

Accounting Income and Cash Flow

CHAPTER 1

Alphabet Company (Google) invests a hundred million dollars in various artificial intelligence (AI) technologies. A vice president of the company may invest hundreds of thousands of dollars by purchasing shares of a newly formed company that manufactures smartphone chips. A human resource manager in the company may invest several thousand dollars in a time-sharing resort apartment. The marketing manager considers the investment of some bonus money in buying government bonds. The marketing manager's secretary may invest savings in a federally insured savings and loan association. The secretary's 12-year-old son buys savings certificates with the money earned through delivering the local paper; he hopes to buy a car. The secretary's 3-year-old daughter deposits all the pennies she finds in a piggy bank in the hope that enough money will accumulate to buy her favorite candy.

What we just described are investment activities from the perspectives of the investors—an analogy similar to that introduced by Sharpe in his definition of investment [5]. A deposit in a savings account at a bank is an investment in the eyes of the depositor. Even cash stored in a piggy bank can be viewed as an investment—one yielding a penny for every penny invested, assuming no fire or theft. Each example involves the sacrifice of something now for the prospect of something later. And this, in the general sense, is investment. In examining individual examples such as these, Professor Sharpe further notes that “We see two different factors involved, *time* and *risk*. The sacrifice takes place in the present and is certain. The reward comes later, if at all, and the magnitude may be uncertain.” In some cases, the element of time predominates (e.g., government bonds). In others, risk (uncertain outcome) is the dominant factor (e.g., betting on a dog race). In yet others, both are important (e.g., AI development).

1.1 WHAT IS INVESTMENT?

The investment examples given are often classified in two categories: financial investments and real investments. A *financial investment* is one in which the investor allocates his or her resources to some form of financial instrument, such as stocks or bonds. *Real investments*, on the other hand, are represented by physical assets such as a new plant and equipment. This book is about evaluating such investment options, considering both time and risk. However, we must emphasize that we are primarily concerned with real (project) investments as contrasted with financial investments.

Economic evaluation of real investments is variously referred to as economic analysis, engineering economy, and economic decision analysis. In particular, the application of economic analysis techniques in the comparison of engineering design alternatives is referred to as *engineering economy*. The widespread use of the engineering economy principle in nonengineering areas, however, has brought about use of the more general term *economic analysis*.

Any contemplated or proposed investment requires evaluation to ensure, with reasonable confidence, that the expected benefits of the project will exceed costs. Whatever methodology is used, certain basic principles remain unchanged. For example, these principles should be applicable whether the investment is for a new firm, the expansion of an existing facility,

or the formation of a new corporate entity. Our goal is to identify such principles, formulate a logical decision framework for economic evaluation, and examine a general analytical methodology for assessing the worth of any proposed capital project.

1.2 THE CORPORATE INVESTMENT FRAMEWORK

The general principles we present should be equally applicable to personal investments and corporate investments, but we will place our emphasis on real investments by a typical firm. For that reason, we first need to define the basic objective of the firm and review some of its functions.

1.2.1 THE OBJECTIVE OF THE FIRM

We will assume that the objective of any firm is to maximize its value to its stockholders. The market price of a firm's stock represents the value of that particular firm. The value is governed by present and prospective earnings per share; the timing, duration, and risk of these earnings; and other factors that affect the market price of the stock. Thus, the market value is an index of a company's progress and reflects the market's assessment of how well the firm is managed for the benefit of its stockholders. Therefore, we can view maximizing the stockholders' wealth as equivalent to maximizing the market value of a share of stock.

It is certainly possible to have objectives other than maximization of the stockholders' wealth. Frequently, maximizing profits is regarded as the proper objective of the firm, but this objective is not as inclusive as that of maximizing stockholders' wealth. For example, a firm could always raise total profits by issuing stock and using the proceeds to invest in U.S. savings bonds. The firm's total profits could also be increased by investing the dividends that would normally be paid to stockholders in some other ventures—or, at the very least, by investing the dividends in a risk-free savings account. Such a policy would surely decrease the market value of the firm's stock.

Earnings-per-share data are the key financial statistics for most investors. These ratios represent, on a per-share basis, the equity of the holder of common stock in a company's current profits. Maximization of earnings per share, however, cannot be a fully appropriate objective of the firm. The shortcoming of this objective is that it does not reflect either the timing and duration of expected returns or the risk and uncertainty of the prospective earning streams. For example, suppose two companies have the same expected future earnings per share. If the earning stream of one company is subject to considerably more uncertainty than the earning stream of the other, the market price per share of its stock may be less.

1.2.2 THE FUNCTIONS OF THE FIRM

As mentioned earlier, we are primarily concerned with economic analysis from the perspective of economic decisions at the company level. At this level, a firm must make three major decisions: (1) the investment decision, (2) the financing decision, and (3) the dividend decision. Each must be considered with the objective of the firm in mind. Ideally, an optimal combination of the three decisions will maximize the value of the firm to its stockholders.

The Investment Decision

Capital budgeting, a major aspect of the investment decision, is the allocation of capital to investment projects whose benefits are to be realized in the future. How the capital is to be allocated is one of the most important and most difficult decisions that any firm must make. Because the future benefits, in most cases, are not known with certainty, investment decisions are always based on predictions about the future—often the distant future.

Furthermore, investment decisions frequently require judgmental estimates about future events. This lack of certainty about the future makes capital budgeting decisions one of the most challenging tasks.

The capital budgeting process embraces a rather broad and diverse class of activities in allocating capital resources to competing investment projects. Essentially, these activities include the administration and organization of a capital expenditure program, the development of new investment opportunities, the estimation of future cash flows of investment projects, and the review of the investment program. We are concerned primarily, however, with the analytical techniques used during the decision-making phase of the capital budgeting process.

The Financing Decision

The second major decision of the firm is the financing decision. For any firm to make capital investments, it must have a source of funds. In general, these funds are obtained from several sources: the sales of stocks, retained earnings, the sale of bonds, and short-term borrowing from a financial institution. Normally, these financing sources are grouped into two classes, equity financing referring to the first two and debt financing referring to the second two.

The firm obtains equity funds by selling to investors shares of common stock, which represent ownership of portions of the firm. (There are many variations in the ways of offering stock; one such is preferred stock.) The firm may also secure capital by retaining a portion of the net profits that it generates for any operating year. This method of obtaining capital is called *retained earnings*. Because the net earnings of the firm are themselves the outcome of a prior equity capital investment by the firm, they belong to the equity investors of the firm. In addition, the firm can obtain capital by borrowing from financial institutions or by selling bonds to investors. Unlike equity financing, this debt financing does not change the ownership attributes of the firm.

The Dividend Decision

The third important decision of the firm is its dividend policy. Investors buy stocks in the expectation of receiving returns on their invested capital. These returns on stockholders' capital are called *dividends*. The dividend decision includes the percentage of earnings paid to stockholders in cash dividends, the stability of absolute dividends over time, and repurchase of stock. The amount of dividends paid to stockholders has an effect on the amount of money available for equity financing. Thus, the value of a dividend to investors must be balanced against the cost of losing these earnings as a means of equity financing. Consequently, a balance must be established between dividend payments and investment needs.

For the purposes of our discussion, the functions of the firm were divided into three decisions. In practice, these functions are rarely separable—they are interrelated. The decision to invest in a new capital project, for example, involves financing of the investment. The financing decision then affects the dividend decision, because any retained earnings used in internal financing represent dividends forgone by the stockholders. With the objective of maximizing stockholders' wealth, the firm should ideally strive for an optimal combination of the three decisions as shown in Figure 1.1.

Market Value

The market price rises and falls depending on (1) how the company is doing at a particular time, (2) what is happening to other stock prices, and (3) most important, how investors expect the company to do in the future. Certainly, the company's decisions to invest in various projects and the actual performance of these projects can be major forces driving the market

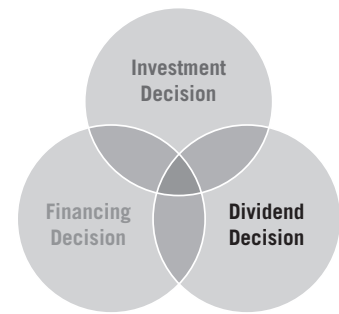


FIGURE 1.1 Three Major Financial Functions of the Firm

Table 1.1 Market Values of Widely Held U.S. Companies

Company	Stock Price (\$) (12/17/2020)	Number of Shares (in billion)	Market Value (Trillion \$)
Alphabet (GOOGL)	1,740.51	0.6773	1.179
Amazon (AMZN)	3,236.08	0.5018	1.624
Wal-Mart	146.10	2.8268	0.413
Tesla (TSLA)	655.90	0.9468	0.621
Apple (AAPL)	128.70	17.001	2.188

value of the company's stock. Table 1.1 summarizes the market values of some of well-known U.S. firms.

1.2.3 THE ANALYSIS FRAMEWORK

We will not attempt in this book to set down an optimum approach to the entire decision area but will focus on problems related to investment decisions. As already mentioned, in practice, the investment decisions are not always independent of the source of financing. For convenience in economic analysis, however, the two activities are usually separated. This approach is followed in this book—first the selection procedures for investment projects are analyzed, and then the choice of financing sources is considered. After this, the appropriate modifications are made to the investment models to allow a formally fixed quantity, the capital budget, to become a decision variable.

1.2.4 ACCOUNTING INFORMATION

During the capital budgeting process, we often need to seek accounting information to determine the effect on the company's financial condition of undertaking an investment project. In practice, we rarely make a capital investment decision on the basis of the profitability of the project alone but rather consider the project in the context of its impact on the financial strength and position of the company.

Accounting is generally the source of much of the past financial data that are needed in making estimates of future financial conditions. Accounting is also a major source of data for postaudit analyses that might be made regarding the actual performance of an investment project compared with the results predicted during the investment decision process. To use accounting information in a proper perspective, we need to understand accounting principles and the significance of accounting data.

The principles of accounting are built on a foundation of basic concepts. These concepts are so basic that most accountants do not consciously refer to them. Nor do accountants fully agree on how many such concepts there are or how they should be defined. There is fairly general support, however, for the following list. (See [1] for a complete discussion.)

1. **Monetary measurement:** Accounting records only facts that can be expressed in monetary terms.
2. **Business entity:** Accounts are kept for business entities as distinguished from the person(s) associated with those entities.
3. **Going concern:** Accounting assumes that a business will continue indefinitely and that it is not about to be sold.
4. **Cost:** Assets are ordinarily entered on the accounting records at the price paid to acquire them, and this cost, rather than the market value, is the basis for subsequent accounting for the assets.
5. **Dual aspect:** The amount of assets equals the amount of equities. There are two types of equities: liabilities, which are the claims of creditors, and owners' equity, which is the claim of the owners of the business. Accounting systems are set up in such a way that a record is made of two aspects of each event that changes assets and equities equally.
6. **Conservatism:** An asset is recorded at the lower of two reasonably possible values, or an event is recorded in such a way that the owners' equity is lower than it would otherwise be.
7. **The accrual concept:** Income is measured as the difference between revenues and expenses rather than as the difference between cash receipts and disbursements.
8. **The realization concept:** Revenue is recognized at the time it is realized.
9. **The consistency concept:** Events of the same character are treated in the same fashion from one period to another.
10. **The materiality concept:** Events that do not have a significant effect on the accounts are not recorded.

These concepts will be explained further through the financial statements in the subsequent sections. For this purpose, three financial statements will be reviewed: (1) the balance sheet, (2) the income statement, and (3) the funds flow (or cash flow) statement. These financial statements report on a company's position at a point in time and on its operations over some past period. Their real value, however, lies in helping us to predict the company's future earnings and dividends, as well as its cash flows.

The balance sheet is a statement of the financial position of a company as of a reporting date. The balance sheet shows the sources from which current operating funds have been obtained (liabilities and owners' equity) and the types of property and property rights in which these funds are currently locked up (assets).

1.3 THE BALANCE SHEET

1.3.1 REPORTING FORMAT

The example shown in Table 1.2 represents the 2019 and 2020 comparative balance sheet accounts of Sunset Inc., a manufacturer of power surge suppressors for personal computers.

Table 1.2 Comparative Balance Sheet

SUNSET INC. BALANCE SHEET <i>December 31</i>			
	2020	2019	Changes
Assets			
Current assets			
Cash	\$ 7,500	\$ 5,500	+ \$2,000
Marketable securities	3,000	5,000	– 2,000
Accounts receivable	23,700	19,500	+ 4,200
Inventories	37,700	39,800	– 2,100
Prepaid expenses	2,000	1,500	500
Deferred charges	<u>2,500</u>	<u>3,000</u>	– 500
Total current assets	76,400	74,300	+ 2,100
Fixed assets			
Plant and equipment	154,000	145,000	+ 9,000
Less accumulated depreciation	<u>(70,000)</u>	<u>(50,000)</u>	+ 20,000
Total fixed assets	84,000	95,000	– 11,000
Other assets			
Total assets	<u>\$160,400</u>	<u>\$169,300</u>	– 8,900
Liabilities and Owners' Equity			
Current liabilities			
Accounts payable	10,000	26,000	– 16,000
Wages payable	16,000	15,000	+ 1,000
Accrued taxes	<u>2,000</u>	<u>3,500</u>	– 1,500
Total current liabilities	28,000	44,500	– 16,500
Other liabilities			
First mortgage bonds	20,000	22,000	– 2,000
Debentures 8%	<u>10,000</u>	<u>10,000</u>	0
Total other liabilities	30,000	32,000	– 2,000
Total liabilities	<u>\$ 58,000</u>	<u>\$ 76,500</u>	– 18,500
Owners' equity			
Preferred stock, 6%, \$100 par value	10,000	10,000	0
Common stock, \$4 par value (10,000 shares)	40,000	40,000	0
Capital surplus	10,000	10,000	0
Retained earnings	<u>42,400</u>	<u>32,800</u>	+ 9,600
Total owners' equity	102,400	92,800	+ 9,600
Total liabilities and equity	<u>\$160,400</u>	<u>\$169,300</u>	– 8,900

This example will be used in subsequent discussions. (Balance sheets do not all follow precisely the same format or use the same account titles.)

Accounting Equation

The dollar amounts recorded in the various accounts in the balance sheet must conform to the fundamental accounting equation

$$\boxed{\text{Assets} = \text{Liabilities} + \text{Net worth}} \quad \text{or} \quad \boxed{\text{Assets} - \text{Liabilities} = \text{Net worth}}$$

and a typical layout of the balance sheet looks like this:

Assets	Current assets	Current liabilities	Liabilities
	Fixed assets	Long-term liabilities	
		Paid-in capital	Net worth
	Other assets	Retained earnings	

The asset side of the balance sheet indicates how the funds provided to the company have been invested as of the date of reporting. The several liability items show the amount of those funds obtained from trade creditors (accounts payable), from lenders (long-term debt), and from other creditors.

The owners' equity section shows the funds supplied by the owners. If the business is a corporation, the owners are stockholders and their contribution consists of two principal parts: funds directly obtained by selling stocks (paid-in capital) and funds that owners provided by permitting earnings to remain in the business (retained earnings). The capital obtained from various sources has been invested according to the management's best judgment; a certain fraction is invested in buildings, another fraction is in inventories, another fraction is in the form of cash, and so on. Therefore, the asset side of the balance sheet reflects the result of these management judgments as of the reporting date. We will look at some of these balance sheet items in more detail.

Assets

The *assets* of a company consist of all its property: what it owns and what is owed to it. The assets are generally divided into three principal categories and are listed in decreasing order of liquidity, where liquidity refers to the ease with which an asset can be converted to cash.

- *Current assets* are listed first. These assets can be converted to cash or its equivalent in less than one year. For example, cash, the most liquid asset, is generally listed at the top of the current assets column on a balance sheet. Other current assets in order of decreasing liquidity would be marketable securities, accounts receivable and inventories, prepaid expenses, and deferred charges. Prepaid expenses might include insurance premiums and rent, whereas deferred charges represent expenses for materials and services whose benefits will extend into the future.
- *Fixed assets* are listed second. These assets are relatively permanent and are not converted to cash or its equivalent in the normal business operating cycle. The major types of fixed assets are land, buildings, factory machinery, equipment, tools, office equipment, furniture, automobiles, trucks, and other vehicles.
- *Other assets*, if any, are listed third. Assets in this category include investments made in other companies (to control their operations) and intangible assets such as goodwill, copyrights, and franchises.

Liabilities and Net Worth (Owners' Equity)

The *liabilities* of a company disclose where the funds were obtained to acquire the assets and to operate the business. Liabilities are claims of creditors that take precedence over the

rights of the owners to the assets. *Net worth* refers to the portion of the assets of a company that is provided by the investors (owners). Liabilities are separated into current and other liabilities.

- *Current liabilities* are debts that are payable within one year. They include accounts and notes payable within one year, accrued expenses (wages, salaries, interest, rent, taxes, etc., owed but not yet due for payment), advance payments, and deposits from customers.
- *Other liabilities* include long-term liabilities such as bonds, mortgages, and long-term notes, which are due and payable more than one year in the future.

Net worth (or owners' equity) is the liability of the company to its owners in case of liquidation. This represents the amount that is available to the owners after all other debts have been paid. It generally consists of preferred and common stock, capital surplus, and retained earnings.

- *Capital surplus* is the amount of money received from the sale of stock in excess of the face value of the stock.
- *Retained earnings* are the accumulated net operating income after taxes less the dividends paid to stockholders.

In the following sections, we will look at each balance sheet item in detail.

1.3.2 CASH VERSUS OTHER ASSETS

Although the assets are all stated in terms of dollars, only cash amounts represent actual money. In Table 1.2, receivables are bills that others owe to Sunset Inc.; inventories consist of raw materials, work in process, and finished goods available for sale; and fixed assets consist of Sunset's plant and equipment. Sunset can write checks for a total of \$7,500 as of December 31, 2020 (while current liabilities of \$28,000 are due within a year). The noncash assets should produce cash flows eventually, but they do not represent cash in hand.

1.3.3 LIABILITIES VERSUS STOCKHOLDERS' EQUITY

From the basic accounting equation, we note that the stockholders' equity, or net worth, is a residual amount:

$$\begin{aligned}\text{Assets} - \text{Liabilities} &= \text{Stockholders' equity} \\ \$160,400 - \$58,000 &= \$102,400\end{aligned}$$

Suppose assets decline in value—for example, some of the accounts receivable are written off as bad debts. Liabilities remain constant, so the value of the net worth must decline. On the other hand, if asset values rise, the benefits will accrue exclusively to the stockholders as well.

Recall that the owners' equity (or stockholders' equity) account consists of two parts: (1) the amount contributed by the stockholders and (2) retained earnings. The amount contributed by the stockholders is called *invested capital* and is further divided into three accounts: preferred stock, common stock, and capital surplus (paid-in capital). Preferred stock has preference over common stock in the receipt of dividends and in the right to assets in the event of liquidation. There is no substantial difference in the accounting treatment of these two types of stock. Accountants generally assign a *par value* (book value) to both

preferred and common stock; Sunset's preferred stock has a par value of \$100 (100 shares), and the common stock has a par value of \$4 (10,000 shares) as of December 31, 2020.

Suppose Sunset were to sell 10,000 additional shares (common stock of \$4 par) at a market price of \$10 per share. What would be the required changes in the balance sheet entries?

SOLUTION:

The company would raise \$100,000, and the cash accounts would go up by this amount. Of the total, \$40,000 would be added to common stock and \$60,000 to *capital surplus*. Thus, after the sale, common stock accounts would show $\$40,000 + \$40,000 = \$80,000$, capital surplus would show $\$10,000 + \$60,000 = \$70,000$, and there would be 20,000 shares (common stock) outstanding.

Example 1.1

Accounting Equation

1.3.4 INVENTORY VALUATION

Sunset uses the first in, first out (FIFO) method to determine the inventory value \$37,700 shown on its balance sheet. This inventory valuation method assumes that the first goods acquired are the first goods sold. In other words, it assumes that each sale is made out of the oldest goods in stock; the ending inventory therefore consists of the most recently acquired goods. This FIFO valuation method may be adopted by any business regardless of whether the physical flow of merchandise is actually oldest units first.

Sunset Inc. could use the last in, first out (LIFO) method. This method assumes that the most recently acquired goods are sold first and that the ending inventory consists of "old" merchandise acquired in the earliest purchases. Under the LIFO method, the cost of goods sold tends to reflect the cost of the items most recently purchased. Advocates of the LIFO approach contend that matching of current costs of merchandise against current sales prices, regardless of which physical units of merchandise are being delivered to customers, actually reflects business pricing decisions.

If this contention is correct, the conventional FIFO system can result in the reporting of false "inventory profits" during periods of rising prices. Thus, the inventory valuation method can have a significant effect on financial statements. In selecting a method, the company should consider the probable effect on the balance sheet, on the income statement, on the amount of taxable income, and on such business decisions as pricing goods.

Assume that 100 units priced at \$10 each are in inventory at the beginning of the year, that during the year 200 units are purchased at \$11 each and another 200 units are purchased at \$12 each, and that 100 units remain in inventory at the end of the year. What are the amount of the ending inventory and the cost of the 400 units that were sold?

Example 1.2

Valuation of Inventory

	Units	Unit Cost	Total Cost
Beginning inventory	100	\$10	\$1,000
First purchase	200	11	2,200
Second purchase	<u>200</u>	<u>12</u>	<u>2,400</u>
Goods available for sale	500	\$11.20	\$5,600
Goods sold during the year	<u>400</u>		
Ending inventory	100		

SOLUTION:

- Under FIFO, the 100 units in inventory at the end of the year are priced at \$12 each, or \$1,200, and the cost of goods sold is $\$10(100) + \$11(200) + \$12(100) = \$4,400$.
- Under LIFO, the 100 units of ending inventory are priced at \$10 each, or \$1,000, and the cost of goods sold is $\$12(200) + \$11(200) = \$4,600$.
- An *average* cost method can be another acceptable practice. Under this pricing method, the average cost of the 500 units available for sale is $[\$10(100) + \$11(200) + \$12(200)]/500 = \11.20 . The 100 units in inventory are priced at \$11.20 each, or \$1,120, and the cost of goods sold is $\$11.20(400) = \$4,480$.

1.3.5 DEPRECIATION

With the exception of land, most fixed assets have a limited useful life; that is, they will be of use to the company over a limited number of future accounting periods. A fraction of the cost of an asset is properly chargeable as an expense in each of the accounting periods in which the asset is used by the company. The accounting process for this gradual conversion of fixed assets into expense is called *depreciation*. There are several ways to depreciate an asset, the straight-line method (charging an equal fraction of the cost each year) being the simplest. (The depreciation methods will be introduced in Chapter 4.) Obviously, the depreciation method chosen for financial reporting purposes will affect both the balance sheet and the income statement.

In the case of Sunset, we interpret the data as follows: the company has invested \$154,000 in plant and equipment as of the reporting date; the portion of the total investment charged to operations for all periods to date is \$70,000, and the portion of the total investment that remains to be charged to operations of future periods is \$84,000. Therefore, the amount shown as accumulated depreciation on the balance sheet does *not* represent the accumulation of any cash; it is merely that portion of the assets' original cost that has already been charged against income.

1.3.6 WORKING CAPITAL

In examining the balance sheet, the analyst usually makes a basic distinction between the working capital items and the other items. *Working capital* is defined as current assets minus current liabilities.

$\text{Working capital} = \text{Current assets} - \text{Current liabilities}$

Therefore, working capital is often considered to be funds available for future operations, because it is the excess left after satisfying all current obligations.

As of December 31, 2019, Sunset's working capital is

$$\$76,400 - \$28,000 = \$48,400$$

As mentioned, current assets are normally converted into cash within a year or a single operating cycle. Likewise, current liabilities are payable within a year. Thus, items in the current section correspond to reasonably recent transactions and are more likely to reflect current market conditions than items in the other sections, which may correspond to transactions that occurred many years previously. In general, the company's financial condition is stronger if working capital increases and weaker if it decreases.

The balance sheet just discussed shows the financial condition of the company on the *reporting date* only and does not indicate whether the company is making or losing money. The income statement (or profit-or-loss statement) is an important financial statement that summarizes the revenue items, the expense items, and the difference between them (net income) for an accounting period.

1.4 THE INCOME STATEMENT

$$\text{Revenue} - \text{Expenses} = \text{Net income (or loss)}$$

1.4.1 METHODS OF REPORTING INCOME

An accounting method is a set of rules that we use to decide when and how to record revenue and expenses in our book and how to prepare the income statement for our accounting period. The two principal methods of accounting are the cash basis method and the accrual basis method.

Cash Basis Method

If we record on a cash basis, we include as gross revenue for all revenue that we received during the year in cash or its equivalent (e.g., savings interest). We deduct all expenses made during the year in cash or its equivalent, if deduction of such expenses is allowed by law.

Accrual Basis Method

If we report revenue when it is *earned*, whether it is actually received or not, and we report expenses when they are *incurred*, whether they are paid or not, we are using the accrual method of accounting.

The tax law does not prescribe a uniform method of accounting to be used by all companies. It expects companies to adopt the forms and methods of accounting suitable for them. If it is necessary to include an inventory, however, *the accrual method must be used for purchases and sales* by the tax law. Therefore, most manufacturing and merchandising businesses use the accrual basis in recording revenues and expenses.

1.4.2 REPORTING FORMAT

As shown in Table 1.3, the income statement presents the details of this procedure according to generally accepted accounting principles (GAAP). Although many variations exist in preparing an income statement, a common income statement might include any of the following [2]:

1. *Revenues*, the gross sales for the period. Gross sales are the total invoice price of the goods shipped (or services rendered) plus the cash sales made during the period. Sales returns and allowances represent the sales value of goods that were returned by the customer or for which the customer was given a credit for any reason. The amount could have been subtracted from the gross sales figures directly.
2. *Cost of goods sold (or revenues)*, the manufacturing or purchasing costs of the goods sold during the period. These include direct labor, material, depreciation, and other manufacturing expenses.
3. *Gross profit or margin*, the difference between revenues and cost of goods sold; item 1 less item 2.

Table 1.3 The Income Statement

SUNSET INC.			
INCOME STATEMENT AND RETAINED EARNINGS			
<i>(For Year Ended December 31, 2020)</i>			
<i>Income statement</i>			
Revenues			
Sales and other operating revenue		\$303,000	
Less sales return and allowances		<u>(5,210)</u>	
Total			294,790
Cost of goods sold			
Labor	120,000		
Materials	60,000		
Overhead	8,000		
Depreciation	<u>20,000</u>		
Total			<u>(208,000)</u>
Gross profit			86,790
Operating expenses			
Selling	15,720		
General administration	29,000		
Lease payments	<u>14,000</u>		
Total	58,720		<u>(58,720)</u>
Net operating profit			28,070
Nonoperating revenues			0
Nonoperating expenses			
Interest payments			<u>(1,803)</u>
Net income before taxes			26,267
Income taxes (25%)			<u>(6,567)</u>
Net income			\$ 19,700
<i>Statement of retained earnings</i>			
Cash dividends			
Preferred stock (per share, \$6.00)		600	
Common stock (per share, \$0.95)		<u>9,500</u>	
Total dividends			\$ 10,100
Retained earnings			
Beginning of year (1/1/2020)		32,800	
Current year		<u>9,600</u>	
End of year			\$ 42,400

4. *Operating expenses*, the selling, administration, and general expenses associated with operating the company's principal business activity during the period.
5. *Net operating profit*, item 3 less item 4.
6. *Nonoperating revenues*, revenue derived from sources other than operations during the period, such as interest on the temporary investment of excess cash.
7. *Nonoperating expenses*, expenses not directly related to the principal business activity and the financial costs of borrowed money.
8. *Income taxes*, the income tax expense, based on item 5 + item 6 – item 7.
9. *Net income*, item 5 + item 6 – item 7 – item 8.

As a part of the income statement, many companies report changes in the common equity accounts between balance sheet dates under the heading of the *statement of retained earnings*. (This could be a separate statement.) If this optional format is followed, the additional entries to the income statement would be

10. *Retained earnings* at the beginning of the year.
11. *Cash dividends* on common stock.
12. *Retained earnings* at the end of the year, item 10 less item 11.
13. *Earnings per share (EPS)*, the net income after tax divided by the number of outstanding shares of common stock.
14. *Dividends per share (DPS)*, the amount of dividends paid to holders of common stock divided by the number of outstanding shares of common stock.

We will address many measurement issues related to accounting income by using Sunset's income statement in Table 1.3.

1.4.3 MEASUREMENT OF REVENUE

Revenues are measured by using the accrual concept; that is, revenues accrue in the accounting period in which they are earned, which is not necessarily the same as the period in which the cash is received. In accounting, a careful distinction is made between revenues and cash receipts, as illustrated in the following example.

Consider the following four sales transactions:

1. Cash sales made this year \$500
2. Credit sales made last year but cash received this year: \$300
3. Credit sales made this year and cash received this year: \$100
4. Credit sales made this year but cash received next year: \$200

Classify the effect of each on cash receipts and sales revenue for "this year."

SOLUTION:

Transaction	Amount	"This Year"	
		Cash Receipts	Sales Revenue
Cash sales made this year	\$500	\$500	\$500
Credit sales made last year but cash received this year	300	300	0
Credit sales made this year and cash received this year	100	100	100
Credit sales made this year but cash received next year	200	<u>0</u>	<u>200</u>
Total		\$900	\$800

Example 1.3

When to Recognize Revenue

Note that in this illustration the total cash receipts do not equal the total sales revenue for the period. The totals would be equal in a particular accounting period only if (1) the company made all its sales for cash or (2) the amount of cash collected from credit customers in an accounting period happened to equal the amount of credit sales made during that period.

1.4.4 MEASUREMENT OF EXPENSES

A similar distinction is made between expenditures and expenses. An *expenditure* takes place when an asset or service is acquired. The expenditure may be by cash, by another asset, or by incurring a liability. Over the entire life of a business, most expenditures made by the business become *expenses*, and there are no expenses that are not represented by an expenditure. As we shall see, however, there is no necessary correspondence between expense and expenditure in any accounting period. Four types of items must be considered in distinguishing between the amounts that are properly considered to be expenses of an accounting period and the expenditures [1].

1. Expenditures this year that are also expenses of this year.
2. Expenditures made prior to this year that become expenses during this year. These appear as assets on the balance sheet at the beginning of this year. First, there are inventories of products; these become expenses when the products are sold. Second, there are prepaid expenses and deferred charges. These represent services or other assets purchased prior to this year but not yet used when the year begins. They become expenses in the year in which the services are used or the assets are consumed (e.g., insurance protection, prepaid rents, and prepaid taxes). Third, there are long-lived fixed assets (except land) that have a limited useful life; that is, they do not last forever. They are purchased with the expectation that they will be used in the operation of the business in future periods, and they will become expenses in these future periods (e.g., depreciation expenses).
3. Expenditures made this year that will become expenses in future years. These appear as prepaid expenses and become assets on the balance sheet at the end of this year.
4. Expenses of this year that will be paid for in a future year. On the balance sheet at the end of this year, these will appear as liabilities (e.g., deferred charges).

To illustrate the book-keeping practices in accounting, let's take two scenarios:

- In 2020, \$10,000 of diesel fuel for a lift truck was purchased for cash. This was an expenditure of \$10,000, the exchange of one asset for another. If only \$8,000 worth of diesel fuel was consumed in 2020, your book entry for 2020 should record an expense of \$8,000 rather than \$10,000.
- A company purchased three years of insurance protection worth \$2,400 on December 31, 2020. The \$2,400 appears as an asset on the balance sheet of December 31, 2020 as a prepaid expense. In 2021, \$800 becomes an expense and \$1,600 remains as an asset on the balance sheet of December 31, 2021. In 2022, \$800 more becomes an expense, and so forth.

1.4.5 RETAINED EARNINGS, CASH DIVIDENDS, AND EARNINGS PER SHARE

According to Table 1.3, Sunset Inc. earned \$19,700 during 2020, paid out \$10,100 in dividends, and put \$9,600 back into the business. Thus, the balance sheet item "retained earnings" increased from \$32,800 at the end of 2019 to \$42,400 at the end of 2020.

Note that the retained earnings account on the balance sheet represents a claim against assets. Further, companies retain earnings primarily to expand the business; this means investing in the plant and equipment, in inventories, and so on, not in a bank account. Thus, retained earnings as reported on the balance sheet do *not* represent the amount of cash that the company has and are not “available” for the payment of dividends or anything else.

In analyzing the income statement, investors pay particular attention to the ratio called *earnings per share (EPS)*. This is computed by dividing *net income applicable* to the *common stock* by the number of shares of common stock outstanding. If the company has only common stock, the net income used in this ratio is the same as the net income shown on the income statement. If the company has senior securities such as preferred stocks, those that have a claim on net income ahead of the claim of holders of common stock, the income figure used in the calculation of EPS is the amount that remains after the claims of the senior securities have been deducted from net income.

Sunset Inc. in 2020 had a net income of \$19,700. On January 1, it had 100 shares of \$6 preferred stock outstanding and 10,000 shares of common stock. Determine the EPS.

Example 1.4

Earning Per Share

SOLUTION:

Since each share of this stock is entitled to an annual dividend of \$6 before any dividends can be paid to holders of common stock, the *EPS* were $(\$19,700 - \$600)/10,000 = \$1.91$ per share.

1.4.6 RETURN ON COMMON EQUITY (ROE)

An important measure of overall financial performance of a firm is known as *return on common equity*—this measure shows the relationship between net income and the common shareholders’ investment in the company. The figure explains how much income for every \$1 invested by the common stockholders is earned. To compute the ratio, we subtract any dividends paid to the preferred stockholders from net income. The remaining net income is known as “net income available to common stockholders.” Then, we divide this remaining net income by the average common equity during the reporting period.

$$ROE = \frac{\text{Net income available to common stockholders}}{\text{Average common stock equity}}$$

The ROE can be rewritten in terms of three management metrics (or financial ratios) such as profit margin, asset turnover, and financial leverage [2,4]:

$$ROE = \frac{\text{Net income available to common stockholders}}{\text{Average common stock equity}}$$

$$= \underbrace{\frac{\text{Net income}}{\text{Sales}}}_{\text{Profit margin}} \times \overbrace{\frac{\text{Sales}}{\text{Assets}}}^{\text{Asset turnover}} \times \underbrace{\frac{\text{Assets}}{\text{Average common stock equity}}}_{\text{Financial leverage}}$$

As can be observed in the formula above, ROE is a two-part ratio in its derivation because it brings together the income statement (net income) and the balance sheet (shareholders

Table 1.4 Relationship between Balance Sheet and Income Statement

Balance Sheet (12/31/2019)		Income Statement (01/01/2020–12/31/2020)		Balance Sheet (12/31/2020)	
Assets		Net sales	294,790	Assets	
Current assets	74,300	Cost of Goods Sold	208,000	Current assets	76,400
Fixed assets	<u>95,000</u>	Gross Profit	86,790	Fixed assets	<u>84,000</u>
Total	169,300	O&M Expenses	58,720	Total	160,400
		Net Operating profit	28,070		
Liabilities and Equities		Nonoperating Profit	(1,803)	Liabilities and Equities	
Current liabilities	44,500	Taxable Income	26,267	Current liabilities	28,000
Other liabilities	<u>32,000</u>	Income Taxes	6,567	Other liabilities	<u>30,000</u>
Total	76,500	Net Income	19,700	Total	58,000
Preferred stock	10,000	Cash Dividends	10,100	Preferred stock	10,000
Common stock	40,000			Common stock	40,000
Capital surplus	10,000	Retained earnings	9,600	Capital surplus	10,000
Retained earnings	<u>32,800</u>			Retained earnings	<u>42,400</u>
Total	169,300			Total	160,400

equity). For this purpose, we create Table 1.4, which summarizes essential items to go with the ROE calculation for Sunset Inc. The balance sheet summarizes the company's financial position at the beginning and ending of the fiscal period whereas the income statement summarizes how much profit the company made during the fiscal period.

For Sunset, the ROE for 2020 is

$$\begin{aligned}
 ROE &= \frac{(19,700 - 600)}{294,790} \times \frac{294,790}{160,400} \times \frac{160,400}{\frac{92,400 + 82,800}{2}} \\
 &= (6.48\%) \times (1.8378) \times (1.8311) \\
 &= 21.81\%
 \end{aligned}$$

ROE is often used to compare a company to its competitors and the overall market. The higher the ROE is, the more efficient a company's management is at turning equity investments into profits. For Sunset, the common stockholders made profits of almost 22 cents for each dollar invested. For a well-managed firm with earnings growing at healthy pace, this ratio tends to increase steadily over time.

1.5 THE FUNDS FLOW STATEMENT

As a company like Sunset Inc. goes about its business, it makes sales, which lead to a reduction of inventories, to an increase in cash, and, if the sales price exceeds the cost of the item sold, to a profit. These business transactions cause the balance sheet to change, and they are also reflected in the income statement. The *cash flow statement* summarizes these business transactions of the period from a different view; it details how the company acquired funds (sources) and how the funds were used (uses).

1.5.1 THE CASH FLOW CYCLE

To understand how business transactions influence the financial statement, we need to understand the cash flow cycle within a company. As shown in Figure 1.2, the flow of funds in a typical company may be visualized as a continuous process. For the going concern, there are really no starting and ending points. For every use of funds, however, there must be an offsetting source. In Figure 1.2, rectangles represent balance sheet accounts and shaded boxes represent actions taken by the company.

A finished product is produced with a variety of inputs—raw material, net fixed assets (plant and equipment), and labor. These inputs are ultimately paid for in cash. The product is then sold either for cash or on credit, thus reducing the inventory. A credit sale creates an account receivable, which, when collected, becomes cash. The cash account, the focal point in Figure 1.2, fluctuates over time with the production schedule, sales, collection of

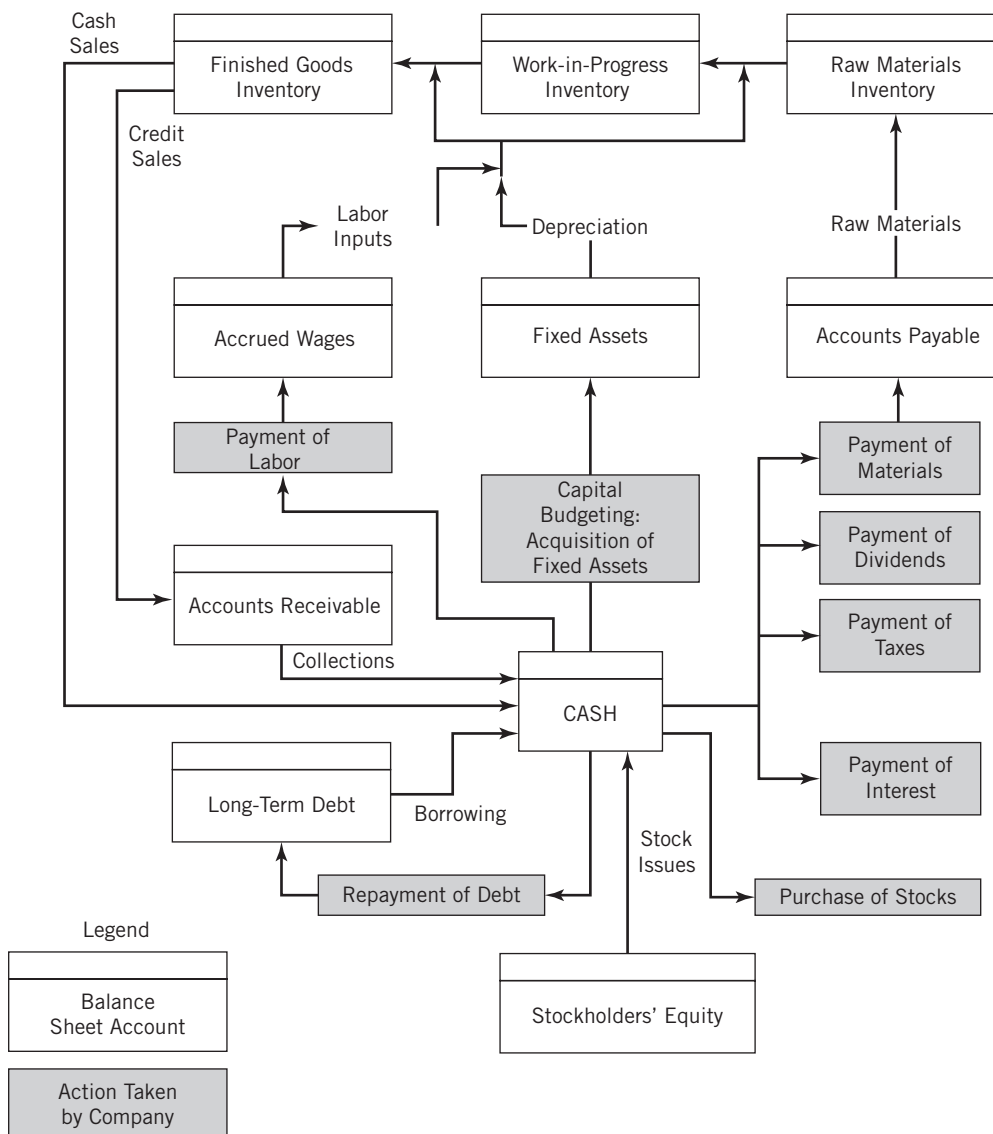


FIGURE 1.2 Cash Flows Within the Company

receivables, capital expenditures, and financing. Current asset accounts such as the finished goods inventory and receivables fluctuate with sales, production schedules, and management policies for receivables and inventories.

Funds may be defined in several different ways depending on the purpose of the analysis. Although they are sometimes defined as *cash*, funds are treated by many analysts as *working capital*—the most common approach by far. The graphic representation of funds flow in Figure 1.2, when converted into numerical form, is shown in annual reports as the *statement of changes in financial position*, often called *the sources and uses of funds statement*.

1.5.2 BASIC RELATIONSHIP

We will first look at how a management decision might affect the balance sheet accounts. As an example, suppose a company wished to buy a new plant. The company could do one of the following five things:

1. It could borrow by issuing bonds, thus increasing long-term debt.
2. It could sell more stock, thus increasing the capital stock.
3. It could forgo dividends, which would show up as an increase in retained earnings.
4. It could use available cash, thus decreasing working capital.
5. It could sell some of its existing fixed assets, thus decreasing fixed assets.

The first three possibilities would be reflected on the balance sheet as an increase in equities; the last two would show up as a decrease in assets.

Looking at the other side of the coin, what uses could the company make of funds that it acquired? It could use the funds in one of the following five ways:

1. It could add new fixed assets by buying equipment.
2. It could add to working capital.
3. It could pay off existing debt.
4. It could pay additional dividends to the stockholders, which decreases retained earnings.
5. It could repay capital to the stockholders.

The first three possibilities would show up as an increase in assets and the fourth and fifth as a decrease in equities. We can therefore generalize as follows.

- Sources of funds are indicated by increases in equities and decreases in assets.
- Uses of funds are indicated by increases in assets and decreases in equities.

With the dual-aspect accounting concept, total sources of funds must equal total uses of funds. The following relationships therefore exist.

Sources		Uses
Increase in equities + Decreases in assets	=	Increase in assets + Decreases in equities

1.5.3 FUNDS STATEMENT ON A CASH BASIS

The starting point in preparing a statement of changes in financial position on a *cash basis* is to determine the change in each balance sheet item and to record it as either a source or a use of funds under the rules previously defined. Table 1.5 shows the changes that occurred in Sunset's balance sheet accounts during the calendar year 2020, with each change designated as a source or a use.

Sources of funds that increase cash are as follows:

1. A net decrease in any asset other than cash or fixed assets.
2. A gross decrease in fixed assets.
3. A net increase in any liability.
4. Proceeds from the sale of stock.
5. Funds provided by operations.

In referring to Table 1.5, we will look at how Sunset Inc. obtained and used the funds for the year 2020. First, from the income statement in Table 1.3, we can determine the amount of funds derived from operation. Because depreciation and deferred income taxes (if any)

Table 1.5 Funds Statement Based on Cash

SUNSET INC.			
CASH FLOW STATEMENT			
(December 31, 2019 to December 31, 2020)			
Sources of cash			
Cash provided from operations			
Net income after tax		\$19,700	
Add noncash expense: Depreciation		<u>20,000</u>	
Total cash from operations		\$39,700	
Adjustments to convert to cash basis			
Decrease in marketable securities	2,000		
Decrease in inventories	2,100		
Decrease in deferred charges	500		
Increase in wages payable	<u>1,000</u>		
Total adjustments		5,600	
Total sources of cash		<u>\$45,300</u>	
Uses of cash			
Cash dividends		10,100	
Acquisition of equipment		9,000	
Reduction of long-term debt		2,000	
Adjustments to convert to cash basis			
Increase in accounts receivable	4,200		
Increase in prepaid expenses	500		
Decrease in accounts payable	16,000		
Decreases in accrued taxes	<u>1,500</u>		
Total adjustments for expenses		22,200	
Total uses of cash		<u>\$43,300</u>	
Net increase in cash flow		<u>\$2,000</u>	

are not cash outflow from the company, we add these two items to net income to obtain the amount of funds derived from operation.

$$\begin{aligned}\text{Funds provided from operation} &= \text{Net income} + \text{Depreciation} + \text{Deferred taxes} \\ &= \$19,700 + \$20,000 + \$0 \\ &= \$39,700\end{aligned}$$

Note that depreciation is not a source of funds. It is a noncash expense that simply reduces the company's tax obligation.

Since we know that revenue in this income statement is based on the accrued accounting method, it is further adjusted to the amount of sales-related cash inflows. For example, we examine the \$2,100 inventories decrease in Table 1.3, which is treated as a source of cash. By definition, the amount of ending inventories is calculated by

$$\text{Ending Inventories} = \text{Beginning inventories} + \text{New purchases} - \text{Units used}$$

Here, the ending inventories being smaller than the beginning inventories would mean that Sunset used old inventories (in addition to new purchases) to produce the goods during the year. Since these old inventories were purchased in the previous year, the actual inventory cash expenses during the year should be less than the inventory (material) expenses reported in the income statement. Similarly, we may treat the changes in the remaining accounts (such as marketable securities, deferred charges, and wages payable) as sources of cash.

Uses of funds include the following:

1. A net increase in any asset other than cash or fixed assets.
2. A gross increase in fixed assets.
3. A net decrease in any liability.
4. A repurchase of stock.
5. Cash dividends.

To compute gross changes in fixed assets, we add depreciation for the period to net fixed assets at the ending financial statement date, and subtract from this amount the net fixed assets at the beginning financial statement date. For the situation of Sunset Inc., we compute the gross increase in fixed assets as follows:

$$\begin{aligned}\text{Gross increase in fixed assets} &= 84,000 + 20,000 - 95,000 \\ &= \$9,000\end{aligned}$$

First, the \$4,200 accounts receivable increase during the year means that the year's revenues exceeded collections. Therefore, this amount has the same effect as the use of cash, as reflected in Table 1.5. If accounts receivable had decreased during the year, this would mean that the amount of actual cash collection had exceeded the sales revenue for the period, and, thus, the amount of the decrease should therefore be added to sales revenue (or treated as source of cash). The other remaining uses of funds are summarized in Table 1.5. When we subtract the total uses of funds other than cash in Table 1.5 from the total sources,

the difference should equal the actual change in cash between the two balance sheet statements.

1.5.4 FUNDS STATEMENT AS WORKING CAPITAL

The *working-capital-based* funds statement in Table 1.6 is essentially the same as the cash-based funds statement. The only difference is that net changes in current assets and liabilities are grouped into one account, working capital. The basic elements listed in the funds statement are

Sources	=	Uses
• Funds provided by operation • Proceeds from sale of fixed assets • Additional long-term debt		• New plant and equipment • Cash dividends • Increase in working capital

To illustrate, we consider the adjustment entries to convert to cash basis in Table 1.5. We note that these adjustment entries are all related to either current assets or current liabilities accounts. By definition, working capital is the difference between current assets and current liabilities. This implies that we can determine the net change in working capital requirement by

$$\text{Working capital requirement} = \text{Change in current asset} - \text{Change in current liabilities}$$

Using either Table 1.2 or Table 1.5, we first list all entries related to the current assets (except cash account—recall that the purpose of the funds statement is to explain the change in this account) and the current liabilities by indicating an increase by “+” sign and a decrease by “−” sign, respectively.

Table 1.6 Cash Flow Statement Showing Working Capital Position

SUNSET INC.	
CASH FLOW STATEMENT	
(December 31, 2019 to December 31, 2020)	
Sources of cash	
Cash provided from operations	
Net income after taxes	\$19,700
Add noncash expense: Depreciation	<u>20,000</u>
Total cash from operation	39,700
Total sources of cash	<u>\$39,700</u>
Uses of cash	
Cash dividends	10,100
Acquisition of equipment	9,000
Reduction of long-term debt	2,000
Working capital requirement	16,600
Total uses of cash	<u>\$37,700</u>
Net increase in cash flow	<u>\$2,000</u>

Marketable securities	– 2,000	Wages payable	+ 1,000
Inventories	– 2,100	Accounts payable	– 16,000
Deferred charges	– 500	Accrued taxes	– 1,500
Accounts receivable	+ 4,200		
Prepaid expense	+ 500		
Net change in current assets:		Net change in current liabilities:	
	+ 100		– 16,500

The net change in working capital is then calculated as

$$\begin{aligned}\text{Net change in working capital} &= 100 - (-16,500) \\ &= \$16,600\end{aligned}$$

With this net change being positive, Sunset has a net *requirement* of working capital in the amount of \$16,600 that has to be expended (or financed) during the year. In this situation the working capital requirement appears as uses of cash in the cash flow statement. If this amount were negative, there would have been a cash inflow from working capital *release*, which could add to the sources of cash.

1.6 NET INCOME VERSUS CASH FLOWS

Up to this point, we have discussed how business transactions affect the company's financial statement. Now we will look in detail at how the company's net income (accounting income) can be affected by the choice of depreciation method used in reporting income to stockholders. We will also address the question of whether the use of cash flows or net income is more appropriate in investment analysis.

1.6.1 DEFERRED INCOME TAXES

Many companies use one depreciation method for tax purposes and another for financial reporting purposes. It is common practice to use an accelerated depreciation method to compute the actual tax liability and a straight-line method for financial reporting. (Different depreciation methods do not change the company's overall tax obligation; they simply cause the annual tax obligation to vary.) The result is that the income tax liability reported on an income statement can be different from the taxes actually paid. The difference between the computed taxes and the actual tax liability is called *deferred taxes*. Thus, the balance sheet item "deferred taxes" represents the cumulative taxes the company has deferred over the years, and it appears in the liability section of the balance sheet. Sunset uses the same depreciation method for calculating its tax liability and for computing net income to report to its stockholders, so it has no such balance sheet entry.

1.6.2 COMPUTING DEFERRED INCOME TAXES

As we have discussed, a company's cash inflows (sources of funds) are *approximately* equal to its net income plus depreciation plus any taxes it has deferred, and all three of these quantities depend on the depreciation methods the company uses for tax and reporting purposes. Therefore, we will first look at how the depreciation method can affect the reported accounting income.

The current tax law allows companies to use either the prescribed rapid depreciation method, commonly referred to as the modified accelerated cost recovery system (MACRS),

or the optional straight-line method when depreciating their assets for tax purposes. Most companies use the rapid method when calculating their taxes because depreciation is a tax-deductible expense and a larger depreciation lowers the current tax liability. However, larger depreciation expenses also reduce a company's net income (accounting income). (The detailed coverage of depreciation and income taxes will appear in Chapter 4.)

A generally accepted accounting principle states that a company should depreciate its assets for reporting purposes by using the method that most accurately reflects the decline in the value of its assets over time. For most companies, this method is straight-line depreciation. A few companies use rapid depreciation for both tax and reporting purposes, but it is much more common to use rapid depreciation for calculating taxes and straight-line depreciation for reporting income to investors [3].

To illustrate the concept, consider Table 1.7, which shows before-tax income, taxes, and net income for a company that has sales of \$500,000 a year, costs equal to 40% of sales, and a single asset that costs \$100,000. This asset has a 5-year useful life, and it will have a salvage value of zero at the end of the 5 years. If the company uses a 3-year property class rate under rapid depreciation for tax purposes and the straight-line method for financial reporting purpose, the annual depreciation allowed each year would be

Item	Year End				
	1	2	3	4	5
MACRS rate*	33%	45%	15%	7%	0
MACRS depreciation	33,000	45,000	15,000	7,000	
Straight-line (SL) rate	20%	20%	20%	20%	20%
SL depreciation	20,000	20,000	20,000	20,000	20,000

*Rounded to the nearest full percentage.

Show that two different depreciation methods do not change the total amount of earnings over the project life.

SOLUTION:

In Table 1.7 the upper section shows the calculation of actual taxes owed by the MACRS method, and the lower section shows the calculation of taxes and net income for reporting purposes by the straight-line method. Notice that after-tax (A/T) incomes are larger in the early years under the straight-line method. For example, using MACRS, in year 1 the company reports to the Internal Revenue Service (IRS) \$33,000 in depreciation, pays \$54,250 in income taxes, and has a net income of \$162,750. It reports to stockholders only \$20,000 depreciation, \$57,500 taxes, and \$172,500 net income. In general, the company would prefer to report to its stockholders an income of \$172,500 rather than \$162,750.

Although the company reports taxes of \$57,500, its tax bill is only \$54,250. The company does not actually pay the difference of \$3,250 in reported taxes in year 1. The \$3,250 difference is reported on the income statement and the balance sheet as *deferred taxes*; that is, the company has deferred payment of these taxes until a later date by using an accelerated depreciation method for calculating them.

Notice also that when MACRS depreciation is used, the net income fluctuates for several years and then is stable at a level above the net income reported to stockholders. Income reported to

Example 1.5

Tax versus Book Depreciation

Table 1.7 Effects of Depreciation on Accounting Income

Item	Operating Year				
	1	2	3	4	5
Case 1: Tax calculations (thousands of dollars)					
Revenues	\$500	\$500	\$500	\$500	\$500
Less					
Labor and materials	200	200	200	200	200
Depreciation (MACRS)*	33	45	15	7	0
Operating expenses	<u>50</u>	<u>50</u>	<u>50</u>	<u>50</u>	<u>50</u>
Net income B/T	217	205	235	243	250
Less					
Income taxes (25%)	<u>54.25</u>	<u>51.25</u>	<u>58.75</u>	<u>60.75</u>	<u>62.50</u>
Net income A/T	\$162.75	\$153.75	\$176.25	\$182.25	\$187.50
Earnings per share	1.63	1.54	1.76	1.82	1.88
Case 2: Calculations for stockholder reporting (thousands of dollars)					
Revenues	\$500	\$500	\$500	\$500	\$500
Less					
Labor and materials	200	200	200	200	200
Depreciation (SL)	20	20	20	20	20
Operating expenses	<u>50</u>	<u>50</u>	<u>50</u>	<u>50</u>	<u>50</u>
Net income B/T	230	230	230	230	230
Less					
Income taxes (25%)	<u>57.50</u>	<u>57.50</u>	<u>57.50</u>	<u>57.50</u>	<u>57.50</u>
Net income A/T	\$172.50	\$172.50	\$172.50	\$172.50	\$ 17.50
Earning per share	1.73	1.73	1.73	1.73	1.73
Deferred income taxes	3.25	6.25	-1.25	-3.25	-5

*Rounded to the nearest full percentage. (For the 3-year MACRS property, the applicable percentages are 33.33%, 44.44%, 14.82%, and 7.41%.)

NOTE: B/T = before tax; A/T = after tax.

stockholders under straight-line depreciation is stable over the entire period. Companies prefer to report stable or growing earnings to fluctuating earnings.

1.6.3 ESTIMATING CASH FLOWS FROM INCOME STATEMENT

The cash flows that accrue to the company are calculated in Table 1.8 on the basis of the income statement and balance sheet (with no working capital requirement). Notice that cash flows, which are equal to net income plus depreciation plus deferred taxes, are the same regardless of the depreciation method used. This will always be so because net income increases by $(1 - \text{tax rate})$ (net change in depreciation amount) and deferred taxes increase by (tax rate) (net change in depreciation amount), which together exactly offset the decrease in depreciation cash flows.

1.6.4 USE OF CASH FLOWS IN EVALUATING INVESTMENTS

Managers and financial analysts are primarily concerned with the stream of cash flows that accrue to a company from its operations. As we have seen, net income (accounting income)

Table 1.8 Effects of Depreciation on Cash Flows

Item	Operating Year				
	1	2	3	4	5
Case 1: Tax calculations (thousands of dollars)					
Net income	\$162.75	\$153.75	\$176.25	\$182.25	\$187.50
Depreciation (MACRS)	33	45	15	7	0
Cash flow	\$195.75	\$198.75	\$191.25	\$180.25	\$187.50
Case 2: Calculations for stockholder reporting (thousands of dollars)					
Net income	\$172.50	\$172.50	\$172.50	\$172.50	\$172.50
Depreciation (SL)	20	20	20	20	20
Deferred income taxes	3.25	6.25	-1.25	-3.25	-5
Cash flow*	\$195.75	\$198.75	\$191.25	\$180.25	\$187.50

*Cash flow = Net income + Depreciation + Deferred taxes.

and cash flows are rarely, if ever, the same. Changes in income can occur without any corresponding changes in cash flows. During a period of investment in plant and inventories, a company can even experience a decrease in cash at the same time that income is increasing.

When the company makes sales on credit, the sales appear as accounting income. However, the company has not yet received the cash, it cannot spend the cash, and the ultimate collection of the cash is uncertain. For the purposes of investment analysis, we are more interested in the point when the cash is to be received. At this time, the company reaches a new decision point. The cash may be returned to the stockholders by payment of a dividend, or it may be used to retire debt, to increase the working capital, or to acquire new assets.

We use the cash flows of an investment in evaluating its economic value. One advantage of using the cash flow approach is that it avoids difficult problems in the measurement of corporate income that necessarily accompany the accrual method of accounting. These problems include the following:

1. In what time period should revenue be recognized?
2. What expenses should be treated as investments and therefore capitalized and depreciated over several time periods?
3. What method of depreciation should be used in measuring income as reported to management and shareholders?
4. Should LIFO, FIFO, or some other method be used to measure inventory flow?

There are disagreements about the answers to these questions. Different approaches may lead to different measures of income. If income is used to evaluate investment worth, investments may look good or bad, depending on how income is measured. Most of all, we can't invest income for anything—it is just an accounting figure to show whether the company made a profit or not. Instead, we can invest or pay with cash, not with profit. Therefore, the use of cash flows for investment evaluation minimizes many of these complications.

Projects are usually started with an investment, which is a cash transaction from the company to the project. Cash outflows that move from the company to the project are arbitrarily given a negative sign. Thus, the net cash flow $-\$1,000$ indicates that $\$1,000$ flows from the company to the project at a particular point in time. A project may require several years of investment before it starts to generate any revenue. When the project is in full operation,

1.7 INVESTMENT PROJECT AND ITS CASH FLOWS

periodic cash inflow from the project to the company is assumed to be generated by product sales. Even though the cash flows may actually take place throughout the year, in cash flow analysis each flow is usually assumed to occur at the end of the year. In this section, we will examine how we can estimate a series of cash flow transactions for a typical investment project and its impact on the firm's financial statements.

1.7.1 THE PROJECT CASH FLOW STATEMENT

Suppose that the company could introduce a new power regulator, model X, with the expected cash flow for the year shown in Table 1.9. To do this, the company has to make an investment of \$35,000 at the end of 2020. The statement in the table indicates that the project is expected to generate \$66,750 in net funds from its first year of operation. The disposal of an old machine, because new equipment has been purchased, adds \$3,000, and proceeds from a new short-term loan add another \$10,000. This short-term loan is secured

Table 1.9 Procedure for Computing the Project Cash Flow

Net Operating Income Statement

Operating revenues (sales)		\$200,000
Less		
Cost of goods sold		
Labor	40,000	
Materials	30,000	
Overhead	20,000	
Depreciation	<u>10,000</u>	
Total	\$100,000	
Operating cost	10,000	
Interest paid on debt	1,000	(111,000)
Taxable income		89,000
Income tax (25%)		<u>22,250</u>
Net income from operations		66,750

Project Cash Flow Statement—Power Regulator Model X for the Year Ending December 31, 2021

Sources of cash		
Net income from operations	66,750	
Add: Noncash expense depreciation	<u>10,000</u>	
Net cash provided from operations	76,750	
Add		
Sale of old equipment replaced by new equipment (net proceeds after tax adjustment)	3,000	
New borrowed money for the project	<u>10,000</u>	
Total cash generated by the project	\$89,750	
Uses of cash		
Repayment of principal	10,000	
Purchase of new equipment	30,000	
Working capital requirement for the project during the period	<u>12,000</u>	
Total cash disbursed for the project	\$52,000	
Net cash inflow to the company		\$37,750

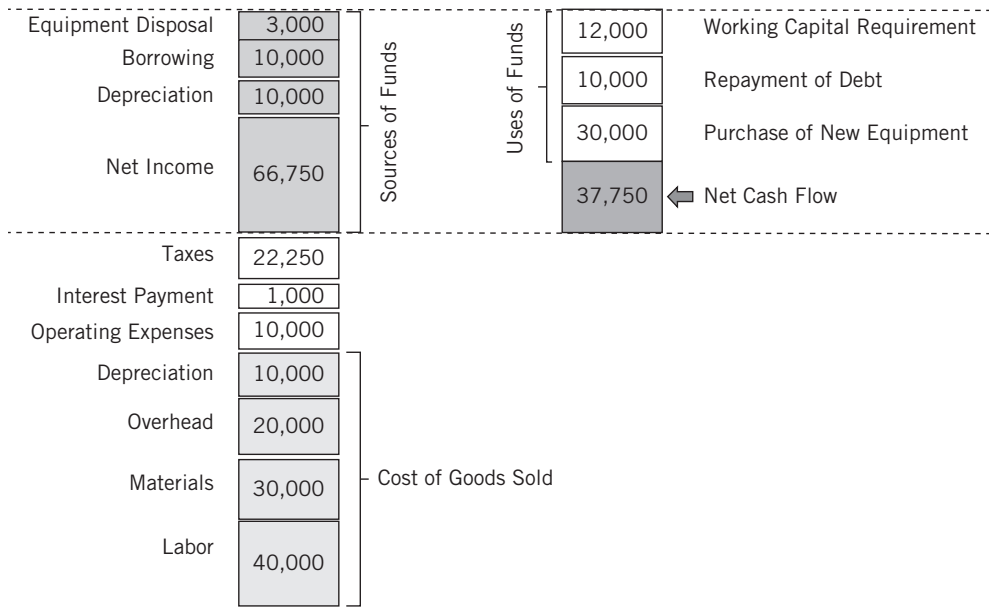


FIGURE 1.3 Illustration of Cash Flow Generation and Application (in \$1,000)

at the beginning of the year at an interest rate of 10%, and both interest and principal are payable at the end of the year. Therefore, the total cash inflow to the company during the year is \$89,750.

In the same period, \$10,000 of this net cash inflow is a cash outflow to repay the principal of the loan, \$30,000 is a cash outflow for other new equipment purchased, \$12,000 is retained in the project as an increase in its working capital, and the balance of \$37,750 is the net cash return from the project to Sunset. Thus, the net cash inflow to the company from the power regulator model X project would be \$37,750 for 2021. Figure 1.3 illustrates the general nature of composition of cash flow generation and applications.

1.7.2 CASH FLOWS OVER THE PROJECT LIFE

When we repeat cash flow estimation over the project life, the result is a series of net cash flows. If the sum of the series is positive, the flow is from the project to the company; if it is negative, the flow is from the company to the project. This series is often called the cash flow series for the project, and the company decides whether to undertake the project on the basis of this estimated cash flow. A typical net cash flow stream for a project might be as follows.

End of Year	2020	2021	2022	2023	2024
Project Year	0	1	2	3	4
Net Cash Flow	-\$35,000	37,750	28,450	23,500	30,500

We commonly use a graphical representation of the foregoing cash transactions, or a cash flow diagram as shown in Figure 1.4, in which receipts during a period are shown by an upward arrow and disbursements during the period are shown by a downward arrow. In fact, such a cash flow diagram will provide a basis for analyzing an investment project throughout this text.

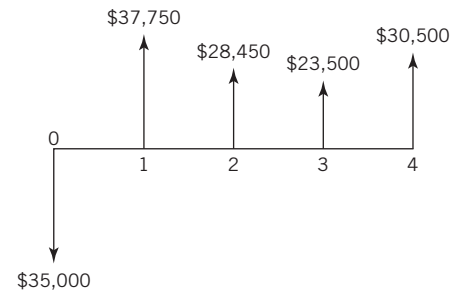


FIGURE 1.4 Cash Flow Diagram for Power Regulator Model X Project

When we have estimated the cash flow series of a project such as that just described, our natural question is, is it worth spending \$35,000 now (2020) to receive a cash inflow stream of \$37,750, \$28,450, \$23,500, and \$30,500 over the next four years?

Any proposed investment must be evaluated to ensure, with reasonable confidence, that the benefits of the project will exceed the costs. Whatever methodology is used for the evaluation, certain basic principles remain unchanged. These principles are applicable whether the investment is for a new company, the expansion of an existing facility, or the formation of a new corporate entity. In the chapters ahead we will identify such basic principles, formulate a logical decision framework for economic evaluation, and examine a general analytical methodology for assessing the worth of any proposed capital project. In essence, this is the role of engineering economy.

Example 1.6

Computing Yearly Net Cash Flow

A chemical processing firm is planning to add a duplicate polyethylene plant at another location. The financial information for the first project year is provided as follows.

Sales		\$1,500,000
Manufacturing cost		
Direct material	\$150,000	
Direct labor	380,000	
Overhead	100,000	
Depreciation	20,000	
Interest payment		20,000
Operating expenses		<u>150,000</u>
Taxable income		680,000
Income taxes (25%)		<u>170,000</u>
Net income after tax		510,000
Equipment purchase		400,000
Increase in inventories		100,000
Decrease in accounts receivable		20,000
Increase in wages payable		30,000
Decrease in notes payable		40,000

Compute the net cash flow from this project during the first year.

SOLUTION:

- The first step is to calculate the net change in working capital, using (+) for increase and (–) for decrease.

CURRENT ASSETS		CURRENT LIABILITIES	
Inventories	+ \$100,000	Wage payable	+\$30,000
<u>Accounts receivable</u>	<u>-20,000</u>	<u>Note payable</u>	<u>-40,000</u>
Net change	+80,000	Net change	-10,000

$$\text{Net change in working capital} = \$80,000 - (-10,000) = \$90,000$$

- The second step is to calculate the total funds provided from operation.

$$\text{Funds provided from operation} = \$510,000 + \$20,000 = \$530,000$$

Since there are neither equipment sales nor borrowing, the total cash generated is \$530,000.

- The third step is to calculate the total uses of cash.

$$\begin{aligned} \text{Uses of cash} &= \text{Equipment purchase} + \text{Net increase in working capital} \\ &= 400,000 + 90,000 = \$490,000 \end{aligned}$$

- The fourth step is to determine the net cash flow for the project year.

$$\text{Net cash flow} = 530,000 - 490,000 = \$40,000$$

SUMMARY

The primary purposes of this chapter were (1) to describe the basic capital budgeting function of the company, (2) to describe the basic financial statements and their uses by investors and managers, and (3) to relate the various types of accounting information in defining the cash flows of investment projects.

As shown, financial analysis is designed to determine the relative strengths and weaknesses of a company—whether the company is financially sound and profitable relative to other companies in its industry and whether its position is improving or deteriorating over time. Both investors and managers need such information in order to estimate future cash flows from the company or to detect problems and strengthen weaknesses.

The use of expected earnings (accounting income) to measure the benefits of an investment would require a much more sophisticated accounting system than is currently being used by any corporation. The net income figures resulting from current accounting practices are *not* usable. Moreover, even with improved measures of income, there would remain the question of whether the use of cash flows or net income is more appropriate. The use of cash flows minimizes many of the problems related to measuring income. Therefore, we suggest that the cash flows of the investment be used in the analysis of it.

The concept of funds flow, or generation of cash flow by a project, was considered in detail to demonstrate how to compute the net cash inflows to the company from executed projects. The net cash flow stream, a discrete or continuous function of time, is the basic economic measure of a project used to determine its profitability to the company.

REFERENCES

1. ANTHONY, R. N., *Management Accounting*, 5th edition, Irwin, Homewood, IL, 1984.
2. GARRISON, R. H. and E. W. NOREEN, *Managerial Accounting*, 16th edition, McGraw-Hill, 2017.
3. PARK, C. S., *Contemporary Engineering Economics*, 6th edition, Pearson, 2016.
4. PARK, C. S., *Fundamentals of Engineering Economics*, 4th edition, Pearson, 2019.
5. SHARPE, W. F., *Investment*, 6th edition, Prentice-Hall, Englewood Cliffs, NJ, 1999.

PROBLEMS

1.1. Consider the following balance sheet entries for Tiger Corporation.

- a. Compute the firm's working capital.
- b. If the firm had the net income after tax of \$100,000, what were the earnings per share?
- c. When the firm issued its common stock, what was the market price of the stock per share?

BALANCE SHEET		
<i>As of December 31, 2021</i>		
Assets		
Cash		\$ 50,000
Accounts receivable		50,000
Inventories		150,000
Manufacturing plant at cost	600,000	
Less: Accumulated depreciation	300,000	
Net fixed assets		300,000
Land		150,000
Liabilities and shareholders' equity		
Notes payable		50,000
Accounts payable		100,000
Long-term mortgage bonds		100,000
Preferred stock, 6%, \$100 par value (1,000 shares)		100,000
Common stock, \$10 par value (20,000 shares)		200,000
Capital surplus		100,000
Retained earnings		50,000

1.2. The following accounting information was taken from the book of Alpha Manufacturing Company.

Beginning inventory	\$35,000	Ending inventory	\$23,000
Operating expenses	\$22,000	New purchases	\$83,000
Income taxes	\$10,000	Net income	\$27,400
Nonoperating revenue	\$5,000	Cash dividend	\$12,000
Depreciation	\$10,000	New borrowing	\$20,000

On the basis of this information, compute the total sales for the period.

1.3. The inventory account for item X showed the following information.

Beginning balance, Jan. 1	100 units @ \$1.90 = \$190
Purchases:	
Jan. 15, 1st purchase	100 units @ \$2.00 = \$200
Feb. 12, 2nd purchase	200 units @ \$1.80 = \$360
Feb. 27, 3rd purchase	250 units @ \$2.10 = \$525
Mar. 15, 4th purchase	150 units @ \$2.20 = \$330

The ending inventory on March 31 consists of 200 units. Determine the cost of the ending inventory based on two methods of inventory valuation: (a) FIFO and (b) LIFO.

1.4. Suppose that a project under consideration is expected to change a firm's financial position for the first year as follows.

Sales		\$500,000
Manufacturing costs of sales		
Direct labor	35,000	
Direct material	25,000	
Overhead	10,000	
Depreciation	30,000	100,000
Selling and administrative expenses (directly associated with the project)		25,000
Equipment purchase		100,000
Decrease in cash revenue of other product		10,000
Increase in accounts receivable		30,000
Increase in inventory		20,000
Increase in current liabilities		30,000
Income taxes associated with the project		100,000
Repayment of the old loan		50,000

- a. Determine the change in the firm's working capital.
- b. Determine the net cash flow for the first project year.

1.5. Kendall Manufacturing Company is considering a project that will add a new line of product. The financial data for the first project year are estimated as follows.

Sales		\$1,000,000
Cost of goods sold		
Labor	\$150,000	
Material	200,000	
Depreciation	20,000	
Total		370,000
Operating expenses		146,000
Interest expenses		10,000
Income taxes		165,900

ADDITIONAL INFORMATION:

- The firm will purchase new equipment worth \$200,000 at the beginning of the year. The purchase will be financed by paying \$100,000 in cash and borrowing the remaining \$100,000 from a local bank at 10% interest payable at the end of each year. The \$10,000 interest expense shown in the income statement represents this interest payment at the end of the first year.
- The project requires \$10,000 in working capital.
Compute the net cash flow from this project during the first year. In doing so, determine the sources of cash and uses of cash, respectively.

1.6. Robert Cooper started Wolverine Bakery, Inc. in Ann Arbor, Michigan, on January 1, 2020. The first order of business was to purchase equipment costing \$8,000, for which Wolverine Bakery paid \$2,000 in cash as a down payment and signed a mortgage note for \$6,000 with the vendor, payable in full (plus 12% interest) in January 1, 2021. Cooper intended to depreciate this equipment on a MACRS basis over 5 years. During the first year of operation, Wolverine Bakery had cash sales of \$136,000. Cash expenses included \$56,000 for dough ingredients, \$44,000 for wages, \$1,500 for equipment rentals, \$9,600 for store rental, \$5,400 for utilities, \$2,000 for miscellaneous supplies, and \$3,160 in payment of estimated taxes. As of December 31, 2020, there was an unpaid bill of \$500 for December utilities and Wolverine Bakery owed \$2,300 to its ingredients vendor. Because the vendor delivered frequently, Wolverine Bakery had only \$2,200 of inventory on hand at the end of December. There was no beginning inventory on January 1, 2020, because operations did not formally commence until the first delivery of ingredients was made in the middle of January. A customer had paid Wolverine Bakery a \$500 advance for a wedding cake to be delivered on January 10, 2021 and a university fraternity owed Wolverine Bakery \$200 for a birthday cake delivered in early December. Based on these accounting transactions, Cooper prepared the income statement and the balance sheets shown in Exhibits 1 and 2.

WOLVERINE BAKERY, INC.			
INCOME STATEMENT FOR THE YEAR 2020			
Revenues ¹			\$136,200
Expenses			
Dough ingredients			
Beginning inventory	0		
Purchase	56,000		
Ending inventory	<u>2,200</u>		
Cost of ingredients		\$53,800	
Wages		44,000	
Rentals		11,100	
Depreciation [\$8,000 (20%) MACRS]		1,600	
Utilities (\$5,400 cash + \$500 payable)		5,900	
Miscellaneous supplies		2,000	
Interest (\$6,000 for one year at 12%)		720	
Total expenses			119,120
Operating profit before tax			17,080
Income tax (18.50%)			<u>3,160</u>
Net income			<u>\$13,920</u>

NOTE 1: The revenues include the \$136,000 cash sales plus the \$200 owed Wolverine Bakery for the fraternity party it catered.

EXHIBIT 1

WOLVERINE BAKERY, INC.			
COMPARATIVE BALANCE SHEETS			
	December 31, 2019	December 31, 2020	
Assets			
Current assets			
Cash	\$5,400		\$20,540
Accounts receivable	0		200
Inventories	0		2,200
Fixed assets			
Equipment at cost	0	8,000	
Less accumulated depreciation	<u>0</u>	<u>1,600</u>	
Net fixed assets	0		<u>6,400</u>
Total assets	\$5,400		\$29,340
Liabilities and Owners' Equity			
Current liabilities			
Accounts payable	\$ 0		\$ 2,800
Deferred revenue ¹	0		500
Accrued interest	0		720
Long-term liabilities			
Mortgage note payable	0		6,000
Owners' equity			
Contributed capital	5,400		5,400
Retained earnings	<u>0</u>		<u>13,920</u>
Total equities	\$5,400		\$29,340

NOTE 1: The \$500 advance payment for the wedding cake for the next year is not revenue of this accounting period; it appears as \$500 deferred revenue on the balance sheet.

EXHIBIT 2

Put yourself in Cooper's position and prepare the cash flow statement for the operating year 2020.

- 1.7. Suppose a company is considering a new project in year 2020 and the following are the projected financial data related to the project activities:

Operating revenue		\$600,000
Cost of goods sold:		
Material	30,000	
Labor	40,000	
Overhead (power and utilities)	30,000	
Depreciation	50,000	
Operating expenses		45,000
Combined federal and state taxes		80,000
 New borrowed capital		200,000
Interest payment on newly borrowed capital		15,000
Repayment of old loan		30,000
 Net proceeds from disposal of old equipment		12,000
Capital expenditure on new equipment		150,000
 Increase in accounts receivable		18,000
Increase in inventory		22,000
Decrease in wages payable		15,000
Increase in prepaid expenses		17,000
Increase in notes payable		35,000
Decrease in accrued taxes		42,000

Determine the company's cash position related to the project in year 2020.