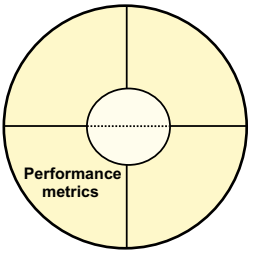


Chapter 2

TIME FOR ACTION: JERRY SAYS HELLO TO FINANCE AND TAKES THE PLUNGE

1. Getting Started

Jerry has decided that he has spent enough time thinking through the issues of the Value Sphere strategy, and the positioning of his new firm. It is time for action.

Nothing ventured, nothing gained, thinks Jerry. So, to solidify his emotional commitment to his fledgling business, Jerry quits his job at the post office. His wife, Sallie, has a steady job in the admissions office at the local university that pays $30,000 a year plus benefits. Since they have no kids, they could probably get by with a little extra frugality.

Sallie senses the excitement Jerry has for his new project. She had never before seen him so alive. All that he could talk about was this new product concept. Fresh squeezed lemon, ice and the usual amount of sugar would all go into the lemonade. But the product differentiation would be a bit of cracked white pepper and salt added to the "basic" lemonade.

There would be variations available in an array of colors, where different fruit flavorings would be blended in to provide just a hint of raspberry, blackberry, pineapple, apple or strawberry. However, lemon would remain the dominant flavor. To entice the kids to his shop, each variation would be named after a popular cartoon character. He planned to amend the characters' names just enough to keep an overzealous copyright attorney at bay. Thus far, his "short list" included Rockin' Raspberry Road Runnur and Pineapple Pluto-nium.

"Have you thought about what kind of a firm this is going to be, Jerry?" asked Sallie as they began dinner one evening.

"Actually, yes," Jerry responded. "I ran into Bob Butterfield the other day — you know, my old buddy from high school. Wouldn't you know he got his Ph.D. in finance a few years ago and joined the business school at the university. Well, of course, we got to talking about my plan. He suggested that it is probably best to start as a sole proprietorship."

A *sole proprietorship* is a business owned by one person. It is the simplest and least regulated form of organization. Its owner keeps all the profits. But he also has *unlimited liability* for business debts. This means that if Jerry takes a bank loan and fails to repay it, the bank can not only take possession of his business assets, but can look beyond them to Jerry's personal assets for repayment. Moreover, there is no difference between personal and business income, so all of Jerry's business income will be taxed as personal income.

Jerry is taking a big risk. But, what else could he have done?

He could have decided to form a *partnership*. This would involve teaming up with one or more other owners. There are two versions of partnership. In a *general partnership*, all the partners share in the gains or losses, and *all* have unlimited liability for all the debts incurred by the partnership. In a *limited partnership*, one or more *general partners* assume unlimited liability. However, there are also limited partners who do not actively participate in the business and who enjoy *limited liability*. This means that creditors cannot touch their personal assets in collecting debts incurred by the partnership.

A third option for Jerry is to form a *corporation*. This is a legal entity that is distinct from its owners. In fact, a corporation enjoys many of the rights and duties of a real person. It can borrow money, own assets, negotiate contracts, own another corporation or partnership, and hire and fire people. Moreover, its owners can enjoy limited liability.

One of the biggest disadvantages of a corporation is double taxation. The income earned by the corporation is taxed at the corporate income tax rate, and then the dividends paid out to shareholders are taxed separately at the personal income tax rate. Another alternative organizational form is a limited liability corporation (or LLC), which provides the limited personal liability and the pass-through taxation of partnerships or S corporations.

2. Where will the Money Come From?

"Jerry, have you thought of a location for the store?" Sallie asked, as Jerry ate dinner.

"Sure. I'm thinking about leasing the store at the mall that has been vacant ever since the travel agency moved out," said Jerry.

"That's a good site. But won't the lease be expensive?" Sallie wondered.

Jerry replied, "Yes, it is expensive. Plus we need to buy the equipment and hire someone to work in the store. We don't have the money for all that, but I'm going to our bank tomorrow to see if they can give us a loan."

Jerry met with the loan officer the next day. After listening to Jerry's vision, the loan officer gave him a list of things that he would need before the bank could process a loan. Among them was a business plan that contained financial projections and ratios. Also included was the bank's standard (boiler plate) loan contract for small business loans, so that Jerry would understand what kinds of restrictions (covenants) the bank would ask for and what his liability was.

Jerry was feeling a bit lost now. "Heck, all I want to do is sell lemonade. Why do I have to know all this financial stuff?" he muttered to himself.

Somewhat dejectedly, he told Sallie about his meeting and what he needed to do. Sallie thought awhile and said, "Why don't you talk to Bob again?"

"You're right," said Jerry, "let me call him."

Jerry's meeting with Bob was very helpful. Bob explained that *loan covenants* were nothing more than a list of conditions the bank would specify. Things that Jerry's Lemonade would have to do and things they could not do. Most of these were expressed in financial terms, but the key for Jerry would be to understand what he would have to do in his business to ensure that the bank's conditions were met.

"This is important, Jerry," emphasized Bob, "because if you violate any of these conditions, the bank could call back the entire loan. And remember what I said about your personal assets being at risk in a sole proprietorship. You could lose your home!"

"This is a tall order, Bob. I don't know that much about finance," mumbled Jerry.

Bob thought for a moment and then said with a smile, "Jerry, why don't you sit in on the corporate finance course I'm offering this semester? It starts next week and we're going to talk about a lot of things you need to know."

"Hmm. That may not be a bad idea. I'll do it," beamed Jerry.

So began Jerry's journey into the world of business finance.

3. What Jerry Learned

In a couple of months, not only did Jerry have the bank loan, but also a working knowledge of basic financial concepts.

Jerry learned that corporate finance was all about answering two key questions: (i) how had the past strategies worked out for the firms owners? and (ii) which

strategic course of action seems best for the same owners? Addressing these questions involved analyzing basic accounting statements, deriving and interpreting operational and financial ratios, estimating a firm's or investment project's cash flows and understanding the time value of money. All of the concepts were at the heart of key performance metrics that are part of a well-balanced Value Sphere. Below is a summary of the notes and observations Jerry made for himself from Bob's lectures.

Analyzing Basic Accounting Statements

A firm can be thought of as a collection of assets that are financed by various liabilities and owners' equity. That is, suppliers, bankers, bondholders, and shareholders provide cash or extend credit to the firm for the purchase of assets like production materials, manufacturing equipment, buildings, and property. Seen this way, assets are what the firm owns and liabilities are what the firm owes. An accountant portrays this in a *balance sheet*. A simple example of a balance sheet is given in Fig. 2.1.

Of course, a firm is *more* than simply a collection of assets. How it puts these physical assets to work determines the stream of cash flows that it will produce.[4] And the *value* of the firm is what investors would be willing to pay today for the right to claim this stream of future cash flows. Although the balance sheet tells us what investments have been made by the firm, it says little about the future cash flows that *will* be produced down the road, and hence little about value.

To get some idea of cash flows, we need to turn to the income statement. Figure 2.2 contains an example of an *operating* income statement; that is, it is exclusive of any *financing* expenses associated with *how* the assets were purchased.

Assets	**Liabilities and equity**
Current assets	Current liabilities
Cash	Accounts payable
Inventory	Other payables
Accounts receivable	Bank debt
Fixed assets	Long-term debt
Plant	Shareholders' equity
Property	
Equipment	

Fig. 2.1. A simple accounting view of the firm.

[4]See Chapter 1, as well as Oliver Hart's *Firm, Contracts and Financial Structures*, Oxford University Press, New York, 1995.

Sales revenue
— Cost of goods sold (COGS)
— Selling, general, and administrative (SG&A) expenses
= Earnings before interest, taxes, depreciation, and amortization (EBITDA)
— Depreciation expense and goodwill amortization
= Earnings before interest and taxes (EBIT)
OR
Net operating profit (NOP)
— Cash taxes on operating profit
= Net operating profit after-tax (NOPAT)

Fig. 2.2. A simple operating income statement.

There are many basic inputs needed to arrive at the rather general definitions of Fig 2.2.

In order, these are defined as:

- **Sales revenue** = Number of units sold × Price per unit
- **COGS** = {(Material cost per unit + Labor cost per unit + Other production costs per unit) × Number of units} + Fixed production costs
- **SG&A expense** = Selling costs + Overhead costs + Administrative expenses
- **Depreciation expense** = Yearly depreciation expense on the fixed assets held by a firm or attributable to a specific project (many times reported as part of COGS)
- **Cash taxes on operating profits** = Cash taxes in current period, that would have been paid on operating profit if the firm had no interest expenses on debt.[5]

With these inputs, Fig. 2.2 shows that:

- **EBITDA** = Sales revenue — COGS — SG&A expenses
- **EBIT or NOP = EBITDA — Depreciation — Goodwill amortization**
- **NOPAT = NOP or EBIT — Cash taxes on operating profit**
  = NOP[1 − T] where T = tax rate

[5]The fact that interest paid out by a firm to service its outstanding debt obligations is a tax-deductible business expense is introduced in Chapter 8.

While most of these terms are fairly straightforward, goodwill amortization, and depreciation need further explanation. Goodwill amortization arises in acquisitions. It is simply that portion of the difference between the purchase price and the revised book value (often called "fair market value") of the acquired firm that is treated as an expense in a given year, although the newly-adopted accounting rules (SFAS142, which became effective January 2002) stipulate that goodwill is to be *no longer* treated this way for financial reporting purposes. That is, companies are no longer to treat goodwill amortization as an annual expense in the company's income statement, and goodwill will impact earnings only if it is considered "impaired" and has to be written down. *Goodwill impairment* is supposed to be a "one-time" devaluation of goodwill on the balance sheet and a change against earnings if the company thinks the goodwill on the balance sheet exceeds the economic value of the asset. For example, AOL Time Warner recorded a goodwill impairment of $93 billion in 2004 to recognize the current value of the merged enterprise. Talk about Value Evaporation! To the extend that the amortization of purchased goodwill (along with other Section 197 intangibles) is deductible for *tax* purposes over a 15-year period, one should still treat it just like depreciation and deduct it as shown above. Generally speaking, depreciation reflects an estimate of the cost of an asset used up in the production process. Since fixed assets have a useful economic life exceeding one year, by subtracting yearly depreciation charges from profits each year, the original purchase price of the asset is spread out over the years of its productive life.

Two points are noteworthy. First, depreciation is really a non-cash item since the true cash is the purchase price paid when the asset was acquired. However, this initial purchase price is not tax deductible (as are other expenses, such as the cost of materials). What the tax authorities do allow is that a fraction of the purchase price can be treated as a tax-deductible expense every year. The fraction for each year, called depreciation, when multiplied by the number of years over which the initial price must be spread out, is equal to the initial purchase price. Being able to treat depreciation like a tax-deductible expense creates a cash benefit. This benefit is called a *depreciation tax shield*. We will come back to it when we define a firm's cash flow.

Second, every type of asset has its own *depreciation schedule*. This schedule tells us how to depreciate the asset and over how many years. The tax laws for depreciation vary by country and by whether the asset is a building, property, or equipment.

For instance, buildings are depreciated uniformly over 39.5 years. We therefore say buildings are depreciated *straight-line to zero* over 39.5 years. A building costing $79,000 would, according to this schedule, generate a $2,000 depreciation charge against pre-tax profits each year for 39.5 years.

Properties, such as land, are not depreciable at all.

Year	3 Year	5 Year	7 Year	10 Year	15 Year	20 Year
1	33.33%	20.00%	14.29%	10.00%	5.000%	3.750%
2	44.45%	32.00%	24.49%	18.00%	9.500%	7.219%
3	14.81%	19.20%	17.49%	14.40%	8.550%	6.677%
4	7.41%	11.52%	12.49%	11.52%	7.700%	6.177%
5		11.52%	8.93%	9.22%	6.930%	5.713%
6		5.76%	8.92%	7.37%	6.230%	5.285%
7			8.93%	6.55%	5.900%	4.888%
8			4.46%	6.55%	5.910%	4.522%
9				6.56%	5.900%	4.462%
10				6.55%	5.900%	4.461%
11				3.28%	5.910%	4.462%
12					5.900%	4.461%
13					5.910%	4.462%
14					5.900%	4.461%
15					5.910%	4.462%
16					2.950%	4.461%
17						4.462%
18						4.461%
19						4.462%
20						4.461%
21						2.23%

Fig. 2.3. MACRS table for the depreciation of equipment.

And lastly, equipment can fall into one of six depreciation categories, depending on its economic life. The tax code specifies which types of assets fall into each economic life classification. The appropriate schedule in the United States is given by the *Modified Accelerated Cost Recovery System* (*MACRS*) which is contained in Fig. 2.3.

For example, a piece of computer equipment costing $3,000 would fall into the 5-year MACRS category. Hence, over the six years[6] following its purchase, the

[6]Even though the equipment is in the five-year depreciation class, it is assumed that it is purchased halfway through the first year. Thus, a sixth depreciation charge is needed to fully depreciate the equipment.

firm could take depreciation charges of:

- \$3,000 × 20.00% = \$600 in Year 1
- \$3,000 × 32.00% = \$960 in Year 2
- \$3,000 × 19.20% = \$576 in Year 3
- \$3,000 × 11.52% = \$345.60 in Year 4
- \$3,000 × 11.52% = \$345.60 in Year 5
- \$3,000 × 5.76% = \$172.80 in Year 6

Observe that charges are higher in the early years and that the sum of the six yearly depreciation charges equals the original cost of the computer. Thus, the cost of an investment in equipment is written off in an accelerated fashion against profits during its accounting life, producing tax shield benefits in each of those years.

The accounting or "book" value of the asset should reflect this depreciation as it occurs. Hence, we calculate the *net book value* of the computer over its full accounting life as:

- \$3,000 in Year 0 (i.e., when the computer is purchased)
- \$2,400 at the end of Year 1
- \$1,440 at the end of Year 2
- \$864 at the end of Year 3
- \$518.40 at the end of Year
- \$172.80 at the end of Year 5
- \$0 at the end of Year 6

Our accountants tell us that the computer has zero book value at the end of Year 6. But remember this is a backward-looking number. Book value at any time, after all, is based solely on historical cost and the accumulated depreciation charges. In reality, book value may have little to do with what the asset is worth in the market. However, let us not worry about this now. It is often assumed that the accounting valuation of the asset is consistent with the economic valuation of the asset. That is, we assume that accounting depreciation coincides with economic depreciation.

We are now ready to revisit the balance sheet presented in Fig. 2.1. Recall that a balance sheet simply reflects the value of assets on one side and the value of liabilities and equity on the other, all at *one point in time*. But these values change over time as assets are depreciated and new assets are added. Therefore, for valuation and performance assessment purposes, we should periodically revise our estimates of the assets employed in the firm. We also want to keep track of assets employed by the firm which are not classified as "fixed."

The total value of a firm's "assets-at-work" at any time is defined as its *Net Assets*. This is the sum of the *Net Fixed Assets* and the *Net Working Capital* held by

the firm at that time.[7] These are defined as:

- **Net assets** = Net fixed assets + Net working capital
- **Net fixed assets** = Gross fixed assets (i.e., original cost) — Accumulated depreciation
- **Net working capital** = Current assets — Non-interest bearing current liabilities (NIBCLs).

Net fixed assets represent the value of the firm's fixed assets (i.e., plant, property, and equipment) and net working capital represents the value of the firm's operating capital (i.e., cash, inventories, and accounts receivable, less items such as accounts payable[8]) which are expected to be cash items within the year. We are now ready to prepare a balance sheet and operating income statement. Figures 2.4 and 2.5 show what these would be like for a fictitious company called MJM Incorporated.

Now using Figs. 2.4 and 2.5, we can calculate the following for MJM:

- **2004 Net fixed assets** = 85,000 − 20,000 = $65,000
- **2005 Net fixed assets** = 100,000 − 35,000 = $65,000
- **2004 Net working capital** = 30,000 − 20,000 = $10,000
- **2005 Net working capital** = 45,000 − 25,000 = $20,000

We now use the above information to derive:

- **2004 Net assets** = $65,000 + $10,000 = $75,000
- **2005 Net assets** = $65,000 + $20,000 = $85,000

However, has MJM put its capital to work wisely? Is the income stream generated in 2005 worth the investment in assets?

Operating and Financial Ratios

To answer these questions, we can turn to ratio analysis. Commonly used ratios in financial analysis fall in four categories: margin ratios, asset ratios, leverage ratios, and financial return ratios.

[7] Observe that in practice, net assets may be referred to as invested capital, capital employed or even capital at work. These are all names for the same thing.

[8] Interest-bearing current liabilities (IBCLs), such as short-term bank debt and commercial paper, are not subtracted from the firm's current assets. The economic logic behind this rule of subtracting only *non-interest-bearing* current liabilities is that we need to offset a portion of our current assets with the current liabilities which are associated with the *operations* of the business, and not the *financing* of the business. This distinction between operating and financing decisions will be clarified in Chapters 9 and 10.

	2004	2005
Assets		
Cash	$5,000	$5,000
Accounts receivable	15,000	25,000
Inventory	10,000	15,000
Current assets	**30,000**	**45,000**
Gross fixed assets	85,000	100,000
Accumulated depreciation	20,000	35,000
Net fixed assets	**65,000**	**65,000**
Total assets	**$95,000**	**$110,000**
Liabilities and equity		
NIBCLs (Accounts payable)	**$20,000**	**$25,000**
Bank debt	**15,000**	**20,000**
Long-term debt	**10,000**	**10,000**
Shareholders' equity	**50,000**	**55,000**
Total liabilities and equity	**$95,000**	**$110,000**

Fig. 2.4. MJM incorporated balance sheet.

(1) Margin ratios: These ratios assess a firm's or project's ability to cover its operating costs. Included are:

$$\textbf{Gross margin} = \frac{\text{Sales revenue} - \text{Cost of goods sold}}{\text{Sales Revenue}}$$

Gross margin reveals the percentage of sales revenue remaining after material and labor costs are accounted for.

$$\textbf{Operating margin} = \frac{\text{Net operating profit}}{\text{Sales revenue}}$$

which determines the percentage of sales revenue remaining after all operating expenses are deducted. In some situations, operating margin is defined more

	2005
Sales revenue	$150,000
Cost of goods sold	60,000
Selling, general, and administrative expense	30,000
Depreciation	15,000
Net operating profit (NOP) or EBIT	**45,000**
Operating taxes at 40%	18,000
Net operating profit after-tax (NOPAT)	**$27,000**

Fig. 2.5. MJM incorporated operating income statement.

generally as:

$$= \frac{\text{Sales revenue} - \text{Cost of goods sold} - \text{SG\&A expenses} - \text{Depreciation}}{\text{Sales revenues}}$$

or

$$= \text{Gross margin} - \frac{\text{SG\&A expenses}}{\text{Sales revenue}} - \frac{\text{Depreciation}}{\text{Sales revenues}}$$

Both gross margin and operating margin help us understand one component of the operating efficiency of the firm by answering the question: What is left of the revenue pie after subtracting the operating costs of production?

How does MJM stack up along these margin ratios? Using the data from Figs. 2.3 and 2.4 we see that

- **Gross margin** $= \dfrac{150{,}000 - 60{,}000}{150{,}000} = \dfrac{90{,}000}{150{,}000} = 60\%$
- **Operating margin** $= \dfrac{45{,}000}{150{,}000} = 30\%$

(2) Asset ratios: Another aspect of efficiency has to do with how efficiently the firm uses its assets. Since net assets include both net working capital and net fixed assets, there are ratios to measure asset efficiency that correspond to both current and fixed assets. The first two ratios relate to the current assets component of net working capital, which includes the sum of accounts receivable and Inventory. The first of these ratios reflects on the firm's ability to collect on the credit it extends to customers. It is given by:

- **Days sales outstanding** $= \dfrac{\text{Accounts receivable} \times 365}{\text{Sales revenue}}$

This ratio tells us how many days of sales the firm has on which it still needs to collect money from its customers. The second ratio measures how fast the firm turns over its inventory:

- **Inventory turnover** $= \dfrac{\text{COGS}}{\text{Inventory}}$

Finally, the next ratio relates to a firm's efficiency in deploying its net fixed assets and is given by:

- **Net asset turnover ratio** $= \dfrac{\text{Sales revenue}}{\text{Net assets}}$

This ratio reflects how many dollars of revenue are generated per $1 of assets. Everything else held constant, the higher this ratio the better. Let us now see how MJM has fared on these ratios in 2005:

- **Days sales outstanding** $= \dfrac{20{,}000 \times 365}{150{,}000} = 48.67$ days
- **Inventory turnover** $= \dfrac{60{,}000}{12{,}500} = 4.8\%$

Observe that we have used the *average* levels of accounts receivable and inventory for 2004 and 2005. The idea is that the assets the firm ties up to generate sales revenue are a weighted average of those with which it begins the year and those with which it ends the year.[9] Similarly, we use average net assets to obtain:

- **Net asset turnover** $= \dfrac{15{,}000}{80{,}000} = 1.875$

(3) Leverage ratios: Ratios in this category reflect a firm's ability to meet its debt service obligations. They often show up in bank loan covenants. They supposedly measure the firm's ability to avoid financial crises. One of these ratios is given by:

- **Times interest earned (or interest cover)** $= \dfrac{\text{EBIT+ depreciation}}{\text{Interest expense}}$

A creditor would be interested in this ratio because it reveals how many times over the firm's cash operating profits could cover its yearly interest expense. Loan covenants typically require the borrower to retain an interest cover of at least 2 over the life of the loan.

[9]Some financial analysts calculate ratios using beginning-of-period asset values for the period, in particular, this is often done when forecasting performance.

Suppose that MJM faced a 10% interest rate on all its debt — bank loans and bonds. Its interest expense for 2005 would have been 10% of $30,000, assuming year-end values of debt as the basis. Thus, MJM has:

- **Debt/Equity ratio** $= \dfrac{\text{Long-term debt}}{\text{Book equity}} = \dfrac{\$30{,}000}{\$55{,}000}$
  $= 0.545$ in 2005

This means MJM is using 54.5 cents in debt for every dollar in equity.

- **Times interest earned** $= \dfrac{45{,}000 + 15{,}000}{3{,}000} = 20$

The Times Interest Earned ratio of 20 is a more than comfortable level of interest coverage. MJM is generating enough pre-tax operating income to cover its debt interest expense 20 times over! Note that all items in these leverage ratios are for 2005.

(4) Financial return ratios: Our last pair of ratios relates to the overall profitability of the firm. The first is the accountant's measure of the rate of return earned by the firm's shareholders as a percentage of the firm's sales revenue:

Return on sales (Net profit margin) $= \dfrac{\text{Net income for year}}{\text{Sales revenue for year}}$

where net income is given by:

- **Net income** $=$ (EBIT $-$ Interest on debt) $(1 -$ Tax rate)

Based on net income, we can also calculate the return shareholders earn on the book value of their equity investment.

- **Return on equity (ROE)** $= \dfrac{\text{Net income}}{\text{Book equity}}$

where we will use average (over 2004 and 2005) book equity.

Net income is a useful piece of information because it is what our shareholders earned during the year, according to the income statement. But it is not the cash flow generated by the business for its owners since it excludes investments in net assets and includes non-cash items like depreciation.

To calculate these two ratios for MJM, we must first calculate:

- **Net income** $= (\$45{,}000 - \$3{,}000)(1 - 0.4) = \$25{,}200$

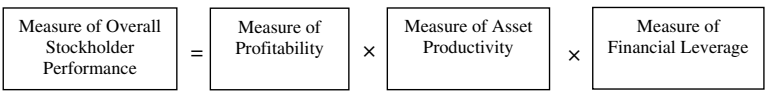
Now we have

- **Return on sales** $= \dfrac{\$25{,}200}{\$150{,}000} = 0.168$ or 16.8%
- **ROE** $= \dfrac{\$25{,}200}{\$52{,}500} = 0.48$ or 48%

where \$52,500 is the average of \$50,000 (2004 equity) and \$55,000 (2005 equity).

(5) The DuPont formula: In the 1960s, DuPont came up with a formula that links ROE to its components, as follows:

$$\text{Return on equity} = \text{Return on sales} \times \text{Net asset turnover} \times [1+\text{debt/equity ratio}]$$



This way we can see how the overall performance of a company is driven by how effectively it manages profit margins, how productively it manages assets, and how well it manages its capital structure.

Estimating Cash Flows

Our next task is to use our definitions of operating profits and net asset values to arrive at an estimate of the cash flows of a business. We are particularly interested in cash flow because value derives from cash, not accounting profits.

We want to focus on the cash flows that come from the operations of the business, before debt interest is paid, but after taxes are paid and investments in capital are made. This is called the free cash flow of a business:

- **Free cash flow** (**FCF**) for the year = NOPAT for the year − increase in net assets during the year

where *Increase in Net Assets* represents the change in the value of net assets over the year. It is defined as:

- **Increase in net assets** = Additions to net working capital during the year + Additions to net fixed assets (New fixed asset investment − Depreciation) during the year.

This suggests three ways to express FCF that are all identical to the FCF formula above:

- **FCF for the year** = NOPAT − increases in net working capital
  − increase in net fixed assets
  = NOPAT + depreciation − investment in property plant and equipment (or capital expenditure)
  − increase in net working capital
  = Net income + depreciation − capital expenditure
  − increase in net working capital + debt interest
  × (1−tax rate).

Any of the free cash flow formulae can be applied to both historical and forecasted data. When used for forecasting, particular attention must be paid to the timing of cash flow as well as the inflationary assumptions used. Remember that in computing FCF we do not subtract interest expenses. We should think about FCF as representing the cash available to pay both the debtholders and shareholders. FCF is sometimes also called the *Operating Free Cash Flow* or *All-Equity Free Cash Flow*.[10]

We can take our definition of FCF a step further to arrive at what's called the *Equity Free Cash Flow*. That is, we can calculate the shareholders' share of the FCF pool by subtracting the cash needed to service the outstanding debt. Debt service payments include both the interest expense incurred on the outstanding principal of the debt, plus any scheduled repayments of the principal itself. Thus, we have:

- **Equity FCF** = FCF − after-tax interest expense during the year
  − debt principal repayments during the year

The equity FCF is often called the *Flows to Equity*. It simply tells us the amount of cash remaining for the owners of the business after all other stakeholders (including the tax authorities) have had their claims satisfied. See the diagram below.

Now for MJM Incorporated, let us calculate its 2005 operating free cash flow first. All we need is MJM's NOPAT and the change in its net asset base. The former is given directly by Fig 2.4 as:

- **NOPAT** = $27,000

[10]The term all-equity FCF captures the idea that our definition of free cash flow is on a pre-financing basis and would be identical to the free cash flows associated with a firm which has no debt outstanding, i.e., an all-equity firm.

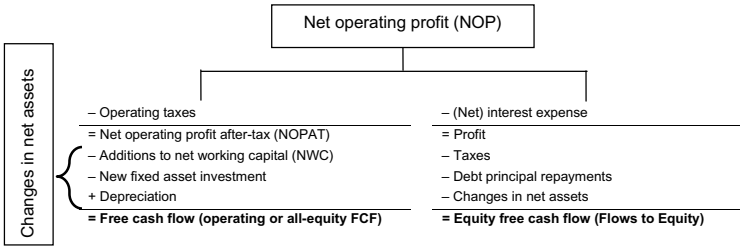


Fig. 2.6. Cash flow definitions.

However, to calculate the change in the asset base, we need to collect a few items first.

From Fig. 2.6, we see that we need three items: addition to net working capital, new fixed asset investment and yearly depreciation. We calculate each of these next.

Addition to net working capital is given by the difference between the net working capital at the end of 2005 and the net working capital at the end of 2004. Thus, using the figures derived above:

- **Addition to net working capital during 2005** $= \$20{,}000 - \$10{,}000$
  $= \$10{,}000$

New fixed asset investment can be calculated by observing the change in the gross fixed asset account in Fig. 2.4. That is:

- **New fixed asset investment** $= \$100{,}000 - \$85{,}000 = \$15{,}000$

Lastly, depreciation expense for 2005 is taken from Fig 2.5 and is:

- **Depreciation** $= \$15{,}000$

Then, as per Fig. 2.6:

- **Operating free cash flow** $= \$27{,}000 - \$10{,}000 - \$15{,}000 + \$15{,}000$
  $= \$17{,}000$

We could have also calculated operating free cash flow more directly as

- **Operating free cash flow** $=$ NOPAT $-$ increase in net assets
  $= \$27{,}000 - (\$85{,}000 - \$75{,}000) = \$17{,}000$

This way of looking at a firm's free cash flow shows us that increases in a firm's net assets represent a drain on the free cash flow generated by after-tax operating profits. This does not mean that investing more in net assets is bad. It is a good

idea as long as these investments generate sufficiently high returns. But a firm that increases its net assets by investing in projects that return less than the cost of the additional capital allows *value to evaporate*.

For example, Harnischfeger Industries, a maker of machinery for the mining and paper industries, found its cash flow — and hence value — evaporating in the early 1990s, partly due to substantial increases in its accounts receivable each year.[11]

Harnischfeger Industries was also in the business of training naval personnel in the use of command and control centers. And while the business was profitable in terms of margins, the government was often late in paying its bills. Thus, a large fraction of the substantial sales revenue the company generated was tied up in accounts receivable.

Increases in accounts receivable directly increase the net asset base of a firm. Moreover, increases in net assets *reduce* operating free cash flow, and ultimately value. Harnischfeger subsequently dropped this business. However, this example of increased asset usage that leads to Value Evaporation is captured nicely in the following quote[12] by their executive vice president for finance and administration, Francis M. Corby, Jr., as he reflected on the firm's performance in 1993:

> The top line was growing [sales revenue], the bottom line was growing [net income], but the stock price was going nowhere.

Value is a function of *cash*, not profits. Firms that pay too much attention to the income statement, while disregarding the assets employed to generate it, risk Value Evaporation! Wayne Wren, CFO of Allwaste Environmental Services, Inc., once said[13] "If you give me enough capital, and that capital is free, I can assure you that I'll increase income."

Now returning to our example, let us calculate the equity free cash flow for MJM. Using the information already in hand, equity free cash flow can be calculated as follows:

Net operating profit	$45,000
− Interest expense	−3,000
= Profit	42,000
− Taxes at 40%	−16,800

[11]See Irwin Ross, "The Stern Stewart Performance 1000," *Journal of Applied Corporate Finance*, Winter 1998, pp. 116–128.
[12]Ibid. Unfortunately the company filed for bankruptcy protection in 1999.
[13]See Irwin Ross, "The Stern Stewart Performance 1000," *Journal of Applied Corporate Finance*, Winter 1997, pp. 115–128.

= Net income	25,200
− Debt principal repayments[14]	+ 5, 000
− Changes in net assets	−10,000
Equity free cash flow	**$20,200**

Observe that the equity free cash flow is greater than the operating free cash flow. This may seem strange at first blush, but it is because of the additional funds brought into the firm through the increase in bank borrowing. The increase of $5,000 outweighs the after-tax interest expense of $1,800.[15]

Observe that all we have done so far is analyzed history. Our calculations do not tell us much about firm value. To calculate value, we need to estimate cash flows that will occur in the future. This goes beyond looking at historical data. However, historical accounting data, while not directly relevant for determining value, may help us forecast future cash flows. The idea is that the past may be useful to predict the future.

Of course, when we estimate future cash flows, we are talking about cash flows that occur at *different points in time*. We also need to make these different cash flows similar to each other on the time dimension, so we can add them all up to arrive at value.

The Time Value of Money

A key concept in finance is the *time value of money*. Simply put, a claim to receive $1 one year from today is worth less than $1 today. Why?

First, inflation erodes value. $1 today buys more than it will a year later from now because inflation will drive up prices.

Second, the $1 today is *certain*, whereas the $1 in one year may be *uncertain or risky*. If there is any chance that the party from whom you received the "claim to $1 in one year" would not pay up, the value of this claim is reduced.

Lastly, there is an *opportunity cost* associated with money. If you have to wait to receive your money, you lose the opportunity to do something else with it. That is, value will evaporate if the forgone opportunity is worth more than the chosen one. For example, you could have put the $1 in a bank account and earned interest on it even if inflation were zero.

[14]Notice that MJM's total debt has risen from 2004 to 2005 due to an increase in bank debt. Therefore, the entry into the "Debt Principal Repayment" is actually negative. Thus *the deduction of a negative number* leads to a positive adjustment.

[15]After-tax interest expense is calculated as Interest × (1 − tax rate) = $3,000 × (1 − 0.4) = $1,800.

Understanding basic time-value-of-money concepts will prove indispensable when we tackle more advanced topics such as capital budgeting, lease-versus-buy decisions, weighted average cost of capital and firm valuation. In this section, we will begin with a discussion of *future value* and *present value* in the single-period case. We will then move to the multiperiod case and conclude with some special cases for valuing *perpetuities and annuities*.

One-Period Case: Let us begin with an example. Suppose you wish to sell your car and run an advertisement in the local paper to solicit buyers. You have used the car sparingly and decided it was time to remove it from your driveway. By the next morning, you have made two appointments to show the car.

The first respondent to the ad arrives at your house, examines the car, and offers you $5,000 for it. Before you react to the offer, the other potential buyer arrives.

She looks at the car, listens to the motor, checks under the chassis and says, "I'll take it! In fact, I'll give you $5,500 for it. But, I will give you the money in one year." You believe her credit is very good and that there is no chance of her reneging on the deal. You look to the first customer inquisitively, who immediately responds, "My offer stands."

What should you do? $5,500 is clearly more money than $5,000. But who wants to wait a year?

You think for a moment, scribble down some numbers and finally smile. You approach the first bidder and say, "Sorry, but I am going with the $5,500 offer."

Why did you do this?

You knew that if you took the first offer, you would receive $5,000 today. This would give you the *opportunity* to immediately deposit the $5,000 in your bank to earn 8% interest for the year. In one year's time, you would get back your $5,000 in principal, plus the yearly interest of $8\% \times \$5{,}000 = \$400$, giving you $5,400 in total.[16] We can express this by saying the *future value* (FV) of $5,000 in one year's time earning 8% interest is:

$$FV = \$5{,}000 + (8\% \times \$5{,}000) = \$5{,}000 \times (1 + 8\%) = \$5{,}000 \times (1.08) = \$5{,}400$$

Since this is less than what the woman will pay you in one year's time, you decide to go with $5,500 paid-in-one-year offer.

You could have come to the same conclusion by employing the present value concept. That is, you could have asked, "What is the present value of $5,500 to be received in one year's time?" or alternatively, "How much do I have to deposit in

[16]For simplicity, we are assuming taxes are not due on the interest income.

the bank today at 8% interest to be able to withdraw $5,500 in one year's time?" That is:

$$\text{PV} = \frac{\$5{,}500}{1.08} = \$5{,}092.59$$

By comparing the $5,000 cash today offer to the PV of the second offer of $5,092.59, you would have reached the same conclusion.

This simple example gives us the general formula for calculating the present value of a cash flow to be received in one period (denoted CF_1) of:

$$\text{PV} = \frac{CF_1}{1+r}$$

where r is the discount (or interest) rate. Moreover, since we are in a one-period world, we can also denote CF_1 as FV and express the relationship between PV and FV in a one-period setting as:

$$\text{FV} = \text{PV} \times (1+r)$$

This basic concept now allows us to easily handle the case when cash flows are received across several years. We refer to this as the multiperiod case.

Multiperiod case: To extend the time value of money concept to multiple periods, we must first begin by introducing the concept of *compounding*. Again, let us consider an example. Suppose you wish to deposit $100 in the bank today to earn 10% interest each and every year (otherwise known as per annum).

As we learned above, in one year's time this investment will be worth:

$$\text{FV} = \$100 + (10\% \times \$100) = \$100 \times (1 + 10\%) = \$100 \times (1.10) = \$110.$$

Of this $110, $100 is your original deposit (the principal) and $10 is the interest earned on that principal.

What would happen if you left *all* your money in the bank for another year?

A year later you will have:

$$\text{FV} = \$110 + (10\% \times \$110) = \$110 \times (1 + 10\%) = \$110 \times (1.10) = \$121$$

Again, you retain your original principal of $100 as well as the interest you had already earned in the first year of $10. But this year, your deposit grew by $11, not $10. Why?

Compound interest! Not only does your original investment of $100 earn 10% interest to give you an additional $10, but now your first year's worth of interest of $10 earns 10% interest as well to give you an additional $1. That is, in the second year you earn 10% on the full $110 available at the end of the first year. This is the beauty of compound interest, or "interest on interest."

However, you could have figured this out at the very beginning by asking, "What will \$100 be worth in two years at a rate of interest of 10%?" Your answer would be:

$$\text{FV} = \{\$100 \times (1.10)\} \times (1.10) = \$100 \times (1.10)^2$$

For an investment of PV, which earns a rate of interest of r for T periods, we have:

$$\text{FV} = \text{PV} \times (1 + r)^{\text{T}}$$

Again we can manipulate the relationship between future and present values to answer a different question: "How much is \$121 two years from now worth today, using a 10% rate of interest?" The answer is:

$$\text{PV} = \frac{\$121}{(1/10)^2} = \$100$$

We can therefore derive the present value (PV) of a cash flow (CF) for a discount rate of r,T periods hence as:

$$\text{PV} = \frac{\text{CF}}{(1 + r)^{\text{T}}}$$

The multiperiod present value formula above will be useful in a capital budgeting context later. We conclude below with some special cases for calculating present values.

Discounting Multiple Cash Flows (Special Cases): Let us begin by considering one more example which includes *multiple cash flows across multiple periods*. Suppose you had a money-making machine that produced \$250 for each of the next three years. If your discount rate was 10%, what is the present value of these three cash flows?

To answer this question, we can use our multiperiod present value formula three times since we receive \$250 in one year, another \$250 in two years, and the last \$250 in three years. The total present value is then the sum of:

1. $\text{PV} = \dfrac{\$250}{(1.10)^1} = \$227.27$
2. $\text{PV} = \dfrac{\$250}{(1.10)^2} = \$206.61$
3. $\text{PV} = \dfrac{\$250}{(1.10)^3} = \$187.83$

which is $621.71 in total. Observe that we can simply add these three values up because they are all expressed in terms of dollars today (i.e., they are each in present value form).

That was easy enough. But what if we had a money-making machine that gave us $250 a year for the next 30 years?

We could apply the same methodology, but it certainly becomes tedious. Worse yet, what if this money-making machine produced $250 per year each year, *forever*?[17] We could obviously use some help here.

The latter case of receiving the same dollar amount every year forever is called a *perpetuity*. Luckily we have a very simple formula for calculating the present value of a perpetuity. It is given by the solution to discounting every year's cash flow (which is the same every year and denoted by CF) and summing them up from now until eternity. We can express this algebraically as:

$$\text{PV} = \frac{\text{CF}}{(1+r)^1} + \frac{\text{CF}}{(1+r)^2} + \frac{\text{CF}}{(1+r)^3} + \ldots \text{until infinity}$$

$$\text{PV} = \frac{\text{CF}}{r}$$

This last formula is known as the *perpetuity* formula. For our example, we could calculate the present value of receiving $250 a year forever at a discount rate of 10% as:

$$\text{PV} = \frac{\$250}{0.1} = \$2{,}500$$

Finally, how do we compute the present value of a cash flow *annuity*. An *annuity* is a stream of identical cash flows for a finite (i.e., less than infinity!) number of years. To arrive at the formula, let us return to our example above when we received $250 a year for only three years. How do we obtain the present value of these cash flows?

If we were to write out all the cash flows, we would have:

$$\text{PV} = \frac{\$250}{(1.1)^1} + \frac{\$250}{(1.1)^2} + \frac{\$250}{(1.1)^3}$$

This can also be written as:

$$\text{PV} = \$250 \times \left[\frac{1}{(1.1)} + \frac{1}{(1.1)^2} + \frac{1}{(1.1)^3}\right]$$

and simplified to:

$$\text{PV} = \$250 \times \left[\frac{1}{0.1} - \frac{1}{0.1 \times (1.1)^3}\right] = \$250 \times 2.4869 = \$621.71$$

[17]Such an investment is not all that unusual. For example, the UK government issues consol bonds that pay a stated interest amount forever.

This is exactly the answer we obtained previously when we summed up the present values of each yearly payment.

In general, the present value of a cash flow (CF) to be received for T periods when the discount rate is *r* is:

$$\text{PV} = \frac{\text{CF}}{r} - \frac{\text{CF}}{r(1+r)^{\text{T}}}$$

or

PV of an annuity for T periods = PV of a perpetuity − PV of the perpetuity you do not have after T periods

Looking at this formula, a key insight emerges: the present value of an annuity for T periods is the PV of a perpetuity minus the PV of the perpetuity you *do not* have after T periods.[18]

4. Jerry's Concluding Thoughts

As Jerry reflected on what he had learned about the basics of finance, he also realized that there was much that Bob had not yet covered. For example, how does one come up with these estimates of future cash flows that determine value? Where do discount rates come from? And how will the decisions he will make for maximizing value creation and its retention in his lemonade company reflect cash flows and the discount rate? Answers to these questions will have to wait until later chapters.

Main Lessons

- Accounting ratios drawn from historical accounting statements can help us analyze and control our firm.
- Value is derived from cash, not accounting profits.
- Estimates of cash flows depend on profits, captured by the income statement, as well as assets employed, captured by the balance sheet.
- Value Evaporation occurs when firms use excessive asset levels to generate profits.
- There is a time value to money — a dollar today is worth more than a dollar tomorrow.
- Financial metrics help us measure value creation and thus help us monitor our value retention, so that we can determine whether our Value Sphere is synchronized.

[18]In Table 2.1, we include standard tables that display the present value, future value, and present value of an annuity, respectively, for $1.

Table 2.1.

	Present value of $1 to be received after t years														
	Interest rate per year														
Number of years	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.812	0.797	0.783	0.769	0.756
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.731	0.712	0.693	0.675	0.658
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.659	0.636	0.613	0.592	0.572
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.593	0.567	0.543	0.519	0.497
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.535	0.507	0.480	0.456	0.432
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.482	0.452	0.425	0.400	0.376
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.434	0.404	0.376	0.351	0.327
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.391	0.361	0.333	0.308	0.284
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.352	0.322	0.295	0.270	0.247
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.317	0.287	0.261	0.237	0.215
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.286	0.257	0.231	0.208	0.187
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.258	0.229	0.204	0.182	0.163
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.232	0.205	0.181	0.160	0.141
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.209	0.183	0.160	0.140	0.123
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.188	0.163	0.141	0.123	0.107
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198	0.170	0.146	0.125	0.108	0.093
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.153	0.130	0.111	0.095	0.081
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164	0.138	0.116	0.098	0.083	0.070
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.124	0.104	0.087	0.073	0.061

Table 2.1. (*Continued*)

	Future value of $1 after t years Interest rate per year														
Number of Years	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110	1.120	1.130	1.140	1.150
2	1.020	1.040	1.061	1.082	1.103	1.124	1.145	1.166	1.188	1.210	1.232	1.254	1.277	1.300	1.323
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331	1.368	1.405	1.443	1.482	1.521
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464	1.518	1.574	1.630	1.689	1.749
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611	1.685	1.762	1.842	1.925	2.011
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772	1.870	1.974	2.082	2.195	2.313
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949	2.076	2.211	2.353	2.502	2.660
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144	2.305	2.476	2.658	2.853	3.059
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358	2.558	2.773	3.004	3.252	3.518
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594	2.839	3.106	3.395	3.707	4.046
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853	3.152	3.479	3.836	4.226	4.652
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138	3.498	3.896	4.335	4.818	5.350
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452	3.883	4.363	4.898	5.492	6.153
14	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797	4.310	4.887	5.535	6.261	7.076
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177	4.785	5.474	6.254	7.138	8.137
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595	5.311	6.130	7.067	8.137	9.358
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054	5.895	6.866	7.986	9.276	10.761
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560	6.544	7.690	9.024	10.575	12.375
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116	7.263	8.613	10.197	12.056	14.232
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.727	8.062	9.646	11.523	13.743	16.367

Table 2.1. (*Continued*)

	Present value of $1 per year for each of t years (annuity)														
	Interest rate per year														
Number of Years	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259

End-of-Chapter Exercises

1. For a division of your company, calculate both your gross margin and your operating margin. How do they compare? What does the difference between the two imply about your operating efficiency? Can you relate the differences in margins to the differences in corporate strategy you identified in Chapter 1?
2. Pick one of your competitors and calculate the same ratios as above. How does your company compare? If differences exist, to what do you attribute them?
3. Calculate the components of return on equity (ROE) as given by the DuPont formula for both your company and your competitor. Does your answer to Question 2 shed light on any differences in the financial performance? Again, relate your answer to possible differences in corporate strategy?
4. Estimate your division's operating free cash flow for the last two years. What was the growth rate you achieved over the past year? Was this growth rate consistent with the strategy.

Practice Problems

1. The Michigan Electronics Co. has the following data:

Income statement year: 2005 ($ thousands)	
Sales	$2,000
Cost of goods sold (including depreciation)	$1,600
SG&A	$200
Operating profit	$200
Interest on debt	$50
Pre-tax income	$150
Taxes (@ 40%)	$60
Net income	$90

Balance sheets ($ thousands)		
	2004	2005
Total current assets	$450	$500
Net fixed assets	$1,200	$1,300
Total net assets	$1,650	$1,800
Payables	$150	$175
Short-term bank debt	$50	$75
Current portion of long-term debt	$150	$125
Total current liabilities	$350	$375
Long-term debt	$1,000	$1,000
Shareholders' equity	$300	$425
Total liabilities and equity	$1,650	$1,800

Calculate Michigan Electronics' free cash flow (FCF) for 2002.

2. Consider the following data for the Wolverine Student Supplies Co.

Income statement year: 2005 ($ thousands)	
Net sales	$150.00
Cost of goods sold (excluding depreciation)	$90.00
Depreciation	$4.00
SG&A Expenses	$36.00
Operating profit (EBIT)	$20.00
Interest	$12.00
Pre-tax income	$8.00
Taxes (@ 40%)	$3.20
Net income	$4.80
Dividends	$2.80
Addition to retained earnings	$2.00

Balance sheets		
	2004	2005
Cash	$25.00	$22.00
Accounts receivables and inventories	$70.00	$75.00
Total current assets	$95.00	$97.00
Net PP&E	$40.00	$50.00
Total net assets	$135.00	$147.00
Accounts payable	$45.00	$60.00
Short-term bank debt	$25.00	$20.00
Total current liabilities	$70.00	$80.00
Long-term debt	$30.00	$30.00
Common stock and paid-in-surplus	$20.00	$20.00
Retained earnings	$15.00	$17.00
Total liabilities and shareholders, equity	$135.00	$147.00

(a) What is Wolverine's operating free cash flow (FCF) for 2005?
(b) Prepare a sources and uses of funds analysis for Wolverine for 2005 to calculate the change in its cash balance from 2004 to 2005 and verify this against the actual change in cash from its 2004 and 2005 balance sheets.

Addendum to Chapter 2

In this addendum we explain in greater detail what free cash flow (FCF) *is* and what it is *not*. In our opinion, FCF is one of the two central concepts in financial valuation, the other being the cost of capital (which will be covered in Chapter 8). Yet, in our experience it is a concept that is often not properly understood. In this addendum, the issues we deal with are:

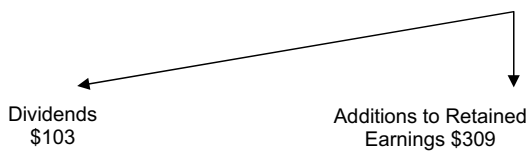
- What is the difference between FCF and the addition to the firm's cash balance by the end of the year?
- What is the relationship between FCF and sources and uses of funds?
- Does a firm's capital structure — the amount of debt it has — impact its FCF?

We will examine these issues, we will work with a numerical example.

Numerical Example:

JUMPSHOOTER COMPANY
Income statement 2005; $ millions

Net sales	$1,509
Cost of goods sold (COGS)	650
Sales, general and administrative (SG&A)	100
Depreciation	65
EBIT (Earnings before interest and taxes)	$694
Interest on debt	70
Pre-tax income	$624
Taxes (@ 34%)	$212
Net income	$412



Balance sheets	**$ millions**	
	2004	2005
Cash	$104	$160
Accounts receivables	$455	$688
Inventories	$553	$555
Total current assets	$1,112	$1,403
Net PP&E (Property plant & equipment)	$1,644	$1,709
Total net assets	$2,756	$3,112
Accounts payable	$428	$389
Total current liabilities	$428	$389
Long-term dept	$408	$454
Common stock and paid-in surplus	$600	$640
Retained earnings	$1,320	$1,629
Total net assets	$2,756	$3,112

Analysis

Increase in net fixed assets (NFA) during 2005
= $1,709 − $1,644 = $65

Net working capital (NWC) at the end of 2005
= $1,403 million (Working capital)
−$389 million (Accounts payable)
$1,014 million

NWC end 2004 = $1,112 − $428 = $684

Increase in NWC during 2005 = $1,014 − $684 = $330 million

ANALYSIS: SOURCES AND USES OF FUNDS

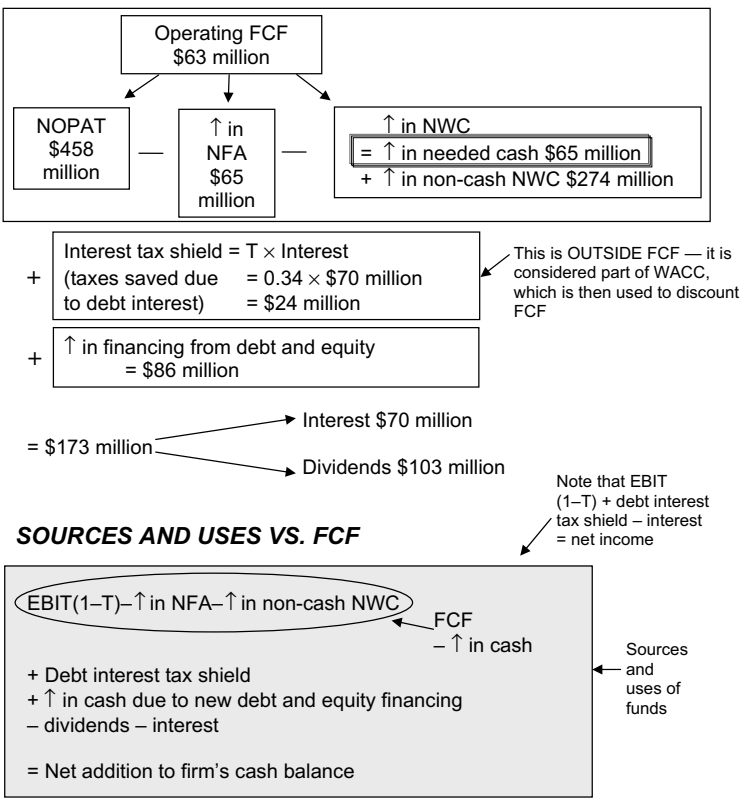
2005 Sources and uses	$millions
Cash Beginning 2005	$104
Sources by cash	
Operations	
Net income	$412
Depreciation	$65
Working capital	
Nothing	$0
Long-term financing	
Increase in common stock	$40
Increase in long-term debt	$46
Total sources	$563
Uses of cash	
Working capital	
Increase in accounts receivable	$233
Increase in inventory	$2
Decrease in accounts payable	$39
Long-term financing	
Fixed assets acquisitions	$130
(increase in net fixed assets = $65 + Depreciation = $65)	
Dividends paid	$103
Total uses	$507

- Net addition to cash = $563 − $507 = $56 million
- Ending cash = Beginning cash + net addition to cash
  = $104 + $56 = $160 million
- *Free cash flow*
  FCF = NOPAT − increase in NFA − increase in NWC
  = EBIT(1 − T) − increase in NFA − increase in NWC
  = $694[1 − 0.34] − $65 − $330 = $63 million

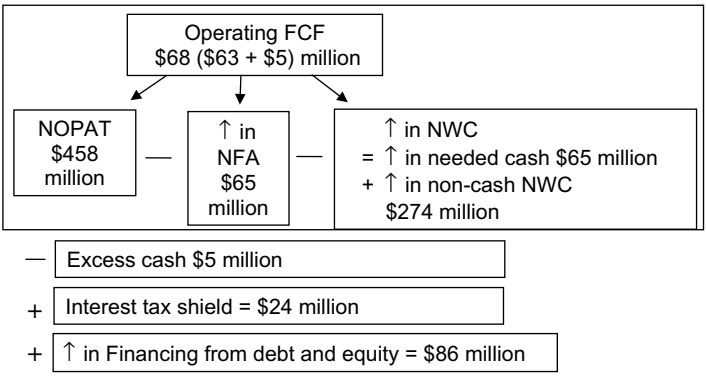
Notes:

- FCF is NOT the addition to the firm's cash from the start to the end of the year.
- FCF considers profit *above* the interest expense line, whereas net addition to cash is *after* payment of interest and dividends. Thus, the amount of debt on the balance sheet has NO impact on FCF.

- In computing net addition to cash via a sources and uses of funds analysis, we do NOT consider changes in cash while computing increase in NWC, because that *would* be double counting.
  - However, we *do* consider increase in cash as an increase in NWC while computing FCF because, if more cash is needed to operate the business (i.e., we are not just accumulating excess liquidity), then this *is* a drain on FCF.
  - Note that the debt interest tax shield (cash saved on taxes due to tax deductibility of debt interest) is not part of FCF (it is BELOW NOPAT in the income statement) because this tax shield is reflected in the weighted average cost of capital (WACC) that we use to discount FCF with.
- WHAT THEN IS THE RELATIONSHIP BETWEEN FCF AND ADDITION TO CASH?
  - Let us look at this pictorially…. (**T** stands for tax rate)



- If the firm accumulates excess cash (i.e., say \$5 out of the \$65 increase in cash is excess) and not needed for business purposes, then



- If you are building up excess liquidity for strategic reasons, then this increase in cash related to excess liquidity is NOT a drain on FCF.