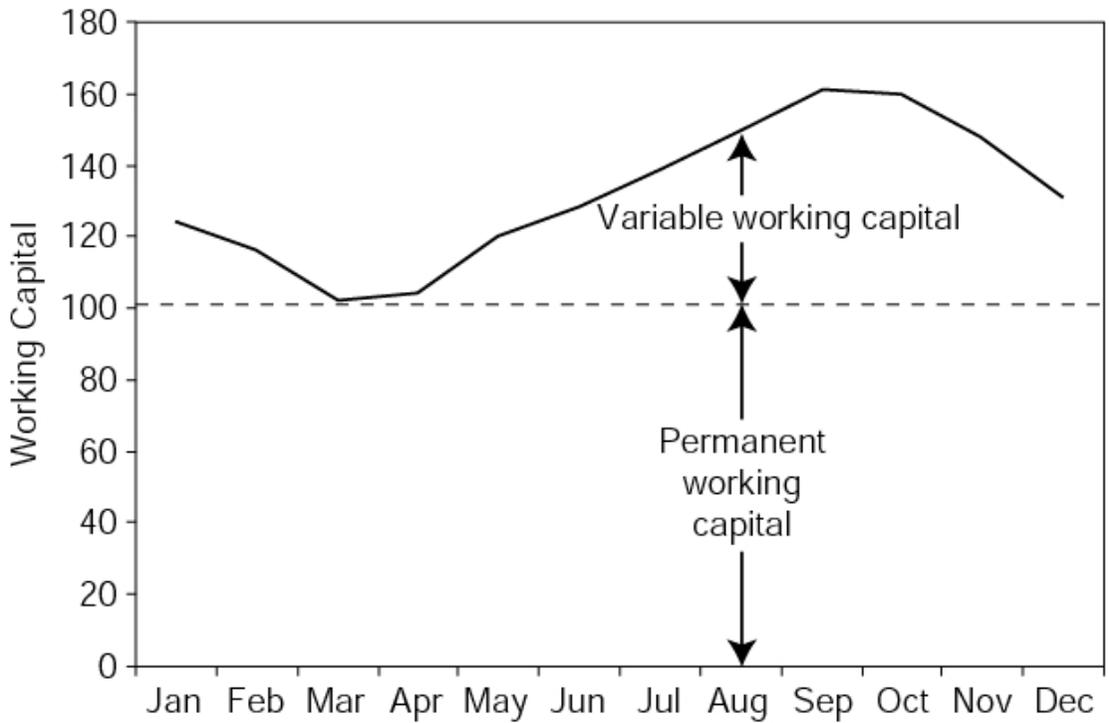
A firm's working capital has two components:

- **Permanent working capital** is the minimum amount of working capital required by the firm to continue operation over the entire year
- **Variable working capital** represents the level of current assets above the level of permanent working capital needed to operate the firm during peak periods of the year

Permanent working capital forms the base working capital of the firm. Variable working capital needs arise because of the seasonal nature of working capital needs. For example, a firm may need to begin building up inventory during April and May to meet seasonal product demand in June and July. [Figure 3-2](#) illustrates the changing needs for working capital for a firm during the year, showing both permanent and variable working capital.

FIGURE 3-2:

Permanent and Variable Working Capital



Three factors principally affect permanent working capital, but can affect variable working capital levels also:

1. Changes in permanent demand for the firm's product—Changes in permanent demand for the firm's product require changes in cash, receivables, and inventory different levels to support sales for the demand.
2. Technological change—New technology can change a firm's needs for current assets.
3. Changes in working capital policy—A change in policy can dictate a different level of current asset.

It is clear how changes in permanent product demand change the need for working capital. As an example of how technological change can affect working capital needs, consider how changes in communication and physical distribution methods have reduced the need for inventory in many industries. Instead of carrying a 30-day safety stock of raw materials, a firm might carry only a 10-day stock, knowing that it can receive a rapid delivery of new supply of materials when needed. As an example of a change in working capital policy, suppose a firm decides that it needs to keep a lower level of cash balances than it has in the past. This decision will reduce cash balances and working capital levels. Variable working capital is affected primarily by seasonal and cyclical variables.

Ratios that Measure Working Capital

When comparing working capital of different firms, it is necessary to use a measure of relative working capital rather than the simple total amount of working capital of the firm. For example, consider the two companies in the retail department store industry in [Table 3-1](#). Wal-Mart Stores, Inc., with total assets of \$97.7 billion, is more than three times the size of Target Corporation. Wal-Mart, because of its larger size, should have greater working capital needs than Target. To compare the two companies, it is necessary to use ratios that measure working capital relative to various elements of the firm.

There are several widely used measures of working capital relative to other financial categories of the firm:

- Current ratio
- Current-assets-to-total-assets ratio
- Current-assets-to-sales ratio (working capital turnover)

Current Ratio

The current ratio is a measure of short-term liquidity comparing the firm's current assets to its current liabilities:

$$\text{current ratio} = \frac{\text{current assets}}{\text{current liabilities}} \quad (3.3)$$

As a ratio of current assets relative to current liabilities, the current ratio is a relative measure of net working capital. Some firms by the nature of their business or operations have a greater need for net working. The current ratio is also a measure of liquidity, so creditors may base decisions to grant credit to the firm on the current ratio. Because of this, a company may want to carry a sufficient level of current assets to yield a sufficiently high current ratio. Other firms have greater needs for net working capital because they find it difficult to finance current assets with current liabilities. For example, a firm might specialize in buying inventory closeouts at large discounts from other firms. On this type of transaction, the firms selling their inventory would most likely not offer trade credit. If the buying firm does not have access to short-term bank financing for inventory, then the firm would provide financing from long-term debt or equity.

Consulting Target's current ratio in [Table 3-1](#), we can see that the firm's increasing current ratio indicates a growing use of working capital. Comparing Wal-Mart's current ratio to Target's shows that Wal-Mart operates with a lower level of working capital than does Target.

TABLE 3-1

Working Capital Ratios for Wal-Mart and Target

	Fiscal Year (millions \$)		
	2001	2002	2003
<u>Target Corp.</u>			
Abbreviated balance sheet			
Current assets	7,304	9,648	11,935
Fixed assets	12,186	14,506	16,668
Total Assets	19,490	24,154	28,603
Current liabilities	6,301	7,054	7,523
Long-term liabilities	6,670	9,240	11,637
Stockholders' equity	6,519	7,860	9,443
Total liabilities and equity	19,490	24,154	28,603
Working capital ratios			
Current ratio	1.159	1.368	1.586
Current assets to total	0.375	0.399	0.417
Current assets to sales	0.198	0.242	0.272
Working capital turnover	5.052	4.134	3.680

(continued)

TABLE 3-1 (continued)

	Fiscal Year (millions \$)		
	2001	2002	2003
<u>Wal-Mart Stores, Inc.</u>			
Abbreviated balance sheet			
Current assets	26,555	28,246	30,483
Fixed assets	51,575	55,205	64,202
Total Assets	78,130	83,451	94,685
Current liabilities	28,949	27,282	32,617
Long-term liabilities	17,838	21,067	22,731
Stockholders' equity	31,343	35,102	39,337
Total liabilities and	78,130	83,451	94,685
Working capital ratios			
Current ratio	0.917	1.035	0.935
Current assets to total	0.340	0.338	0.322
Current assets to sales	0.139	0.130	0.125
Working capital	7.205	7.711	8.022

Current-Assets-to-Total-Assets Ratio

A firm's **current-assets-to-total-assets ratio** presents the working capital as a portion of total assets:

$$\text{current assets to total assets} = \frac{\text{current assets}}{\text{total assets}} \quad (3.4)$$

The ratio measures the extent of working capital in the firm's total structure. Comparing Target's ratio to Wal-Mart's shows that Target relies on a higher level of working capital in its asset structure than Wal-Mart.

Current-Assets-to-Sales Ratio

The **current-assets-to-sales ratio** expresses working capital as a portion of sales:

$$\text{current assets to sales} = \frac{\text{current assets}}{\text{sales}} \quad (3.5)$$

The ratio shows the investment in working capital needed to support one dollar in sales. For example, [Table 3-1](#) shows that in 2003, Target needed 27.2 cents in working capital to generate one dollar in sales while Wal-Mart used only 12.5 cents to produce a dollar of sales. The lower the current-assets-to-sales ratio, the less a firm needs to invest in working capital to generate a dollar of sales, which usually means that the firm is utilizing its working capital in a more resourceful manner.

Another way to express the concept in the current-assets-to-sales ratio is its reciprocal, **working capital turnover**:

$$\text{working capital turnover} = \frac{\text{sales}}{\text{current assets}} \quad (3.6)$$

Working capital turnover conveys the number of times that a company sells or turns over its working capital in a year. In general, the greater the working capital turnover, the more efficiently the firm uses its working capital to produce sales.

Working Capital Policy

Working capital policy involves addressing two fundamental issues:

- The proper amount of current assets to carry
- The appropriate sources of financing current assets

The Amount of Working Capital

Companies should establish policies that guide them to determine the proper levels of cash, receivables, and inventory to carry at various times of the year. A number of factors influence the appropriate amount of current assets that a firm should carry:

- The nature of the firm's business
- The availability of credit
- The size of the firm
- The firm's attitude toward risk and return

The Nature of the Firm's Business

The types of business activities that the firm carries out will affect the desired level of a firm's working capital. For example, companies that provide a service have little or no need to carry inventory, and companies that sell for cash or funnel their sales through third-party credit providers such as credit cards will have no receivables.

[Table 3-2](#) shows average working capital variables for 12 broad business sectors of the economy. Even when divided by broad sector, the working capital needs of the various sectors as measured by total current assets, the current ratio, and the current-assets-to-total-assets ratio differ considerably. The average current ratio of financial firms is 7.69 while the average current ratio for utilities is only 1.26. Although current assets comprise only 18 percent of total assets of utility companies, they make up 61 percent of the assets of firms in the technology sector.

The Availability of Credit

Companies that have ready access to short-term or long-term sources of financing can often reduce a current asset. For example, a company that has an ample line of credit available from a bank will find it unnecessary to carry a large safety balance in cash. If the firm runs short of cash, it simply draws funds from its bank line of credit to provide the needed cash.

TABLE 3-2

Average Working Capital of U.S. Companies, 2002

Sector	Total Assets (Millions of Dollars)	Current Assets (Millions of Dollars)	Current Ratio	Current- Assets-To- Total-Assets Ratio
All firms (6921)	2,014	635	3.07	0.49
Basic materials (493)	1,963	584	4.47	0.39
Capital goods (411)	1,349	555	2.57	0.55
Conglomerates (24)	28,968	11,163	1.69	0.39
Consumer cyclical (429)	3,016	1,527	2.61	0.59
Cons. Non-cyclical (291)	2,602	879	2.07	0.45
Energy (311)	4,344	1,063	1.69	0.24
Financial (166)	985	442	7.70	0.54
Healthcare (874)	897	394	4.39	0.59
Services (1619)	2,466	542	1.95	0.41
Technology (2021)	749	370	3.49	0.61
Transportation (138)	3,081	564	1.65	0.31
Utilities (144)	10,014	1,743	1.26	0.18

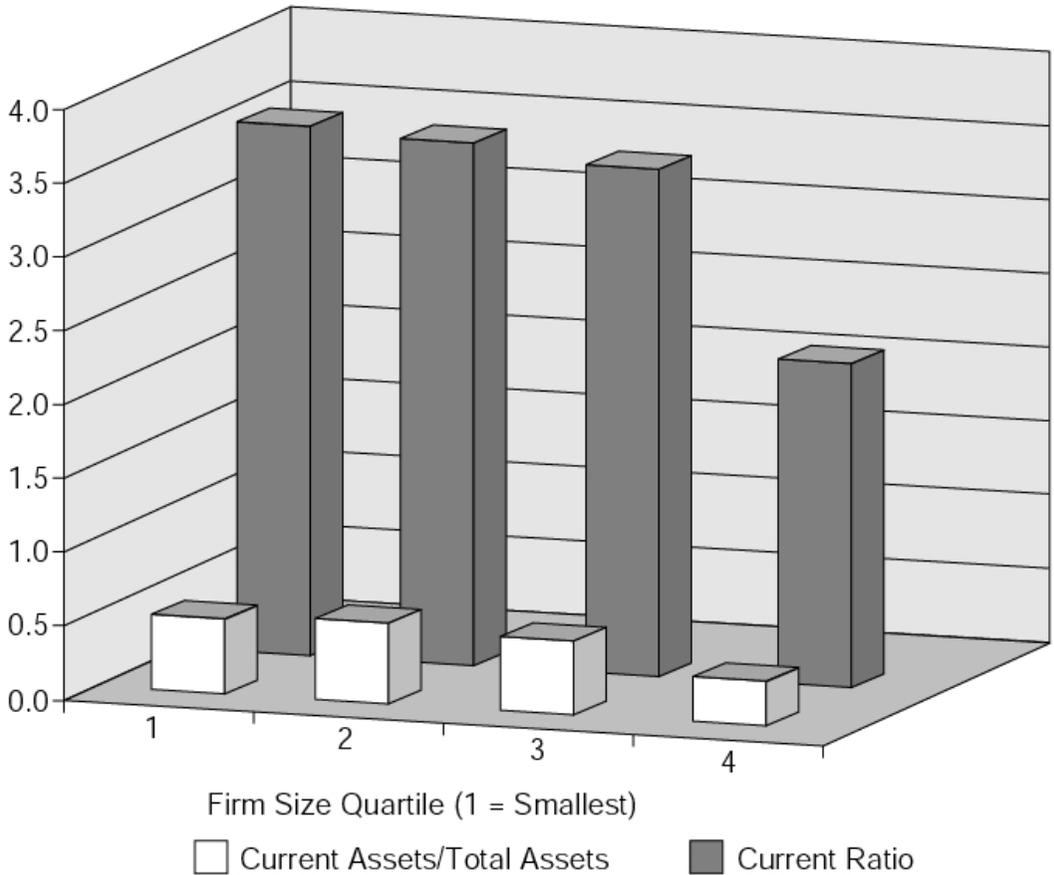
The Size of the Firm

Large companies often have quite different needs for working capital than do smaller firms. Larger firms often have more credit available to reduce needs for carrying current assets. Smaller companies would be more affected by the failure of a few customers to pay their bills than would a larger company. In general, larger firms need less working capital as a percentage of their total assets than do smaller firms.

[Figure 3-3](#) illustrates how larger firms, on average, use less working capital. The figure divides U.S. firms into four size quartiles. Quartile 1 contains the smallest quarter of all firms, and quartile 4 contains the largest companies. The current ratio, a measure of relative net working capital, decreases as the firm size grows. The current-assets-to-total-assets ratio, a measure of working capital as a percentage of firm size, is also less for the larger firm quartiles.

FIGURE 3-3:

Average Working Capital Measures of U.S. Firms by Firm Size, 2002



The Firm's Attitude Toward Risk and Return

The use of funds to finance working capital represents a cost to the firm. Therefore, a relatively large amount of working capital invested in current assets tends to reduce profits of the firm. However, if the firm reduces working capital in an attempt to improve profitability, the firm will most likely find itself in a position of increased liquidity risk. For example, the company that reduces inventory to minimize inventory-carrying cost increases the risk of running out of stock.

In working capital management, as in all areas of finance, there is a tradeoff between risk and return. Measures taken to increase return usually also increase risk. Firms have to identify a working capital policy that finds a balance between profitability and risk so that the value of the firm is maximized in the long run.

The Appropriate Sources of Financing Working Capital

Companies must also develop policies for financing their current assets. Short-term sources of financing include current liabilities such as short-term debt and accounts payable; long-term sources include long-term debt and equity.

A traditional rule of thumb states that firms should match the duration of each type of asset with a comparable liability. Such a rule leads to financing current assets with current liabilities. Unfortunately, a rigid approach such as this does not

allow the flexibility to minimize costs of financing using various sources.

More commonly, firms utilize a combination of long-term and short-term financing for their current assets. For example, a company could purchase inventory using trade credit and the financing source would become accounts payable, a current liability. The company could finance its inventory with an issue of 8-year bonds, and the financing source would be long-term debt.

Advantages of financing working capital with short-term sources include

- *Lower costs*—Interest on short-term debt is usually (though not always) lower than on long-term debt. In addition, using trade credit when available at a low cost can provide cheaper short-term financing.
- *Relationships with commercial banks*—A company can use a bank line of credit to draw on when it needs funds in the short term. The process of negotiating these lines of credit and prompt repayment of these loans allows companies to develop business relationships with commercial banks that may be beneficial when the company needs larger, long-term financing.

Advantage of long-term sources of funds include

- *Reduced repayment risk*—Long-term financing eliminates the need to plan for frequent repayment of short-term loans, thereby reducing the risk that the firm will lack funds to make the frequent repayments.
- *Reduced operational risk*—Long-term financing provides a degree of stability to asset levels and therefore to cash flows from operations. For example, an inventory manager relying on permanent funds rather than on trade credit to finance inventory might be able to maintain a more stable and optimal level of inventory.
- *Reduced liquidity risk*—The use of long-term debt to finance current assets allows the firm to increase its net working capital (increase its current assets relative to current liabilities). Net working capital and the current ratio (the ratio of current assets to current liabilities) are measures of firm liquidity and are used by creditors to measure firm credit risk.

Policies for Working Capital Financing

Matching an item of working capital with a specific source of funding should be within an overall policy framework. It is not realistic to consider that a particular bank loan provides funding for a particular set of accounts receivable. The financing goes into a pool of available funds, and these funds finance all current assets. However, as a general policy, it is reasonable to match categories of financing with categories of assets with the goal of having an overall rational policy of funding working capital.

[Table 3-3](#) shows three possible policies for working capital financing:

1. The total current assets working capital financing policy
2. The major current assets working capital financing policy
3. The permanent and variable working capital financing policy

TABLE 3-3

Working Capital Financing Policies

Category	Source of Financing
Total Current Assets Policy	
Pre-set portion of current assets	Short-term
Remaining portion of current assets	Long-term
Major Current Asset Accounts Policy	
Cash	Short-term or long-term
Receivables	Short-term or long-term
Inventories	Short-term or long-term
Permanent and Variable Working Capital Policy	
Variable working capital	Short-term
Permanent working capital	Short-term and long-term

The Total Current Assets Policy

The simplest of the policies for working capital financing is the **total current assets financing policy**. This policy does not distinguish among the different types of current assets. To implement this policy, the financial manager selects a portion of current assets to be financed with short-term sources. The remaining current assets then receive long-term financing. For example, the firm's financial managers might decide to target 60 percent of the current assets to be financed with current liabilities, allowing a variance of plus or minus 5 percent. Long-term financing will provide the funds for the remaining 40 percent (35 to 45 percent after considering the allowable variance) of current assets.

Financial managers should consider a number of variables when determining the percent of current assets to finance with current liabilities. These variables should include factors such as

- The rate of inventory turnover
- The speed with which the firm collects its receivables
- The firm's attitude toward risk

The Major Current Asset Accounts Policy

The **major current asset accounts working capital financing policy** distinguishes between the different current asset accounts. A firm developing such a policy would direct its financial managers to match each current asset category with a specific long- or short-term financing source. For example, cash and marketable securities is the most liquid of the current assets. The policy might state that these should be funded with short-term debt. Receivables are also quite liquid and might also be funded with a short-term source such as accounts payable or a combination of payables and short-term loans. Inventory is the least liquid of the major current asset accounts. The policy might declare that inventory be financed with long-term sources.

The Permanent and Variable Current Assets Policy

The **permanent and variable working capital financing policy** recognizes the seasonal nature of working capital. Variable working capital, the current assets that vary throughout the year, are typically funded with short-term liabilities such as short-term loans that can be reduced to zero when not needed. Long-term capital or combinations of short and long-term sources are used to meet the needs of the permanent working capital.

Working Capital Strategy

A company's **working capital strategy** is the plan that implements the working capital policy. Financial managers should carefully review the firm's working capital policy and design a strategy that is consistent with the policy.

The Importance of Working Capital Strategy

Developing and implementing a viable working capital strategy for managing and financing the firm's current assets are important for the overall profitability of the firm. Several reasons explain the importance of working capital strategy:

- *Daily effects*—The decision to acquire or sell assets is important to the firm. While firms make decisions regarding capital assets only from time to time, firms face decisions about current assets every day. Daily management of the current asset accounts is necessary to prevent running short of cash and inventory and to prevent receivables from increasing beyond a critical point.
- *Resources of the firm*—Current assets comprise a considerable portion of the assets of most firms. While the percentage of total assets represented by current assets varies greatly by industry and firm, current assets average about 50 percent of total assets.

- *Financial reporting*—Investors and the firm’s creditors analyze the firm’s financial statements to make investment and credit decisions based on the financial soundness of the firm. A solid working capital section of the balance sheet is important to attract investors and credit.
- *Ability to adjust current assets*—The current asset accounts are constantly fluctuating, giving the firm the opportunity to make adjustments with the goal of changing liquidity and increasing the profitability of the firm. Financial managers can fine tune the firm’s current assets and liabilities and show immediate results. On the other hand, it is difficult to make minor adjustments to fixed asset investments.

Strategies

The purpose of working capital is to support the operations of the company. To generate sales, the firm has to supply working capital. One measure of the use of working capital is the ratio of sales to current assets, also called the **current asset turnover**. The current asset turnover indicates how many dollars of sales that one dollar of current assets supports.

Working capital strategies can be classified into three general groups according to their ability to support a given level of sales:

- Conservative strategies
- Aggressive strategies
- Moderate strategies

Conservative Working Capital Strategy

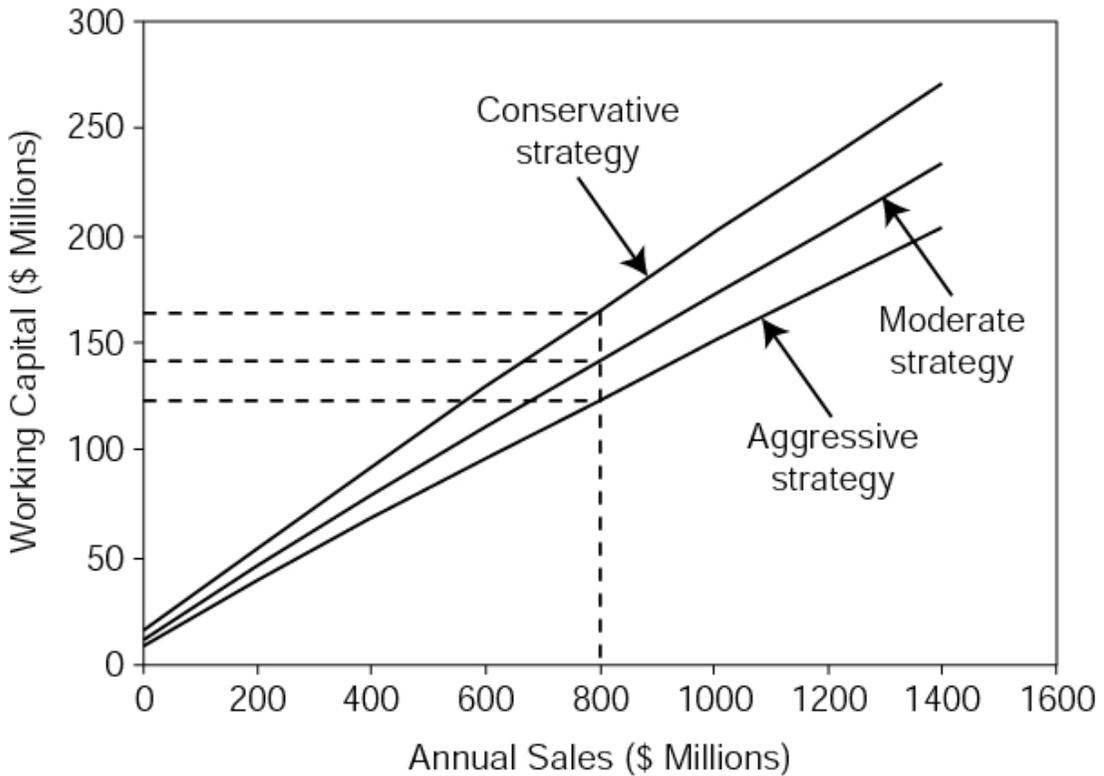
Conservative working capital strategies allow ample current assets to support sales generation. Conservative strategies place emphasis on having an adequate amount of current assets available with a very low probability of running short of cash or inventory. Firms pursuing a conservative strategy generally have the following characteristics of their current asset balances:

- Cash balances that are more than enough to carry out the firm's usual operations
- Inventories that are generous to reduce the possibility of a stock out
- Receivables that are relatively high because of liberal credit policy

A conservative strategy is low risk and requires less attention to current asset management, so it is a relaxed strategy. In a conservative strategy, current assets are high relative to sales, resulting in a relatively low current asset turnover ratio.

[Figure 3-4](#) provides an illustration of various working capital strategies on the level of current assets and the level of sales they support. For a given level of sales, the conservative working capital strategy requires more investment in current assets. In the figure, the firm with a conservative strategy needs to have a \$166 million investment in current assets to support sales of \$800 million, and the resulting current asset turnover ratio is 4.83.

FIGURE 3-4:
Alternative Working Capital Strategies



Aggressive Working Capital Strategy

Aggressive working capital strategies attempt to provide the minimum amount of current assets to support the firm's sales. Aggressive strategies try to minimize the costs of investment in current assets. These strategies realize that there is a cost associated with running low on cash or selling out of inventory, and they try to balance these costs with the cost of carrying excess current assets. Companies following an aggressive working capital strategy typically have current asset balances with these characteristics:

- Cash balances are at a minimum. Excess cash balances are invested in marketable securities, and the firm often draws on a bank line of credit to raise short-term funds when cash and securities run low.
- Inventories are managed so that they are as low as possible without stock outs reducing sales to the extent that overall profits fall.
- Receivables are relatively low, resulting from a credit policy that encourages cash sales and rapid payment of accounts.

An aggressive strategy is higher risk and calls for constant management of current assets to keep them at a minimum, so it is a restrictive type of strategy. Aggressive strategies yield current asset levels that are relatively low compared to sales; therefore, the current asset turnover ratio is relatively high.

In the example provided by [Figure 3-4](#), the aggressive strategy yields a lower investment in current assets for a given level of sales. In the figure, the firm with an aggressive strategy requires an investment in current assets of \$124 million to maintain sales of \$800 million, giving a current asset turnover ratio of 6.48.

Moderate

Moderate working capital strategies find a balance between conservative and aggressive strategies. They recognize that working capital management can reduce costs and increase profits, but they do not reduce current asset levels as low as the aggressive strategies.

In [Figure 3-4](#), the company following a moderate working capital strategy has \$142 million tied up in current assets on sales of \$800 million. The current asset turnover ratio for the moderate strategy is 5.63.

❖ Managing Current Assets

The goal of working capital management is to provide a minimum but sufficient level of working capital to support the firm's level of sales. Managing working capital entails controlling the major categories of current assets:

- Cash
- Accounts receivable
- Inventory

❖ Cash Management

Cash management is the management of the firm's cash and liquid short-term investment assets with the goal of minimizing the need for cash while still maintaining sufficient liquidity to satisfy the firm's needs.

Strictly defined, a company's cash is equal to the firm's banking demand deposits plus any currency. Cash is a nonearning asset in the sense that cash generates no revenue for the firm. However, firms do find it necessary to maintain cash balances. There are two primary types of cash balances:

- **Transactions balances**—These cash balances are necessary to make the routine payments that firms typically transact such as wages, payments for raw materials, and interest payments

- **Compensating balances**—These cash balances are funds that the firm holds with a commercial bank in order to compensate the bank for services provided. While banks sometimes charge fees for their services, they often require companies to keep compensating balances in lieu of paying fees. Banks may prefer compensating balances to fees because compensating balances increase the bank's deposit base and the income earned from lending out those deposits.
- Companies often have two secondary motives for holding cash:
- **Precautionary balances**—Funds are held as a safety reserve for seasonal or unexpected needs for cash.
- **Speculative balances**—Funds are held in reserve to be able to take advantage of opportunities that may arise in the future.

Balances for precautionary and speculative purposes need not be kept in the form of cash because they are not needed immediately. However, they should be held in the form of liquid marketable short-term securities so that they can be accessed quickly if they are needed. Holding balances as marketable securities allows the firm to earn a return on those balances rather than leaving them to remain idle as a cash deposit.

Money-market marketable securities provide a degree of liquidity almost equal to that of cash, so marketable securities may substitute for cash needed precautionary, speculative, and even some transactions balances. Therefore, cash management involves the management of both cash balances and short-term investments in money market securities or other short-term liquid investments.

A firm's should maintain a sound cash-management policy to ensure that the firm has sufficient liquidity to do the following:

- Make everyday transactions and make timely payment of bills due so that the firm can take advantage of any **trade discount** that a supplier may offer. A trade discount is a discount from the invoice price for early payment.
- Maintain its credit rating by keeping its current ratio and quick ratio in line with industry standards.
- Take advantage of any special opportunities that may arise.
- Deal with financial emergencies that may crop up from time to time.

The Cash Budget

A **cash budget** is a document that forecasts a firm's cash inflows and outflows over a specified period. The cash budget combines forecasts of sales, inventory requirements to support those sales, and the timing of the collections of those sales, payment for materials, taxes, dividends, and other payments in cash. The cash budget provides a model for forecasting the cash balances and the need for short-term borrowing should forecasted cash balances prove inadequate.

Compared to pro forma financial statements, a cash budget provides significantly more detail about future cash flows. The cash budget usually breaks cash flows down into smaller component parts, and it breaks the period down into smaller periods. For example, a cash budget usually identifies specific sources and uses of cash that are often combined into one category on a financial statement. Cash budgets are most useful when they are prepared for sub-periods of the accounting period. Financial statements are usually prepared quarterly and annually, while cash budgets are monthly, weekly, and even daily.

Cash budgets serve two main purposes:

- They alert the firm of projected cash deficits or surpluses.
- They serve as a benchmark for judging future performance.

To develop a cash budget, there are six basic steps:

1. Develop the scenario with a set of assumptions on which to base forecasts.
2. Forecast sales for each sub-period based on the assumptions.
3. Estimate the anticipated cash inflows from operations for each sub-period.
4. Project the expected cash outflows from operations for each sub-period.
5. Estimate nonoperating cash flows such principal payments on long-term debt, new stock issued, or cash dividends.
6. Calculate net cash flow and resulting deficit (need for short-term borrowing) or surplus (need to invest cash in marketable securities).

Setting Up the Cash Budget

As an example of a cash budget, consider the Cachet Pen Company, Inc. in Example Case 3A. Forecasted sales for Cachet Pen are 12 million pens. At an average price of \$10 per pen, forecasted annual sales in dollars are \$120 million. Cachet's average cost is \$4 per unit, so cost of goods sold is \$48 million.

Example Case 3A

Cachet Pen Company, Inc.—Working Capital

The Cachet Pen Company, Inc. manufactures quality pens and mechanical pencils that generally sell in the \$15 to \$50 range at retail. The company forecasts that it will sell 12 million pens and pencils next year at an average price to distributors of \$10 each. The firm's cost of production averages \$4 per unit.

Analysts working with Alice Wright, Cachet's Chief financial Officer, have projected next years earnings based on assumptions outlined in [Table 3-4](#) and monthly sales forecasts detailed in [Table 3-5](#). These forecasts resulted in the financial statements in [Table 3-6](#).

Examining the financial statements, Alice notes that the analysts project a profit for next year and that the firm's cash and equivalents position should increase over the year. However, Cachet lags the industry (Office Products) in terms of profitability. Cachet's projected return on assets is about two percent compared to the industry average of five percent. Alice believes that working-capital policy may be contributing to the firm's poor performance and wants to examine several working-capital issues.

Working Capital Issues

The principal working-capital issues facing Cachet are:

1. Cachet begins the year with no short-term debt and should end the year with excess cash invested in marketable securities. Does the cash manager need to plan for short-term borrowing during the year?
 2. Does Cachet need to find permanent financing for its working capital needs?
 3. Does it appear that Cachet manages its inventory adequately?
 4. Does Cachet maintain a favorable credit policy?
-

Develop the Scenario

The basic assumptions for Cachet Pen's cash budget are in [Table 3-4](#). Cachet collects 20 percent of its sales per month in cash, and the remaining 80 percent of sales remains in accounts receivable and is collected during the following month. Cachet pays 40 percent of its monthly manufacturing costs during the current month and delays payment on the remaining 60 percent until the following month.

TABLE 3-4

*Cachet Pen Company, Inc., Financial Situation
Information and Assumptions*

Item	Amount
Sales and Costs:	
Projected unit sales	12 million
Average price per unit	\$10
Average manufacturing cost per unit	\$4
Collections and Payments:	
Sales collected in the current month	20%
Sales collected the following month	80%
Manufacturing costs paid in the current month	40%
Manufacturing costs paid in the following month	60%
Interest Rates:	
Interest rate received on investment in marketable securities (interest is received on the previous month's ending balance)	4%
Interest rate paid on notes payable (interest is paid on the previous month's ending balance)	8%
Interest rate paid on long-term debt (interest paid monthly)	7%
Non-Income-Statement Projected Cash Receipts and Payments:	
Annual cash dividend (paid quarterly in Mar, Jun, Sep, and Dec)	\$.04
Payment of current portion of long-term debt (Nov)	\$2 million
Payment for capital improvements (half in Jan, half in Aug)	\$4 million
Other:	
Tax rate	30%
Cash balance maintained	\$2 million

Cachet maintains a \$2 million cash balance with its bank and invests any excess funds in marketable securities. When Cachet's bank balance falls below \$2 million, the company takes on short-term notes payable against a line of credit extended by the bank.

Forecast Sales for Each Sub-Period

[Table 3-5](#) contains the monthly forecasts of sales. Pen sales are slightly seasonal with a small peak in April because pens are popular graduation gifts. A greater sales peak occurs in October as retailers begin stocking up for the Christmas season.

[Table 3-5](#) also shows the monthly forecasts for production. Cachet Pen produces at a slightly greater rate during peak demand periods, but manufacturing procedures prevent the firm from matching production to demand unit for unit every month. The firm shuts down production at the end of each year for annual plan maintenance and renovation.

Estimate the Cash Inflows from Operations

[Table 3-6](#) provides the pro forma income statement on which the cash budget is based. Income statements do not provide the level of detail that a cash budget provides. Cash budgets give information about both the source and timing of cash flows. The "Cash Receipts from Operations" section of Cachet's cash budget shows the operating cash inflows.

ADVANCED TOPICS IN FINANCIAL MANAGEMENT
Section Three: Cash Flow and Capital Management

TABLE 3-5

Cachet Pen Company, Inc., Monthly Sales and Production Forecasts (Thousands of Dollars)

Month	Units				Value	
	Beginning Inventory	Production	Sales	Ending Inventory	Sales	Ending Inventory
Jan	4,000	600	600	4,000	\$ 6,000	\$ 16,000
Feb	4,000	1,000	1,000	4,000	10,000	16,000
Mar	4,000	1,000	1,000	4,000	10,000	16,000
Apr	4,000	1,000	1,400	3,600	14,000	14,400
May	3,600	1,000	800	3,800	8,000	15,200
Jun	3,800	1,000	800	4,000	8,000	16,000
Jul	4,000	1,000	800	4,200	8,000	16,800
Aug	4,200	1,200	800	4,600	8,000	18,400
Sep	4,600	1,200	1,000	4,800	10,000	19,200
Oct	4,800	1,200	2,000	4,000	20,000	16,000
Nov	4,000	1,200	1,200	4,000	12,000	16,000
Dec	4,000	600	600	4,000	6,000	16,000
Total	4,000	12,000	12,000		120,000	
Average				4,083		16,333

TABLE 3-6

*Cachet Pen Company, Inc., Financial Statements
(Thousands of Dollars)*

Last Year Actual Next Year Projected

Income Statement

Revenue	\$ 120,000
Cost of goods sold	<u>48,000</u>
Gross profit	72,000
Administrative expense	55,000
Depreciation	<u>12,000</u>
Operating earnings	5,000
Net interest expense	<u>1,814</u>
Earnings before taxes	3,186
Taxes	<u>956</u>
Net income	<u>\$ 2,230</u>
Shares outstanding	40,000
Earnings per share	\$ 0.058

(continued)

ADVANCED TOPICS IN FINANCIAL MANAGEMENT
Section Three: Cash Flow and Capital Management

TABLE 3-6 (continued)

	Last Year Actual	Next Year Projected
<hr/> Balance Sheet		
Cash	\$ 2,000	\$ 2,000
Marketable securities	0	2,630
Accounts receivable	4,800	4,800
Inventory	<u>16,000</u>	<u>16,000</u>
Total current assets	22,800	25,430
Fixed assets	104000	<u>100,000</u>
Total assets	<u>\$ 126,800</u>	<u>\$ 125,430</u>
Liabilities		
Notes payable	\$ 0	\$ 0
Current portion of LT debt	2,000	2,000
Accounts payable	<u>1,440</u>	<u>1,440</u>
Total current liabilities	3,440	3,440
Long-term debt	20000	18,000
Common equity	<u>103,360</u>	<u>103,990</u>
Total liabilities and equity	<u>\$ 126,800</u>	<u>\$ 125,430</u>

The operating cash inflows for Cachet Pen result from product sales. January sales of 600,000 units represent revenue of \$6 million. Of that amount, Cachet collects 20 percent in January. Twenty percent of \$6 million is \$1.2 million, so the “Cash sales” line of the cash budget in [Table 3-7](#) records \$1,200. (Numbers in the tables are in thousands.) The remaining 80 percent of the month’s sales remain in receivables to be collected during the following month.

In addition to cash sales for the month, Cachet collects its accounts receivable from the prior month. Referring to the balance sheet for the prior year in [Table 3-6](#), Cachet Pen shows accounts receivable of \$4,800 that the company will collect in January, so the cash budget lists “Collections” of \$4,800. Collections for February will be 80 percent of January’s sales, which amounts to \$4,800.

Following this procedure of estimating monthly sales, cash collections, and collections of the previous month’s receivables, we compute the “Cash Receipts from Operations” for each month. The final column shows the total for the year.

ADVANCED TOPICS IN FINANCIAL MANAGEMENT
Section Three: Cash Flow and Capital Management

TABLE 3-7

*Cachet Pen Company, Inc., Monthly Cash Budget
(Thousands of Dollars)*

Rounding may cause some listed totals to differ slightly from the column or row totals

	Jan	Feb	Mar	Apr	May	Jun
Revenue						
Unit sales	600	1,000	1,000	1,400	800	800
Unit price	10	10	10	10	10	10
Total revenue	6,000	10,000	10,000	14,000	8,000	8,000
Production Costs						
Unit production	600	1,000	1,000	1,000	1,000	1,000
Unit cost	4	4	4	4	4	4
Total cost of production	2,400	4,000	4,000	4,000	4,000	4,000
Cash Receipts From Operations						
Cash sales	1,200	2,000	2,000	2,800	1,600	1,600
Collections	4,800	4,800	8,000	8,000	11,200	6,400
Interest income	0	0	0	0	0	2
Total cash receipts from operations	6,000	6,800	10,000	10,800	12,800	8,002
Cash Payments for Operations						
Cash production costs	960	1,600	1,600	1,600	1,600	1,600
Payments on account	1,440	1,440	2,400	2,400	2,400	2,400
Administrative costs	4,583	4,583	4,583	4,583	4,583	4,583
Interest paid	128	162	169	165	151	128
Taxes			239			239
Total cash payments for operations	7,112	7,786	8,991	8,748	8,735	8,951
Total cash from operations	(1,112)	(986)	1,009	2,052	4,065	(949)
Non-Operating Cash Receipts and (Payments)						
Capital investment	(4,000)					
Payment on LT debt						
Cash dividends			(400)			(400)
Total non-operating cash payments	(4,000)		(400)			(400)
Net cash flow	(5,112)	(986)	609	2,052	4,065	(1,349)
Cumulative net cash flow	(5,112)	(6,097)	(5,489)	(3,437)	628	(720)

(continued)

ADVANCED TOPICS IN FINANCIAL MANAGEMENT
Section Three: Cash Flow and Capital Management

TABLE 3-7 (continued)

	Jul	Aug	Sep	Oct	Nov	Dec	Total
Revenue							
Unit sales	800	800	1,000	2,000	1,200	600	12,000
Unit price	10	10	10	10	10	10	10
Total revenue	8,000	8,000	10,000	20,000	12,000	6,000	120,000
Production Costs							
Unit production	1,000	1,200	1,200	1,200	1,200	600	12,000
Unit cost	4	4	4	4	4	4	4
Total cost of production	4,000	4,800	4,800	4,800	4,800	2,400	48,000
Cash Receipts From							
Cash sales	1,600	1,600	2,000	4,000	2,400	1,200	24,000
Collections	6,400	6,400	6,400	8,000	16,000	9,600	96,000
Interest income	0	0	0	0	0	10	12
Total cash receipts from	8,000	8,000	8,400	12,000	18,400	10,810	120,012
Cash Payments for							
Cash production costs	1,600	1,920	1,920	1,920	1,920	960	19,200
Payments on account	2,400	2,400	2,880	2,880	2,880	2,880	28,800
Administrative costs	4,583	4,583	4,583	4,583	4,583	4,583	55,000
Interest paid	133	138	172	183	167	128	1,826
Taxes			239			239	956
Total cash payments for	8,716	9,041	9,794	9,567	9,551	8,791	105,782
Total cash from operations	(716)	(1,041)	(1,394)	2,433	8,849	2,019	14,230
Non-Operating Cash							
Capital investment		(4,000)					(8,000)
Payment on LT debt						(2,000)	(2,000)
Cash dividends			(400)			(400)	(1,600)
Total non-operating cash	0	(4,000)	(400)	0	0	(2,400)	(11,600)
Net cash flow	(716)	(5,041)	(1,794)	2,433	8,849	(381)	2,630
Cumulative net cash flow	(1,437)	(6,478)	(8,272)	(5,839)	3,011	2,630	

Interest income is also an operating cash inflow. While some argue that interest is a financial flow, the Financial Accounting Standards Board requires firms to classify interest received as an operating flow on their statement of cash flows. For this reason, cash budgets illustrated in this text place interest in the operating cash categories. According to the assumptions, Cachet receives interest at the rate of 4 percent on its previous month's investment in marketable securities. The balance sheet for last year shows no investment in marketable securities, so Cachet's interest income for January is \$0.

Project Cash Outflows from Operations

The "Cash Payments for Operations" section of the cash budget shows Cachet's operating cash outflows. For Cachet, operating outflows result from payments for the manufacturing process, payments of administrative and selling costs, interest expenses, and taxes.

Cachet Pen's January production of 600 units represents costs of \$2,400. Cachet pays for 40 percent of that amount in the current month, so January's "Cash production costs" are \$960. Cachet will carry the remaining 60 percent (\$1,440) of January's materials purchases in accounts payable and pay them during February. The balance sheet shows \$1,440 in "Accounts payable" from the previous year, so January's "Payments on account" are \$1,440.

Cachet Pen's annual administrative expenses such as office rent, salaries, advertising, and other items total \$55,000 for the year. Assuming that the firm pays this sum evenly over the year, January's cash budget shows \$4,583 (1/12 of \$55,000) for "Administrative costs."

Cachet Pen's interest payments result from

- Interest on long-term debt (including the current portion of long-term debt listed in current liabilities), paid monthly
- Interest on notes payable, paid monthly on the previous month's notes payable balance (if any)

The firm's long-term debt at the end of the last year is \$20,000, and the current portion is \$2,000, so Cachet pays 7 percent interest on \$22,000. One month's worth of long-term debt interest is therefore \$128 (1/12 of 7 percent of \$22,000). Cachet ended the year with no funds borrowed as notes payable, so no interest is due in January on notes.

Another important operating cash outflow is taxes. Businesses typically pay estimated taxes on a quarterly basis. For constructing a cash budget, taxes present a problem because taxes are not known until profits are known. However, profits are not known until the end of the year. In the case of Cachet, the pro forma income statement serves as a basis for estimating the quarterly tax payment. In practice, companies make estimated tax payments based on forecasts, adjusting the

payments each quarter as more information is available about actual profits that the firm will report and taxes that the firm will owe at the end of the year.

Estimate Non-Operating Cash Flows

Non-operating cash flows generally result from one of the following sources:

- **Investment cash flows**—Cash flows resulting from the acquisition or sale of fixed assets
- **Financing cash flows**—Cash flows resulting from sources of financing

Investment cash flows are typically payments made to acquire the fixed assets required to operate the firm. This includes assets used in the manufacturing process and assets used as general overhead for the firm. Because these cash flows are payments, the cash budget identifies them as cash outflows. However, the sale of an asset results in a cash inflow. It is important to remember that the sale of an asset may have tax consequences that need to be considered when estimating tax payments. In the case of Cachet Pen Company, the firm has planned capital investments that result in budgeted cash outflows of \$4,000 in January and \$4,000 in August.

Financing cash flows result from the financing activities of the firm. The principal financing cash flows are as follows:

- Borrowing funds as long-term debt (cash inflow)
- Repaying long-term debt (cash outflow)
- Raising capital by issuing stock (cash inflow)
- Repurchase and retirement of stock (cash outflow)
- Payment of cash dividends (cash inflow)

Cachet Pen's balance sheet identifies planned repayment of long-term debt as the "Current portion of long-term debt" on the balance sheet. The firm's debt agreement schedules this payment for the end of December, so the cash budget reflects the payment of \$2,000 at that time.

Cachet Pen plans to make an annual cash dividend distribution of four cents per share paid in quarterly installments during March, June, September, and December. Those months of the cash budget reflect a cash outflow of \$400 (\$0.01 per share on 40,000 shares).

Completing the Cash Budget

Summing the cash flows in the cash budget yields the net cash flow for each month. The final item on the cash budget is the cumulative net cash position, which represents the firm's cash surplus for the month if positive or deficit if negative. For Cachet Pen, the estimated net cash flow in January is -\$5,112,

leaving the January cumulative cash position at a deficit of \$5,112.

Investing the Cash Surplus or Financing the Deficit

If the cumulative cash position represents a cash surplus, the primary place to park that cash is in short-term securities. Unless company management has identified another investment for a cash budget surplus, the cash budget should assume that the firm would invest excess cash in marketable securities or other short-term investments such as a bank certificate of deposit. There is no incentive to let excess funds lie idle in the form of cash deposits. Although the basic assumption is that the firm will invest a cash surplus, part of the utility of a cash budget is to identify the timing of excess cash, should the company have other uses for it. For example, company management might decide that an increase in dividends would be a desirable measure, but only in the case where excess cash is available to pay those dividends.

If the cumulative cash position is negative, the basic treatment in a cash budget is to assume that the firm borrows short-term funds to cover the deficit. However, the cash budget also serves as a tool that is useful in identifying times when the company needs to raise more permanent capital. For example, if the cash budget reveals a deficit continuing throughout the year, then company financial managers should consider obtaining longer-term funds to finance that need for cash.

Effect of the Cash Surplus or Deficit on the Cash Budget

The existence of a cash surplus or deficit in one month affects the cash flow in the following month. For this reason, construction of a reliable cash budget is a sequential process:

1. Estimating the net cash flow for one month
2. Considering the effect of the new cash position on interest charges or income for the following month
3. Estimating the following month's cash flow

The cash analyst continues these steps until the cash budget is complete.

For example, consider the impact of January's cash position on February's cash flow for Cache Pen. The company finances the deficit of \$5,112 by short-term borrowing and must pay the interest on that debt in February. At Cachet's interest rate on notes payable of 8 percent, the firm owes \$34 in interest on its short-term debt payable in February. Combined with the monthly interest payment of \$128 on long-term debt, Cachet's cash budget for February shows total interest charges of \$162 in February.

February's net cash flow of -\$986 leaves a cash shortage of \$6,097 to be financed with short-term debt. The short-term debt requires an interest payment of \$41 in March which, when

added to long-term debt interest of \$128, yields March's interest payment of \$169. This process is continued until the last period to allow for completion of the cash budget.

Cachet Pen shows its first cash surplus (\$628) in May, which results in interest income of \$2 in June. The company finishes the year with a positive net cash flow of \$2,630.

Optimal Cash Balances

Companies should manage their cash so that the profitability of the firm is maximized without taking on additional risk. This strategy implies that financial managers need to strike a balance between carrying extra liquidity in marketable securities and financing working capital needs with borrowing.

The first question in Example Case 3A is, "While Cachet begins the year with no short-term debt and should end the year with excess cash invested in marketable securities, does the cash manager need to plan for short-term borrowing during the year?" The cash budget allows us to address that question. Without additional long-term borrowing, it is clear that Cachet will need to access its line of credit during the year. Cumulative net cash flows show a deficit balance during nine months of the year

Liquidity Ratios

The firm's liquidity ratios and working capital ratios help address issues regarding the level of working capital that the firm carries. These ratios, defined as equations 3-4 to 3-6, are

- Current ratio
- Current assets to total assets
- Current assets to sales
- Working capital turnover

The second question in the sample case is, "Does Cachet need to find permanent financing for its working capital needs?" The current ratio provides a good venue to analyze this issue. If a company relies too heavily on short-term financing, then its current liabilities will be relatively high, and its current ratio will be relatively low.

[Table 3-8](#) presents current ratios for Cachet Pen and for the consumer non-durables industry. The industry average current ratio is 2.2 while the year-end current ratio for Cachet is 7.39. It appears that Cachet Pen does not need to seek permanent financing; the current ratio is much higher than the industry average.

TABLE 3-8

Current Ratio for Cachet Pen Company, Inc.

	Current Ratio
Consumer Non-Durables Industry Average	2.20
Projected Current Ratios Using Cachet Pen Company Cash Budget by Month:	
Jan	2.67
Feb	2.47
Mar	2.63
Apr	3.52
May	5.51
Jun	4.76
Jul	4.32
Aug	2.36
Sep	2.22
Oct	3.17
Nov	6.27
Dec	7.39

However, because Cachet Pen's sales are seasonal, and the bulk of sales occur near the end of the year, it is possible that Cachet's current ratio is high only at the end of the year and not so during the year. To check this issue, the cash budget allows us to estimate the firm's current ratio during the year. For example, for January, Cachet's current assets should be:

- Cash—\$2,000
- Marketable securities—none
- Accounts receivable—\$4,800 (80 percent of sales of \$6,000)
- Inventory—\$16,000 (see [Table 3-5](#))

Cachet's current liabilities should be:

- Notes payable—\$5,112 (the cumulative net cash flow)
- Accounts payable—\$1,440 (60 percent of the cost of production of \$2,400)
- Current portion of long-term debt \$2,000

Current assets for January total \$22,800 and current liabilities total \$8,552, giving a current ratio of 2.67. Cachet's lowest current ratio during the year of 2.22 (in September) is equal to the industry average, but the ratio is higher than the industry average for the remainder of the year. This information leads to two conclusions:

- Cachet's level of short-term debt is not too high, and the firm does not need to seek permanent financing for working capital.
- Cachet's level of current assets (working capital) may be too high.

The Cash Balance and Investing Excess Cash

Many financial statements combine cash and marketable securities into one statement line because marketable securities are sufficiently liquid to be treated as cash equivalents. In general, a company should seek to minimize cash and maximize cash equivalents because cash equivalents earn income. However, analysts should realize that a large cash balance is not necessarily an unfavorable position.

Companies may keep cash in compensating balances because their bank requires them to do so according to terms of their banking relationship. For example, a firm might keep a cash balance of \$5 million in demand deposits at its bank when transactions demands for cash dictate a minimum balance of

only \$3 million would be necessary. However, if the firm were to not keep its \$5 million cash balance, the company might find that the bank would charge a higher interest rate on short-term loans and higher fees for other banking services. These costs and fees that the firm saves may exceed the interest that the company could earn on marketable securities, so it is favorable for the company to maintain compensating balances rather than minimize cash and invest the surplus in short-term investments.

The Operating Cycle

The liquidity of a firm is more than just the company's position in liquid assets; it is also the experience of the firm's operations in converting product into cash. The term **ongoing liquidity** refers to the cash flow as the firm's process of acquiring materials, producing the final product, making payments, recording sales, and collecting receivables continues.

Ongoing liquidity is a function of a firm's **cash cycle**. A firm's cash cycle is the amount of time between the payment that the firm makes to acquire product materials and the receipt of cash for the sale of product.

To estimate a firm's cash cycle, it is first necessary to understand the **operating cycle**. The operating cycle is the time between the purchase of materials and the receipt of cash. [Figure 3-5](#) illustrates the operating cycle. The cycle begins when the firm purchases material and ends when the firm finally collects the cash for the product it has sold. In other words, the operating cycle is equal to the number of days that the firm carries material and product in inventory plus the number of days it takes to collect cash from the sale:

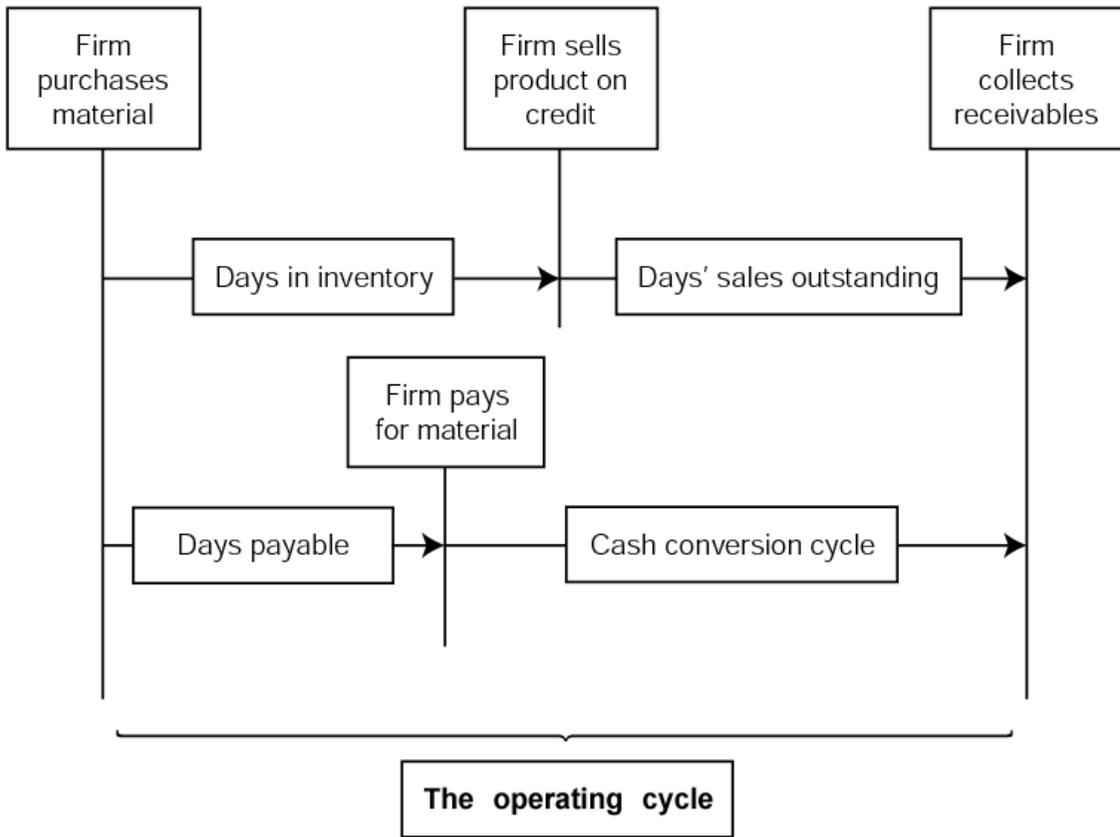
$$\text{operating cycle} = \text{days in inventory} + \text{days' sales outstanding} \quad (3.7)$$

$$\begin{aligned} \text{days in inventory} &= \frac{365}{\text{inventory turnover}} \\ &= \frac{365 \times \text{inventory}}{\text{cost of sales}} \end{aligned} \quad (3.8)$$

$$\begin{aligned} \text{days' sales outstanding} &= \frac{365}{\text{receivables turnover}} \\ &= \frac{365 \times \text{accounts receivable}}{\text{sales}} \end{aligned} \quad (3.9)$$

FIGURE 3-5:

The Operating Cycle and Cash Conversion Cycle



The cash conversion cycle begins when the firm pays for its purchases of material and product and ends when customers ultimately pay their bills. It is equal to the operating cycle minus the firm's days payables outstanding:

$$\text{cash conversion cycle} = \text{operating cycle} - \text{days' payables outstanding} \quad (3.10)$$

$$\begin{aligned} \text{day's payables outstanding} &= \frac{365}{\text{payables turnover}} \\ &= \frac{365 \times \text{accounts payable}}{\text{cost of sales}} \end{aligned} \quad (3.11)$$

The cash conversion cycle is a useful analytical tool. As the cycle grows longer, the liquidity position of the firm deteriorates. The shorter the cycle, the stronger is the firm's ongoing liquidity position.

Cachet Pen's operating cycle is

$$\begin{aligned} \text{operating cycle} &= \frac{365 \times 16,000}{48,000} + \frac{365 \times 48,000}{120,000} \\ &= 121.7 + 14.6 \\ &= 136.3 \end{aligned}$$

The cash conversion cycle is

$$\begin{aligned} \text{cash conversion cycle} &= 136.3 - \frac{365 \times 1,440}{48,000} \\ &= 136.3 - 11 \\ &= 125.3 \end{aligned}$$

Managing Cash Flows

In addition to management of the cash balance and investment in marketable securities, effective cash management requires management of cash inflows and outflows. Firms today treat cash management much more actively than 50 years ago. Two factors have led to the development of cash management techniques:

1. Fluctuating interest rates have emphasized the fact that high interest rates increase the cost of holding cash.
2. Technological changes such as electronic funds transfer have increased the opportunities to manage cash effectively.

An effective forecast of the firm's cash position with cash budgets is the foundation for efficient cash management. Beyond the cash budget, the firm can employ a number of methods to improve the efficacy of cash management. These methods include:

- Synchronizing cash flows
- Using float
- Accelerating receipts
- Transfer of funds

Synchronizing Cash Flows

If a business could plan its cash disbursements to coincide perfectly with its cash receipts, then there would be no need to carry a cash balance (assuming that the firm's receipts are sufficient to cover disbursements). Given the natural variations in factors such as sales volume and deliveries of materials, perfectly synchronizing cash receipts to disbursements is not a realistic strategy. However, improved forecasts and cash budgeting can allow a company to plan as close a match of cash inflows to outflows as possible.

A strategy of planning cash disbursements to occur at times when receipts are anticipated or a strategy of timing receipts to arrive at preplanned times allows the firm to minimize its needed cash balance throughout the year. For example, companies such as credit card issuers that have consumer debt accounts arrange their monthly billings on a cycle so that different groups of customers receive bills during different times of the month, and the bills are due on different dates. A simple strategy would have all customers whose last names begin with the letters A to G paying by the 10th of the month, customers whose names begin with H to P paying by the 20th, and the bills of Q to Z coming due on the 30th.

Using Float

Float is the difference between a firm's cash balance reflected in its books and the cash balance shown on the bank's records. For example, a firm might show that it has a cash balance of \$50,000 while the bank shows a cash balance of \$45,000.

The causes of float are:

- **Mail float**—The time it takes a check to travel to its destination
- **Processing float**—The time it takes the recipient to process the check and deposit it in the bank
- **Clearing float**—The time it takes the check to clear through the banking system

Disbursement float can provide benefits for a company. Disbursement float is the amount of a firm's payments that have not yet cleared its bank account. For example, a firm writes an average of \$10,000 in checks per day with an average time of 7 days for the checks to clear the bank. The result will be that the firm's books show a cash balance that is \$70,000 lower than the balance with the bank. This firm has \$70,000 in disbursement float.

Collections float is the other side of disbursement float. It represents the amount of funds that the firm has deposited with the bank but for which the bank has not yet credited to the firm's account. Suppose the example firm receives checks

totaling \$14,000 per day, and the bank posts the checks to the firm's bank balance four days later. This will cause the firm's books to show a balance that is \$56,000 more than the bank balance, a collections float of \$56,000.

Thus, the firm has a net float of \$14,000. The greater the positive net float, the greater the benefit to the firm. Cash managers attempt to maximize the firm's net float. Cash managers who do their job well speed up the processing of incoming checks and try to stretch out their bill payments as long as possible.

The primary cause of collections float is clearing float. As electronic settlement systems have developed, the average length of clearing float has diminished. In the mid-1800s, clearing of checks through the correspondent banking system could take weeks. By the late 1900s, the Federal Reserve Bank had a system in place where checks cleared rapidly through the Fed system within a few days at most. At the time of the writing of this text, the Fed still cleared checks by physically moving the paper checks through its system, but a proposed bill in Congress would permit the banking system to clear digital images of checks instead of the paper document. Such a practice would allow a check deposited in Maine to clear its bank in San Diego virtually instantaneously and would have the potential for eliminating clearing float.

Accelerating Receipts

While the speed with which checks clear is dependent on the banking system, there are other measures that a firm can take to speed collection of cash:

- A **lockbox arrangement**—With a lockbox arrangement, the company rents post office boxes in various regional locations. Customers send their payments to the nearest post office box, and the company has an arrangement with a local bank to retrieve and process those checks on a daily basis. The local bank can then wire the funds to the company's central bank as soon as funds are collected. A lockbox arrangement can significantly reduce mail float and can also reduce clearing float.
- Automatic debits—Many firms encourage customers to pay with automatic debits in which the company's bank processes an automatic debit (usually monthly) on a prespecified date to pay the customer's account.
- Requiring large customers to pay by bank transfer—Customers use cash management techniques, too, and large customers are the most likely group to try to utilize float to their advantage. If the company can require these customers to pay by bank transfer rather than by check, the float can be reduced.

Transfer of Funds

When a company transfers funds from one of its banks to another, it should use bank wire transfers rather than writing checks. The Federal Reserve System maintains a wire transfer system that facilitates interbank transfers of funds.

International Issues in Cash Management

Companies with many international transactions and multinational firms face additional issues with regard to cash management.

Cash Budgeting

For a domestic company, the two principal variables affecting cash are the cash inflows (sales, collections, etc.) and cash outflows (payments for materials, administrative costs, taxes, etc.). For a multinational firm, exchange rates provide an additional variable that affects cash flows. Multinational firms often prepare three cash budgets:

- One each national entity of the firm
- One for each currency within the firm's system
- One for the entire multinational firm

Cash Deficits

A multinational firm's units in each country have their own cash needs and cash budgets. Multinational firms have an additional flexibility that domestic firms lack. When a domestic firm has a cash shortage, it normally borrows short-term to fill that void. This option is available to a national unit of a multinational firm, but the multinational unit also has the opportunity to receive a cash infusion from another affiliate of the firm. Thus, the affiliate on one country could borrow funds from another affiliate of the firm in another country.

Cash Surpluses

Similar to the situation of a multinational firm unit with a deficit, a unit with a surplus may invest the cash itself or remit the cash to the multinational parent. The opportunities for various cash management strategies are numerous. The various foreign affiliates can each maintain the minimum amount of needed cash needed for operations plus make contributions to or withdrawals from a central pool of funds invested in short-term securities.

Multilateral Netting

Sometimes a multinational firm will have transactions between two or more of its units in different countries as a normal course of business. **Multilateral netting** is a process of settling these transactions that reduces the number and cost of foreign exchange transactions.

For example, suppose Consolidated Worldwide has subsidiaries in a number of countries. Consolidated USA sells raw materials to Consolidated Japan, which manufactures parts. Consolidated Japan sells parts to other firms including Consolidated Mexico that assembles parts into product. Consolidated Mexico sells product to many other firms including Consolidated USA. [Table 3-9](#) illustrates the following three transactions:

- Consolidated Japan buys \$8 million from Consolidated USA
- Consolidated Mexico buys \$4 million from Consolidated Japan
- Consolidated USA buys \$2 million from Consolidated Mexico

TABLE 3-9

An Example of Multilateral Netting

Paying Unit	Receiving Unit			Total Payments
	Japan	Mexico	USA	
Japan			8	8
Mexico	4			4
USA		2		2
Total Receipts	4	2	8	14
Total Payments	8	4	2	
Net Payment (Payment)	(4)	(2)	6	

Purchasers make payment in the currency of the paying customer. For each of the transactions in [Table 3-9](#), the receiving unit must convert the currency of the paying unit to local currency. Transactions total \$14 million, and if the cost of exchanging currencies and transferring funds is 0.2 percent, then the total cost is \$28,000. If Consolidated Worldwide has a multilateral netting system, then the parent company would direct Consolidated Japan to pay \$4 million and Consolidated Mexico to pay \$2 million to Consolidated USA. Each subsidiary would have the same amount of cash as before, but total transactions would be only \$6 million with costs reduced to \$12,000.

❖ Accounts Receivable Management

Given the choice, most firms would probably opt for selling their product for cash rather than on account. However, competitive forces and market realities drive many companies to offer credit terms to their customers. A company records a sale on its books when it sells an item. If the sale is in cash, the company records an equal increase in its cash position. If the sale is on credit, the firm creates a receivable. The company does not increase cash and reduce the receivable until the debtor pays account.

From one point of view, carrying receivables increases working capital requirements of the firm and increases costs. The firm should therefore want to minimize receivables. From the other point of view, giving customers access to credit and hence carrying receivables increases sales. Firms should therefore want to increase the availability of credit to their customers, which would increase receivables.

A sound working capital management policy and strategy includes a receivables management strategy that should attempt to balance the costs of carrying additional receivables with the benefits of generating additional sales. Management of accounts receivable includes:

- The trade credit decision
- Monitoring the level of receivables

The Trade Credit Decision

The trade credit decision has two important components:

- The credit granting policy
- The receivables collection policy

Both of these components affect the cost of carrying receivables and the sales that receivables help stimulate for the firm. These two policies are not independent of each other. Strategies adopted within the credit granting policy often affect receivables collection and its policies.

The Credit Granting Policy

A firm's **credit policy** determines who will qualify to receive credit from the firm and under what conditions the customer will repay the debt. There are two components of credit policy:

1. Credit standards—The qualifications that a customer must meet in order to receive credit from the firm
2. Credit **terms**—The conditions under which the customer agrees to receive credit and repay the debt

The firm's credit standards determine which of the firm's customers may purchase on credit. The goal of credit standards is to identify those customers with a high probability of paying their account. To determine the credit quality of a customer, the credit standards examine the customer's:

- *Financial strength*—Measured by data such as the customer's current ratio, debt-to-equity ratio, interest-coverage ratio, and other information extracted from the firm's financial statements
- *Ability to generate income and cash*—Measured by income data from the customer's income statement, profitability ratios, and pro forma statements
- *Credit history*—Measured by information from the customer's other suppliers that show if the firm pays promptly and whether the firm has been late on any payments

The credit terms identify the:

- *Amount of credit*—The amount of credit that the firm is willing to extend to the customer
- *Credit period*—The amount of time that the customer has to pay the account
- *Discount*—Any discount that the customer might receive for paying early

For example, a company might have standard credit terms to extend a credit line of \$20,000 to customers who agree to pay on terms of 2/10 net 30. These terms state that the customer receives a 2 percent discount for paying within 10 days of the invoice, and the net invoice amount is due in 30 days.

A company may have flexible credit standards that modify the terms according to a customer's credit quality. A customer might not meet the firm's regular credit standards, but in order to get the customer's business, the firm might extend a lower amount of credit with a different payment period. For example, a customer who does not meet the firm's normal income requirements to receive credit might be given a credit line of \$10,000 with payment terms of net 15.

The Collection Policy

The firm's **collection policy** outlines procedures that the firm uses to attempt to collect past-due accounts. For example, a collections policy might contain the following elements:

- Account is 15 days past due—Customer receives a reminder letter.
- Account is 30 days past due—Customer receives a second letter followed up with a phone call, the customer can make no new purchases on account.
- Account is 60 days past due—Customer receives notice that account will be reported to a credit bureau and turned over to a collection agency if not paid within 20 days.
- Account is 90 days past due—Account is turned over to a collection agency.

Collection of past-due receivables can be a sensitive issue. On the one hand, the company granting credit needs to keep control of its receivables and demand timely payment. On the other hand, the firm has to consider that aggressive collection procedures might be inappropriate for loyal customers who may find themselves temporarily in a cash-short position. The company needs to find a balance between the need to promptly collect receivables and the negative impact that aggressive collection might have on the firm's image.

Consequences of Credit Policy

When determining credit policy and the strategies to achieve the policy, a firm should consider the costs and the benefits of each component of the credit policy. In general, making credit easier for the customer to obtain and giving more liberal repayment terms helps to stimulate sales. However, the costs of easy credit are greater losses for bad debts, greater investment in working capital (slower cash receipts and higher accounts receivable), and greater collection costs. [Table 3-10](#) outlines the costs and benefits of different credit strategies.

The best credit policy is one that maximizes profits to the company. Such a credit policy balances the costs with the benefits and identifies the optimum combination of credit standards, terms, and collection policy.

TABLE 3-10

Costs and Benefits of Trade Credit Strategies

Strategy	Benefits	Costs
Credit Standards		
Liberal credit standards	Encourages sales	Increases bad debts, collection costs, receivables
Conservative credit standards	Decreases bad debts, collection costs, receivables	Discourages sales
Credit Terms		
High amount of credit	Encourages sales	Increases bad debts, collection costs, receivables
Low amount of credit	Decreases bad debts, collection costs, receivables	Limits sales
Long credit period	Encourages sales	
Short credit period	Decreases investment in receivables	Discourages sales
High Discount	Encourages sales	Reduces gross profit margin
Low discount	Increases gross profit margin	Discourages sales
Collection Policy		
Less-aggressive collection strategies	Encourages sales	Encourages customers to lag in paying bills
Aggressive collection strategies	Increases collection rate, decreases investment in receivables	Discourages sales, creates ill will

Optimal Receivables Levels

An important part of receivables management is determining and targeting an optimum level of receivables. There are two main factors that determine the amount of accounts receivable for a firm:

- The amount of sales on credit
- The average amount of time it takes to collect the credit sales

Monitoring Receivables

The primary metric for monitoring receivables is the **days' sales outstanding** ratio (DSO), sometimes called the **average collection period**. DSO is

$$\text{days' sales outstanding} = \frac{\text{receivables} \times 365}{\text{sales}} \quad (3.12)$$

DSO for Cachet Pen is

$$\begin{aligned} \text{days' sales outstanding} &= \frac{4,800 \times 365}{120,000} \\ &= 14.6 \end{aligned}$$

Because DSO is the average collection, we can compute DSO if we know how long it takes to collect various categories of accounts. Cachet Pen sells on terms of net 14. The company collects 96 percent of its credit sales on time at 14 days while 4 percent of sales are collected in 28 days. Treating DSO as a weighted average of outstanding accounts:

$$\begin{aligned} DSO &= .96 \times 14 + .04 \times 28 \\ &= 14.6 \end{aligned}$$

Using DSO, a company can estimate the impact on receivables of a change in sales.

$$\text{receivables} = \text{average daily sales} \times DSO \quad (3.13)$$

For example, if Cachet Pen were to launch a new marketing plan designed to increase sales by \$20 million, what would be the increase in accounts receivable. Cachet makes 80 percent of its sales on credit, so average daily sales would be:

$$\begin{aligned} \text{average daily sales} &= \frac{.8 \times 20,000}{365} \\ &= 43.836 \end{aligned}$$

The marketing plan would increase average daily sales by \$43.836, so the increase in receivables would be:

$$\begin{aligned} \text{receivables} &= 43.836 \times 14.6 \\ &= 640 \end{aligned}$$

Cachet Pen's receivables would increase by \$640,000.

One useful tool for monitoring accounts receivable is an **aging schedule**. An aging schedule classifies the firms accounts receivable by the age of the account. By examining the aging schedule, a financial manager can examine issues relating to collecting of receivables. [Table 3-11](#) provides an example aging schedule.

TABLE 3-11

Example Aging Schedule

Age of Accounts	Total Value of Accounts
0 to 10 days	\$50,000
11 to 20 days	10,000
21 to 30 days	10,000
31 to 60 days	2,000
61 to 90 days	1,000

Setting a Receivables Policy

Suppose the McArdle Corp. wants to change its credit policy to stimulate sales. The firm current has sales of \$100,000 with a credit policy of net 15. All of its customers pay in 15 days. The firm is considering easing its credit standards, offering terms of 1/10 net 30, and using an outside collection agency for anticipated bad debts. This new credit policy has the following anticipated effects on accounts:

- 50 percent of McArdle's customers will pay in 10 days.
- 40 percent will pay in 30 days.
- 8 percent will pay in 60 days.
- 2 percent will be collected by the collection agency in 90 days. The agency charges a fee of 50 percent of the amount collected.

If McArdle has to finance any increase in receivables at an interest rate of 9 percent, should the firm adopt the proposed credit policy if it would increase sales by 10 percent?

[Table 3-12](#) provides the analysis of McArdle's credit policy. DSO under the existing credit policy is 15 days. Under the proposed policy, DSO would rise to:

$$\begin{aligned} DSO &= .50 \times 10 + .40 \times 30 + .08 \times 60 + .02 \times 90 \\ &= 23.6 \end{aligned}$$

TABLE 3-12

Effects of a Change in Credit Policy for McArdle Corp.

	Existing Credit Policy	Proposed Credit Policy
Days' sales outstanding (DSO)	15	23.6
Average daily sales (ADS)	274	301
Receivables (DSO x ADS)	4,110	7,104
Additional receivables of the proposed policy		2,994
Sales	\$ 100,000	\$ 110,000
Variable costs (80 percent of sales)	80,000	88,000
Collection costs (Half of 1 percent of sales)		1,100
Discount taken (1 percent of 50 percent of sales)		550
Interest expense (9 percent of add. receivables)		269
Profit	20,000	20,081

Average daily sales with the proposed policy would increase to \$301. The firm's accounts receivable balance would rise to \$7,104 from \$4,110, an increase of \$2,994.

The new policy would result in sales of \$110,000 and generate additional gross profits. The proposed policy would also increase McArdle's costs:

- *Collection costs*—Nonexistent with the existing credit policy, would be half of the \$2,200 ($2,200 = .02 \times 110,000$) in past-due accounts outstanding for 90 days
- *Discounts*—Not offered before, taken not only on new sales generated but on all sales, would be 1 percent of 50 percent of sales
- Interest expense on the increase in accounts receivable—9 percent of \$2,994, \$269

The existing credit policy yields a profit (before fixed costs) of \$20,000. The proposed credit policy has an expected profit of \$20,081, which is slightly higher. Therefore, McArdle should adopt the new credit policy.

There are two factors ignored in the analysis presented here. This analysis assumes that McArdle needs to finance all of the increase in accounts receivable. Since McArdle makes a profit from sales, in actuality only the cost of sales needs financing. In addition, the analysis neglects any additional inventory that might be needed to support additional sales.

❖ Inventory Management

Like receivables, inventory represents a significant working capital investment for many firms. Management of inventory from an operational standpoint is normally the responsibility of the operating units of the firm. Financial managers, however, must be concerned with inventory management because of the financial commitment that inventory represents. Efficient management of inventories reduces investment in inventory and increases profitability.

Inventory management is important for all firms, but especially for manufacturing firms. Manufacturers typically have three categories of inventory:

- **Raw material inventory** —The materials and goods used to manufacture products
- **Work-in-process inventory**—Partially finished goods that have not yet reached the final stage of production
- **Finished goods inventory**—Goods that are ready for sale

Inventory management is vital to manufacturing firms because of the need to keep the production lines operating. Insufficient inventory at any point in the manufacturing process can shut down the entire production.

Firms that are mainly involved in the distribution of goods, such as wholesalers and retailers, may have little or no raw material inventory and work-in-process inventory but high levels of finished goods inventory. Firms in the service businesses may hold practically no inventory other than supplies needed to carry on their business.

Benefits and Costs of Investment in Inventory

The ability to carry product inventory has both benefits and costs for the firm. Effective inventory management balances the benefits with the costs to identify optimum levels of inventory. Benefits of inventory include:

- *Avoid stock outages*—Carrying inventory reduces the probability of running out of stock and being unable to meet demand.
- *Speculation*—Carrying inventory allows firms to purchase material in anticipation of a price increase.
- *Quantity discounts*—Carrying inventory allows firms to take advantage of discounts that suppliers may offer for purchases in large quantity.
- *Marketing benefits*—There may be marketing benefits associated with carrying a full line of product rather than just some of the merchandise.

Costs of carrying inventory are:

- *Carrying costs*—Costs of financing and storing inventory include interest expense, storage fees, insurance, taxes, spoilage, and obsolescence.
- *Ordering costs*—These costs are associated with ordering additional inventory.
- *Costs of running out of inventory*—Costs include disruptions in the production process, lost sales, and loss of customer goodwill.

Approaches to Inventory Management

There are many different methods, systems, and approaches to inventory management. Three such systems are

- The ABC method
- MRP
- Just In Time

The ABC Method

One traditional inventory management system is the **ABC method**. In the ABC method, firms classify inventory into three groups:

- A—High-dollar-value inventory items; A items may represent only 10 percent of the unit inventory but 50 percent of the value of inventory.

- B—Medium-dollar-value inventory items; B items may represent 40 percent of the unit inventory and 40 percent of value of inventory.
- C—Low-dollar-value items; C items may represent 50 percent of the unit inventory but only 10 percent of the value of inventory.

Consider, for example, a hardware store. A inventory items might be lawnmowers and power saws; B items would be hammers, rakes, and a bucket of paint. C items would be nuts, bolts, and pencils.

By classifying inventory into separate groups, the firm can focus its inventory management efforts on those items for which effective inventory management is most critical. The hardware store would probably closely monitor the level of inventory of lawnmowers while checking the number of pencils less often because carrying a few extra pencils in stock costs much less than carrying extra lawnmowers.

MRP

MRP inventory control is materials requirement planning. MRP systems are computerized inventory management systems that coordinate the purchasing of materials. They combine information about supply availability and the production process to identify times when the firm should order inventory. They are particularly useful for large firms that manufacture a

number of products using a large number of different components. Some of these components may even be used in the manufacture of more than one product, so coordination of inventory with the different production lines is important.

Just In Time

In a **just-in-time** inventory control system, the firm schedules deliveries of material or product to arrive just at the time they are needed. For example, a computer manufacturing firm may have received orders for 6,000 computers today. It places that order in the computerized production planning system that the company follows. The firm then schedules the production of the computers and the arrival of needed components. The memory chips may be needed on the fourth day, so the firm schedules delivery of chips from its suppliers on the fourth day to arrive at the time the chips are required.

Just-in-time systems require close cooperation from suppliers. Many large manufacturers are able to negotiate such a relationship with suppliers because their business is so important to the supplier.

Effective implementation of just-in-time inventory control can substantially reduce and sometimes virtually eliminate the need to carry inventory. It significantly reduces inventory costs of the firm and transfers them to the supplier.

Optimal Inventory Levels

From the financial manager's perspective, the optimal level of inventory is that level which maximizes the value of the firm. IT will be the point at which the cost of adding additional inventory balances the benefits of having the extra inventory on hand.

McArdle Corp.'s marketing department has conducted an extensive study of the firm's product line. The marketers estimate that an investment in additional inventory of \$150,000 will generate significant new sales by avoiding out of stock situations and reducing customer dissatisfaction with the firm when product is out of stock. They have turned their data over to the financial managers who estimate that the new sales will result in the following:

- Additional net cash flows of \$16,000 per year
- Additional physical (non-financial) inventory costs of \$4,500 per year

Furthermore, the financial managers estimate the cost of funds for carrying inventory (the financial cost) to be 8 percent.

The benefit per year of the new inventory after physical inventory costs is

$$\begin{aligned} \text{benefit} &= 16,000 - 4,500 \\ &= 11,500 \end{aligned}$$

The cost of adding inventory is

$$\begin{aligned} \text{cost} &= .08 \times 150,000 \\ &= 12,000 \end{aligned}$$

The net benefit to McArdle, therefore, of increasing its inventory level is

$$\begin{aligned} \text{net benefit} &= 11,500 - 12,000 \\ &= -500 \end{aligned}$$

The additional inventory has a negative benefit, or a net cost, to McArdle of \$500. It is therefore not a good strategy to add the additional inventory. McArdle appears to be at an optimal inventory level. To fully analyze the situation, the financial managers should estimate the net benefit of reducing McArdle's investment in inventory.

❖ Management of Current Liabilities

Current liabilities represent a ready source of financing the firm's working capital. Current liabilities, or short-term financing, can be:

- **Spontaneous short-term financing** – any source of short-term financing that tends to change automatically when current assets change, such as accounts payable
- **Negotiated short-term financing** – any source of short-term financing that the firm negotiates and agrees to terms with the lender, such as a short-term bank loan

Advantages and Disadvantages of Short-Term Financing

Conservative financing policies generally utilize lower amounts of short-term financing while aggressive policies tend to make greater use of short-term sources of funds. The potential advantages to the firm of using short-term financing compared to long-term financing are

- **Cost**—The cost of short-term financing is often lower than the cost of long-term financing. The normal situation for interest rates is an upward-sloping **yield curve**. The yield curve is the relationship between interest rates and maturity, so an upward-sloping yield curve occurs when short-term interest rates are greater than long-term rates.
- **Speed**—A short-term loan can usually be negotiated and closed in a shorter amount of time than a long-term loan.
- **Flexibility**—Short-term financing commits the firm for a shorter length of time with fewer contractual conditions. Although long-term financing can often be repaid before its scheduled maturity, there is usually some penalty for doing so. In addition, long-term loans often contain contractual provisions that limit actions a company can take. For example, a loan agreement might restrict the firm's ability to pay dividends until the loan is repaid. Short-term loans are usually less restrictive.

Short-term financing is not always the optimal alternative for the firm. The disadvantages of short-term financing include

- **Cost**—Sometimes the cost of long-term funds is cheaper than short-term funds. This can occur when the yield curve is downward sloping, and borrowing money short-term is more expensive than borrowing long-term. Long-term funds can also be lower when the company already has an outstanding fixed-rate long-term loan at a low interest rate.
- **Risk**—While short-term rates are usually lower than long-term rates, short-term financing is riskier than long-term financing. The principal reason that short-term financing is riskier is that short-term rates are more volatile than long-term rates, so the interest expenses of long-term borrowing are more stable and predictable than for short-term borrowing. In addition, during an economic downturn, the firm that borrows short-term may find it difficult to repay both principal and interest of the short-term loan while long-term borrower has only to pay the interest plus possibly a portion of the principal.

Sources of Short-Term Financing

Although there are a number of potential sources that firms may employ, there are four major sources:

1. Accruals
2. Accounts payable
3. Bank loans
4. Commercial paper

Accruals

Accruals are payables that the firm owes regularly for expenses such as wages and taxes. Because the date of a firm's balance sheet does not necessarily coincide with the date that these payables are due, a firm's current liabilities will often list some accrued wages and accrued taxes.

Accruals are a spontaneous form of financing, and the use of accruals is costless in the sense the firm make no explicit payment for their use. However, the firm has little discretion or control over their use. Legislation or economic forces govern the payment of taxes and wages, and while the firm should delay paying them as long as reasonable feasible, failure to pay them as scheduled would bring strong consequences to the firm.

Accounts Payable

Accounts payable, or trade credit, can be a significant source of short-term financing for a firm. It is a spontaneous source when the firm has credit with its suppliers.

Trade credit is the largest single source of short-term financing for most companies. How much trade credit should a firm use? The simple answer is that the firm should utilize the grace periods of its accounts payable to the fullest extent possible. This period represents a period of essentially costless financing. For example, if a firm purchases materials on terms of net 20, it should pay on the twentieth day, not sooner. Extending the payment as long as possible takes full advantage of the period of costless financing.

If a discount is available for early payment, it is normally beneficial to take the discount. Missing the discount is typically an expensive form of financing. For example, suppose that Almay Electric Supply purchases electric parts from a distributor on terms of 2/10 net 30. On an invoice of \$1,000, Almay owes \$980 on the tenth day. If Almay chooses not to extend the credit beyond the tenth day, payment of the entire \$1,000 is due 20 days later on the thirtieth day. In other words, when Almay extends the payment period, it pays \$20 to borrow \$980 for 20 days. The nominal interest rate that this represents is

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$$\begin{aligned} \text{nominal rate} &= \frac{20}{980} \times \frac{365}{20} \\ &= .0204 \times 18.25 \\ &= .372 \end{aligned}$$

The first term in the equation above represents the rate for borrowing \$980 at a cost of \$20, 0.0204 (or 2.04 percent). If the firm made that transaction ever 20 days, it would do so 18.25 times per year, so the annual rate is 0.372 (37.2 percent).

The general formula for calculating the cost of trade credit is

$$\text{nominal annual rate} = \frac{\text{discount}}{1 - \text{discount}} \times \frac{365}{\text{net period} - \text{discount period}} \quad (3.14)$$

Using equation (3-14), the cost to Almay of not taking the discount is

$$\begin{aligned} \text{nominal annual rate} &= \frac{.02}{1 - .02} \times \frac{365}{30 - 10} \\ &= .372 \end{aligned}$$

A cost of funds of 37.2 percent is very high. Almay should always take the discount as long as the firm's cost of short-term borrowing is less than 37.2 percent. If Almay does not have the cash to pay the account, then the firm is better off borrowing the money on a short-term loan and paying within 10 days to get the discount.

Equation (3-14) is a nominal rate. Considering compounding, this cost of foregoing a discount is even higher. The effective annual rate, considering compounding, is

$$\text{effective annual rate} = \left[1 + \frac{\text{discount}}{1 - \text{discount}} \right]^{\frac{365}{\text{net period} - \text{discount period}}} - 1 \quad (3.15)$$

For Almay, the effective annual rate is

$$\begin{aligned} \text{effective annual rate} &= \left[1 + \frac{.02}{1 - .02} \right]^{\frac{365}{30 - 10}} - 1 \\ &= [1.024]^{18.25} - 1 \\ &= 0.54 \end{aligned}$$

In summary, firms should always wait until the end of the discount period, or the free period, to pay an account. The decision to forego a discount and take addition time is a decision that must take into account the cost of not taking the discount and the cost of obtaining alternative financing.

Sometimes firms will pay after the due date, extending the payment as long as possible until the creditor demands payment, believing that the extra time represents a period of free credit. Or, possibly, the firm pays late because of financial difficulty and an inability to obtain short-term funds from other sources. In either case, a record of late payment may accrue to the firm's credit history. Current suppliers may limit access to credit or demand payment in cash, and potential new suppliers may deny credit to the firm. There is an implicit cost to paying accounts late, and firms should normally avoid accumulating a

record of late payment.

Bank Loans

Short-term banks loans are second only to trade credit in terms of short-term financing for businesses. Bank loans are a negotiated source of short-term funds. Short-term business loans make up the largest portion of commercial bank lending.

Promissory Notes

A business obtains a short-term loan from a bank by making application for a loan and signing a **promissory note**. The promissory note details the terms of the loan, and the firm records it on the balance sheet as notes payable. The terms of a promissory note identify the following:

- Face amount of the note
- Collateral or guarantees backing the note – if short-term notes are secured, inventory or accounts receivable are common collateral items
- Due date of the principal or any installments of the principal
- Nominal interest rate and whether interest is simple (paid on the face amount) or discount (discounted from the face amount)
- Interest payment dates

- Maturity of the note—common maturities for notes are 30 days, 60 days, 90 days, 180 days, and 1 year. Notes may also be callable, in which case the bank may demand payment at any time.
- Any other terms

Credit Agreements

A **line of credit** is an agreement between a bank and its customer identifying an amount of credit the bank is willing to extend to the firm. A line of credit is an informal agreement and not an obligation on the part of the bank. If the company's financial position deteriorates or the bank has other reason not to extend credit, the bank may reduce or eliminate the line of credit at any time. As an example of a line of credit, a bank commercial loan officer might notify a credit applicant that the bank is extending a \$100,000 line of credit for one year. The firm may then draw upon that line of credit. If the company signs a \$20,000 promissory note with the bank, the line of credit will have \$80,000 remaining.

A formal line of credit is a **revolving credit agreement**. In a revolving line of credit, the bank commits to extend credit up to the agreed upon amount during a specified period of time. In exchange for this guarantee of credit, the borrower agrees to pay a fee for the revolving credit agreement. Banks usually reserve their revolving credit agreements for larger, more financially sound customers. For example, a bank might issue a

revolving credit agreement giving the borrower the right to draw up to a total of \$20 million during the next three years. The interest rate will be the prime rate at the time of the note plus $\frac{1}{2}$ to $\frac{3}{4}$ percent depending on the value of the borrower's debt-to-equity ratio. The borrower will pay a fee of $\frac{1}{4}$ of 1 percent of any unused credit each year.

The Cost of Bank Loans

The interest due on a bank loan is equal to the principal of the loan multiplied by the stated interest rate adjusted for the fraction of a year that the loan is outstanding:

$$\text{interest} = \text{interest rate} \times \text{loan principal} \times \frac{\text{days to maturity}}{365} \quad (3.16)$$

The cost of short-term bank credit is not always the stated rate on the note. Two factors that cause the effective rate to be different from the stated rate are:

- Compensating balances
- Discount interest

Banks often require compensating balances as a condition of a loan. The amount of the compensating balance is negotiable but is often from 10 to 20 percent of the loan amount. When a borrower agrees to leave a compensating balance with a bank, the effect is that the principal amount of the loan available to the borrower is reduced. For example, a firm obtains a \$200,000 90-day loan from its bank at an interest rate of 8

percent with a 10 percent compensating balance. The loan is for \$200,000, but the firm must keep \$20,000 as a compensating balance and therefore has access to only \$180,000 of the loan. When determining the cost of such a loan agreement, it is proper to reduce the face of the loan by the compensating balance. To compute the cost of a loan with a compensating balance requirement:

$$\text{effective rate} = \text{stated rate} \times \frac{\text{principal}}{\text{principal} - \text{compensating balance}} \quad (3.17)$$

The effective interest rate on the example loan after considering the effect of compensating balances is

$$\begin{aligned} \text{effective rate} &= .08 \times \frac{200,000}{200,000 - 20,000} \\ &= .0842 \end{aligned}$$

While the loan states a rate of 8 percent, the compensating balance raises the effective cost of the bank loan to 8.42 percent.

Discount interest is interest that is paid at the beginning of the loan. In effect, the borrower pays interest on the principal amount but has access to a reduced amount of funds as in the case of compensating balances. The reduced amount of funds available to the borrower is equal to the principal amount of the loan less the interest. The effective rate for a discount loan is

$$\text{effective rate} = \frac{\text{stated rate}}{1 - \text{stated rate}} \quad (3.18)$$

For example, a bank offers a \$50,000 30-day loan at 8 percent discount interest. The effective rate is

$$\begin{aligned} \text{effective rate} &= \frac{.08}{1 - .08} \\ &= .087 \end{aligned}$$

When a loan had discount interest and compensating balances, the effective rate is

$$\text{effective rate} = \frac{\text{stated rate} \times \text{principal}}{\text{principal} \times (1 - \text{stated rate}) - \text{compensating balance}} \quad (3.19)$$

A loan combining the features of the two preceding example loans (8 percent discount interest and a \$20,000 compensating balance) would have an effective rate of

$$\begin{aligned} \text{effective rate} &= \frac{.08 \times 200,000}{200,000 \times (1 - .08) - 20,000} \\ &= .0976 \end{aligned}$$

The combined effect of discount interest and the compensating balance increases the effective interest rate from 8 percent to 9.76 percent.

Commercial Paper

For larger corporations, an important source of short-term financing is **commercial paper**. Commercial paper is a short-term (maturity of one year or less) unsecured promissory note issued by a corporation directly to investors. Large corporations with excellent credit ratings are able to sell their commercial paper to investors in the financial markets. The effective interest rates that they pay on this commercial paper are

typically slightly less than what they would have to pay for a bank loan because they are bypassing the bank as the intermediary (financial middleman) and raising short-term funds directly from investors. Rates on commercial paper are usually somewhat less than the prime lending rate.

For example, Motorola Corporation raises short-term funds regularly by selling commercial paper in the market. In May 2003, the firm had about \$500 million in outstanding commercial paper. However, should the firm find that it could not sell commercial paper on sufficiently favorable terms, it has a revolving credit agreement with a group of banks for \$700,000 million. While Motorola has never drawn on the revolving credit, it has a backup for its commercial paper.

Commercial paper is a discount financial instrument. The issuing corporation sells the paper at a discount from face value and then pays the face value at maturity, so equation (3-18) can be used to compute the effective cost of commercial paper.

❖ Capital Investment

While working capital represents the short-term investment of the firm, a firm's **capital** is its long-term investment in the fixed assets and property that form the productive base for the company. While budgeting and managing working capital is an important component of firm profitability, managing the investment in capital assets, or **capital budgeting**, is critical to the long-term success of the firm. Capital budgeting is the process of analyzing proposed investment projects and choosing those that are appropriate for the firm.

There are a number of reasons for the importance of capital budgeting. Foremost among these is the fact that capital projects are long-term and represent substantial commitment of funds. They affect results for a number of years and commit the firm to a particular long-term investment and strategy. This commitment limits the firm's flexibility to adopt other investments or strategies. In a nutshell, a firm's capital budgeting delineates the firm's strategic direction for at least the next few years.

An effective capital budgeting process can do more than simply measure the quality of an investment. It can forecast the need for the investment and time the commitment of funds to the investment to coincide with the firm's need for the asset. Planning such as this requires accurate forecasts of future sales and needs for capital investment to supply those sales. Firms

that wait until there is a backlog of orders to begin the process of acquiring new capital equipment to supply those orders probably are losing a significant portion of their potential business. On the other hand, firms that invest in new capital equipment in anticipation of an expansion in sales that never materializes find themselves with excess capacity and reduced profits. Accurate forecasts are essential to a successful capital budgeting program.

Capital budgeting projects can be of many types. Here are some examples of the kinds of investment projects that should be analyzed within a capital budgeting framework:

- New expansion projects—Going into new markets, product lines, or products
- Expansion of existing projects—Adding capacity because demand for existing products in existing markets is growing
- Replacement projects—Investing in new equipment to replace worn out equipment or to replace old equipment with new technology that operates at lower costs
- Research and development projects—Projects exploring new ideas that are associated with uncertain future cash flows

- Investment required by statute or regulation—Installing pollution control equipment or other equipment required by some external entity
- Other projects—There are many miscellaneous projects, many that do not generate revenues, but are deemed necessary or beneficial to the operation of the business

Briefly, the steps in the capital budgeting process are as follows:

1. Identify potential capital investment projects.
2. Estimate the cash flows from the projects.
3. Estimate the cost of capital applicable to the projects.
4. Classify projects as acceptable or unacceptable.
5. Choose among the acceptable projects considering capital constraints.

The Cost of Capital

The capital budgeting process weighs the costs and benefits of a capital investment project. It considers the tradeoffs between receiving cash flows sooner rather than later. In order to make capital budgeting decisions, financial managers must have an estimate of the **cost of capital**. The cost of capital is the cost of funds that the firm invests in capital assets. It is the

required rate of return, the minimum rate of return that the firm must receive on an investment in order to justify committing funds to that investment.

The cost of capital may be an explicit cost in cases where the firm can identify actual expenses it pays for the use of funds. In other instances the firm cannot identify an explicit expense associated with the funds used to finance assets. These funds nevertheless have a cost. This cost is the return that the firm or investors could get elsewhere on other investments of similar risk. This is the **opportunity cost of capital**.

The cost of capital for a firm is an important metric in the capital budgeting process. It provides the hurdle or standard against which the return on capital investment projects must be compared. It represents the discount rate to apply when comparing near-term cash flows to cash flows expected to be received farther in the future. For purposes of this section of the text, we assume that the financial manager has estimated and knows the firm's cost of capital to use in the capital budgeting decision process. The next section of the book provides a detailed discussion of the cost of capital and methods for computing it.

Estimating Project Cash Flows

In the capital budgeting process, financial managers are concerned with the cash flows that capital projects generate

and the timing of those cash flows. Cash flows are usually different from income as defined on a firm's income statement, and it is cash flows that are relevant to the capital budgeting decision, not accounting income or profits.

There are four principal reasons that cash flows differ from accounting profits:

1. Purchase of a fixed asset is a cash outflow—When a company purchases a capital asset, it has a cash outflow. Even if the funds to purchase the asset are borrowed, the asset purchase still generates a cash payment (which is funded by the loan). Accounting procedure, however, does not treat the purchase of a fixed asset as an expense. The accountant records the transaction as an asset and then expenses an annual amount (depreciation) from income for more than one year.
2. Investment in working capital is a cash outflow—A new capital investment often requires additional investment in working capital. For example, a new assembly line for sneakers requires investment in sneaker raw materials inventory. Working capital is not an expense for accounting income, but it is a cash outflow for the financial manager.
3. Some accounting expenses are not cash flows—Some expenses that accountants subtract from income, such

as depreciation and depletion, is not a cash flow in the current period. For example, the delivery vehicle in its third year of use receives depreciation of \$8,000. The cash payment for the vehicle occurred not this year but three years prior.

4. Interest expense should not be considered a project cash outflow—The reason that financial managers do not treat interest expense as a project cash outflow is that interest expense is part of the cost of capital, and the financial manager uses the cost of capital to discount the project cash flows to present value.

A Five-Step Outline for Estimating Project Cash Flows

The basic procedure for computing cash flows is a five-step process as follows:

1. Compute projected operating income before taxes.
2. Subtract the tax due on projected operating income.
3. Add back non-cash flow expenses, such as depreciation.
4. Add (subtract) any increase (decrease) in net working capital—Possibly there is a large increase in net working capital at the beginning of the project and a recapture of net working capital at the end of the project.
5. Add (subtract) any other cash flows—Such as the initial investment, additional investment during the life of the project, and any after-tax salvage value of the project.

To illustrate cash flow estimation and the capital budgeting process, Example Case 3B describes a capital investment proposed by Alan Hall to the management of Cachet Pen Company, Inc. [Table 3-13](#) shows the information on which Alan is going to base his analysis.

Example Case 3B

Cachet Pen Company, Inc.—Capital Budgeting

Alice Wright has made a request of Alan Hall, vice president for finance of Cachet Pen Company, Inc. (see Example Case 3A), to propose new capital investment projects for the firm with the goal of improving profitability. After investigating several possibilities, Alan proposes that Cachet Pen add a new production line for a line of high-quality desk paperweights. The new line, branded *Executive Desk* paperweights, target consumers giving gifts and awards to business executives, managers, and graduating college students. The paperweights should be profitable for in the first year since the product complements Cachet's pen and pencil lines, and Cachet can sell to its existing distributors.

Alan's goal is that Cachet establish the profitability and name brand of the paperweight line, then sell the line to an office products firm at the end of the fourth year and use cash from the sale to seek new profitable investments.

With assistance from the firm's marketing department, sales staff, and manufacturing operations managers, Alan forecasts the information provided in [Table 3-14](#). Using that information, he proceeds to forecast project cash flows as a basis for a capital budgeting analysis.

Alan forecasts that an investment in net working capital of 18 percent of sales is necessary to adequately support the forecasted level of sales. Alan makes a simplifying assumption that the firm commits the working capital at the end of the year. In reality, a company requires working capital throughout the year somewhat in advance of sales, but Alan knows that this simplifying assumption will affect his calculations by only a small amount, so he is willing to accept a very small possible error in order to simplify his calculations. In addition, Alan believes that at the end of the project, the net working capital will be transferred to the buyer at the book value, so Cachet Pen will recapture the new working capital in its entirety.

The *Executive Desk* paperweight project as proposed by Alan is a four-year project with cash flows that start at the beginning of the first year (labeled time 0) with the initial capital outlays for the project. Subsequent cash flows occur at the end of each of the four years, times that are labeled 1, 2, 3, and 4.

Initial Outlay

[Table 3-14](#) presents Alan's worksheet for forecasting project cash flows. The initial outlays at time 0 are for purchase of the building and manufacturing equipment. The total is \$6 million. [Table 3-14](#) notes this as \$6,000 because all of the numbers in the table are in thousands.

TABLE 3-13

Cachet Pen Company, Inc.—Proposed Investment in Executive Desk Paperweight Project

Description	Forecast
Initial Outlay:	
Building	\$ 2,000
Equipment	4,000
Sales Forecasts:	
Year 1	5,000
Year 2	6,000
Year 3	6,500
Year 4	7,000
Costs:	
Variable costs (percent of sales)	44%
Fixed costs	1,800
Tax rate	30%
Cost of capital	10%
Investment in net working capital as a percent of sales	18%
Sale of the Product Line in Year 4:	
Building	2,500
Equipment	2,500
Brand name	500

TABLE 3-14

*Cachet Pen Company, Inc.—Forecasted Cash Flows
for Proposed Investment*

Net Cash Flow Resulting From	Time				
	0	1	2	3	4
Sales		\$ 5,000	\$ 6,000	\$ 6,500	\$ 7,000
Variable costs		-2,200	-2,640	-2,860	-3,080
Fixed costs		-1,800	-1,800	-1,800	-1,800
Depreciation (building)		-24	-51	-51	-51
Depreciation (equipment)		<u>-572</u>	<u>-980</u>	<u>-700</u>	<u>-500</u>
Operating earnings before taxes		404	529	1,089	1,569
Taxes on operating earnings		<u>-121</u>	<u>-159</u>	<u>-327</u>	<u>-471</u>
Operating earnings after taxes		283	370	762	1,098
Add non-cash expenses		<u>596</u>	<u>1,031</u>	<u>751</u>	<u>551</u>
Cash flow from operations		879	1,401	1,513	1,649
Investment outlay	-6,000				
Change in net working capital		-900	-180	-90	1,170
Sale of building					2,297
Sale of equipment					2,124
Sale of brand name					<u>350</u>
Total net cash flow	<u>\$ -6,000</u>	<u>\$ -21</u>	<u>\$ 1,221</u>	<u>\$ 1,423</u>	<u>\$ 7,590</u>

Cash Flows From Operations

Starting with the first year, Alan begins to forecast the cash flows by following the five-step outline. The first year's sales are \$5,000, and variable costs, at 44 percent of sales, are \$2,200. Fixed costs are \$18,000.

Depreciation

From an economic point of view, depreciation represents the wear and tear on capital equipment as it is used over time. Financial statements recognize this principal and approximate the economic concept of depreciation by estimating the useful life of a capital asset and reducing income by a fixed portion of asset's cost over the useful life. Accountants prepare financial statements using this **straight-line method of depreciation** that depreciates the value of an asset at a constant rate over its life.

When setting tax policy, governments seldom follow the economic concept of depreciation. Governments often allow businesses for tax reporting to depreciate assets at a rate faster than the rate represented by straight-line depreciation. This is called **accelerated depreciation**, and there are several standard methods of computing it. When businesses capture more depreciation during the early years of an asset's life, the reportable income is lower, and the business pays less taxes. The effect of accelerated depreciation for individual companies is to increase net cash flows in the early years of investment projects. This increases the value of investment in the asset to the company and encourages the company to invest. If companies then do invest, the effect of accelerated depreciation for the economy is that it stimulates capital investment and economic growth. Therefore, governments

often adopt accelerated depreciation methods for tax purposes as part of a package of economic incentives.

The U.S. tax code currently uses an accelerated depreciation system known as **MACRS**, the **Modified Accelerated Cost Recovery System**. The discussion of MACRS presented here is brief. The U.S. tax code is a complicated system that changes somewhat every year and is overhauled from time to time. Readers who are interested in more timely and detailed information should consult a tax reference.

MACRS both shortens the depreciable life of an asset and uses a schedule of accelerated depreciation within that shorter life. The effect is that businesses write off a major portion of an asset's cost very early in the asset's useful life. In MACRS, an asset deemed as having useful lives of 10 years (such as office furniture), are classified as 7-year property and depreciated at an accelerated rate over 7 years. The exception is real property. Residential rental property is depreciated over 27.5 years and non-residential property, such as a manufacturing plant, over 39 years, both using the straight-line method. [Table 3-15](#) shows recovery periods for a sample of depreciable assets under MACRS.

TABLE 3-15

*Recovery Periods for Some Example Asset Classes
Using the MACRS*

MACRS Recovery Period (Years)	Types of Assets or Activity the Asset is Used In
3	Tractor units for use over the road Certain special tools for use in manufacturing
5	Information systems Data handling equipment Automobiles, taxis Cutting of timber Manufacture of apparel
7	Office furniture, fixtures, and equipment Agricultural equipment Manufacture of glass products Manufacture of tobacco products Manufacture of wood products and furniture Manufacture of motor vehicles Mining
10	Manufacture of grain products Petroleum refining Ship and boat building dry docks
15	Telephone distribution plant Electric utility nuclear production plant
20	Water utilities

Source: IRS Publication 946, "How to Depreciate Property"

[Table 3-16](#) presents sample schedules of MACRS depreciation rates. MACRS offers several different tables depending on the time of the year the company places the asset in service. For simplicity, the tables presented here for 3- to 15-year assets use the half-year convention that assumes assets are placed in service on average at mid-year. For real property, the schedule assumes the asset is placed in service in July. For assets placed in service during other months, only the first and last month's depreciation is affected. All examples and cases in this text use the depreciation schedules in [Table 3-16](#).

[Table 3-17](#) shows the calculation of depreciation and accumulated depreciation for each year for the Cachet Pen capital budgeting project. For example, depreciation for the first year for the building is \$24, and the equipment's first-year depreciation is \$572. Since Alan proposes to sell the project at the end of four years, it is necessary to compute depreciation only for four years even though the recovery periods for the assets are longer.

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TABLE 3-16

Example Depreciation Schedules for MACRS

Depreciation for Recovery Period*

Year	3-Year	5-Year	7-Year	10-Year	15-Year
1	33.33%	20.00%	14.29%	10.00%	5.00%
2	44.45	32.00	24.49	18.00	9.50
3	14.81	19.20	17.49	14.40	8.55
4	7.41	11.52	12.49	11.52	7.70
5		11.52	8.93	9.22	6.93
6		5.76	8.92	7.37	6.23
7			8.93	6.55	5.90
8			4.46	6.55	5.90
9				6.56	5.91
10				6.55	5.90
11				3.28	5.91
12					5.90
13					5.91
14					5.90
15					5.92
16					2.95
Nonresidential Real Property – 39 Years**					
1	1.177%				
2-39	2.564				
40	1.391				

Source: IRS Publication 946, "How to Depreciate Property"

* Using the half-year convention that assumes that assets on average are placed in service at mid-year.

**Assumes the asset is placed in service in July, for other months, consult the source.

TABLE 3-17

Calculation of Depreciation for the Cachet Pen Capital Budgeting Project

Year	Asset Cost	Depreciation Rate	Depreciation	Accumulated Depreciation	Asset Book Value
Building					
1	2,000	0.01177	24	24	1,976
2	2,000	0.02564	51	75	1,925
3	2,000	0.02564	51	126	1,874
4	2,000	0.02564	51	177	1,823
Equipment					
1	4,000	0.1429	572	572	3,428
2	4,000	0.2449	980	1552	2,448
3	4,000	0.1749	700	2252	1,748
4	4,000	0.1249	500	2752	1,248

Taxes

After estimating the depreciation for the project assets, Alan can compute the operating earnings before taxes from the project. Projected operating earnings before taxes for the first year of the project are \$404. Then, based on projected operating earnings, Alan can estimate the taxes due on those earnings. At Cachet Pen's tax rate of 30 percent, estimated taxes for the first year are \$121. Subtracting the taxes from the operating earnings before tax yields the operating earnings after tax.

Non-cash Expenses

Expenses that the firm deducts from its income statement but which the firm does not pay in the current period are called **non-cash expenses**. The firm gets the benefit of reducing its taxable income by deducting non-cash expenses, but they do not represent a cash outflow. Therefore, to find cash flow from operating earnings, financial analysts add non-cash expenses back to operating earnings after taxes.

The most common category of non-cash expense is depreciation. **Depletion**, expense deducted for natural resources extracted from land, is also a non-cash expense. For the first year of the *Executive Desk* paperweight project, Alan's cash flow projection add back a total of \$596 to after-tax operating earnings to account for depreciation on the building

and equipment. This yields a total cash flow from operations of \$879.

Other Cash Flows

In addition to cash flows from operations, there are a number of other cash flows that may result from a project. These cash flows may be positive or negative, and it is important to consider the after-tax cash flow rather than before-tax.

Additional investment outlays

Some proposed investments, particularly those with relatively long lives, might require outlays of additional funds in the future. For example, consider a planned investment in pollution control equipment. Purchase and installation of the equipment requires an initial investment of \$2 million. The equipment should last for 20 years but needs an extensive cleaning and overhaul every five years at a cost of \$500,000. The financial analyst would treat these periodic overhauls as cash outflows in the year they occur.

Commitment of Net Working Capital

Investment in net working capital represents an investment of funds by the firm. Net working capital is the amount of current assets less current liabilities. Any change in net working capital caused by an investment project represents a cash flow that needs to be considered in the capital budgeting process. However, since current assets are liquid, they might be

completely or substantially recovered at the end of a project. For example, suppose a proposed project required the investment of \$20,000 in inventory. At the end of the project, the inventory can be sold, although maybe at a discount from its book value.

[Table 3-18](#) illustrates the computation of the investment in new net working capital for the Cachet Pen capital budgeting project. Alan Hall has estimated that the net working capital requirement for the *Executive Desk* project is 18 percent of sales. His simplifying assumption is to compute working capital based on year-end amounts. In the first year, all sales require new working capital, so the increase in net working capital for the year is \$900 (18 percent of \$5,000). The second year's sales are \$6,000, \$1,000 greater than in year 1. The project requires new net working capital on this \$1,000 of incremental sales. The increase in net working capital for year 2 is therefore \$180. Additional sales in year 3 necessitate an additional \$90 in net working capital. In year 4, increased sales add \$90 in net working capital, but upon the sale of the project at year's end, Cachet Pen recovers the entire investment in net working capital (\$1,260), so the net cash inflow at the end of year 4 is \$1,170.

TABLE 3-18

Cachet Pen Company, Inc.—Investment in Net Working Capital

Year	Sales	Change in Sales from Previous Year	New Investment in Net Working Capital	Recapture of Net Working Capital at End of Project	Cash Flow Due to Net Working Capital
1	\$ 5,000	\$ 5,000	\$ 900		\$ -900
2	6,000	1,000	180		-180
3	6,500	500	90		-90
4	7,000	500	<u>90</u>	\$ 1,260	1,170
			1,260		

Salvage Value or Sale of Capital Assets

Some investment projects have a planned finite life even from the beginning of the project. Other proposals are investments that the firm expects to continue on into the indefinite future. In such a case, the proposed project is actually a chain of proposed projects where the initial proposal represents the first link in the chain. As the equipment for that project wears out, a second link in the chain is the replacement of the equipment and continuation of the product. Later, a third link enters the picture.

The *Executive Desk* project for Cachet Pen is one that has a pre-planned sale at the end of four years. Of course, the company's financial management may reconsider the issue as the end of the fourth year approaches. Reevaluation of the project might lead the firm to keep the line of paperweights rather than sell. However, the initial evaluation of the idea is based on the projected sale of the *Executive Desk* line at the end of year 4.

When a company sells a capital asset, regardless of whether the project is ending or the firm is simply replacing the asset with a new model, the cash flow resulting from the asset sale must consider taxes. After taking depreciation on an asset, the company's books reflect a value for the asset that is probably not equal to the asset's market value. In some cases, the book value of the asset may be greater than the price for which the company could sell the asset, and the sale generates a taxable loss for the company. In many other cases, because of accelerated depreciation, the market price of the asset exceeds its book value, and the company must claim a taxable gain when disposing of the asset.

[Table 3-19](#) illustrates the effect of taxes on asset sales for Cachet Pen. At the end of the fourth year, Cachet has taken total depreciation of \$177 (see [Table 3-19](#)) over the four years on the building, leaving a book value of \$1,823 from the original cost of \$2,000. However, the value of the building is \$2,500, which represents a book profit of \$677 on the sale of the project. The tax due on this profit is 30 percent of \$677, a total of \$203. Therefore, the net cash flow resulting from the sale of the building is equal to the sales price of \$2,500 less the tax of \$203, leaving a net cash inflow of \$2,297.

TABLE 3-19

Cachet Pen Company, Inc.—Calculation of Cash Flow From Project Asset Sales

Description	Building	Equipment	Brand name
Sales price of asset	\$ 2,500	\$ 2,500	\$ 500
Book value of asset	<u>1,823</u>	<u>1,248</u>	<u> </u>
Taxable gain (loss)	677	1,252	500
Tax on gain (30%)	203	376	150
After-tax cash flow	<u>\$ 2,297</u>	<u>\$ 2,124</u>	<u>\$ 350</u>

The sale of the *Executive Desk* brand name is the sale of an asset that is associated with the project, so it should be considered as part of the cash flows resulting from the project. While the *Executive Desk* brand name has a value, Cachet Pen does not carry it on the books with a specific value. The cost of building the goodwill that the brand represents was part of the expenses as the project developed, so the asset has no capitalized value of Cachet's books. Therefore, the entire sales price of the brand name represents a taxable gain for the firm. [Table 3-19](#) shows that this yields a tax liability of \$150 and a net cash inflow of \$350 at the end of the project.

Net Cash Flows

The sum of all of the various component cash flows for a capital budgeting project yields the total net cash flow. Cachet Pen's *Executive Desk* paperweight project yields negative cash flows at periods 0 and 1 with positive cash flows following in the remaining periods.

Cash flows are the ultimate benefit or cost of a project. Although the investment project for Cachet Pen shows positive profitability as measured by an earnings-to-sales ratio of 5.7 percent in the first year, the project costs Cachet Pen \$21 in cash outflow. Even if a project shows continued profitability, it must provide cash in order to be a beneficial investment for the firm. Financial analysts consider cash flows, not profits.

Note, however, that cash flows do not consider interest expense. Financial analysts consider that capital has a cost regardless of whether it arises from interest (which is tax deductible) or dividends (which are not). The capital budgeting process considers the cost of capital, whether it be from debt financing or equity financing, as a discount factor for cash flows, not as a deduction from income. The discounting procedure applies to the various criteria that analysts use for project evaluation.

Criteria for Project Evaluation

Most methods for evaluating capital investments take into account the effect of the time value of money on future expected cash flows from the project. For readers who need a review of the concepts of the present value, The Appendix to Section 3 provides a brief summary of the computation of time value using a financial calculator or present-value tables. Spreadsheet programs are also useful tools for computing present value and rates of return.

There are five principal techniques for evaluating projects:

1. Payback period
2. Net present value
3. Internal rate of return
4. Modified internal rate of return
5. Profitability index

Payback Period

The payback period represents the amount of time needed to recover a project's initial investment. It is the only evaluation method presented here that does not take into account the time value of money.

When a project has equal cash flows throughout its life, computation of the payback period is straightforward:

$$\text{payback period} = \frac{\text{initial outlay}}{\text{annual cash flow}} \quad (3.20)$$

For example, a project costing \$15,000 with annual cash flows for the next eight years has a payback of:

$$\begin{aligned} \text{payback period} &= \frac{15,000}{3,000} \\ &= 5 \end{aligned}$$

This project has a payback of five years.

The decision rule for the payback period criterion sets a minimum or hurdle payback period for acceptable capital investments for the firm. The decision rule is as follows:

- If the project's payback period is less than or equal to the hurdle payback period, accept the investment.
- If the project's payback period is greater than the hurdle payback period, reject the investment.

For example, a firm might decide that it wants all of its investments paid back within four years. Based on that criterion, this example payback period of five years is

insufficient to justify the firm's committing its capital to the project.

When proposed investment projects have cash flows that are unequal each year, the procedure to find the payback is to determine how much of the original investment remains to be repaid each year. [Table 3-20](#) provides an example using Cachet Pen. The cash flow balance for the project is still negative in year 3 but is positive in year 4. Payback is at the point where the cash flow balance is zero, so the payback for the project is between year 3 and year 4.

TABLE 3-20

Computation of the Payback Period for Cachet Pen Company, Inc.

Year	Cash Flow	Cash Flow Balance
0		\$ -6,000
1	\$ -21	-6,021
2	1,221	-4,800
3	1,423	-3,377
4	7,590	4,213

When the payback occurs between two years, it is common to assume that the cash flow occurs at an even rate throughout the year and compute the payback as a fraction of the year by interpolating between the two years. For example, interpolation for the Cachet Pen project yields

$$\begin{aligned} \text{payback period} &= 3 + \frac{0 - (-3377)}{4213 - (-3377)} \\ &= 3.445 \end{aligned}$$

Using the interpolation method, payback occurs at 3.44five years. However, in this particular case, we know that the year-4 cash flow does not occur at an even rate over the year. Only the operating cash flow occurs throughout the year; the cash flow from the asset sales happens at the end of the year. Therefore, for Cachet Pen, it is reasonable to state that the payback period of this project is four years. If Cachet Pen's hurdle payback period for making investment decisions is four years or more, then the firm should accept the project. Otherwise the firm should reject the proposed investment.

The principal advantage of the payback period as a decision making tool is that it is simple to compute and understand. Even people without formal financial training can understand payback and its implications for a financial decision. However, the payback method has some serious drawbacks:

- It does not take into account the time value of money.

- It ignores any cash flows that occur after the payback point, and those cash flows may be important.
- Determination of the hurdle payback period is arbitrary and does not consider the cost of capital for a firm.

Net Present Value

The **net present value** (NPV) method finds the value of the sum a project's cash flows discounted at the cost of capital.

Stated mathematically, the NPV is

$$\begin{aligned} NPV &= CF_0 + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n} \\ &= \sum_{i=0}^n \frac{CF_i}{(1+k)^i} \end{aligned} \tag{3.21}$$

Equation 3-21 simply states that the NPV is equal to the present value of all cash flows from now until n discounted at k , the cost of capital.

If a project provides benefit to a company, it will have a positive NPV and increase the value of the firm. The decision rule for the NPV criterion is therefore

- If the NPV is positive, accept the project.
- If the NPV is zero or negative, reject the project.

The *Executive Desk* investment project for Cachet Pen provides an example. [Table 3-21](#) shows the computation of the NPV for the project. The NPV of the cash flows is \$1,243. The positive NPV signifies that this proposed project has an expected positive value for the company, and Cachet Pen should accept the project.

TABLE 3-21

Computation of the NPV for Cachet Pen Company, Inc.

Year	Cash Flow	Present Value Factor	Present Value of Cash Flow
0	\$ -6,000	1.0000	\$ -6,000
1	-21	0.9091	-19
2	1,221	0.8264	1,009
3	1,423	0.7513	1,069
4	7,590	0.6830	<u>5,184</u>
Net Present Value			<u><u>\$ 1,243</u></u>

Internal Rate of Return

The **internal rate of return** (IRR) of an investment is the rate of return that the project's cash flows yield to the investor. Mathematically, it is the rate of return that makes the investment's NPV be zero:

$$0 = \sum_{i=1}^n \frac{CF_i}{(1 + IRR)^i} \quad (3.22)$$

When a proposed investment yields a return that is greater than the firm's cost of funds to finance the investment project, the project adds value to the firm. The capital budgeting decision rule for IRR is

- If the IRR of a project is greater than the cost of capital, accept the project
- If the IRR is less than or equal to the cost of capital, reject the project

Solving for the IRR usually requires the use of a financial calculator or spreadsheet program (the IRR function) except in simple situations when the cash flows are all equal. Financial calculators have the flexibility to compute IRRs even when cash flows differ each period. Because each brand of calculator has a somewhat different sequence of keys to use to compute IRR, readers should consult their calculator's user's manual for specific direction on solving for the IRR of a project.

The sequence of cash flows for the Executive Desk project of Cachet Pen Company yields an IRR of 15.96 percent. Alan Hall has identified Cachet Pen's cost of capital as 10 percent, so the IRR decision rule leads to accepting the project.

The IRR method of investment decision making is popular because rates of return are easy to understand. When a financial analyst makes a presentation of a proposed investment that has an expected return of 14 percent compared to the cost of funds of 12 percent, the implication is clear; the project is desirable.

In general, the NPV method of evaluating projects is preferable to the IRR method. In most cases where the decision is simply to accept or reject a proposed investment, both methods lead to the same conclusion. However, there are some instances when the IRR and the NPV methods can lead to conflicting conclusions:

- Mutually exclusive projects
- Multiple IRRs

Mutually Exclusive Projects

Independent projects are projects that do not affect each other. The decision to accept or reject one has no influence on the decision to accept or reject the other. Independent projects lead to the same investment decision using both the NPV and IRR criteria.

Some projects are **mutually exclusive**. Mutually exclusive projects are investment projects in which the adoption of one precludes investment in the other. An example might be an apartment complex or a shopping center, where both projects would occupy the same available parcel of land. Obviously both projects cannot be accepted, so the decision is not one of accept or reject but one of, "Which project adds more value to the company?"

Given that question, the NPV is the logical choice for a decision rule. The project with the greatest NPV will add the most value to the company. Normally the project with the highest NPV will also have the highest IRR. In some cases, however, a project may have the greater IRR but the lower NPV. This typically happens when one of the following conditions is true:

- The cost of one project is much greater than the cost of the other project. For example, a return of 10 percent on a \$100,000 investment yields \$10,000, while a much greater return of 20 percent on an investment of \$10,000 yields only \$2,000. If these two investments were mutually exclusive, then the investment with the greater NPV is the better choice.
- There are big differences in the timing of the cash flows. The assumption implicit in the computation of the cost of capital is that the firm can reinvest all cash flows from the

project at the IRR. This may not be a reasonable assumption, particularly when the cash flows early in the project are large. A more conservative approach is to assume that reinvestment of cash flows occurs at the cost of capital. The NPV method assumes that reinvestment is at the cost of capital, so the NPV can be a better choice when cash flow timing is different.

Multiple IRRs

It is possible, though not common, for there to exist two (or more) different and positive solutions to the IRR equation. This can happen when a project has a large cash outflows late in the project.

Consider, for example, an investment that has an initial outlay of \$100 followed by a cash flow at year 1 of +\$1,000 and a cash flow of -\$1,000 at year 2. The IRR solution for this project is both 13 percent and 787 percent. Obviously, your calculator will give only one answer depending on the value it uses to begin its iterative solution, but both solutions are correct. (Compute the NPV of the cash flows. Both rates yield an NPV of zero.)

In cases where the IRR method does not yield a unique solution, the NPV method is a better choice for decision-making. The reason again is that the NPV method assumes that cash flows are reinvested at the cost of capital, not the IRR.

Modified IRR

The problem of multiple IRRs occurs because of the assumption that the firm reinvests project cash flows at the IRR. The more conservative approach is to reinvest cash flows at the cost of capital. A rate-of-return calculation that considers both rates is the **modified internal rate of return** (MIRR). The MIRR is the rate of return on an investment when the future cash flows are reinvested at the cost of capital.

Most financial calculators allow the user to specify a reinvestment rate to allow computation of the MIRR. For spreadsheets, the MIRR function computes the MIRR. The MIRR for the Cachet Pen project, assuming reinvestment of cash flows at the 10 percent cost of capital, is 15.29 percent.

The MIRR allows the analyst to avoid the multiple-IRR problem, and it represents a more conservative approach than the IRR. The decision rule for the MIRR is the same as for the IRR.

Profitability Index

The **profitability index** (PI) is the present value of the cash inflows divided by the present value of the cash outflows:

$$PI = \frac{\sum_{i=1}^n \frac{CIF_i}{(1+k)^i}}{\sum_{i=1}^n \frac{COF_i}{(1+k)^i}} \quad (3.23)$$

where *CIF* is a cash inflow and *COF* is a cash outflow. The PI is the ratio of the present value of a project's benefits to its costs.

When a project benefits exceed project costs, the PI has a value greater than one. Therefore, the decision rule for the PI is

- When the PI is greater than one, accept the project
- When the PI is less than or equal to 1, reject the project

Capital Constraints

The simple capital budgeting decision of accepting or rejecting a project can lead to accepting a number of different projects, all which add value to the firm. If the firm has an unlimited supply of capital it a fixed cost, then going forward with all acceptable projects is a desirable strategy.

Most firms do not have access to unlimited capital. At some point, raising additional funds will cost the firm more money. At some higher point, the firm may not be able to raise additional

capital regardless of the cost. Most firms face a situation of **capital rationing**. Capital rationing recognizes that capital is a scarce resource with an increasing cost as a firm uses more of it.

Under situation of capital rationing, firms may need to decide which projects in the set of acceptable projects provides the maximum benefit for the firm. With capital rationing, a firm may end up rejecting an investment with a positive NPV.

Prioritizing Projects

The goal of the capital budgeting process under capital rationing is to select the optimal set of investments for the firm. This involves finding the set of projects that maximizes the total NPV.

To prioritize or rank projects, probably the most useful of the capital budgeting metrics is the PI used in conjunction with the NPV. A good starting point is to rank the projects by their PI. Then, choose projects from the list until the capital budget is exhausted. The set of resulting projects is not necessarily the optimal set, but it is a good beginning. From this point, the analyst should search for other combinations that would maximize NPV without going over budget.

For example, [Table 3-22](#) shows a firm with a capital budget of \$1,000 and eight proposed investment projects. Projects G and H have negative NPVs, so they drop off the list of acceptable investments immediately. Projects A to F have positive NPVs and are ranked in the table by their PIs. On the first try to find an optimal set of investments, the analyst begins accepting projects from the top of the list until the committing the entire capital budget. This involves accepting projects A, B, and C. At that point, there is \$142 left in the capital budget, and the total NPV of the three projects is \$140.

TABLE 3-22

Project Selection with Capital Rationing

Project	PI	NPV	Initial Outlay	Balance in Capital Budget	Cumulative NPV of Selected Projects
First try:					
				\$ 1,000	
A	1.200	\$ 60	\$ 300	700	\$ 60
B	1.150	30	200	500	90
C	1.140	50	358	142	140
D	1.122	22	180	-38	
E	1.109	35	320		
F	1.079	11	140		
G	0.950	-8	160		
H	0.911	-17	190		

(continued)

TABLE 3-22 (continued)

Project	PI	NPV	Initial Outlay	Balance in Capital Budget	Cumulative NPV of Selected Projects
Second try:				\$1,000	
A	1.200	\$ 60	\$ 300	700	\$ 60
B	1.150	30	200	500	90
C	1.140	50	358		
D	1.122	22	180	320	112
E	1.109	35	320	0	147
F	1.079	11	140		
G	0.950	-8	160		
H	0.911	-17	190		
Third try:				\$1,000	
A	1.200	\$ 60	\$ 300	700	\$ 60
B	1.150	30	200	500	90
C	1.140	50	358	142	140
D	1.122	22	180		
E	1.109	35	320		
F	1.079	11	140	2	151
G	0.950	-8	160		
H	0.911	-17	190		

For the second try, dropping project C and accepting projects D and E allows the company to spend the entire capital budget and increase the total NPV to \$147. Therefore, combination A, B, D, and E is preferable to A, B, and C. However, there is a third possibility. Including C and omitting D and E leaves sufficient funds in the budget to include F. The inclusion of F reduces the capital budget balance to \$2 and increases the total NPV to \$151, which represents the best possible combination of investments for the firm (investments A, B, C, and F).

The process of finding the optimal combination of investments is an iterative procedure of continuing to examine different combinations until identifying the set of investments that maximizes NPV for the firm.

Dependent Projects

Dependent projects are investment projects whose acceptance affects the acceptance of other projects. For example, suppose that a firm is considering investing in constructing an amusement park and a new roller coaster for the park. While these two decisions are separate decisions, the decision to invest in the roller coaster is dependent on a yes decision for the amusement park.

When projects are dependent, there is an additional complication in the capital budgeting process because of the interdependency of the dependent projects. For example, suppose that project F in [Table 3-22](#) was dependent of project D such that D must be in place for F to be feasible. In this case, the set of projects previously identified as optimal (A, B, C, and F) is not feasible because F needs D. With this dependency between D and F, the optimal investment set with capital rationing would be A, B, D, and E.

❖ Summary

A firm's working capital is the sum of its current assets, while net working capital is current assets less current liabilities. Firms have both a permanent component and a variable component of their working capital needs. To measure working capital, financial analysts use the current ratio, current-assets-to-total-assets ratio, and the current-assets-to-sales ratio (or working capital turnover).

A firm's working capital policy deals with the appropriate amount of working capital to carry and with the sources of financing that working capital. Factors that affect the amount of working capital are the nature of the firm's business, the availability of credit, firm size, and the firm's attitude toward risk and return. A firm can finance its working capital with short-term financing, long-term financing, or some combination of the two.

Working capital strategies implement the firm's working capital policy. Strategies can be conservative, moderate, or aggressive.

Cash management is the portion of working capital management dealing with cash and liquid short-term investments. Firms carry cash as transactions balances, compensating balances, precautionary balances, and speculative balances. The cash budget is the document that

forecasts a firm's cash inflows and outflows. It allows a financial manager to forecast an excess of cash or a need to raise cash in the future. A firm with excess balances held in cash should invest those funds in short-term investments that yield some income.

A firm's cash cycle is the amount of time between the firm's payment to acquire materials and the ultimate receipt of cash after the firm sells that product. The operating cycle is the amount of time between the purchase of materials and the receipt of cash. A firm can effectively manage its cash flows using a combination of synchronizing planned cash flows, using float, accelerating receipts, and efficiently transferring funds.

Accounts receivable management is the area of working capital management that controls the level and flows of receivables. Effective receivables management addresses the decision to grant trade credit and the firm's monitoring of the level of its receivables. The decision to grant trade credit concerns a credit policy that identifies credit standards and terms. The decision also must address the collection policy for accounts receivable. The days' sales outstanding ratio (average collection period) is the fundamental metric for measuring and monitoring accounts receivable. In addition, a firm should use an aging schedule to help identify times when there are too many accounts past due.

Inventory management is the area of working capital management that deals with the appropriate levels of inventory for a firm. Types of inventory include raw material inventory, work-in-process inventory, and finished goods inventory. Carrying inventory has its benefits and costs, and effective inventory management finds a balance between the two. Approaches to inventory management include the ABC method, MRP, and just-in-time inventory control systems.

Management of current liabilities addresses both spontaneous and negotiated short-term financing for the firm. Principal sources of short-term financing are accruals, accounts payable, bank loans, and commercial paper.

Capital budgeting is the process of analyzing proposed investment in fixed assets and deciding which investments are most beneficial for the firm. The financial manager analyzes investments by forecasting the project's cash inflows and cash outflows. Cash flows are the important measure for financial analysis, not accounting profits. The criteria for evaluating the cash flows from investment projects include the payback method, net present value, internal rate of return, modified internal rate of return, and the profitability index.

Investment projects are independent when the cash flows of one project do not depend on the cash flows of another project. Projects are dependent when the acceptance of one project affects the cash flows of another project. When projects are mutually exclusive, the firm can accept only one of them.

A firm that finds that it has a limited amount of capital or that the cost of capital rises substantially if the firm raises more capital finds itself in the situation of capital rationing. With capital rationing, the capital budgeting decision is not simply to accept or reject a proposed investment. The investment decision with capital rationing should find the combination of investments that maximizes the net present value for the firm.

❖ Glossary

ABC method A traditional method of inventory management that classifies inventory into high-value, medium-value, and low-value groups

accelerated depreciation Method of depreciation that depreciates an asset at rates faster than that used in straight-line depreciation

aging schedule A schedule that classifies a firm's accounts receivable by the age of the account balance

average collection period The average number of days that accounts receivable are outstanding

capital A firm's long-term investment in fixed assets

capital budgeting The process of analyzing proposed investment projects and choosing those that are appropriate for the firm

capital rationing The situation in which capital for the firm is limited

cash budget The document that forecasts a firm's cash inflows and outflows over a specific period

cash cycle The amount of time between the payment that the firm makes to acquire materials and the receipt of cash in payment for the firm's products

clearing float The time it takes a check to clear through the banking system

collection policy The firm's statement outlining the procedures to be used to attempt to collect past-due accounts

collections float The amount of funds that a firm has deposited with the bank but for which the bank has not yet credited to the firm's account

commercial paper The short-term unsecured debt of large corporations

compensating balances Cash balances that a firm holds with a bank to compensate the bank for services provided to the firm

cost of capital The cost of funds that the firm invests in its capital assets

credit standards The qualifications that a customer must meet in order to receive credit from the firm

credit terms The conditions under which the customer agrees to receive credit and repay debt

current-assets-to-sales ratio Working capital as a portion of sales

current-assets-to-total-assets ratio Working capital as a portion of total assets

- days' sales outstanding** The average number of days that accounts receivable are outstanding
- dependent projects** Investment projects whose acceptance affects the cash flows of another project
- depletion** Expense deducted for natural resources extracted from land
- disbursement float** The amount of a firm's payments that have not yet cleared its bank account
- discount interest** Interest paid at the beginning of a loan
- financing cash flows** Cash flows that result from sources of financing
- finished goods inventory** The firm's inventory of goods ready for sale
- float** The difference between a firm's cash balance on its books and the cash balance on the bank's records
- independent projects** Investment projects whose acceptance does not affect the cash flows of any other investment project of the firm
- internal rate of return** The rate of return that a capital investment project yields to the firm, the rate of return that yields a net present value of zero
- investment cash flows** Cash flows that result from the acquisition or sale of fixed assets

just-in-time Inventory management system in which the firm schedules deliveries of material to arrive just at the time needed

line of credit An agreement between a bank and its customer identifying an amount of credit the bank is willing to extend to the firm

lockbox arrangement Arrangement in which a company rents a post office box in regional locations, customers in that region send their payments to the box, and a bank collects and process the checks

MACRS Modified Accelerated Cost Recovery System, the accelerated depreciation system used in the U.S. tax code

mail float The time that it takes for a check to travel to its destination

major current asset accounts working capital financing policy Policy for financing the firm's current assets that distinguishes between the different types of current asset accounts

modified internal rate of return The rate of return on an investment project assuming that future cash flows are invested at the cost of capital instead of the internal rate of return

MRP Computerized inventory management systems that coordinate the purchasing of materials for many different products with many components

multilateral netting The process of settling transactions between two or more units in a firm that reduces the number and cost of foreign exchange transactions

mutually exclusive Investment projects are mutually exclusive when the acceptance of one project precludes the acceptance of the other

negotiated short-term financing Any source of short-term financing that the firm negotiates with the lender

net present value The present value of all of the cash flows resulting from a capital investment project discounted at the cost of capital

net working capital A firm's current assets less its current liabilities

non-cash expenses Expenses that the firm deducts from income but for which the firm does not pay in the current accounting period, examples are depreciation and depletion

ongoing liquidity The continuing cash flow from a firm's process of acquiring materials, producing product, making payments, recording sales, and collecting receivables

operating cycle The time between the purchase of materials and the receipt of cash

opportunity cost of capital The return that a firm or investor could achieve on alternative investments

permanent and variable working capital financing policy Policy for financing the firm's current assets that recognizes the seasonal nature of working capital

permanent working capital The minimum amount of working capital required by the firm to continue operations throughout the year

precautionary balances Funds held as a safety reserve for seasonal or unexpected demands for cash

processing float The time required for a recipient of a check to process the check and deposit it in the bank

profitability index The ratio of the present value of an investment's cash inflows to the present value of its cash outflows

promissory note A short-term debt instrument document that details the terms of the loan

raw material inventory The inventory of materials and goods used to manufacture products

required rate of return The minimum rate of return that the firm must receive in order to justify committing funds to an investment

revolving credit agreement A commitment from a bank to extend credit up to an agreed-upon amount

speculative balances Funds held in reserve so that the firm has the ability to take advantage of opportunities that may arise

spontaneous short-term financing Any source of short-term financing that tends to change automatically when current assets change

straight-line depreciation Method of depreciation that depreciates the value of an asset at a constant rate over its life

total current assets financing policy Policy for financing the firm's current assets that does not distinguish between the different categories of current asset

trade discount A discount that a firm offers its customers for paying prior to a certain date

transactions balances Cash balances needed to make routine payments such as wages, payments for raw materials, and interest payments

variable working capital The level of working capital over and above the level of permanent working capital

work-in-process inventory The firm's inventory of partially finished goods

working capital The firm's total assets used in operations

working capital policy A firm's policy that addresses the proper amount of current assets to carry and the appropriate financing sources for those current assets

working capital strategy The firm's plan that implements its working capital policy

working capital turnover The number of times a company sells its working capital in a year

yield curve The relationship between interest rates and the time to maturity of debt

❖ Questions

1. Define working capital and net working capital.
2. Differentiate between permanent working capital and variable working capital.
3. Identify the factors that influence the amount of working capital that a firm should have.
4. List the advantages of using short-term financing and the advantages of using long-term financing for a firm's working capital.
5. State the four types of cash balances that firms carry.
6. Describe the process of setting up a cash budget.
7. Differentiate between a firm's cash cycle and its operating cycle.
8. Describe the process of multinational netting using three different divisions of a hypothetical multinational firm.
9. Outline the components of a firm's credit granting policy.
10. Describe three systems for controlling and monitoring inventory.
11. List four sources of short-term financing.
12. Differentiate between a line of credit and a revolving credit agreement.
13. Contrast simple interest and discount interest.

14. Describe how depreciation leads to a cash inflow for a firm.
15. List five methods of evaluating capital budgeting projects.
16. Identify the decision rule for accepting or rejecting investment projects using NPV.
17. Give an example of mutually exclusive investment projects and explain how they affect the capital budgeting decision.
18. Explain how the MIRR differs from the IRR.

❖ Problems

1. Two companies, A and B, have the following balance sheet accounts:

	A	B
Current assets	\$ 150	\$ 800
Fixed assets	300	2200
Current liabilities	75	600
Long-term debt	75	1000
Equity	300	1400

- Compute values for all of the ratios that measure working capital for firms A and B.
- Compare Firm A to B with regards to its need for working capital and how it finances its working capital (short-term vs. long-term financing).

2. The Latigo Company has the following financial information:

Sales	\$ 200
Cost of goods sold	100
Administrative expense	44
Depreciation	40
Interest expense	2
Tax	<u>7</u>
Net profit	\$ 7

Cash	\$ 5
Accounts receivable	20
Inventory	25
Fixed assets	50
Accounts payable	5
Note payable	15
Long-term debt	20
Equity	70

- The current assets to sales ratio for the industry is 0.20. State whether Latigo make more or less use of working capital than the industry.
- Compute the working capital turnover for Latigo and for the industry.
- Compute the operating cycle and the cash conversion cycle for Latigo.
- The industry average cash conversion cycle is 112 days. Compare the industry to Latigo and identify any inferences that you can make.

3. Gramble Corp. uses trade credit on terms of 2/15 net 40.
 - a. Compute the nominal annual cost of not taking the discount.
 - b. Compute the effective annual cost of not taking the discount.
4. Gramble Corp. has a promissory note at the bank for \$150,000 on which it pays 9 percent interest. The bank requires Gramble to maintain a compensating balance of \$10,000. Compute the effective rate on Gramble's note.
5. National Pen and Pencil, Inc. has a short-term discount note payable at its bank. The rate stated on the note is 10 percent. Compute the effective rate on the note.
6. Compute the cash flow for Latigo Company (problem 2).

❖ Appendix to Section 3: Time Value of Money

This subsection presents a review of the concepts of the time value of money and the present-value computations that are used often in the field of investments. It is not the intent of this section to present a comprehensive view of time-value concepts; it contains only a brief presentation of present value. Any reader who needs additional review of present value or future value should consult a more detailed reference.

A sum of money grows when invested at some rate of return over one or more periods of time. When invested for multiple periods, the interest from the prior period becomes part of the principal amount during the second period, so the amount of growth in the second period is greater than that during the first period. Because interest accumulates not only on the original principal but also on the interest earned during the first period, the accumulated interest grows at an increasing rate. This is the phenomenon of compound interest, and it causes a sum of money to grow by increasing amounts during each succeeding interest payment period.

In investments, we are concerned with the value of an asset. The fundamental tenet of valuation is that the worth of an asset is equal to the present value of all of the future cash flows that the investor expects to receive from that asset. When computing present value, we must take into account the compounding of interest over time.

Computing compound interest over multiple time periods requires the interest rate to be raised to a power equal to the number of compounding periods. Because of this, computing the formulas for compound interest can be complex, and the traditional method for dealing with compound interest is by using tables of compound-interest factors. The widespread use of calculators with built-in compound-interest functions has made compound-interest calculations easier. The approach taken in this text is to present present-value calculations using two methods:

- Using present-value tables from the back of this book
- Using the generic present-value keys on a financial calculator

There is a wide range of calculators on the market from a number of manufacturers. They vary from simple calculators with the basic generic present-value keys to fancy graphing financial calculators with a wide range of financial functions. It is beyond the scope of this book to present instruction on the sequence of keys needed to compute asset-value calculations on all of these calculators. Calculator users should consult the users' manual of their calculator for instruction on the specialized present-value capabilities of their model. This text does present a method of computing present value using a set of generic present-value keys available on most financial calculators.

There are five generic time-value-of-money keys common to most financial calculators. The letters (or similar letters) labeling them and their descriptions are as follows:

- N —the number of periods
- I —the interest rate per period (usually expressed in percent)
- PV —the present value
- PMT —the payment per period
- FV —the future value

For presenting solutions to problems, this book will represent the keys and the values to be input using the following grid:

N	I	PV	PMT	FV
<i>input</i>	<i>input</i>	<i>solution</i>		<i>input</i>

Keys for which no input is necessary for the solution are left blank, keys with input will have the input numbers, and keys that yield a solution are shaded.

The Present Value of a Single Payment

The present value yields the current worth of an asset valued at some time in the future. The formula for present value on a single payment or future asset value is

$$PV = FV \times \frac{1}{(1+r)^n} \quad (3A-1)$$

where V = the present value

FV = the future asset value or cash payment

r = the per-period rate

n = the number of periods in the future that FV is received

The last term in equation (2-30) is the present-value factor that is available from present-value tables such as those in Appendix 1 of this text.

To compute present value, we can solve equation (3A-1) by raising $(1 + r)$ to the n th power using a calculator; we can look up the present-value factor for $(100 \times r)$ percent at n periods; or we can use a financial calculator. For example, suppose that we are expecting to receive a cash flow of \$1,000 one year from now and the rate of interest is 8 percent. The present value of that amount using the present-value factor for 8 percent and 1 period (0.9259) from Appendix 1 is

$$\begin{aligned} PV &= 1000 \times 0.9259 \\ &= 925.9 \end{aligned}$$

Using the financial calculator:

<i>N</i>	<i>I</i>	<i>PV</i>	<i>PMT</i>	<i>FV</i>
1	8	925.93		1000

The present value of receiving \$1,000 one year from now is \$925.93. Some financial calculators match the direction of cash flows and will give an answer of –925.93. They do this because paying \$935.93 now (cash outflow) is equivalent to receiving \$1,000 a year from now (cash inflow).

Now consider compounding. What is the present value of \$1,000 one year from now when the annual rate is 8 percent compounded quarterly? There are four quarters in a year, so dividing 8 percent by four periods gives a rate of 2 percent per three-month period. The present-value factor for 2 percent for four periods is 0.9238, so the present value is

$$\begin{aligned}
 PV &= 1000 \times 0.9238 \\
 &= 923.80
 \end{aligned}$$

The financial calculator solution is

<i>N</i>	<i>I</i>	<i>PV</i>	<i>PMT</i>	<i>FV</i>
4	2	923.85		1000

ADVANCED TOPICS IN FINANCIAL MANAGEMENT
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An analyst estimates that an investment will sell for \$75 six years from now. If the investment has no other cash flow between now and the end of the sixth year, what is the value of the investment today at a discount rate of 12 percent? The present-value factor for 12 percent for six years from Appendix 1 is 0.5066, so the present value is

$$PV = 75 \times 0.5066$$

$$= 37.995$$

<i>N</i>	<i>I</i>	<i>PV</i>	<i>PMT</i>	<i>FV</i>
6	12	37.997		75

In addition to knowing the future value and interest rate to solve for the present value, sometimes we know the present and future values and want to find the rate, or internal rate of return. For example, if an ounce of gold sells for \$350 today and \$648 per ounce eight years from now, what rate of return does this represent? Solving for the present-value factor gives

$$350 = 648 \times \text{present-value factor}$$

$$\text{present-value factor} = 0.5401$$

Referring to the line in Appendix 1 for 8 periods, scan the line for a value close to 0.5401. The value 0.5403 appears under the 8 percent column, so the rate of return is 8 percent. Using the financial calculator:

<i>N</i>	<i>I</i>	<i>PV</i>	<i>PMT</i>	<i>FV</i>
8	8.004	350		648

(If you use a calculator that needs the direction of the cash flows identified, then either the *PV* or the *FV* input must be negative.)

The Present Value of a Series of Payments

An annuity is a series of regular, periodic payments. An ordinary annuity considers that the payments take place at the end of each period. The present value of an annuity is

$$\begin{aligned}
 PVA &= PMT \times \sum_{t=1}^n \frac{1}{(1+r)^t} \\
 &= PMT \times \left[\frac{1}{r} - \frac{1}{r \cdot (1+r)^n} \right]
 \end{aligned}
 \tag{3A-2}$$

The second term in (3A-2) is the present-value-of-an-annuity factor. Appendix 2 of this text has these present-value-of-an-annuity factors.

As an example, consider an investment that pays an income of \$120 per year for five years when the discount rate is 12 percent. From Appendix 2, the present-value-of-an-annuity factor for five periods at 12 percent is 3.6048. The present value is

$$\begin{aligned}
 PVA &= 120 \times 3.6048 \\
 &= 432.576
 \end{aligned}$$

<i>N</i>	<i>I</i>	<i>PV</i>	<i>PMT</i>	<i>FV</i>
5	12	432.573	120	

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Changing the above example slightly, compute the present value of the annuity if the \$120 annual payment is paid in equal monthly installments. In other words, there are 60 monthly payments of \$10 each. The annual rate of 12 percent needs to be compounded monthly, so 12 percent divided by 12 months in a year is 1 percent per month. The present-value-of-an-annuity factor for 60 payments at a 1 percent rate is 44.9550, so the present value is

$$\begin{aligned} PVA &= 10 \times 44.9550 \\ &= 449.55 \end{aligned}$$

<i>N</i>	<i>I</i>	<i>PV</i>	<i>PMT</i>	<i>FV</i>
60	1	449.55	10	

Note how the present value of the monthly annuity is greater than the present value of the annual annuity. The greater present value results because the recipient of the monthly payments receives 11 monthly payments before the holder of the annual annuity receives any payment. These earlier payments have a greater present value.

As an example of computing the rate of return, consider an investment that pays its owner \$100 per year for five years. If the current price of the investment is \$379, what rate of return does the investment yield? A price of 379 and payment of 100 yield a present-value-of-an-annuity factor of 3.79. Scanning the row for five periods in Appendix 2 shows a value of 3.7908 for 10 percent.

<i>N</i>	<i>I</i>	<i>PV</i>	<i>PMT</i>	<i>FV</i>
5	10.008	379	100	