Finance for Managers

v. 0.1

This is the book Finance for Managers (v. 0.1).

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Chapter 3

Ethics and Finance

One Bad Apple...

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The business profession has certainly had its share of scandals over the years, and finance in particular has had more than its fair share of the culprits. Given the importance of trust when dealing with matters of money, finance professionals should realise more than most the importance of integrity and reputation. But, more importantly, we should all strive for a higher ideal: to do what is right and just.

Every human that has developed the ability to reason (that is, not acting solely on instinct) has had to make ethical judgments. Debate about what is ethical is not a new topic (many important writings that are still studied today are thousands of years old). It would be impossible for us to definitively explore all of ethics in one book or one course, let alone one chapter, and yet we must, for ethical dilemmas abound for financial managers. To teach the tools of finance without any discussion about ethical use would be negligent (and unethical!).

3.1 Ethics Foundations

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define and discuss a working concept of ethics.
2. Describe the four main categories of approaches to ethics.

What is **ethics**[1]? For our purposes, we define it as a system for evaluating whether an action is right or wrong. For example, consider this following famous thought experiment:

A trolley car is hurtling out-of-control down a track where there are 5 workers ahead. You are standing by a switch that can divert the car onto a side track, where only 1 worker is currently. If you do nothing, the 5 workers will be killed, and if you throw the switch, the 1 worker will be killed (but the 5 will be spared). There is no time to warn the workers or take any other action. Should you throw the switch or not?

Asking this question in a group of individuals is bound to start some (perhaps intense) discussion about whether throwing or not throwing the switch is the right choice. In an ideal world, we would each embrace an ethical framework within which we can evaluate this situation.

There are four main categories of approaches to ethics:

1. Outcome based (consequentialism): the possible outcomes (consequences) of actions are determined, and the most desirable of the outcomes chosen.
2. Universal rules (deontology): the “duty” of the actor is to abide by a governing set of rules.
3. Character based (virtue ethics): how an individual’s actions reflect upon their identity and moral standing drives what is proper.
4. Social norms (pragmatic ethics): behaving in ways acceptable to the bulk of society. Sometimes characterized as, “What would be the

1. A system for evaluating whether an action is right or wrong.

reaction if this action was on the front page of the Wall Street Journal?"

To contrast these approaches, consider a friend who has received a terrible haircut asking, "Do you like it?" An outcome based view might support lying, since telling the truth would result in the friend having hurt feelings. Another outcome might be that the truth would make the friend angry, and they might retaliate. Or perhaps telling the truth might convince the friend to visit a different barber.

Instead, one might feel that lying is always wrong, no matter the outcome. Or there might be more complex rules dictating exactly when lying is appropriate.

The third case involves considering the virtue of honesty and the virtue of charity of one's neighbor. The character of an ideal human must have some balance (neither deficiency nor excess) of these virtues.

Another consideration might be, "What is the socially acceptable thing to do?" If the norm is to lie when someone has received a bad haircut, this might be a guide that can be used to determine proper behavior. It might not be acceptable to lie under oath in a court of law, but society may accept a certain amount of dishonesty.

Within these categories, there are many systems which can be considered, and scholars have debated the merits of each over the centuries. It is the recommendation of the authors, however, that finance managers give some thought to ethics **before** encountering dilemmas in the workplace; otherwise, it is more likely that one is influenced to pick an ethical system to justify a desired action, when the causality should flow the opposite direction.

So Which Ethical System Should I Choose?

We can't tell you what system will work for you. We would argue that it is each person's responsibility as a human being to think about this very seriously, and try to arrive at a workable system. There are many books dedicated to thinking about ethics and entire fields of philosophy that discuss these issues.

We can say that we subscribe to a virtue ethics system, and we believe that surrounding oneself with mentors and colleagues that are paragons of virtue is the best way to learn how to act.

Legal vs. Ethical

Note that "legal" and "ethical" are not necessarily the same thing. Most ethical systems include following just laws (since they arise from a social contract), but can allow for the violation of laws that are unjust (the civil disobedience of Gahndi and Rosa Parks are some canonical examples). And, in many ethical systems, the fact that something is permitted by law does not necessarily mean that it is ethical to engage in the behavior.

Additionally, many professions include self-governance or designations that require adherence to a set of ethical guidelines or a code of conduct. For example, the CFA Institute maintains a "Code of Ethics & Standards of Professional Conduct" that members with a CFA designation are obliged to uphold.

KEY TAKEAWAYS

- Ethics are a framework to determine what is right from what is wrong.
- Legal ≠ Ethical

EXERCISES

1. You are standing on a bridge. You see a runaway trolley car hurtling toward 5 workers on the tracks who will be killed if the trolley isn't stopped. Also on the bridge is a fat man who is large enough to stop the car if he is pushed onto the track; he does not see the trolley, and there isn't enough time to get his attention. You yourself do not weigh enough to stop the car. Should you push the man onto the tracks?
2. Justify an answer to the following question using reasoning from each of the four main categories of ethical frameworks: If slavery were still legal, should you own slaves?
3. What does cheating on an assignment imply about the character of an individual?

3.2 Ethics in Finance

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LEARNING OBJECTIVES

1. Explain the concept of fiduciary duty.
2. Discuss examples of ethical issues that arise in finance.

As those who are trained in finance are often in charge of other people's money, it is important to understand the concept of **fiduciary duty**[2], which entails putting another's interests (especially financial) before personal interests. The other party (the "principal") is typically at a disadvantage, either in access to information or experience, to the fiduciary, and thus relies upon the good faith of the fiduciary. There are legal definitions of when fiduciary duty exists in the relationship; there exist cases, however, where there is no legal burden but do invlove an ethical burden.

An example: a trader is told that her client would like to sell shares of stock ABC. The client's order would depress the stock price. It would be a breach of fiduciary duty for the trader to liquidate her position before executing the client's order (this is also called "front running").

Consider the possibility of adopting an accounting strategy that would minimize tax payments. On the one hand, this will increase profits for shareholders, but it will also reduce the amount of taxes paid to the government. Does the company have a responsibility to pay taxes to the government, and if so, does it only extend to the letter of the law?

Another scenario involves a company in distress selling off valuable assets to make interest payments to bondholders. A financial manager has a responsibility to pay the bondholders what they are due, while a duty to the shareholders to not cripple the ability of the company to function as a going concern.

2. The requirement to put another's interests (especially financial) before personal interests.

In each of these cases, the interests of one party conflict with another's, and a financial manager will have to determine how to evaluate and resolve the issue. While there can be legal guidance (especially in the case of fiduciary duty), often it will be up to the manager to make the choice he or she deems appropriate.

KEY TAKEAWAYS

- Fiduciary duty can obligate a manager to put another's interests ahead of one's own.
- While numbers are important, it is equally important to think about context and what lies beyond.

EXERCISE

1. Mike is paid to advise his clients on how to invest their money. One day, he is reviewing the financial statements for a publicly traded company, and believes the company is poised to gain significantly in value. If Mike would like to invest his own money into the company, might he have an obligation to disclose his discovery to his clients first?

3.3 Ethics in Management

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the agency problem.
2. Describe the stakeholder relationship and enumerate key stakeholders.

Similar to fiduciary duty is the concept of **agency**[3]: a relationship in which one party (the agent) is expected to act on behalf of another party (the principal). A company's management, for example, is expected to act on behalf of the board of trustees, who in turn act on behalf of the shareholders.

Unfortunately, there are many documented cases of the **agency problem**[4], where an agent has incentives to place personal interest over the principal's. One solution is to try to align the incentives of the agent and principal; performance bonuses and stock grants are two common ways to reward employees directly for creating value for shareholders.

Arguably, this relationship extends further. Each employee has a responsibility to diligently work and fulfill the employment agreement. If a conflict of interest arises, the employee should put personal interests aside or terminate the employment arrangement in a fair manner. Management, however, has a responsibility to the employees as **stakeholders**[5] (parties affected by the operations of the company) to balance their interests when making decisions. Many decisions in management involve tradeoffs among stakeholders (which include shareholders) which can rarely be simplified to numbers or a simple good/bad analysis.

Opinions differ on which groups should be considered stakeholders and how their claims should be weighed against one another. The narrowest view endorses maximizing shareholder profit as the dominating factor and only considers stakeholders as far as they can affect profit. For example, a subscriber to this view would choose to protect customers only if they thought doing so would ultimately positively contribute to the wealth of the stockholder. A broader view would

3. A relationship in which one party (the agent) is expected to act on behalf of another party (the principal).

4. A situation where an agent has incentives to place personal interest over the principal's.

5. Parties affected by the operations of the company.

include employees, suppliers, customers, investors, communities (and their governments) where the business operates, etc. Even competitors can be considered stakeholders!

In dealing with the balance between stakeholders, we suggest following one very important guideline: that human dignity is paramount. No manager has the right to consider themselves superior to their employees, suppliers, customers, etc. Treating people as a means to an end cannot ultimately be good for business. This might mean considering the rights of customers to use and resell a product or the rights of employees to a just wage for their work. Of course, in more extreme cases, it can mean considering the effects of addictive substances or even slave labor or human trafficking.

Beyond this principle, there is much room for debate about the proper balance of stakeholder concerns. Businesses are very complex, and a comprehensive list of guidelines could not possible cover every situation a manager will experience in his or her career. This is why it is so important to have managers who are willing and able to exercise their own ethical judgment!

KEY TAKEAWAYS

- One solution to the agency problem is to align incentives of the agent with the incentives of the principal.
- Stakeholders can include employees, customers, suppliers, investors, communities (and their governments), and potentially even competitors!
- Maintaining human dignity should always factor into a management decision.

EXERCISES

1. Supplier ABC has 90% of its output purchased by Company DEF. How might ABC have influence over DEF? How might DEF have influence over ABC? Is ABC a stakeholder of DEF, or is DEF a stakeholder of ABC?
2. A CEO uses company funds to purchase a jet that the CEO will almost exclusively use. How might this be against shareholder desires? How might this be in-line with shareholder desires?
3. Company GHI has developed a drug that causes addiction with painful withdrawal symptoms. Selling the drug is projected to double GHI's profits, and it would be legal to do so. What other factors might convince GHI to sell the drug? What other factors might convince GHI to not sell the drug?

3.4 International Considerations

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVE

1. Discuss how globalization can cause ethical conflicts.

As companies extend their reach across internation boundaries, ethical issues have taken a more prominent position in discourse about the benefit of globalization. Nowhere can the legal vs. ethical divide be more pronounced than when considering international prospects, for what is legal in one jurisdiciton might be illegal in another. As different cultures attempt to work together, different values can emerge on topics such as: fair wages, working hours, child labor, environmental impact, facilitating payments, discrimination in hiring or customer base, etc. Futhermore, companies might make decisions upon where to locate their workforce based upon taxation, labor costs, or regulations.

Being sensitive to cultural differences is a good skill to foster, as attempting to understand the viewpoint of another party can allow for greater collaboration and increased opportunities. Being open to new views and ideas, however, is very different from accepting everything as relative. Many an executive has tried to explain away unethical behavior as "that's just the way they do business there." While this might be a completely true statement, this fact alone does not give a company justification for violating ethical principles. Another common trope is "if we left, another company would come in that is even worse." Choosing the best from among bad options is one thing, whereas it is very hard to support a decision on the grounds of merely being "less unethical".

KEY TAKEAWAYS

- Globalization creates new ethical considerations.
- Cultural plays a role in ethical financial decisions.

EXERCISES

1. Relocating to a key factory to another country will allow a company to reduce labor costs, allowing for greater profits and a lower cost for customers. Discuss the impact on current employees, potential employees in the new country, and other stakeholders.
2. A government official says that company ABC's paperwork will be approved, but that it would probably take six weeks to process. With a $1,000 payment, he can see that it is done by the end of the week. The extra five weeks of productivity is worth at least $10,000 to the bottom line of ABC. What are some of the ethical considerations of this arrangement?
3. Company DEF has a factory located in country GHI. The government of GHI has just declared that one of the byproducts that the factory emits into the local water table is now illegal. The factory requires a $10 million refit to eliminate the byproduct. As an alternative, the factory could be relocated to a neighboring country for $1 million, where the byproduct is not illegal. What are some of the ethical considerations of this situation?

3.5 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVE

1. Explain how decisions have both financial and ethical considerations.

Financial problems often have quantifiable components (such as maximizing return, revenues, or profits, or minimizing expenses or risk) and calculating these accurately is certainly important to the decision making process. Impact upon the "bottom line" is a key consideration, but it is not the only consideration; relying upon one or two numbers to justify a business decision is usually too narrow in scope. Throughout this book, many of our exercises are indeed simplifications, designed to allow a student to focus on one particular aspect of a financial problem. But we encourage students to think beyond the problems as presented and consider how they might appear in a "real world" situation. Discussion with colleagues and instructors can help to illustrate how the techniques we present might be part of a larger management decision with answers that are not as clear cut.

Since ethical considerations pervade everything we do, each following chapter will have a section in "The Bigger Picture" devoted to ethics. While we can in no way be exhaustive in addressing ethical issues, our hope is to, at a minimum, begin the discussion about what is right and just concerning the financial topics we present.

KEY TAKEAWAY

- Even simple decisions can have far reaching ethical implications.

EXERCISE

1. Your friend wants a stick of gum. The pack of gum cost you $1.50, and there are 6 sticks in the pack. How much should you charge your friend? Try to answer this question beyond what is the "textbook" answer!

3.6 End-of-Chapter Exercises

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End-of-Chapter Problems

1. A trolley car is hurtling out-of-control down a track where there are 5 workers ahead. You are standing by a switch that can divert the car onto a side track, where only 1 worker is currently, but that worker is your best friend. If you do nothing, the 5 workers will be killed, and if you throw the switch, your friend will be killed (but the 5 will be spared). There is no time to warn the workers or take any other action. Should you throw the switch or not? Does your answer change if there are 50 workers ahead? 500 workers? Does your answer change if the 1 worker is not just your friend, but is your mother? What kind of ethical system are you using to make these decisions?
2. Justify an answer to the following question using reasoning from each of the four main categories of ethical frameworks: is underage drinking ethical?
3. What does the phrase, "He would sell his own mother!" imply about the character of an individual?
4. Jill has placed an ad to sell her used car. She knows that there is a defect with the engine that needs $300 worth of parts to fix, but is unobservable to an inexpert eye. Jack arrives and says he like to purchase the car for Jill's advertised price. What ethical considerations should Jill have?
5. Buying a new machine will increase the quality of company ABC's product. It will also require less labor, so that one worker will no longer be needed. The savings from the worker's salary will pay for the machine. What are the ethical implications of this decision?
6. Upon a recent inspection, it was found that the foreign factory for company XYZ is employing child labor. Using child labor for this work is legal in the foreign country, but illegal in the home company. Furthermore, when the children (and their parents) are asked if they prefer to do the work, the all agreed that they without the factory, they could not afford good food and new clothes. What are some of the ethical considerations of this discovery?

Chapter 4

Financial Statements and Ratio Analysis

Financial Statements

PLEASE NOTE: This book is currently in draft form; material is not final.

Firms with publicly-traded securities must submit certain financial statements to the Securities Exchange Commission (SEC). Companies must submit a 10-K, which is a summary of the firm's financial performance using specific data following detailed rules. The 10-K includes the balance sheet, the statement of cash flows, and the income statement. Firms also must submit an annual report to their shareholders, which is a slightly different version of the firm's performance, as mangers have a bit more flexibilty in conveying the information. Financial statements are typically constructed by internal employees and then audited by an outside body. A quick review of the construction of financial statements will be helpful before we analyze and interpret these statements.

For those who like to cook, financial statements share some attributes with recipes. A lasagna recipe might list the ingredients and detail the steps involved, but it might not explain how to know exactly when the noodles were done (but not overdone) and how to know when the cheese has melted to perfection, opting instead for "cook for about 35 minutes." In order to better understand what makes a delicious lasagna, we need to know not only the ingredients and steps, but how to interpret the recipe and a basic understanding of cooking in general. In finance, a fundamental analysis of financial statements would be to review them and then perform some type of analysis of them. A fundamental analysis combines economics and accounting. The accounting provides the data on the financial statements; the economics provides the tools to analyze these statements. A successful analysis includes both the quantitative data (the financial statements) and analysis of this data (using, for example, ratio analysis). In this chapter we review the basic financial statements provided to us by the accountants and use economic analysis to analyze these statements.

4.1 Income Statement

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe what an income statement is.
2. Explain how to read an income statement.
3. Describe what factors influence the income statement.

The first financial statement we examine is the income statement. An income statement includes revenues earned, expenses paid, and the bottom line to the investors: net income. The income statement is like a movie: it provides a financial film of a firm over a period of time. It is a moving picture of the firm's financial performance during a given time period, typically a year, but monthly and quarterly financial statements are also prepared. And, while the calendar year ends December 31, companies often pick other dates as their fiscal year end, depending on their industry or selling cycle.

The first line (top line) of an income statement is **revenue**[1] (also called sales revenue or sales). This is the total dollar amount of goods and services sold during the given time period. From this, direct expenses incurred to make the good are deducted as **cost of goods sold (COGS)**[2]. This results in **gross profit**[3], also known as Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). Gross profit is what the company made by making and selling its product. From gross profit we need to pay operating, financial (interest) and tax expenses. **Operating expenses**[4] include selling, general and administrative expenses (SG&A), lease expenses, depreciation and amortization and are the typical cost of doing business. While fixed assets aren't directly "used up" over time, a machine or building will wear out over time and eventually need to be replaced. **Depreciation**[5] and **amortization**[6] are annual charges that reflect the legal portion of costs of the assets allowed to be deducted. Depreciation relates to tangible assets such as machines and amortization relates to intangible assets such as patents.

Once we subtract the operating expenses from gross profit our result is **earnings before interest and taxes (EBIT)**[7]. EBIT shows us the firm's ability to generate cash

1. Income or the amount of money received by a company during a specific period.
2. Direct costs attributable to the production of goods or services including raw materials and labor.
3. The total amount of profit. The difference between revenue and costs before accounting for other items such as interest, depreciation, taxes and amortization.
4. Expenditures that result from normal business operations.
5. A way to allocate the cost of an asset over its useful life.
6. Paying off a debt in regular installments over time.
7. A company's profitability as calculated by revenues minus expenses, excluding tax and interest.

flow. From EBIT we subtract factors from outside the firm's operations such as taxes and interest charges. Subtracting interest leaves **net profit before taxes**[8] also known as Earnings Before Taxes (EBT). Finally we must pay the tax man. After taxes are taken out then **net income**[9] (or **profit**[10]) is left. A pro-forma income statement is shown in Figure 4.1 "Pro-Forma Income Statement".

Figure 4.1 *Pro-Forma Income Statement*

Depreciation and Taxes

Is depreciation a good or bad thing for companies? When equipment or property that will be used over time for operations is purchased, the company is typically not allowed to count the purchase as an expense. If it was allowed, then they EBT would be lower by the cost, and thus taxes due would be lower. Instead, the government makes companies "write down" then machine over time (under the "matching principle" of accounting), which leads to the tax reduction being spread out over time as well. From one point of view, depreciation is nothing more than a legally mandated loan to the government: the tax effect spread out over time instead of taken in the year the fixed asset was purchased!

KEY TAKEAWAYS

- Income statements provide a moving picture of a company's financial position over a period of time.
- An income statement includes revenues earned and expenses paid and the bottom line to the investors: net income.

8. Revenues minus all expenses except taxes.
9. A company's total profit calculated by revenue minus expenses, depreciation, interest and taxes.
10. The financial gain when revenue exceeds costs.

EXERCISES

1. Review the following 10-K statements

   a. Here is a link to Nike’s 10-K.

      http://nike.q4cdn.com/25140a27-0622-47e1-9f85-99892a766984.pdf?noexit=true

      Look at the Income Statement on page 56. Can you identify revenues? Net income?

   b. Here is a link to Starbuck’s 2011 10-K.

      http://investor.starbucks.com/phoenix.zhtml?c=99518&p=irol-SECText&TEXT=aHR0cDovL2lyLmludC53ZXN0bGF3YnVzaW5lc3MuY29tL2RvY3VtZW50L3YxLzAwMDExOTMxMjUtMTEtMzE3MTc1L3htbA%3d%3d

      Look at the Income Statement on page 43. Can you identify Net Income? Sales revenue? Taxes?

2. Using this data below, construct an income statement.

   Last year Sun Skateboards had $200,000 in revenues. The company had $70,000 in COGS and $30,000 is SG&A. It was in the 40% corporate tax rate. They had depreciation expense of $35,000 and interest expense of $20,000.

4.2 The Balance Sheet

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe what a balance sheet is.
2. Explain how to read a balance sheet.
3. Describe what factors influence a balance sheet.

Unlike the financial movie the income statement, a balance sheet is a snapshot of a company's financial position. A balance statement represents a company's finanical position at a specific date in time (the company's year end). During different times of the year the balance sheet may change as sales, assets and receivables change. If a firm does seasonal business such as Toro (lawnmowers and snowblowers), its inventory levels, sales and receivables will all vary dramatically throughout the year.

The balance sheet is divided into two sections: **assets**[11] on the left side and **liabilities**[12] and equity on the right side. The left side lists all assets including cash, accounts receivable and investments. The right side lists the firm's liabilities including accounts payable and debts. The right side also includes **shareholder's equity**[13] which is the value of the firm held by its stockholders and **retained earnings**[14].

Items on the balance sheet are listed in order of **liquidity**[15], or the length of time it takes to convert them to cash. The longest term items are listed last because they are the least liquid. On the right side, stockholders are listed last because they are the least liquid and will be paid in the event of bankruptcy only after all other debts have been satisfied. The values listed on a balance sheet are book values which are based on purchase price. Book values (purchase price) may be very different from market value (current fair market values).

11. A resource with value.
12. A company's debts or legal obligations.
13. The equity stake in a firm held by the firm's investors.
14. Earnings not paid out as dividends but retained by the firm to pay its debt or reinvest in firm.
15. Ease with which an asset can be converted to cash.

Assets

Assets are divided by liquidity into two categories: **current assets**[16] and **fixed assets**[17]. Current assets consist of cash, accounts recievable and inventories. These items can be expected to be coverted to cash in under one year. Inventory includes raw materials, work-in-progress and actual product. Accounts recievable generate when a company sells its product to a customer but it is waiting to receive payment. Fixed assets are both tangible such as buildings, machinery and land and intangible such as patents. Companies also may hold investments in other companies or other securities. These assets are also included on the balance sheet and are listed in order of liquidity. The sum of all of these assets is a company's total asset number.

Liabilities and Equity

The right side of the balance sheet is for liabilities and equity and are also listed in order of liquidity. Liabilities are listed first and are money owed. **Current liabilities**[18] are payments due within one year. Accounts payable are generated when a company makes a purchase for raw materials or advertising but does not pay for it immediately. Listed next are longer term liabilities such as notes payable and accruals. Accruals are wages owed to employees and taxes owed to the government. Notes payable are loans taken out by the company. These may also be longer term and listed under long term debt.

The equity component includes Shareholder's Equity and Retained Earnings. Retained earnings are the cumulative amount of earnings earned by a firm since inception that have not been paid out as dividends. Retained earnings are not cash but rather earnings used to finance corporate activities. Stockholder's equity is stockholder's claim on the firm. The sum of common stock and retained earnings is called 'common equity' or simply equity. Sometimes common equity is also referred to as net worth, a company's assets net of its liabilities. A pro-forma balance sheet is shown in Figure 4.2 "Pro-Forma Balance Sheet".

Figure 4.2 *Pro-Forma Balance Sheet*

16. Items that can be expected to be converted to cash in under one year.
17. Items not expected to be converted to cash in under one year.
18. Liability items that are expected to be converted to cash in under one year.

KEY TAKEAWAYS

- A balance sheet is a snapshot of a company's financial position.
- Balance sheet lists assets on the left side and liabilities and shareholder's equity on the right.

EXERCISES

1. Review the following 10-K statements

    a. Here is a link to Nike's 10-K.

        http://nike.q4cdn.com/25140a27-0622-47e1-9f85-99892a766984.pdf?noexit=true

        Look at the Balance Sheet on page 57. Can you identify current assets? Current liabilities? Shareholder's equity?

    b. Here is a link to Starbuck's 2011 10-K.

        http://investor.starbucks.com/phoenix.zhtml?c=99518&p=irol-SECText&TEXT=aHR0cDovL2lyLmludC53ZXN0bGF3YnVzaW5lc3MuY29tL2RvY3VtZW50L3YxLzAwMDExOTMxMjUtMTEtMzE3MTc1L3htbA%3d%3d#toc232803_21

        Look at the Balance Sheet on page 44. Can you identify total assets? Total liabilities? Shareholder's equity?

2. Last year Sun Skateboards had $80,000 in current assets and $95,000 in current liabilities. It had $40,000 in fixed assets. Determine the amount of shareholder's equity and construct a balance sheet for Sun Skateboards.

4.3 Cash Flow Statement

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe what a statement of cash flows is.
2. Explain how to read a cash flow statement.
3. Describe what factors influence a cash flow statement.

The ability to generate cash is vital to the success of a company. The statement of cash flows is a summary of cash flows over the period of time reported. Cash flows are the difference between what a company brings in and what it pays out. Companies need to generate enough income from operations to fund the future growth of the firm and any future investments in capital or securities and provide a solid investment for investors.

The statement of cash flows includes cash flows from operating, investing and financing cash flows. **Operating cash flows**[19] are cash flows provided from normal business operations. Operating cash flows also accounts for non-cash items such as depreciation and the change in working capital. **Investing cash flows**[20] are cash flows received from investments such as the buying and selling of fixed assets in our own firm or financial investments in other firms. **Financing cash flows**[21] are those received from financing activities. This includes debt such as principal payments on loans, equity or selling investments. This section also includes dividend payments and stock repurchases.

Cash flow from operating activities can be either positive or negative: when a firm earns revenue, cash flows are positive, when it pays expenses, cash flows are negative. Of great importance to investors is the ability of the firm to generate positive cash flow. If not, survival will not be for long. A pro-forma statement of cash flows is shown in Figure 4.3 "Pro-Forma Statement of Cash Flows".

Figure 4.3 *Pro-Forma Statement of Cash Flows*

19. Revenues generated from the operations of a company. Generally defined as revenues less all operating expenses.

20. Cash flows received from investments or other non-day to day activities.

21. Cash flows generated from external activities.

KEY TAKEAWAYS

- Cash flows are vital to the health of a business.
- The statement of cash flows consists of cash from operating, investing and financing activities.

EXERCISES

1. Review the following 10-K statements
   a. Here is a link to Nike's 10-K.

      http://nike.q4cdn.com/25140a27-0622-47e1-9f85-99892a766984.pdf?noexit=true

      Look at the Statement of Cash Flows on page 58. Can you identify the cash from operating activities? From financing activities? From investing activities?

   b. Here is a link to Starbuck's 2011 10-K.

      http://investor.starbucks.com/phoenix.zhtml?c=99518&p=irol -SECText&TEXT=aHR0cDovL2lyLmludC53ZXN0bGF3YnVzaW5lc3MuY29tL2RvY3VtZW50L3YxLzAwMDExOTMxMjUtMTEtMzE3MTc1L3htbA%3d%3d#toc232803_21

      Look at the Statement of Cash Flows on page 45. Can you identify cash from operating activities? Cash from investing activities? Cash from financing activities?
2. Last year, Sun Skateboards had $50,000 in operating cash flow, $45,000 in financing cash flow and $30,000 in investing cash flow. Generate a statement of cash flows for Sun Skateboards.

4.4 Other Statements

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define additional financial statements
2. Understand the importance of these additional financial statements.

Statement of Shareholder Equity

The **statement of shareholder equity**[22] describes the changes to a company's equity section of the balance sheet over a year. This includes any equity account transactions such as retained earnings, common and preferred stock as well as other income. It shows the beginning balance, any additions or deductions and the ending balance of shareholder equity. A pro-forma statement of shareholder equity is shown in Figure 4.4 "Pro-Forma Statement of Shareholder Equity".

Figure 4.4 Pro-Forma Statement of Shareholder Equity

Statement of Retained Earnings

The **statement of retained earnings**[23] reports the change in retained earnings over a year. In essence it is an abbreviated form of the statement of shareholders equity. This statement explains the changes in retained earnings from net income (or loss) and from any dividends over a period of time. A pro-forma statement of retained earnings is shown in Figure 4.5 "Pro-Forma Statement of Retained Earnings".

Figure 4.5 Pro-Forma Statement of Retained Earnings

22. The changes to a company's equity section of the balance sheet over a year.
23. Abbreviated statement that states the changes to retained earnings over a year.

Notes to Financial Statements

Just as the endnotes to a paper or the notes in a margin of a novel may be the most important and thought provoking pieces, the **notes to financial statements**[24] may be the most interesting as well. Financial statements will often include explanatory notes about important parts of the statement. These notes provide more detailed information about the transactions occuring in the statements. Common issues discussed include income taxes, revenue discussion, details about fixed assets, pension plan details, stock options and debt terms. Since the passage of Sarbanes-Oxley the financial statement notes also include information about compliance to the law. Because these items can have an effect on the bottom line of a company these notes are very important to read.

KEY TAKEAWAYS

- Sometimes the most important information is not in the main financial statements. Be sure to look at all of the financial information—especially the notes! Management will explain (or try to explain!) the company's actions in places other than the main financial statements.
- Statement of Shareholder Equity describes any changes to the equity section of a firm's balance sheet over a year.
- Statement of retained earnings reports the change in retained earnings over the year.
- The notes to financial statements are also very important as they contain explanations about certain financial actions taken by the company.

24. Important information describing what occurs in financial statements.

EXERCISE

1. Review the following 10-K statements

    a. Here is a link to Nike's 10-K.

       (http://investors.nikeinc.com/Theme/Nike/files/doc_financials/AnnualReports/2010/docs/NIKE_2010_10-K.pdf) . Can you find the statement of shareholder equity? The statement of retained earnings? Any notes to financial statements?

    b. Here is a link to Starbuck's 2011 10-K.

       http://investing.businessweek.com/research/stocks/financials/drawFiling.asp?docKey=136-000119312511317175-4GD90P5S78QNVSI18877OC4HLR&docFormat=HTM&formType=10-K

       What does the statement of retained earnings say about the company?

    c. Here is a link to McDonald's 10-K.

       http://www.aboutmcdonalds.com/mcd/investors/sec_filings.html

       Can you find any notes to financial statements?

4.5 Ratio Analysis

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Understand how to analyze financial statements.
2. Use the categories of ratios to gain knowledge about the strength of a company.

This Sunday's paper has a big ad for a toolbox. Jim was impressed and wanted to buy one for her father. Inside of it were all kinds of things: screwdrivers, hammers, pliers, etc. Some items looked easy to use (hammer and screwdriver), while some items looked a bit more complicated (this big heavy looking drill). This toolbox had a bunch of incredibly useful stuff in it and Jim knew his dad knew how to use all of it.

Ratio analyses are also tools. They can be very useful, if you know how to properly use them (like Jim's father) or dangerous if you don't (like Jim). Some are easy to understand, others a bit more complicated. Instead of the toolbox from the newspaper ad, in this section we focus on the financial manager's toolkit and the items inside.

Ratio analysis[25] is one of the most important tools for evaluating a company's financial health (and it can be fun too!). It's not just about calculating ratios, it's about interpretation of the ratios and seeing changes, opportunities and threats. Ratios are only as good as the mind (yours) that analyzes them.

Ratios are divided into categories depending on what they analyze. The first category is Liquidity Ratios.

Liquidity Ratios

Liquidity ratios[26] measure the ability of a business to meet its short-term financial obligations. These ratios are associated with a firm's working capital.

25. A quantitative tool used to analyze a company's financial statements.

26. Ratios that measure the ability of a company to meet its short-term financial obligations.

Current Ratio

Our first ratio is called the **current ratio**[27]. This is computed by dividing current assets by current liabilities. The current ratio measures the ability of a company to repay its current liabilities.

$$\text{Current Ratio} = \frac{\text{Total Current Assets}}{\text{Total Current Liabilities}}$$

Quick Ratio (Acid Test)

A second liquidity ratio is the **Quick Ratio**[28] also known as the "acid test". It was given the nickname "acid test" after a method used by gold miners to confirm their nuggets were real gold. Nuggets gold miners discovered were dipped in acid. Most metals will dissolve in acid and fail the test—except the real deal: gold. Financially, the 'acid test' measures the ability of a firm to pay its liabilities with the real deal: cash. The acid test measures if a company can pay its current liabilities without relying on the sale of its inventory. In the acid test, we subtract inventories from current assets and then divide by current liabilities. The acceptance range for the actual value depends on the industry but a quick ratio greater than 1 is usually recommended. The quick ratio is a better measure when a firm's inventory cannot quickly be converted to cash. If a firm has inventory that is liquid, the current ratio is preferred.

$$\text{Quick Ratio} = \frac{\text{Total Current Assets} - \text{Inventories}}{\text{Total Current Liabilities}}$$

Asset Management Ratios

The second category is **asset management ratios**[29] (or activity ratios) which measure how well a firm manages its assets.

First, let's discuss averages. For many of the asset management ratios, we use an average. In some cases average sales, average inventory or average purchases. For these numbers we are looking for an average per day. In each of these situations, to calculate the average per day take the annual number (year end) and divide by 365. Some textbooks use 360 to simplify the math but we use 365 here. For example here's a calculation for average sales:

$$\text{Average Sales} = \frac{\text{Annual Sales}}{365}$$

27. Current assets divided by current liabilties.

28. Current assets less inventories divided by current liabilities.

29. Ratios used to measure the effectiveness of a firm in managing its assets.

That's it! So any time you see an average in the next section remember to divide the annual number by 365.

Inventory Turnover Ratio

The **inventory turnover ratio**[30] tells how many times during a year the firm's inventory is bought and sold. Once again, this ratio is industry specific but a relatively high ratio is preferred. This result is most meaningful when compared to competitors and can be influenced by technology and distribution techniques.

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

Another meaningful measure is **average age of inventory**[31]. This is easily converted from the inventory turnover ratio by dividing the inventory turnover ratio into 365. Note that this is a different calculation than the averages computed above.

$$\text{Average Age of Inventory} = \frac{365}{\text{Inventory Turnover Ratio}}$$

Average Payment Period

The **average payment period**[32] measures how long it takes a company to pay its suppliers. It is calculated by dividing accounts payable by the average purchases per day. If average payment period increases then cash should increase as well. Companies usually pay their biggest suppliers first and some companies will pay faster to take advantage of trade discounts.

$$\text{Average Payment Period} = \frac{\text{Accounts Payable}}{\text{Average Purchases per Day}}$$

Receivables Turnover Ratio

The **receivables turnover ratio**[33] is the other side of the coin. It measures how how effective the company is in collecting money owed to them or how efficient they are in extending credit and collecting debts. It is the total revenue divided by the average receivables. Obviously we would like to get our money and sooner is better than later!

$$\text{Receivables Turnover Ratio} = \frac{\text{Sales}}{\text{Average Receivables}}$$

30. How many times during a year a firm's inventory is bought and sold. Defined as the cost of goods sold divided by the average inventory.

31. Defined as 365 divided by the inventory turnover ratio.

32. Measures how long it takes a company to pay its suppliers. Defined as accounts payable divided by average purchases per day.

33. Measures how effective a company is in collecting money owed to them. Defined as sales divided by accounts recievable.

Total Asset Turnover Ratio

Total asset turnover ratio[34] gives us an idea how effectively a firm uses its assets to generate sales. It is computed by dividing total revenues by total assets for the same time period. If the asset turnover ratio is relatively high, then the firm is efficiently using its assets to generate sales. If it is relatively low, then the firm is not using assets effectively and may want to consider selling some assets if sales do not increase.

$$\text{Total Asset Turnover} = \frac{\text{Sales}}{\text{Total Assets}}$$

Fixed Asset Turnover Ratio

Sometimes we also calculate the turnover on just our fixed assets such as plant and equipment. Because variable costs vary (that's why they are variable costs!) these costs have different impacts on financial statements. **Fixed asset turnover**[35] focuses on our long term assets and is calculated by dividing sales by net fixed assets (remember net means with depreciation taken out).

$$\text{Fixed Asset Turnover} = \frac{\text{Sales}}{\text{Net Fixed Assets}}$$

Debt Management Ratios

Debt management ratios[36] measure how much a firm uses debt as a source of financing. When a company uses debt financing, they use other people's money to finance their business activities. Debt has higher risk but also the potential for higher return. Debt has an impact on a company's financial statements. The more debt a company uses, the greater the financial leverage. Because with debt the stockholders maintain control of the firm, the more debt a company uses, the greater the financial leverage and the greater the returns to stockholders. With the debt ratios we try to measure the indebtness the firm which gives us an idea of the riskiness of the firm as an investment. There are two types of measures of debt usage. The first is the ability of the company to pay back its debts. The second is the degree of the indebtness of the firm. The first measure of the amount of debt a firm has is the debt ratio.

Debt Ratio

The **debt ratio**[37] is the ratio of debts to assets (in actuality total liabilities to total assets). It measures the percentage of funds provided by current liabilities and by long-term debt. Creditors prefer low debt ratios because a low ratio indicates that

34. A measure of how effective a firm is in using its assets to generate sales. Defined as sales divided by total assets.
35. A measure of how effective a firm is in using its fixed assets to generate sales. Defined as sales divided by total assets.
36. Calculate how much a firm uses debt as a source of funding.
37. The ratio of debt to assets. Defined as total liabilities divided by total assets.

the firm has plenty of assets to pay back its debts. In other words, the firm has a financial 'airbag' in case of an accident which will protect against a creditor's losses in the event of bankruptcy. On the other hand, a stockholder may prefer a higher ratio because that indicates the firm is appropriately using leverage which magnifies the stockholder's return. Simply put, the debt ratio is a percent. It is the percent of financing in the form of liabilities and is an indicator of financial leverage.

$$\text{Debt Ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}}$$

Debt-Equity Ratio

A close cousin of the debt ratio and another version of the indebtedness of a firm is the **debt-equity ratio**[38]. The debt-equity ratio presents the information in a slightly different way. It subtracts total liabilities from total assets in the denominator. This calculation is easy to comprehend because it shows us dollars of debt for every dollar of equity.

$$\text{Debt-Equity Ratio} = \frac{\text{Total Liabilities}}{(\text{Total Assets} - \text{Total Liabilities})}$$

Times-Interest-Earned (TIE, or the Ability to Pay Interest or Interest Coverage Ratio)

The first measure of how able a firm is to pay back its debt is the **time-interest-earned**[39] or TIE. TIE measures the extent to which operating income can decline before the firm is unable to meet its annual interest costs. It is determined by dividing earnings before interest and taxes by interest expense. If a company fails to meet their interest payments then they can be sought after by creditors. The higher the number the more able a firm is to pay back its debts. A value of at least 3.0 or preferably closer to 5.0 is preferred. (leave in?) The TIE number give us a percentage which is the percent that EBIT could fall by and the firm would still be able to make its interest payments.

$$\text{Times-Interest-Earned} = \frac{\text{EBIT}}{\text{Interest Expense}}$$

EBITDA Coverage Ratio

Another measure of a firm's ability to pay back debt is **EBITDA coverage ratio**[40]. The EBITDA Coverage ratio improves upon the TIE ratio because it includes lease payments and because more cash is available for debt than just EBIT. This ratio is

38. The ratio of dollars of debt for every dollar of equity. Calculated by total liabilities divided by the difference between total assets and total liabilities.
39. A measure of the firm's ability to pay interest. Is EBIT divided by interest expense.
40. Improves upon TIE by including other variables such as lease payments. It is calculated by the sum of EBITDA and lease payments divided by the sum of interest plus principal payments plus lease payments.

most useful for short-term lenders because over the short-term depreciation funds can be used to pay off debt.

$$\text{EBITDA Coverage Ratio} = \frac{(\text{EBITDA} + \text{Lease Payments})}{(\text{Interest} + \text{Principal Payments} + \text{Lease Pay}}$$

Fixed Payments Coverage Ratio

Another way to measure risk and the firm's ability to pay back its debtors is the **fixed-payments coverage ratio**[41]. This ratio measures the firm's ability to payback all of its fixed-payment obligations such as loans and leases. The higher the value the better as that indicates the more the firm is able to cover its fixed payments. The lower the ratio, the greater the risk to lenders and owners.

$$\text{Fixed Payments Coverage Ratio} = \frac{\text{EB}}{\text{Interest} + \text{Lease Payments} + \{(\text{Princi}}$$

Profitability Ratios

We love to focus on profit, the so called 'bottom line'. Ratio analysis helps us to put our profit number into context. These ratios used together can help give a clear picture of the profitability of a firm.

Profit Margin

Profit margin[42] is the amount of profit left over from each dollar of sales after expenses are paid. The higher the number the better as it indicates that the firm retains more of each sales dollar.

$$\text{Profit Margin} = \frac{\text{Sales} - \text{Cost of Goods Sold}}{\text{Sales}}$$

Operating Profit Margin

Operating profit margin[43] only uses operating expenses to calculate. It does not consider items such as depreciation, interest or taxes. In this case, higher is also better.

$$\text{Operating Profit Margin} = \frac{\text{Operating Profits}}{\text{Sales}}$$

41. Measures the firm's ability to payback all of its fixed-payment obligations such as loans and leases.
42. The amount of profit left over after all expenses are paid. Defined by the difference between sales and cost of goods sold divided by sales.
43. Profit margin using only operating expenses. Defined as operating profits divided by sales.

Net Profit Margin

Net profit margin[44] is the percentage of each sales dollar that remains after all expenses have been deducted. Expenses including interest, taxes and preferred stock dividends. This can sometimes be referred to as net profits after taxes divided by sales. In this situation, higher is also better but what is considered a 'good' profit margin varies greatly across industries.

$$\text{Net Profit Margin} = \frac{\text{Earnings Available for Common Stockholders}}{\text{Sales}}$$

Earnings Per Share

Earnings per share[45] are the amount of earnings generated by each share of stock. It is not necessarily the amount of earnings actually paid out per each share (that's dividends per share). Earnings per share is the dollars earned for each share of stock.

$$\text{Earnings Per Share} = \frac{\text{Earnings Available for Common Stockholders}}{\text{Number of Shares of Common Stock Outstanding}}$$

Basic Earning Power (BEP)

Basic Earning Power[46] shows the raw earning power of the firm before the influence of taxes and leverage. This is helpful to analyze because firms have very different financing and tax situations.

$$\text{Basic Earning Power} = \frac{\text{EBIT}}{\text{Total Assets}}$$

Return on Equity (ROE)

Two of our favorite (and most famous—if a ratio can be famous) ratios are ROE and ROA. Both ratios are return on an outlay. **Return on Equity**[47] is the ratio of net income to total equity. This ratio tells us the return investors are earning on their investment. The higher the ratio better.

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Common Equity}}$$

44. Percentage of each dollar that remains after all expenses have been paid. Calculated by earings available for common stockholders divided by sales.
45. The amount of earnings generated by each share of stock. It is earnings available for common stockholders divided by number of shares of common stock outstanding.
46. The raw earning power of the firm before taxes and leverage. It is EBIT divided by total assets.
47. The return investors are earning on their investment. Defined as net income divided by common equity.

Return on Assets (ROA)

Return on Assets[48] is the ratio of net income to total assets. This measures the managers overall effectiveness in creating profits with the firms' assets. The higher the ratio the better.

$$\text{Return on Assets} = \frac{\text{Net Income}}{\text{Total Assets}}$$

Market Value Ratios (Investment Valuation Ratios)

Market Value Ratios[49] relate a firm's value as measured by stock price to other accounting measures such as earnings and cash flow. These are a way to measure the value of a company's stock relative to another company's stock.

Price/Earnings Ratio

Price / Earnings ratio[50] is used to show how much investors are willing to pay per dollar of profits.

$$\text{Price/Earnings Ratio} = \frac{\text{Price per share of stock}}{\text{Earnings per share of stock}}$$

Price/Cash Flow Ratio

Cash is king as we stated before. A company's stock price is dependent on its ability to generate and manage cash. A useful ratio is **Price / Cash Flow**[51] which analyzes the company's ability to generate cash.

$$\text{Price/Cash Flow Ratio} = \frac{\text{Price Per Share}}{\text{Cash Flow Per Share}}$$

Market Book Ratio

Market book ratio[52] is a measure of investor's evaluation of firm performance. It relates the market value of the firm to the book value of the firm. The market value is the firm's current value while the book value is an accounting measure. First the **book value per share**[53] of stock is calculated.

$$\text{Book Value Per Share of Stock} = \frac{\text{Common Stock Equity}}{\text{Number of Shares of Stock Outstandin}}$$

48. The return managers are earning on assets. Defined by net income divided by total assets.
49. These ratios relate a firm's value (measure by stock price) with other variables.
50. Shows how much investors are willing to pay per dollar of profit. Calculated by dividing the price per share by the earnings per share of stock.
51. Measures the ability of the company to generate cash. Defined as the price per share divided by the cash flow per share.
52. Measures the market value of the firm to the book value. Defined as market value per share of stock divided by the book value per share of stock.
53. Is the commons stock equity divided by the number of shares of stock outstanding.

This is then substituted in to calculate the Market/Book ratio

$$\text{Market Book Ratio} = \frac{\text{Market Value per share of common stock}}{\text{Book Value per share of common stock}}$$

If a firm is expected to earn a high return relative to its risk will most often sell at a higher Market/Book multiple.

KEY TAKEAWAYS

- Ratio analysis helps analyze the financial strength of a company
- The main categories of ratio analysis are liquidity, debt management, asset management, profitability and market value.

EXERCISE

1. Refer back to the Nike 10-K. What is their Quick Ratio? What is Nike's ROE? Debt ratio? Do the same for Starbucks.

4.6 Final Thoughts on Ratio Analysis

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. The DuPont equation combines ROE and ROA.
2. Comments and limitations on ratio .

DuPont Equation

The **DuPont equation**[54] is a handy way to analyze a company's financial position by merging the balance sheet and income statement using measures of profitability. DuPont merges ROA and ROE. ROA is now defined using two other ratios we calculated: net profit margin and total asset turnover. ROA was calculated as net income divided by total assets.

$$\text{Return on Assets} = \frac{\text{Net Income}}{\text{Total Assets}}$$

ROE was calculated as net income divided by earnings available to shareholders (common equity).

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Common Equity}}$$

The DuPont equation defines ROA as follows:

$$\text{ROA} = \text{Net Profit Margin} \times \text{Total Asset Turnover}$$

Remembering that net profit margin is earnings available for shareholders divided by sales and total asset turnover is sales divided by total assets, we can make the following substitutions:

54. Merges ROA and ROE. Breaks it down into profit on a company's sales and return on a company's assets.

$$\text{ROA} = \frac{\text{earnings available for shareholders}}{\text{sales}} \times \frac{\text{sales}}{\text{total assets}}$$

From this we see that sales will cancel out and ROA will become earnings available for shareholders divided by total assets.

$$\text{ROA} = \frac{\text{earnings available for shareholders}}{\text{total assets}}$$

This will give us the same number for ROA that was calculated using the original formula. However, the DuPont equation breaks it down into two components: profit on a company's sales and return to the use of a company's assets.

Trend Analysis, Comparative Ratios and Benchmarking

Just as important as the actual numbers is the numbers value over time. Trends in ratios tell us a lot about a company and can indicat if a company is trending favorably or unfavorably. Just as time series data is important—so is cross-sectional. We may have what we consider a fantastic ratio, but it may be low for our industtry. Ratios are particularly useful to compare to other companies and competitors. Ratios are available for industries and a company can see how it compares to its competitors.

Uses and Limitations of Ratio Analysis

Ratios are only as good as the head who analyzes them. They can be incredibly helpful tools when used properly and create horrible mistakes if misused.

1. A single ratio is generally not enough to judge the overall performance of the firm.
2. Ratios should be used at the same time for each year.
3. Be sure to use audited financial statements.
4. Be aware of different accounting treatments behind the financial data and ratios.

KEY TAKEAWAYS

- Ratio analysis is an important and can be fun tool to use to analyze the financial health of a company. More than just plugging into equations is the actual analysis of a company. Understanding what the ratios tell us and putting them into context is as important as getting the correct number out of the formula.
- The DuPont equation combines ROA and ROE to analyze a company.
- Putting the numbers in context is as important as getting the correct number. Looking at ratios over time and versus competitors gives us insight into the company's financial health.

EXERCISES

1. Calculate the DuPont equation from the following data.
2. Review the company's performance given the following time series and cross-sectional data.

4.7 Worked Problem: CABS Inc.

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. See ratio analysis in work!
2. Calculate and analyze ratios for a fictional company.

CABS Example

CABS Inc. is a fictional company that makes custom invitations and cards. Below are their financials.

Figure 4.6 *CABS, Inc. Balance Sheet*

Figure 4.7 *CABS, Inc. Income Statement*

Figure 4.8 *CABS, Inc. Statement of Cash Flows*

Figure 4.9 *CABS, Inc. Other Data*

In this section we pick some *key ratios* to calculate for CABS. Then we will analyze using data over time and versus competitors.

Liquidity Ratios

The two liquidity ratios are the Current Ratio and the Quick Ratio. Both are important to calculate.

Current Ratio

To calculate the current ratio we take the current assets number from the balance sheet and divide it by the current liabilities number, also from the balance sheet. For CABS the calculation is:

$$\text{Current Ratio} = \frac{\text{Total Current Assets}}{\text{Total Current Liabilities}} = \frac{315.7}{169.5} = 1.86$$

Quick Ratio

To calculate the quick ratio we take three numbers from the balance sheet: current assets, inventories and current liabilities.

$$\text{Quick Ratio} = \frac{\text{Total Current Assets} - \text{Inventories}}{\text{Total Current Liabilities}} = \frac{315.7 - 33.6}{169.5} =$$

Asset Management Ratios

Asset management ratios calculate how efficiently the firm uses its assets. Here we calculate average sales per day, total asset turnover and fixed asset turnover.

Average Sales per Day

Average sales per day takes the sales number from the income statement and divides it by 365.

$$\text{average sales} = \frac{\text{annual sales}}{365} = \frac{1680.0}{365}$$

Total Asset Turnover

Total asset turnover is computed by dividing the sales number from the income statement by the total asset number from the balance sheet.

$$\text{Total Asset Turnover} = \frac{\text{Sales}}{\text{Total Assets}} = \frac{1680.0}{458.2} = 3.66$$

Fixed Asset Turnover

Fixed asset turnover focuses just on the fixed assets (for example a factory). It divides the sales number from the income statement by the net fixed assets (note: net!) from the balance sheet.

$$\text{Fixed Asset Turnover} = \frac{\text{Sales}}{\text{Net Fixed Assets}} = \frac{1680.0}{142.5}$$

Debt Ratios

Debt management ratios measure the indebtness of the firm. The key ratios we analyze here are the debt ratio, debt-equity and TIE.

Debt Ratio

The debt ratio simply divides two numbers from the balance sheet: total liabilities divided by total assets.

$$\text{Debt Ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}} = \frac{242.1}{458.2} = 0.52$$

Debt-Equity Ratio

The debt-equity ratio changes the denominator by subtracting total liabilities. Debt-equity also uses total assets and total liabilities from the balance sheet.

$$\text{Debt-Equity Ratio} = \frac{\text{Total Liabilities}}{(\text{Total Assets} - \text{Total Liabilities})} = \frac{242.1}{458.20 - 24}$$

TIE

TIE measures the ability of a firm to pay back its debt. It uses EBIT and interest expense from the income statement.

$$\text{Times-Interest-Earned} = \frac{\text{EBIT}}{\text{Interest Expense}} = \frac{222.6}{25}$$

Profitability Ratios

Debt management ratios measure the indebtness of the firm. The key ratios we analyze here are the debt ratio, debt-equity and TIE.

Profit Margin

The amount of money left over after all expenses are paid. It uses sales and cost of goods sold from the income statement.

$$\text{Profit Margin} = \frac{\text{Sales} - \text{Cost of Goods Sold}}{\text{Sales}} = \frac{1680.0 - 910.4}{1680.0} = 0.4$$

Operating Profit Margin

Operating profit margin is a better measure of the actual profit from operations because it ignores items such as depreciation. It is operating profits (EBIT) divided by sales. Both numbers come from the income statement.

$$\text{Operating Profit Margin} = \frac{\text{Operating Profits (EBIT)}}{\text{Sales}} = \frac{222.6}{1680.0} = 0.$$

Net Profit Margin

Net profit margin is the percentage of each sales dollar that remains after all expenses have been deducted. It is calculated by dividing earnings (net income) by sales. Both numbers come from the income statement.

$$\text{Net Profit Margin} = \frac{\text{Earnings Available for Common Stockholders}}{\text{Sales}} =$$

Earnings Per Share

Is the amount of earnings generated by each share of stock. It is calculated by dividing earnings by the number of shares of stock.

$$\text{Earnings Per Share} = \frac{\text{Earnings Available for Common Stockholders}}{\text{Number of Shares of Common Stock Outstanding}}$$

Basic Earning Power (BEP)

Basic Earning Power is earning power of the firm before taxes and leverage. It is calculated by dividing EBIT from the income statement by total assets from the balance sheet.

$$\text{Basic Earning Power} = \frac{\text{EBIT}}{\text{Total Assets}} = \frac{222.6}{458.2} = 0.49$$

Return on Equity (ROE)

Return on Equity is the ratio of net income to total equity. It is calculated by dividing net income from the income statement by equity, from the balance sheet.

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Common Stock Equity}} = \frac{118.6}{216.1} = 0.55$$

Return on Assets (ROA)

Return on Assets is the ratio of net income to total assets. This is calculated by diving net income from the income statement by total assets from the balance sheet.

$$\text{Return on Assets} = \frac{\text{Net Income}}{\text{Total Assets}} = \frac{118.6}{458.2} = 0.26$$

Market Value Ratios (Investment Valuation Ratios)

Market Value Ratios are a way to measure the value of a company's stock relative to another company's stock. Here we focus on P/E ratio and market book ratio.

Price/Earnings Ratio

Price / Earnings ratio is used to show how much investors are willing to pay per dollar of profits. It is calculated by dividing the price per share of stock (in the other information section) by the earnings per share (calculated earlier).

$$\text{Price/Earnings Ratio} = \frac{\text{Price per share of stock}}{\text{Earnings per share of stock}} = \frac{149}{19.77} = 7.54$$

Market Book Ratio

Market book ratio is a measure of investor's evaluation of firm performance. First the book value per share of stock is calculated using the common equity number from the balance sheet and dividing it by the number of shares outstanding from the other information.

$$\text{Book Value Per Share of Stock} = \frac{\text{Common Stock Equity}}{\text{Number of Shares of Stock Outstandin}}$$

This is then substituted in to calculate the Market/Book ratio. This equation uses the market price (selling price) per share of stock from the other information section and the book value calculated above.

$$\text{Market Book Ratio} = \frac{\text{Market Value per share of common stock}}{\text{Book Value per share of common stock}} = \frac{149}{36.0}$$

Comparision Information

Below is a table summarizing the numbers we just calculated in the CABS 2011 column. The table also includes CABS data from last year and also the industry average for 2011.

Figure 4.10 *CABS, Inc. Averages*

How do you think CABS is doing financially? How are they doing versus other players in their industry?

KEY TAKEAWAYS

- Ratio analysis is easy and fun! It's just a matter of knowing what number to put where. Practice makes perfect!
- Comparing ratios over time and against competitors is an interesting way to analyze a company. It is as much of an art as it is a science.

EXERCISES

1. Calculate the following ratios from the data for CABS (these were not calculated above):
    a. DuPont equation
    b. Inventory turnover
    c. average age of inventory
    d. average payment period
    e. net profit
2. Review the 10-K for Starbucks again. Compute some ratios for Starbucks. Then find some already computed ratios on yahoo.finance. Did you get the same numbers as an analyst? Why or why not?

4.8 End-of-Chapter Assessment

End-of-Chapter Assessment Head

First paragraph.

Paragraph.

Paragraph.

Last paragraph.

End-of-Chapter Assessment Head

1.
2.
3.
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End-of-Chapter Assessment Head

1.
    a.
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    e.

Chapter 5

Pro Forma Statements

Predicting the Future

PLEASE NOTE: This book is currently in draft form; material is not final.

If we could accurately predict the future, we could easily become wealthy by making many wise investments (and we're not just speaking of winnig lottory numbers). Even imperfect information could guide our decisions and lead to a greater chance of success. As individuals, we constantly try to predict the future (for example: should I buy the phone plan with 500 or 1000 minutes?) and the accuracy of our predictions has financial consequences (paying for minutes we don't use, or running over).

One way companies try to envisage the future is through the use of pro forma statements. 'Pro forma' is Latin 'for the sake of form'. Accurately predicted pro forma statements can help a company plan for the future. How much will sales be next year? Profits? Pro formas (for short) can also be created for distinct scenarios to see which would be more profitable. If created properly, pro forma statements can be a type of financial crystal ball that help a company 'see' the future, although we should always remember that no prediction is likely to be 100% accurate.

5.1 Pro Forma Income Statement

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Analyze a pro forma income Statement and its purpose.
2. Complete a pro forma income Statement.

A **pro forma income statement**[1] is a projected income statement which shows predicted future operating cash flow. A pro forma income statement shows what potential sales revenue, expenses, taxes and depreciation might look like. Pro forma statements typically only forecast operating items on the income statement such as sales and EBIT, and not any items generated by financing or investing flows.

The simplest method used to prepare a pro forma income statement is to use the **percent-of-sales method**[2]. In a nutshell, future sales are forecasted, and then expenses are calculated as a percentage of the new sales figure. Step 1: We create a **common size income statement**[3] where each entry is expressed as a percentage of revenue.

Equation 5.1 Calculating percentage of sales

$$X \text{ as a percent of sales} = \frac{X}{Sales}$$

We should notice that many expenses are related to the level of sales, that is, they have similar entries in each year of the common size statement. For example, raw materials used and labor costs typically increase as sales increase. Step 2: We consider current (observed) sales and determine a forecasted growth rate to arrive at a projected revenue number. Step 3: We consider each line of the income statement and either hold it at current levels (if we don't think it scales with sales) or make the entry a percentage of our projected sales number. In the case of taxes, we use the appropriate tax rate.

1. A projected income statement.
2. Future sales are forecasted, and then expenses are calculated as a percentage of the new sales figure.
3. A income statement with all entries expressed as a percentage of revenues.

Projecting the proper growth rate for sales is key to this analysis and, unfortunately, one of the most difficult things to do accurately. We can attempt to look at historical growth and adjust it using our beliefs about prospects, economic climate, etc. Sometimes companies have employees whose dedicated task is to constantly update sales projections.

To illustrate, Pet Products Forever Inc. has sales of $110, COGS of $51 and SG&A of $26. See Pet Products Forever, Inc. Income Statement.

Figure 5.1 *Pet Products Forever Inc. Income Statement (Thousands)*

What percent of sales are COGS and SG&A?

COGS / Sales = 51 / 110 = .464 or 46.4%

SG&A / Sales = 26 / 110 = .236 or 23.6%

Figure 5.2 *Pet Products Forever Inc. Common Size Income Statement (Thousands)*

If Pet Products Forever Inc.'s sales increase by 10% to $121, then how much will future COGS and SG&A expenses be?

new COGS = 46.4% of $121 = .464 × 121 = $56.1

new SG&A = 23.6% of $121 = .236 × 121 = $28.6

If we assume that depreciation and interest expense don't scale with sales, and our tax rate is 40%, then our pro forma statement might look like this:

Figure 5.3 *Pet Products Forever Inc. Pro Forma Income Statement (Thousands)*

Note that our net earnings have increased by more than the 10% of our sales growth! This is because we assumed that some of our expenses (in this case, depreciation and interest) didn't scale with sales.

Why don't all expenses necessarily scale with sales? One expense we held constant was depreciation: our depreciation is tied to our fixed asset purchases; if we don't need to increase fixed assets to handle the increase of sales, then our depreciation will probably remain steady. If, however, all of our machines are at capacity and we have no more factory space, then sales growth might increase fixed assets, which might in turn increase depreciation! Likewise, if we need to borrow money to purchase those fixed assets, our interest expense might increase! Forecasting involves many such judgment calls, and each assumption we make can influence the bottom line.

KEY TAKEAWAYS

Pro forma statements are a way to look into the future. The pro forma income statement projects future cash flow.

- The pro forma income statement uses current sales to calculate future sales.
- Many expenses are increased using the percent-of-sales method. Some expenses will remain the same.

EXERCISES

1. What is a pro forma income statement and what is its purpose?
2. Prepare a common size income statement given the following information: revenues are $100,000, COGS is $43,000, SG&A is $22,000, depreciation is $10,000, interest owed is $5,000 and the tax rate is 40%.
3. Prepare a pro forma income statement from the data and common size income statement from #2, assuming that sales will grow by 5% and all expenses but interest and taxes will scale with sales.

5.2 Pro Forma Balance Sheet

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Analyze a Pro Forma Balance Sheet and its purpose.
2. Complete a Pro Forma Balance Sheet.

Similar to a pro forma income statement, the **pro forma balance sheet**[4] is a projection of a balance sheet. While the percentage-of-sales method could be used for the balance sheet as well, a more sophisticated and accurate approach would be to analyze each line of the balance sheet. A properly forecasted balance sheet uses best judgement to predict future sales and expenses. For example, our company may need to hold a certain amount of cash to meet basic expenses. Or a company at capacity might need to add assets to continue sales growth. A **common size balance sheet**[5], which shows each balance sheet item as a percentage of total assets, may help guide us in making these decisions. This infomation enables an individually tailored and more accurately forecasted balance sheet.

Pet Product's Forever Inc. has the following balance sheet. They know certain things about their next year which will play a role in determining the pro forma balance sheet.

Figure 5.4 Pet Products Forever Inc. Balance Sheet (Thousands) 2012

Figure 5.5 Pet Products Forever Inc. Common Size Balance Sheet (Thousands) 2012

Pet Products Forever has certain financial goals and knowledge about the upcoming year.

4. A projected balance sheet.

5. A balance sheet with entries expressed as a percentage of total assets.

1. From our pro forma income statement, we expect net earnings of $11 thousand on sales growth of 10%.
2. The company wants to hold at least $20 thousand in cash.
3. The company's debt (long-term and notes payable) will remain the same.
4. No new common stock will be issued (common stock will remain the same). $4 thousand will be paid out in dividends to the shareholders.
5. Accounts receivable should scale with sales.
6. The company has determined that the current level of inventory is too low. They would like to hold $13 thousand in inventory.
7. Accounts payable should scale with sales.

Given this information we construct the following balance sheet.

Figure 5.6 Pet Products Forever Inc. Pro Forma Balance Sheet First Pass (Thousands) 2013

Note that retained earnings has increased by our earnings less our divindends paid ($11 thousand – $4 thousand = $7 thousand). Since accounts receivable and payable both scale with sales, and sales increased by 10%, each of these has increased by 10% as well.

After our first pass, our balance sheet doesn't balance! If our total assets are larger than our total liabilities and equity, we need to raise money somehow, either by increasing financing (that is, borrowing more, reducing dividends, or issuing equity) or reducing assets. Smaller total assets means returning cash to our investors (by reducing debt or increasing dividend payout) or parking the cash on our balance sheet (in cash or other short term investments).

Since after the first pass the total assets are smaller, we can choose to increase cash held to balance the books.

Figure 5.7 Pet Products Forever Inc. Pro Forma Balance Sheet Second Pass (Thousands) 2013

KEY TAKEAWAYS

Pro Forma balance sheets provide a look into a company's future.

- They can be constructed using percentage changes from the previous year.
- It is more accurate to use last year's balance sheet and past information to make realistic assumptions about the next year.

EXERCISES

1. Using the original Pet Products Forever balance sheet from 2012, construct a pro forma balance sheet using the following information:

    a. Sales are projected to grow by 5%, causing net earnings of $10 thousand.
    b. The company wants to hold at least $30 thousand in cash.
    c. The firm's long-term debt will decrease to $10 thousand.
    d. No new common stock will be issued, but $3 thousand in dividends will be paid to shareholders.
    e. Accounts receivable will scale with sales.
    f. The company would like to hold $10 in inventory.
    g. The tax rate will remain the same.
    h. The note payable will remain the same.
    i. Accounts payable will scale with sales.

5.3 Assessment of Pro Forma Statements

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVE

1. Use pro forma statements to analyze a business.

Pro forma statements are to be tools to help a company plan for the future. They are only as good as the assumptions upon which they are constructed.

Our analysis has been straightforward and simple but it can get more complex. Companies can change many of the other variables found on their income statements and balance sheets. Companies determine their dividend policy (which influences retained earnings) and they can influence their level of debt (through their capital structure decisions which influences their interest expense) as well as their common stock.

Now we have constructed our pro forma statements. But how accurate are they? What's the probabilty that our pro forma will correctly depict our company's future? To answer this question, pro formas can be analyzed using scenario analysis, which we cover in more detail in chapter 13. Companies can analyze best, worst, and most likely case scenarios by creating sets of pro formas with different underlying assumptions. This might seem like a lot of work, but spreadsheets can make these calculations fairly easily.

Pet Products Forever estimates that their most likely case is increase in sales of 10%. Their best case would be an increase of 20% and their worst case would be an increase of 2%. Remember that COGS are % of sales and SG&A are % of sales.

Figure 5.8 *Pet Products Forever Inc. Pro Forma Income Statements (Thousands) 2013*

The best case results in net earnings of $13 thousand, while our worst outcome is $9.4 thousand. The company is still doing well, even under the worst case scenario. Not a bad result!

KEY TAKEAWAYS

- Understand the assumptions behind the pro forma statements.
- Analyze the financial statements taking risk into account and look at a best, worst and most likely case scenario.

EXERCISES

1. Why would we be interested in risk with regard to pro forma statements?

   2. Analyze the following pro forma statement using the percent of sales method under best case and worst case scenarios given below.

      Sales are $100,000, COGS is $43,000, SG&A is $22,000. Depreciation is $10,000 and tax rate is 40%.

5.4 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Discuss the role pro forma statements play in financial management.
2. Identify the ethical considerations involved when creating pro forma statements.

Pro forma statements are used to make many business decisions. Should we launch a new product line or open a new factory? Should we add another sales person or a worker in the plant? Pro formas use our best judgements to construct likely scenarios about the future. Accurately and appropriately used and constructed they can be helpful tools to improve our business.

When analyzing pro forma statements, it is important to understand how they were constructed, what the assumptions were and how to read them. Cash flows can be manipulated as well as assumptions. Economic and political conditions can change quickly which can strongly influence business outcomes. As with most predictions—take them with a grain of salt. No one can predict the future with 100% accuracy.

Ethical Considerations

Managers within a company may have different objectives. Someone in sales may want to have a low sales projection so they are guaranteed to 'hit their number' and earn their bonus. A retiring manager may want to maximize their current year compensation or the company's share price to maximize their retirement benefit. When constructing pro forma statements managers may also have different opinions on the likelihood of the outcome of each scenario. While pro forma statements are projections, many business decisions are based upon them. Correct calculation and analysis is important.

KEY TAKEAWAYS

- Pro forma statements assist managers in making many business decisions.
- Ethics play an important role in the correct creation of pro forma statements.

5.5 End-of-Chapter Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

EXERCISES

1. Using data from CABS, create pro forma income statements. CABS expects sales to increase by 5% (worst case), 10% (most likely) or 15% (best case). Using the percent of sales method (and assuming that only COGS and SG&A costs increase), create new balance sheets for the best, worst and most likely cases.

CABS Pro Forma Income Statement

Figure 5.9
CABS Income Statement (Thousands of Dollars)

2. Using the following assumptions, create new pro forma balance sheets for CABS.

    a. The company wants to hold at least $100 in cash.
    b. The firm's long-term debt will decrease to 82.6.
    c. No new common stock will be issued.
    d. Accounts receivable take on average 80 days to collect.
    e. The company would like to hold 25 in inventory.
    f. The tax rate will remain the same.
    g. The note payable will remain the same.
    h. The company typically pays 45 days and accounts payable are projected to be 123.

CABS Pro Forma Balance Sheet

Figure 5.10
CABS Balance Sheet (Thousands of Dollars)

Chapter 6

Time Value of Money: One Cash Flow

A Dollar Today vs. A Dollar Tomorrow

PLEASE NOTE: This book is currently in draft form; material is not final.

Saving for college. Paying a mortgage. Expecting a paycheck. Each of these scenarios contian two very important factors: money and time. All other things being equal, should we prefer to have our cash now or later?

6.1 Present Value and Future Value

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define and explain investments and opportunity cost.
2. Define and explain the concepts of present value and future value.

“Lend me $10 for the pizza tonight, and I’ll give you $15 when I get my paycheck next week. Okay?” This was a common way for Mary to hit up John for some cash. Thankfully, Mary didn’t ask too often, and was always good to her word. But John only had $50 in his wallet, just enough for the new video game that is coming out this weekend....

If John could time-travel (bear with me for a second...), he could loan the money to Mary, travel to next week to collect the $15, travel back to today, and have enough for the video game all while making $5. Of course, then Mary probably wouldn’t be asking to borrow John’s money at all, since she could just go forward in time to collect her paycheck. Since, as of this writing, time-travel is still an impossibility, John instead has to make a choice to commit his limited resources faced with a set of potential outcomes; he must choose which **investment**[1] is more desirable. He could deny Mary, but then he wouldn’t gain the extra $5. But if he lends the money to Mary, he won’t have enough to purchase the video game until Mark pays him back. John therefore faces an **opportunity cost**[2]: the greatest outcome from the set of choices not taken when considering an investment.

Only the Greatest...

John could also use his $50 to purchase a math textbook, new socks, or a gift for his professor. But since he values the video game the most, that is the appropriate measure of the opportunity cost.

1. A choice to commit limited resources faced with a set potential outcomes.

2. The greatest outcome from the set of choices not taken when considering an investment.

Mary has already faced a similar decision and made her choice: she is willing to forego $15 in a week to receive $10 now (presumably to exchange for pizza for her growling stomach). Specifically, she has determined that the **present value (PV)**[3] (the equivalent value of an outcome in today's cash) of $15 at the time of her paycheck is less than $10 (otherwise, she wouldn't be offering those terms).

Figure 6.1 *Comparing Outcomes*

There is no way to directly compare $10 today and $15 in a week, since the $15 is a **future value (FV)**[4]. A future value is a cash flow at any time later than the present, so comparing a PV and an FV would be like comparing apples and oranges. The only proper comparison is to find the present value of each cash flow. Note that the present value of $10 today must be equal to $10, by definition.

We have to make similar choices every day (for example, should I put in an hour of work studying now with the hopes of eventually earning a higher grade on the exam, but foregoing that television program). Technically, we could talk about the present value of an hour of labor in the future in terms of today's hour of labor. For now, we will restrict ourselves to only considering financial investments, where the inputs and the outcomes are all quantifiable in monetary terms.

Which is worth more, a dollar today or a dollar tomorrow? (Feel free to substitute any currency.) Mary is willing to pay $15 dollars in a week for $10 today, so today's dollars must be worth more to her. The reason she is offering the higher future amount is, presumably, because she intends to do something with those dollars in the meantime that is of higher value than paying $5 of interest. Could the reverse ever be true? No! A dollar today could easily be turned into a dollar tomorrow by just holding on to it and not doing anything, so no one would ever accept fewer dollars tomorrow.

3. The equivalent value of an outcome in today's cash.

4. A cash flow at any time later than the present.

Picking Nits

If there was some cost to holding dollars, say because you had so many you had to hire a guard to make sure nobody stole your cash, then it might be possible for a dollar tomorrow to be worth more. But that assumes there is nothing else for you to do with your money better than holding it (even spending it!), and that the cost of the guard is not trivial. For all practical purposes, a dollar today is going to be worth more than a dollar tomorrow.

KEY TAKEAWAYS

- Everyone's resources are limited, so committing to an investment has an opportunity cost equal to the best alternative use of the resources.
- Comparing PVs with FVs tell us nothing. Comparisons can only be made with cash flows evaluated at the same point in time.
- A dollar (or euro, or yen, etc.) today is worth more than a dollar tomorrow.

EXERCISES

1. What is the relationship between present value and future value?
2. What are the opportunity costs of attending college? In general? For your 9am class tomorrow morning?

6.2 Interest

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define the concepts of principal and interest.
2. Describe how an interest rate is derived from a PV and FV.
3. Describe how a market interest rate is determined.

Continuing our discussion of John and Mary: suppose John declines the original deal, and Mary counterproposes, "Could you lend me just $8, then? I'll still pay you the full $15 next week." We now know that $8 is greater than the present value of $15 to Mary. If John were to now accept the proposal, we would further know that the PV of $15 to John is somewhere between $8 and $10, since he accepted $8 but rejected $10. If Mary continued to make proposals to John, she would eventually find the point where John is indifferent between giving the agreed sum now and receiving $15 later. This point of indifference must be the present value to John of $15 in a week. Of course, John could do the same to Mary to find her PV. As long as the PV of $15 in a week for Mary is less than John's PV, they should be able to come to an agreement. Of course, if they're exactly equal, then they could agree, but both would be indifferent to doing the trade.

"Okay, I Guess...."

In everyday conversation, when we speak of being indifferent, that usually means something negative. When we say "indifferent" in economics and finance, we mean it literally: just as happy to do the trade as not. If we got one penny more, we'd always do the trade, and one penny less and we'll say, "No thank you!"

Let's assume Mary's PV is exactly $9. We can now quantify the opportunity cost for Mary as ($15–$9) = $6. Mary is willing to pay $6 future dollars to borrow $9 for a week. In a loan, we call the original borrowed amount ($9) **principal**[5] and the difference between the amount borrowed and the amount repaid (the extra $6) **interest**[6]. If we look at the ratio of the interest to the principal, we get an **interest rate**[7]. In this case, the interest rate for the week is ($6 / $9) = 66.67%.

Mary will, as a borrower, try to get the lowest interest rate she can find; perhaps Martha down the hall will be willing to loan her $9 and only ask for $14 in a week. If so, she will only pay $5 interest, for a weekly interest rate of ($5 / $9) = 55.56%. And John, as the lender, wants to receive the highest interest rate he can for his loan. If there are other potential borrowers, he'll pick the one willing to accept the highest rate (assuming, of course, that his PV of the principal plus interest is greater than the amount borrowed). As we add more potential lenders and borrowers to the mix, the invisible hand takes over and we should find an equilibrium interest rate, or market interest rate, emerge. Note that interest rates are implied by the market, based on the participants' relative valuations of cash at different time periods. We will often, as a shorthand, speak of the interest rate as a given, but it is good to remember that ultimately the interest rate is the derived number.

If the market is large enough, then if Mary wanted to borrow twice as much ($18), she should be able to still apply the same interest rate to her principal to find the interest owed. So if Martha is willing to lend Mary $18 at 55.56%, Mary will owe her: principal + interest = $18 + ($18 × 55.56%) = $18 + $10 = $28, or twice Martha's original agreed FV of $14. Note that if we know the interest rate for the period, *r*, then the relationship between the PV and the FV will be:

Equation 6.1 Interest Rate Matches Time Period

$$\text{principal} + \text{interest} = \text{FV}$$

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

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

Interest, at a fundamental level, represents the costs (especially opportunity costs) of an investment; if the market is competitive, then a competitive interest rate can be obtained from another choice of investment for the resources. Included in these costs are the perceived risks of an investment. For example, Mary has always been a reliable borrower in the past, but if John believes that there is a chance Mary might not pay him back, then he might demand a higher FV for the same PV, effectively raising the interest rate.

5. In a loan, the amount originally borrowed.
6. In a loan, the difference between the amount borrowed and the amount repaid.
7. The ratio of the interest to the principal for a loan. Typically expressed as an APR.

KEY TAKEAWAYS

- principal + interest = FV
- Interest is derived from the difference between PV and FV and is compensation for the costs (including opportunity costs and the cost of perceived risk) of an investment.
- The market interest rate is derived from the relative values of PV and FV by the participants.

EXERCISES

1. If a bank account begins the year with a $50 balance, but ends the year with $55, what is the implied annual interest rate?
2. If interest rates are currently 5% per year, than what is the interest earned on a $200 investment in one year? What is the total FV?
3. If at the end of the year an investment is worth $480, and the implied interest rate is 20% per year, what was the PV of the investment at the beginning of the year?

6.3 Simple Interest

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define simple interest.
2. Calculate simple interest for an investment.

What do you think should happen if Mary wishes to borrow the $9 from Martha for two weeks? Should she assume she'll only have to pay the same $5 of interest? Of course not! It is likely to expect that Martha will desire more interest to compensate her for the opportunity cost of the second week. So it is always important to note for what period an interest rate applies! For example, it's no use using a 2-year interest rate if you need a 1-week rate!

Let's assume that Martha is willing to lend to Mary for the second week for an additional $5; determining interest in each period from outstanding principal only is known as **simple interest**[8]. Two weeks of borrowing means (2 × $5) = $10 of interest owed, for a final payment of (principal + interest) = ($9 + $10) = $19.

Equation 6.2 Simple Interest for 2 Periods

principal + first week's interest + second week's interest = FV

$$PV + (PV \times r) + (PV \times r) = FV$$

$$PV \times (1 + r + r) = FV$$

$$PV \times (1 + 2r) = FV$$

The total interest paid is $10 vs. $9 borrowed, so the implied 2-week interest rate is ($10/$9) = 111.11%. Note that this is precisely twice the 1-week rate of 55.56%. To generalize for more periods, since the interest paid will be the same for each period, we can simply multiply the interest rate by the number of periods, *n*, to get the effective rate for that period.

8. Determining interest in each period from outstanding principal only.

Equation 6.3 Simple Interest for n Periods

$$PV \times (1 + nr) = FV$$

KEY TAKEAWAY

- Simple Interest: $PV \times (1 + nr) = FV$

EXERCISES

1. If $300 is invested at a 4% interest rate, how much simple interest will be earned in 4 years? What is the total FV of the investment?
2. If a loan shark offers to give you $5,000 today in return for $8,000 in three weeks, what is the implied weekly interest rate assuming simple interest?
3. A bank account currently has a balance of $720 dollars. If the initial deposit was made four years ago, and the simple interest rate is 5%, what was the initial deposit?

6.4 Compound Interest

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define compound interest.
2. Calculate compound interest for an investment.

Now what happens if Martha takes the following line of thought: "Mary owes $14 at the end of week 1, so the second week is as if she is borrowing $14 to pay her first week's debt. I should be charging her 55.56% of $14, or $7.78, interest for the second week!"

Where does the extra $2.78 of interest ($7.78–$5) come from? Martha is now assuming that in the second week, additional interest needs to be paid on the first week's interest of $5. Since 55.56% of $5 is $2.78, Mary would owe even more interest for each week she doesn't repay the loan, including interest-on-interest, interest-on-interest-on-interest, etc. This state of affairs, where interest is determined in each period based upon principal and accrued interest is called **compound interest**[9].

Compound interest is much more common than simple interest; unless specifically stated otherwise, it is best to assume interest will be compounded. Compounding also introduces another complexity, the idea of a **compounding period**[10]: how frequently interest-on-interest is determined. In this case, our compounding period is weekly, so we need to use the weekly rate of interest, and charge interest-on-interest appropriately.

Equation 6.4 Compound Interest for 2 Periods

principal + first week's interest + second week's interest + interest-on-interest = FV

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

$$\text{PV} \times (1 + r + r + r^2) = \text{FV}$$

9. Determining interest in each period based upon principal and accrued interest.

10. How frequently interest-on-interest is determined.

$\text{PV} \times (1 + r)^2 = \text{FV}$

Equation 6.5 Compound Interest for 2 Periods (alternative)

amount owed at week 1 + interest on amount owed at week 1 = FV

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

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

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

$\text{PV} \times (1 + r)^2 = \text{FV}$

Considering that the total owed at period n must be $(1 + r)$ times what is owed the prior period gives us the generalized form for compound interest:

Equation 6.6 Compound Interest for n Periods

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

Geometric Growth

Compound Interest for *n* Periods is one of the most important equations in all of finance and, actually, many of the sciences as well. Anything that grows at a constant rate based on the amount the period before (for example, bacteria in a petri dish) can be modeled by this equation.

Now that we have a generalized equation, we can rearrange it to solve for more than just FV. This equation is so important that most financial calculators and spreadsheet programs have dedicated functions that can be used to solve for any of the variables given the other three.

KEY TAKEAWAYS

- $\text{PV} \times (1 + r)^n = \text{FV}$
- Compound interest includes interest-on-interest.

EXERCISE

1. If $300 is invested at a 4% interest rate, how much compound interest will be earned in 4 years? How much more compound interest is earned vs. simple interest (in other words, what was the interest on interest)? What is the total FV of the investment?

6.5 Solving Compound Interest Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Create timelines to solve single cash flow problems.
2. Calculate the FV of a cash flow.
3. Calculate the PV of a cash flow.
4. Calculate the interest rate implied by two cash flows.
5. Use a calculator or spreadsheet to calculate FV, PV, r, or n, given the other 3 inputs.

When solving compound interest problems, the first crucial step is to visualize the problem as a timeline. In creating the timeline, there are two important conventions to follow. First, cash inflows should be represented coming toward the reader (pointing down), whereas cash outflows are away (pointing up). Second, the PV is always earlier in time (to the left) of FV.

Figure 6.2 Basic Timeline

We will demonstrate how to solve these problems by using the equation and by using a financial calculator and spreadsheet software. Please note that, when using a calculator or spreadsheet, cash inflows will be represented using positive values, while outflows will be negative. Also, while the inputs are fairly standardized among brands, please see the appendix to this chapter for differences among the popular calculator and spreadsheet brands.

Solving for FV

Susan deposits $2,000 into a savings account. If the interest rate is 2% compounded annually, what is her expected balance in five years?

Since Susan is giving her money to the bank, that is a cash outflow. In five years, she could potentially withdraw the money, causing an inflow.

Figure 6.3 *FV Example Timeline*

Note that if we solve the problem from the bank's point of view, the only difference is the direction of the cash flows. The numbers will necessarily have to be the same!

Figure 6.4 *FV Example Timeline (Bank's View)*

We can solve this problem without resorting to formulas or technology by reasoning through the balances at the end of each of the years. After the first, her $2,000 will grow by 2%: $2,000 + ($2,000 × 2%) = $2,000 + $40 = $2,040. For year two, the entire balance will grow by another 2%: $2,040 + ($2,040 × 2%) = $2,040 + $40.80 = $2,080.80. And so on until we reach a year five balance of $2,208.16.

Figure 6.5 *Ending balances*

Solving with the formula yields the result faster, but it is very important to conceptualize why the formula works! Using a PV = $2,000, *n* = 5 years, *r* = 2% per year, results in:

$$\$2,000 \times (1 + .02)^5 = \$2,208.16$$

. Note that we must use the decimal representation of the interest rate (.02 instead of 2%) for the formula to work properly.

Sanity Check

Since the difference between simple interest and compound interest are relatively small, we can quickly use simple interest to "sanity check" our work for errors. 2% of $2,000 is $40, so with simple interest we would get $40 per year, or 5 × $40 = $200 total interest. Compounding should yield slightly more than simple interest, which we can verify only adds $8.16 more. Of course, the higher the interest rate or the more periods there are will cause the difference to increase, but it's a useful benchmark to test that we are in the ballpark.

Solving with a financial calculator is fairly straightforward, once you've identified the proper inputs and account for a few minor differences. The first is that cash inflows are represented as positive numbers and outflows as negative numbers. Thus, to represent our problem accurately, the PV should be entered as a negative number (since Susan is depositing the money in the bank, which is a cash outflow. Of course, if we solve this problem from the perspective of the bank, with a positive PV, we will get the same answer for FV, just with the sign flipped!). The other important difference for financial calculators is that they expect the interest rate as a percentage, not decimal. For now, you can ignore the **pmt** key.

<CLR TVM> –2000 <PV> 5 <N> 2 <I> <CPT> <FV>

should show the proper solution of 2,208.16.

Using a spreadsheet function is very similar to a financial calculator. **pmt** will probably be a required input, so for now just enter 0; we'll explain what this is used for in the next chapter.

=FV(rate, nper, pmt, pv)

=FV(2%, 5, 0, –2000)

2,208.16

Also, when determining the inputs for a problem, no matter what method you use, it is a good habit to write the time units for *n* and *r*, as they **must match the compounding period**. Traditionally, interest rates are quoted as an **Annual Percentage Rate (APR)**[11], or the compounding period's interest rate multiplied by the number of periods in a year. Since the compounding period in our sample

11. A rate quote determined by multiplying the compounding period's interest rate by the number of periods in a year.

problem was yearly, we didn't need to take this into account, but most real-world examples tend to have shorter compounding periods (semi-annually, monthly, or daily). Unless specifically stated otherwise, all subsequent interest rates in this book should be assumed to be quoted as APRs.

Equation 6.7 Periodic Interest Rate from APR

APR / # of periods in a year = periodic interest rate

How would our answer change if the interest was compounded monthly? PV would still be $2,000, but *r* would need to be 2% / (12 months per year) = 0.1667% per month, and *n* would need to be (5 years × 12 months per year) = 60 months. Now that *r* and *n* both match the compounding period, we can use our equation: $\$2,000 \times (1 + .001667)^{60} = \$2,210.20$. Compounding more frequently will get Susan about $2 more in interest; this might seem like a small difference, but for higher interest rates or longer duration, more frequent compounding can have a larger impact.

Common Formula Mistakes

Pay attention to the details when using the formula, as there are ample ways to make mistakes. The two biggest are using percentage when decimal is necessary, and not matching the compounding period. Since the numbers we are dealing with for interest rates can be small, a good rule of thumb is to keep four digits (not counting leading zeros!) of the interest rate before rounding. A 2% APR compounded daily has 0.005479% of interest per day. Converting to decimal (another potential source of error—count those decimal places!) gives r = 0.00005479.

Another common source of confusion can come from the labels "present" and "future", since present day does not always line up with PV. Consider the following example:

Five years ago, Susan deposited $2,000 into a savings account. If the interest rate is 2% compounded annually, what is her balance today?

This example is exactly equivalent with the first in this section, despite present day now being the FV! If one were to always assume "present value" must be "present day", the set-up to the problem would go all wrong. Drawing the timeline, however, safely puts the labels where they properly should be. This is why, by the way, we will almost exclusively use the labels PV and FV instead of the full words.

Figure 6.6 *Graph of FV over Time for Different Interest Rates*

Solving for PV

Susan has a $3,312.24 balance in her savings account. If the interest rate has been 2% compounded annually, how much did she deposit five years ago when she opened the account?

Figure 6.7 *PV Example Timeline*

It is very important to note that, even though her current balance is 3,312.24, this is our FV, as we need to solve for the amount earlier on the timeline (which must be the PV). A rephrasing of the same problem would be:

Susan wants to have $3,312.24 balance in her savings account in five years. If the interest rate is 2% compounded annually, how much must she deposit now?

$$\mathrm{PV} \times (1 + .02)^5 = 3,312.24$$

Solving for PV yields the solution of $3,000. Because solving for PV is such a frequent task in finance, it is worthwhile to rearrange the equation.

Equation 6.8 Compound Interest for n Periods (rearranged)

$$\mathrm{PV} \times (1 + r)^{\mathrm{n}} = \mathrm{FV}$$

$$\mathrm{PV} = \frac{\mathrm{FV}}{(1+r)^n}$$

Using a financial calculator:

<CLR TVM> 3312.24 <FV> 5 <N> 2 <I> <CPT> <PV>

should show the proper solution of −3,000.

Spreadsheet:

=PV(rate, nper, pmt, fv)

=PV(2%, 5, 0, 3312.24)

−3,000.00

Figure 6.8 *Graph of PV over Time for Different Interest Rates*

Solving for the Interest Rate

David currently has $100 thousand and would like to double this money, through investing, by his planned retirement in 10 years. At what interest rate must he invest to achieve this goal?

Since David has $100 thousand and wants to double his money, he must want to receive $200 thousand in 10 years.

Figure 6.9 *Rate Example Timeline*

So Many Zeros….

Sometimes in finance we deal with very large sums of cash: thousands, millions, or even billions! Rather than type all of those zeros each time (and possibly leave one off in error), we can still use these formulas just fine by treating all of our cash numbers in their respective units. For example, this problem can still be solved properly with PV=100 and FV=200, since our units are now thousands of dollars. Just remember to be consistent!

$$100,000 \times (1 + r)^{10} = 200,000$$

.Solving for *r* (you'll need to take the 10th root) yields the solution of 0.07177 or 7.177%.

Using a financial calculator:

<CLR TVM> –100,000 <PV> 10 <N> 200,000 <FV> <CPT> <I>

should show the proper solution of 7.177%. Note that one of the cash flows must be negative and one positive, or the calculator will produce an error.

Spreadsheet:

=RATE(nper, pmt, pv, fv)

=RATE(10, 0, –100000, 200000)

0.07177

Growth Rate

Note that we can use this formula to solve for any rate of growth, for example, revenue growth or growth in the dividends of a stock!

Solving for the Number of Periods

David currently has $100 thousand and would like to double this money, through investing, by his retirement. If the best interest rate he can find is 6%, how long will he have to wait to retire?

Figure 6.10 *Number of Periods Example Timeline*

$$100,000 \times (1 + .06)^n = 200,000$$

. Solving for *n* is a little tricky: we'd need to use logarithms. Most professionals will just use a financial calculator or spreadsheet for these types of problems.

Using a financial calculator:

<CLR TVM> -100,000 <PV> 6 <I> 200,000 <FV> <CPT> <N> should show the proper solution of 11.90 years. Again, one of the cash flows must be negative and one positive, or the calculator will produce an error.

Spreadsheet:

=NPER(rate, pmt, pv, fv)

=NPER(6%, 0, -100000, 200000)

11.90

Rule of 72

Finding time-to-double is so common that there is a quick trick to get the approximate answer. Simply divide 72 by the interest rate, and that's your time (in matching periods, of course). So if my business is growing at 9% a month, it will double in about (72 / 9) = 8 months. It also works to find the interest rate given number of periods: if I want my money to double by my retirement in 20 years, then I need a (72 / 20) = 3.6% rate.

KEY TAKEAWAYS

- Always make a timeline. PV is to the left of FV.
- When using a financial calculator or a spreadsheet function, cash inflows are positive and outflows are negative. There must always be at least one of each type if solving for r or n.

EXERCISES

1. If $300 is invested at a 4% APR, how much interest will be earned in 10 years compounded annually? Compounded monthly? Compounded daily?
2. If a loan shark offers to give you $5,000 today in return for $8,000 in three weeks, what is the implied weekly interest rate? What is this rate quoted as an APR?
3. A bank account currently has a balance of $7,400 dollars. If the initial deposit was made four years ago, and the interest rate is 5% compounded annually, what was the initial deposit? If the interest rate is instead a 5% APR compounded monthly, what was the initial deposit?

6.6 Effective Interest Rates

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the difference between an APR and an effective interest rate.
2. Calculate an effective interest rate.

If you are searching for the lowest interest rate for a loan, and one advertisement proclaims a 6% APR while another offers a 5.9% APR, should you always opt for the latter? It turns out to not be so straightforward because of the potential differences in compounding periods. If the 5.9% is compounded daily but the 6% is compounded yearly, you'll have the following:

Figure 6.11 Effect of Daily Compounding

Per dollar of principal, the 6% loan is .08 cents, or .08%, better over a year. Because of more frequent compounding, the realized rate of the second, 5.9% APR loan is actually 6.08%! This is called the **effective interest rate**[12], or the equivalent rate if the loan were to be compounded annually.

The easiest way to find the effective interest rate is to take a PV of $1 and compare to the FV in one year, given the terms of the loan. Subtracting the $1 principal from the loan nets the interest, which also equals the effective interest rate. Of course, if the compounding period is annual to begin with, the APR is the effective interest rate. Typically, however, compounding is more frequent, causing effective interest rates higher than the quoted APR (much to the chagrin of many credit card holders!). Most financial calculators include a function that computes the effective interest rate. For spreadsheet users, the function is:

=EFFECT(APR, # of periods in a year)

=EFFECT(5.9%, 365)

12. The equivalent interest rate of a loan if it were to be compounded annually.

0.0608

Using effective interest rates allows two or more offers to be directly compared without the need for further consideration of the compounding period.

KEY TAKEAWAY

- Comparing rates using APRs could be misleading; calculating the effective interest rate allows for direct comparison.

EXERCISE

1. Your credit card charges a 19% APR compounded daily. What is the effective interest rate?

6.7 End-of-Chapter Assessment

End-of-Chapter Assessment Head

First paragraph.

Paragraph.

Paragraph.

Last paragraph.

End-of-Chapter Assessment Head

1.
2.
3.
4.
5.

End-of-Chapter Assessment Head

1.
    a.
    b.
    c.
    d.
    e.
2.
    a.
    b.
    c.
    d.
    e.
3.
    a.
    b.
    c.
    d.
    e.

Chapter 7

Time Value of Money: Multiple Flows

The Cash Comes In, The Cash Goes Out...

PLEASE NOTE: This book is currently in draft form; material is not final.

Mortgages, student loans, credit cards... sadly, most people's understanding of personal finance extends only so far as "pay what the bill says to pay". How do we know if we're paying the proper amount? And what would the effect be if I paid $5 more than the minimum this month? The basic tools necessary to answer these questions have already been provided in the previous chapter, and now we'll explore how to use them to solve these very common problems.

7.1 Multiple Cash Flows

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Calculate the NPV of an investment.
2. Evaluate investment choices using NPV.

Jamie was up late watching infomercials, and saw that she could purchase the latest wonder product for either $43, or three easy monthly installments (the first payment is immediate) of $15. If she earns 4% APR compounded monthly in her savings account, which option should she pick?

The trick to comparing cash flows usually is to PV them all to the same point in time. When they have been discounted to the same time, then they can be added, subtracted, or compared without worry. Discounting all of the cash flows for an investment to the present, adding inflows and subtracting outflows, is called finding the **net present value (NPV)**[1]. When deciding among investments, we typically wish to choose the one with the highest (or, in some cases, least negative) NPV.

The NPV of paying $43 immediately is obviously–$43. To find the NPV of the installment plan, we should look at the timeline.

Figure 7.1 *NPV Example Timeline*

4% APR compounded monthly gives a monthly interest rate of 0.3333%. (More discussion of example)

Many financial calculators have an NPV solving functionality to handle multiple cash flows. Please check the appendix for differences between the models, but the standard process is:

1. Discounting all of the cash flows for an investment to the present, adding inflows and subtracting outflows.

- Step 1: Enter Cash Flow worksheet.
- Step 1a: If entering new data (as opposed to editing what is already entered), clear the worksheet.
- Step 2: Enter CF0 (Net cash flows at time 0).
- Step 3a: Advance worksheet to enter C01 (Cash flow at time 1).
- Step 3b: Advance worksheet to enter F01 (The number of times C01 repeats).
- Repeat steps 3a and 3b until all are entered.
- Step 4: Press NPV and enter periodic interest rate.
- Step 5: Compute NPV.

In our example problem, the initial cash flow (CF0) is −$15. Both of the next two cash flows are −$15, so we can either enter them separately (C01: −15; F01: 1; C02: −15; F02: 1) or tell the calculator to repeat the entry (C01: −15; F01: 2). Both methods will give the proper answer. Here are the precise keystrokes for the latter method:

<CF> <2ND> <CLR WORK> −15 <ENTER> <DOWN ARROW> −15 <ENTER> <DOWN ARROW> 2 <ENTER> <NPV> 0.3333 <ENTER> <DOWN ARROW> <CPT>

Remember that interest rate should be entered as a percentage (0.3333 in this case, not 0.003333).

The corresponding spreadsheet function is:

=NPV(periodic rate, cash flows from period 1 to *n*) + net of initial cash flows

Note that the spreadsheet function expects cash flows to start in the first period: any initial cash flows need to be netted and added to the result. Like the financial calculator, positive values should be used for cash inflows, and negative values for outflows.

Figure 7.2 *NPV in a Spreadsheet*

KEY TAKEAWAYS

- The net present value (NPV) of an investment can be found by summing the PVs of all of its cash flows.
- Comparing investments is most easily done by comparing their NPVs: the higher the NPV, the better the investment.

EXERCISES

1. An investment costs $1,000 today, but will produce cash flows of $400 in year 1, $500 in year 2, and $600 in year 3. If interest rates are 10%, what is the NPV of this investment?
2. Investment A costs $2,000 today, with cash inflows of $400, $400, $400, and $1,200 in years 1–4 respectively. Investment B costs $1,000 today and will have one cash inflow of $1,100 in 1 year. If interest rates are 8%, what are the NPVs of the investments? At this interest rate, which is the better investment? If interest rates are 5%, what are the NPVs? At this rate, which is the better investment?

7.2 Perpetuities

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define a perpetuity.
2. Calculate the PV of a perpetuity.
3. Explain how the PV of a perpetuity is derived.

As discussed in the previous section, finding the NPV for a fixed set of cash flows will always work. But what if the cash flows were to continue forever? If the payments are constant over time, we can intuit what the value must be for the entire set, instead of figuring out each one separately: if I put $200 into a bank account that promises me 5% per year, and I just withdraw the interest each year without ever touching the principal, how much will I get each year? The first year, the interst will be 5% of $200, or $10. Since I withdraw the interest, my second year balance is also $200, so my interest is again $10. In fact, I (or my heirs) can withdraw $10 a year *forever* as long as I keep the original $200 in the bank.

Figure 7.3 *Perpetuity Timeline*

Note that this is essentially the same as the bank offering the following: pay $200 today, and the bank will pay the customer $10/year. Therefore, at 5% interest, $10/year forever must be the equivalent of exactly $200 today! This arrangement, with constant periodic payments lasting forever, is called a **perpetuity**[2]. The periodic payment must be the interest rate times the present value, since it is analogous to our bank deposit example above.

Equation 7.1 Perpetuity Equation

PV × interest rate = payment

PV × r = PMT

2. Constant periodic payments lasting forever.

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

Note that the interest rate and the payment must be quoted in the same period; if the payments are monthly, than the monthly rate should be used. Also, the first payment is assumed to be at the end of the year; if the first payment was immediate, then the value would be higher by exactly the amount of one payment.

The fact that a stream of payments lasting forever has a specific finite value today is a surprising result for some people. The key is to realize that, because of the time value of money, each successive payment contributes a smaller and smaller amount to the PV.

Figure 7.4 *Contribution of Payments over Time to Value of Perpetuity*

Returning to the bank deposit example: if I don't withdraw the full 5% of the $200, instead only withdrawing 4% (that is, 1% less), then I won't receive as much money this year ($8 vs. $10), but my principal balance will grow by 1% to $202. If I continue to withdraw only 4%, my second year's withdraw will be $202 × 4% = $8.08, which happens to be exactly 1% higher than my first year's withdrawal. Withdrawing 1% less causes both my principal to grow by 1% at the end of the year, and my following year's payment to grow by the same 1%.

Figure 7.5 *Perpetuity with Growth Timeline*

If I consistently withdraw less than the interest rate (the difference, interest rate minus withdrawal rate, being the growth rate, *g*), I can model the relationship using the following modified perpetuity equation:

Equation 7.2 Perpetuity with Constant Growth

PV now × withdrawal rate = payment at end of year

PV now × (interest rate – growth rate) = payment at end of year

$$PV_n \times (r - g) = PMT_{n+1}$$

$$PV_n = \frac{PMT_{n+1}}{(r-g)} \quad \left\{ \text{for } g < r \right\}$$

Note that we are assuming that *some* money is withdrawn in each year, meaning that g must be less than r. And, when g equals zero, this equation reduces to our earlier equation.

What Do These Subscripts Mean?

Since our payments are changing over time, we use subscripts (the little "n" and "n+1" in the above equation) to differentiate one payment from another. Almost always, subscripts will denote time periods for us, such that today is 0, one time period in the future is 1, and so on. Unless we specifically say otherwise, the default time period will be years, so PMT_0 is the payment we just received today, and PMT_1 is what we expect to receive in exactly one year. If we want to be more generic and describe any given year, than PMT_n is year "n" and PMT_{n+1} is the year immediately following year "n".

Since we know that our growth rate, g, is constant, given any payment we can find the following year's payment by increasing it by g.

Equation 7.3 Payment Growth

payment at end of year = payment now + (g × payment now)

$$PMT_{n+1} = PMT_n + (g \times PMT_n) = PMT_n(1 + g)$$

$$PV_n = \frac{PMT_{n+1}}{(r-g)} = \frac{PMT_n\,(1+g)}{(r-g)} \left\{\text{for } g < r\right\}$$

Here PMT_n is the payment just paid, so technically its value isn't included in the PV; we are only including it since we can use it to find the payment due next year.

KEY TAKEAWAYS

- A perpetuity is a constant stream of payments lasting forever, but a finite PV can be calculated.
- The perpetuity equation can be extended to account for cases where the payment grows over time, provided that the rate of growth is less than the interest rate.

EXERCISES

1. What is the present value of $50 per year forever, if the current interest rate is 10%? What if only the first payment in a year's time is $50, but then the payments grow at 2% per year?
2. I buy a perpetuity from a bank today for $200. In five years, after collecting each year's payment, I then offer to sell the perpetuity back to the bank. If interest rates haven't changed, what should the perpetuity be worth at that time? If interest rates have risen, should the value of the perpetuity rise or fall?

7.3 Annuities

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. For an annuity, calculate the fifth variable given four of: PV, FV, rate, PMT, and *n*.
2. Calculate the PV of an annuity due.

Since, in practice, very few financial arrangements include "forever" as a reasonable timeframe, we should consider the value of cash flows over shorter periods. Any set of constant periodic payments lasting for a fixed amount of time is called an **annuity**[3]. Paying down a credit card, mortgages, lottery payouts, and more can all be modeled as annuities. All annuities can be valued using the "long way", by calculating the NPV of the cash flows, but we can also value them using mathematical intuition.

Figure 7.6 *Annuity Timeline (General)*

Figure 7.7 *Annuity Example Timeline*

If we want to figure out the value of $10/year for 15 years, and the current interest rate is 5%, then we can use our perpetuity formula to determine the value of the annuity in the following way:

1. Determine the value of an equivalent perpetuity (in this case, $10/year at 5% gives a PV for the perpetuity of $200).
2. Determine the PV of the value of the perpetuity at the end of the annuity period (in this case, the PV of $200 in 15 years is $96.20).
3. Subtract #2 from #1 to get the value of the annuity ($200–$96.20 = $103.80).

3. Constant periodic payments over a fixed amount of time.

Equation 7.4 PV of an Annuity

PV of annuity = PV of equivalent perpetuity – PV of perpetuity at end of annuity

$$\text{PV} = \frac{PMT}{r} - \frac{\frac{PMT}{r}}{(1+r)^n}$$

$$\text{PV} = \frac{PMT}{r} \times \left(1 - \frac{1}{(1+r)^n}\right)$$

Sometimes an annuity will also include an additional one-time cash flow at the conclusion of the annuity. In this case, it is a simple matter of adding the PV of this cash flow to your calculated value to get the total value of the annuity. Continuing our example, if the annuity delivered $100 at its conclusion, then the PV would increase by the PV of $100 in 15 years at 5%, or $48.10, making the total value $103.80 + $48.10 = $151.90.

Watch the Direction of Cash Flows

As we get more complex with or calculations, it becomes all the more important to keep track of whether our cash flows are inflows or outflows. For example, if a one-time payment in this example were instead a cash outflow, then our value would drop by $48.10 to a total value of $55.70.

Financial calculators and spreadsheets can also easily solve annuities. On the calculator, the PMT key accepts the input for the periodic payment, and any four inputs can be used to calculate the fifth.

Using a financial calculator:

<CLR TVM> 15 <N> 5 <I> 10 <PMT> 100 <FV> <CPT> <PV> should show the proper solution of −151.90.

Spreadsheet:

=PV(rate, nper, pmt, fv)

=PV(5%, 15, 10, 100)

−151.90

Also, PMT can be solved for given the other four inputs. =PMT(rate, nper, pv, fv) is the corresponding spreadsheet function. It is critical that we always input our rate, number of periods, and payment based upon the same time period. For example, if payments are monthly, then rate should be a monthly rate, and number of periods will be the number of months.

Why Is the Result Negative?

Calculators and spreadsheets always assume that a financial transaction is occurring, so they figure out the "fair value" based on the inputs. Since the NPV of the annuity's inflows is $151.90, the calculated answer is that you should be willing to pay $151.90 (an outflow) to receive the scheduled payments in a completely "fair value" transaction.

With most annuities, each payment is assumed to occur at the end of each period. When payment in each period occurs at the beginning instead of the end, the annuity is called an **annuity due**[4].

Figure 7.8 *Annuity Due Timeline*

While technically each payment is occurring at the beginning of its period instead of the end, in effect, the only change is that the very last payment has been moved to the very beginning! Thus, the value of an annuity due is higher by the difference between the PV of a payment at the end and the PV of a payment now (which, by definition, is equal to the total payment).

Equation 7.5 PV of an Annuity Due

PV of annuity due = PV of annuity + (payment – PV of payment at end)

$$PV_{due} = PV_{ordinary} + (\mathrm{PMT} - \frac{PMT}{(1+r)^n})$$

If our example were an annuity due, its value would increase by $10 minus the PV of $10 in 15 years at 5%, or ($10 – $4.81) = $5.19.

4. An annuity with payments due at the beginning of each period instead of at the end.

Financial calculators can be set to solve for annuity due (see appendix). Most spreadsheet functions can be set to automatically calculate an annuity due by taking a fifth argument, “type”. When type is omitted, it is assumed to be calculating an ordinary annuity, but by using an input of “1” instead, an annuity due is calculated:

=PV(rate, nper, pmt, fv, type)

=PV(5%, 15, 10, 100, 1)

−157.09

KEY TAKEAWAYS

- Annuities are a fixed stream of payments over a finite time. Given four of PV, FV, rate, PMT, and *n*, the fifth variable can be solved for.
- Rate, PMT, and *n* should all be in the same time units!
- An annuity due is a type of annuity where the payments are due at the beginning of the period.

EXERCISE

1. Jill purchases an annuity that pays $1,000 per month for the next 300 months, with no value at the end of the 300 months (FV=0). If interest rates are 12% APR, what is the fair PV of this annuity? What would it be worth if it were an annuity due?

7.4 Loan Amortization

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain loan amortization.
2. Create an amortization schedule.

Fred owes $1,500 on his credit card! When his monthly bill arrives, Fred is relieved to see that the minimum payment is only $30. If the advertised rate is 20% APR (assume monthly compounding), how many months will it take Fred to pay off his debt?

If Fred makes his payments every month, the debt will finally be fully paid after 109 months, or over 9 years! We can verify this quickly using a financial calculator or spreadsheet.

=NPER(20%/12,30,–1500)

=108.4

During this time, the total amount of money paid by Fred will be about 109 * $30 = $3,270, or over twice the original amount owed. This means that Fred paid more in interest ($3,270–$1,500 = $1,770 in interest) than he originally borrowed ($1,500). On the plus side, Fred was able to slowly pay down the balance owed, so that he never had to pay more than $30 in any month, but the total principal was paid by the end of the loan. This process of spreading out principal payments of a loan over time is called **amortization**[5] (from the Latin root "mort-", meaning death, as the loan balance slowly "dies" as the principal is paid down). Mortgages are a common example of this type of loan (also coming from the same Latin root), as the principal is paid down over 15, 30 or more years. A loan that pays only the interest payments, with no principal payments, is called an interest only loan. If the periodic payments are so low they don't even cover the interest on the initial principal, then the loan will be a negative amortization loan, and the extra interest will be added to the principal due over time.

5. The process of spreading out the principal payments of a loan over time.

Figure 7.9 *Amortization Schedule for Credit Card Payments*

As each month passes, the outstanding principal balance decreases, so the interest due also decreases. Thus, over time, the amount paid toward principal grows from a small portion of the monthly payment to a larger portion. This is particularly important when evaluating mortgages, as often the interest portion is tax deductible, but the principal portion is not. If we were to continue the chart for the full 109 months, we would see that the last month would only require a partial payment (that is, less than $30) to pay off the remaining principal.

Figure 7.10 *Principal and Interest Portion of Payments Over Time*

Of course, not all loans have constant payment schedules. Some loans have “teaser” periods, with low interest rates for a certain period of time. These might seem like fantastic deals, until we realize that the loan is actually negatively amortizing over the period, causing higher rates (or a longer payoff time) once the period is over.

KEY TAKEAWAYS

- Payments can be broken into principal and interest components.
- As principal is paid down, interest decreases. Future payments will, over time, accelerate in their rate of paying down principal.
- Negative amortization can actually increase principal balances over time.

EXERCISES

1. If Fred could afford to pay $5 more than the minimum payment, how many months would it take to pay off the balance?
2. A 30 year fixed rate mortgage has monthly payments (and no payment due at the end). If the interest rate is 6% APR and the amount borrowed is $200,000, what is the monthly payment due? Create an amortization schedule for this mortgage.

7.5 End-of-Chapter Assessment

End-of-Chapter Assessment Head

First paragraph.

Paragraph.

Paragraph.

Last paragraph.

End-of-Chapter Assessment Head

1.
2.
3.
4.
5.

End-of-Chapter Assessment Head

1.
    a.
    b.
    c.
    d.
    e.
2.
    a.
    b.
    c.
    d.
    e.
3.
    a.
    b.
    c.
    d.
    e.

Chapter 8

Securities Markets

"To market, to market…"

PLEASE NOTE: This book is currently in draft form; material is not final.

One of the most difficult ideas to define is the concept of a market. Some physical places are called "markets", and there we expect to see individuals negotiating and exchanging with each other. In the modern age, some markets have become electronic, moving to the internet and other "virtual" systems. But we can also speak of the market for a product or marketing an idea, which implies that a market goes beyond a physical or virtual space. A market can be formed by the beliefs of individuals, and some of these "information markets" can be more accurate in making predicitions than any of the participating individuals! Two defining characteristics of a market are connections between individuals (or companies) and exchange of some sort (usually including information, but often of products or currency).

Modern social networks, like Facebook, are a prime example of the power in making connections. As more and more people are involved, the benefit of the network grows at an even faster rate. Likewise, the more products a supermarket has, the easier it is for shoppers to compare offerings and to make buying decisions. And the more shoppers a store can attract, the greater economies of scale can be realized, to the benefit of the store and the shoppers.

Financial markets (like the New York Stock Exchange) and institutions (like banks) also make use of these network effects and economies of scale, but with capital and information instead of groceries or wall posts. Financial institutions are the major participants in these exchanges, and help to facilitate individuals' and companies' access to markets.

8.1 Financial Environment: Institutions and Markets

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe the difference between a commercial bank and an investment bank.
2. Explain why commercial banks and investment banks have been merging into "megabanks".
3. Describe markets, especially with regards to physical vs. electronic presence.

Institutions

The most visible of financial institutions to the majority of people are **commercial banks**[1] that provide checking and savings accounts for depositors and loans for borrowers. Banks can also provide services, such as currency exchange. Successful commercial banks traditionally inspire feelings of security (with thoughts of large vaults) and trust. The overly simplistic view of a bank is that depositors place their money at the bank and it sits there until it is withdrawn. A slightly more accurate view is that the bank takes these deposits and lends most of the money out to borrowers, who promise to pay the money back with interest. When the borrowers pay back the loans, the interest returned is shared by the depositors and the owners of the bank. In reality, there are many ways a bank can take deposits and even more ways to invest the funds.

In contrast, **investment banks**[2] provide services geared to corporations and market operations. Investment banks have employees who specialize in evaluating, issuing and trading securities, conducting mergers and acquisitions, and raising capital for companies. From 1933 to 1999, the Glass-Steagall Act mandated a separation of the commercial and investment activities in the USA, under the premise that commercial deposits should be protected from the riskier investment activities.

In recent years, many commercial banks in the US have been merging with each other to form large chains, as customers demand greater flexibility and banks can

1. A bank that provides checking and savings accounts for depositors and loans for borrowers.
2. A bank that provides services geared to corporations and market operations.

make use of economies of scale. Additionally, mergers and acquisitions between commercial banks and investment banks have proliferated since the 1999 repeal of the Glass-Steagall provisions. Since the latest financial crisis, however, there has been some who suggest that this division be restored, as the new “megabanks” are so large and involved in the economy that they are **“too big to fail”**[3]. As used by most commentators, this means that governments are pressured into supporting these companies when they are in distress, as the alternative of letting the company become insolvent is perceived to be even worse.

Markets

Markets exist for trading any product, financial or otherwise. One of the most famous of financial markets is the New York Stock Exchange (operated by NYSE Euronext). Here, various securities, particiularly shares of ownership in corporations, are traded. Through most of its history, these transactions involved representatives of institutions negotiating prices with each other face-to-face. In recent years, however, electronic systems have dominated the transaction volume. As technology and communications have improved, more transactions are occuring in non-traditional marketplaces, some specifically designed to mask the identities of the buyers and sellers, or to allow for transactions of large volume. The NASDAQ is an electronic market that has no physical location, but is an alternative exchange that many companies (especially technology companies) have chosen.

Markets used to be segmented by product (such as pork bellies vs. shares of IBM) and location (Tokyo vs. New York), but these barriers are rapidly falling away. Virtually every product is trading somewhere in the world at any point in a 24 hour day, and technology is allowing for linkages among the various markets. As a consequence, markets are broadening the variety of products with which they deal, and mergers among the exchanges are becoming more commonplace. Many “markets” have no physical location or formal recognition, as they are decentralized; for example, most corporate bonds are traded amongst representatives at the various financial institutions. These are called **over-the-counter (OTC) markets**[4]. We will discuss the various types of securities and financial products and where they are traded later in this chapter.

3. A label that means governments are pressured into supporting a company when it is in distress, as the alternative of letting the company become insolvent is perceived to be even worse.

4. Decentralized market with no physical location or formal recognition.

KEY TAKEAWAYS

- Commercial banks focus on retail customers and small businesses; investment banks focus on capital markets for larger businesses.
- Since 1999, many commercial banks and investment banks have been merging after the elimination of government restrictions on the practice
- Many markets still have a physical presence, but the bulk of volume is now electronic.

EXERCISES

1. When a company is in distress, a government can choose to let it fail or attempt to rescue it (often termed a "bailout" by those against the move). When might it be in the best interest of the populace to "bail out" a company? If "bailouts" are common, would companies be more or less likely to engage in risky business activities?

8.2 Regulation of Financial Institutions

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVE

1. Describe the main regulatory acts for US markets and institutions.

Financial institutions face different regulations depending upon where they operate. Some countries, particularly those with communist ties, heavily control banks and who can invest and how. As the largest markets and most of the largest banks (as of this writing) are located in the USA, we will focus on the key regulations governing these bodies.

The **Glass-Steagall Act of 1933**[5], in addition to separating investment from commercial banks, also established the Federal Deposit Insurance Corporation (FDIC), which insures deposits made by consumers at commercial banks. On the one hand, banks so insured benefit from the added perceived security, since depositors are confident that their money is secured by the government. This gives the FDIC, and thus the government, the ability to monitor insured banks and close those deemed unsound.

The **Securities Act of 1933**[6] and **Securities Exchange Act of 1934**[7] created regulations governing the sale of securities (such as what can be promised and who can advise) and established the **Securities and Exchange Commission (SEC)**[8] to enforce securities laws.

The **Dodd-Frank Wall Street Reform and Consumer Protection Act**[9] passed into law in July 2010 and gave the task to many government oversight agencies (FDIC, SEC, etc.) to enact more regulations. Certain provisions of Dodd-Frank are still being worked out legislatively (especially regarding the “Volker rule”, which regulates risky speculative trading by commercial banks). As the fallout from the latest crisis continues to be felt and understood, the nature of government regulation is bound to change.

5. Imposed banking reforms on relationships between investment and commercial banks and established the FDIC.

6. Limited affiliations between commercial and investment banks.

7. Further regulated financial markets and established the SEC.

8. Federal agency responsible for regulating securities and enforcing federal securities laws.

9. Changed American financial regulatory environment by improving accountability and transparency.

KEY TAKEAWAY

- Regulation is constantly changing, and a financial manager should monitor regulations that affect his or her business.

EXERCISE

1. On the whole, do you think that regulations are beneficial or a hindrance to financial institutions?

8.3 Modern History of Financial Crises

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe recurrent themes of financial crises.
2. Enumerate recent financial crises.
3. Describe how financial crises can relate to the business cycle.

Financial crises are not new phenomena, existing at least since coins have been used for currency; very early crises tended to focus on the debasement of hard currency (that is, whether the metal in the coins had the value the coin declared) or on a government's **solvency**[10], or ability to successfully repay debt (and, thus, were often tied to political crises). Most modern crises are similar in that they involve an uncetainty in the valuation of some sort of asset, and many also include a decline in confidence of governments or banks and other financial institutions.

The most significant financial crisis of the 20th century was the Great Depression, which is typically dated as lasting from the stock market crash in 1929 through the next decade into the beginning of World War II. During the depression, many banks failed, particularly when investors would have doubts about a banks solvency, choosing to withdraw all deposited funds in a **run on the bank**[11].

The last thirty years in the United States have witnessed the stock market crash of 1987, the savings and loan crisis, the liquidation of Long Term Capital Management in 1998, the bursting of the internet bubble in 2000–2001, and the housing bubble/financial crisis. Other countries have had their fair share of crises as well (for example, the Asian currency crisis), though as the economy has become more global in nature, as have the crises. For example, the latest crisis (by some metrics, the worst since the Great Depression) has had serious implications on the stability of the European Union and questions of solvency regarding Greece, Ireland, Portugal, Spain, among other nations.

10. The ability of an entity to successfully repay debt.
11. When investors have doubts about a banks solvency, choosing to withdraw all deposited funds.

Financial crises are often tied with the concept of the **business cycle**[12], the periodic rise and fall of nations' gross domestic product observed over years. The direction of causality is a hotly debated topic (that is, whether financial crises tend to be caused by or are the cause of a lagging economy). **Asset bubbles**[13], where a type of asset (like real estate, technology stocks, or tulips) rises dramatically in valuation seemingly well beyond its intrinsic value, are often a component in these boom/bust patterns; the dramatic increase in the asset's value leading up to the "bubble bursting" makes the decline in value have a larger impact on the balance sheet of the asset owners. Despite having a seemingly regular periodic occurrence, the effective predictability of the specific cause a financial crisis is also a debated topic.See the work of Nassim Nicholas Taleb regarding "black swans".

KEY TAKEAWAYS

- Financial crises usually boil down to issues of trust: either trust in the value of an asset, or of an entity like a government or bank.
- Financial crises often correlate with the down-swing of a business cycle, though it isn't always clear which caused the other.

EXERCISE

1. What are some factors that have contributed to past financial crises?

12. The periodic rise and fall of nations' gross domestic product observed over years.

13. A type of asset (like real estate, technology stocks, or tulips) rises dramatically in valuation seemingly well beyond its intrinsic value.

8.4 Types of Financial and Other Traded Assets

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe commonly traded assets.
2. Explain the concepts of liquidity and fungibility.

Almost anything we can imagine is traded somewhere (although not always legally!), and one aim of markets is to increase the **liquidity of assets**[14], or their ease at arranging a trade between a buyer and a seller. Certain assets are easier to trade or value than others, due to government regulation, ease of transfer or storage, **fungibility**[15] of assets (the ability to substitue one instance of the asset for another), or a myriad of other factors. We will now discuss the most common types of traded assets.

Commodities[16] include agriculture products (like wheat, corn, pork bellies, or coffee), metals (like gold, silver, or iron), energy products (like oil or electricity), or a host of other highly fungible physical products. Some of the earliest exchanges focused on commodities, as farmers and other producers of goods sought corresponding buyers.

Currency trading has become more significant since the largest economies removed tying their currencies directly to the value of precious metals. Given the high level of liquidity in most currencies (government regulated currencies being the chief exception), these markets are very competitive and active 24 hours a day.

Real estate[17], which includes land the fixed developments upon it, is in contrast much less liquid than previously discussed assets. As such, transactions tend not to occur in organized markets, but are handled by localized agents arranging specific transactions. Nonetheless, the value in this market is significant; for homeowners, real estate is typically the largest capital investment.

14. The ease at arranging a trade between a buyer and a seller of an asset.
15. The ability to substitue one instance of the asset for another. Gasoline is very fungible, since any one gallon is very like another, whereas a unique work of art is not fungible.
16. Agriculture products (like wheat, corn, pork bellies, or coffee), metals (like gold, silver, or iron), energy products (like oil or electricity), or a host of other highly fungible physical products.
17. Land the fixed developments upon it.

Alternative investments[18] like art, antiques, wine, and collectibles (like rare baseball cards) are extremely illiquid and hard to value. There are auction houses that specialize in pricing and trading these items, but the market is relatively small compared to other assets.

In addition to these physical assets, which derive most of their value from what they are, and currencies, which have purchasing power backed by their respective governments, there exist financial assets, whose value derives from some sort of contractual agreement involving future transfers of wealth. The three main categories of financial assets are debt instruments, equity, and derivatives. Many financial assets have contracts written so that the owner of the instrument has the ability to transfer the benefits (that is, sell it) to another, in which case we call the asset a **security**[19].

Bonds[20] and debt instruments (for example, certificates of deposit) are securitized loans, principally traded over the counter (OTC). While some government issues (especially US treasuries) can be liquid, the majority of this market has a lower liquidity. Many loans, however, are not securitized, and typically remain between the bank and the borrower until they are fulfilled.

Equity includes **shares of stock**[21], securitized ownership in a corporation, which can range in liquidity depending upon the size of the company, where it is registered, and many other factors. Many shares are traded in exchanges, either physically located (like the NYSE) or electronically (like the NASDAQ). Smaller companies can be traded in the distributed OTC markets. **Private equity**[22] (investments in non-public companies) is also an asset, though it tends to be very illiquid (some contracts barring investors from withdrawing funds for over a decade!).

Derivatives[23] include any financial assets which primarily derive their value from any other asset. For example, stock options can give the purchaser the ability to buy or sell shares of stock, and futures contracts can guarantee a price for a transaction of a commodity to occur at a future date. Most derivatives are illiquid, although some products are specifically designed to take illiquid assets (like mortgages) and make them easier to trade. Derivative contracts have been prominently featured in some of the most spectacular losses by traders, as they often have complex risks associated with their trading.

18. Art, antiques, wine, and collectibles (like rare baseball cards) are extremely illiquid and hard to value.
19. Financial assets with contracts written so that the owner of the instrument has the ability to transfer the benefits (that is, sell it) to another.
20. Securitized loans.
21. Securitized ownership in a corporation.
22. Investments in non-public companies.
23. Any financial assets which primarily derive their value from any other asset.

KEY TAKEAWAYS

- Many different assets are traded, and each has different features and risks.
- One goal of markets is to increase the liquidity of assets.

EXERCISES

1. If the liquidity of an asset increases, does that benefit the buyer or seller of the asset?
2. How are financial assets different from other traded assets?

8.5 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain how financial markets and institutions fit into financial decision making.
2. Discuss ethical implications of financial institutions and markets.

All companies need access to capital: growing companies need to purchase assets to expand, distressed companies need to maintain liquidity while "righting the ship", and established companies may need to fund existing projects. Financial institutions and markets provide this access. During financial crises, when aquiring more capital can be more costly or difficult, companies may have to scale back on new projects. Good relationships with financial institutions need to be maintained if a company wants to be certain of having the necessary cash without paying an exhorbitant cost.

Managers must be able to "think like an investor" when necessary, as these stakeholders are able to choke off access to capital if they are unhappy. Additionally, financial managers need to pay attention to what is happening in the markets, as during a financial crisis might not be the best time to embark on a large expansion project. In upcoming chapters, we will examine how investors value the financial assets that companies issue to raise cash, and also consider how we factor in this valuation to enable us to make capital budgeting decisions.

Ethical Considerations

Unfortuantely, some managers view meeting the bare minimum the regulations require as sufficient for fulfilling the obligations to investors. A few even go so far as trying to mislead investors with the information presented when applying for loans, issuing stock or bonds, and the like.

On the other side of the coin, financial institutions have much influence over companies' actions because of their control of capital access. In recent years, financial institutions have been criticized for taking on extra risk with the intention of increasing profits. This extra risk might result in increased capital access: for example, issuing mortgages or business loans to higher risk individuals. This added risk might be one of the factors leading to more extreme financial crises in recent years.

Though markets are made up of hopefully ethical individuals, there is no guarantee that aggregate results will reflect a concrete opinion of management's actions. Often, managers will justify an unethical course of action by the market's positive response; in reality, the market participants could be reacting to any number of pieces of information, such as expected return, risk, or a number of other factors. This is especially true when material information has not yet been made public. In such situations, management must do what is right for the stakeholders using their own judgment, since they might be the only ones with the relevant knowledge.

KEY TAKEAWAYS

- Management needs to be able to "think like an investor".
- Keeping the markets happy is important, but not if it means misleading statements or unethical behavior.

EXERCISE

1. A bank manager is considering relaxing certain restrictions on the types of mortgages that the bank can issue. By lowering standards, 50 more families will qualify for mortgages to purchase their first homes. Since these mortgages will come with a higher interest rate attached, bank profits will be affected positively if the mortgages are repaid, but if the mortgages aren't repaid, then the bank's finances will be in trouble. What are some ethical considerations the manager should include in making this decision?

8.6 End-of-Chapter Exercises

PLEASE NOTE: This book is currently in draft form; material is not final.

End-of-Chapter Problems

1. Does financial regulation seem to be proactive or reactive in the US? Look at the dates the key pieces of legislation were enacted, and consider the main financial event a few years before and after the legislation.
2. What are some reasons that some assets can be easily traded on a global exchange, while others never progress beyond regional markets?

Chapter 9

Interest Rates and Bond Valuation

My Word is My Bond...

PLEASE NOTE: This book is currently in draft form; material is not final.

Loaning small amounts of money to your friends might take no more than a word or a handshake, but when dealing with large amounts of money with complete strangers, we tend to require a bit more formality. Banks are the first place we tend to consider when we think about these more formal loans, but there are other avenues for governments, municipalities, corporations, and other borrowers to raise funds, as we disucssed in Chapter 8 "Securities Markets".

9.1 Bonds and Interest Rates

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain what a bond is and who issues bonds.
2. List and describe the key features of a bond.
3. Calculate the coupon rate given the annual coupon payments and the par value of a bond.

In this chapter, we will focus on bond instruments, which are one way to **securitize**[1] (to make a series of cash flows into a tradable instrument) a loan. A **bond**[2] is a loan packaged as a tradable security, typically with a periodic interest payment and a repayment of principal at maturity.

Who Issues Bonds?

There are many different entities that will issue bonds, and often bonds will behave differently based upon the type of issuer. At an investment bank, bond traders will often specialize in trading one type of bond. Here are some of the more common:

- Corporation = Corporate Bonds or "Corporates"
- US Government = Government Bonds or "Govies"
- Smaller Government Entities (e.g. Cities or States) = Municipal Bonds or "Munies"
- Other Governments = Sovereign Bonds or "Sovereigns"

Bonds originally were pieces of paper, stating all of the necessary information in the center with coupons (yes, just like the Sunday paper!) around the edge. The owner of the bond would cut off the coupon and turn it in to receive each periodic

1. To make a series of cash flows into a tradable instrument.
2. A loan packaged as a tradable security, typically with a periodic interest payment and a repayment of principal at maturity.

interest payment. The terminology stuck, so even with today's electronic bonds, the periodic payments are called **coupon payments**[3]. Most bonds pay these coupon payments twice a year (semiannually), though once a year (annual) payments are not uncommon.

These coupon payments typically occur until the **maturity date**[4], at which time the final coupon payment and the principal of the bond would be due. This principal amount is called the **par value**[5]. Currently, the most common par value for corporate bonds in the USA is $1,000. When describing a bond, we typically list the **coupon rate**[6], which is the annual total of the coupon payments expressed as a percentage of the par value.

For example, a bond which pays $50 semiannually would be paying a total of $100 ($50 × 2) every year. If the par value of the bond is $1,000, then we say that the bond has a coupon rate of $100 / $1,000 = 10%.

Equation 9.1 Coupon Rates

Annual Coupon Payments ÷ Par Value = Coupon Rate

Coupon Rate × Par Value = Annual Coupon Payments

Coupon Rate vs. Interest Rate

It is very easy to confuse the coupon rate with the interest rate. The key item to remember is that the interest rate can change over time (as the price of the bond fluctuates), but the coupon rate for most bonds is established at the time of issue and typically doesn't change over the life of the bond. To make things more confusing, companies typically like to issue the bonds with the coupon rate being close to the prevailing interest rate! But just remember that, once the coupon rate is set at the time of issue, it doesn't change.

There do exist bonds that having "floating" coupon rates which can change, but they are the exception and not the rule. In this book, we will always assume that bonds are standard bonds with fixed coupons.

All bonds are governed by a **bond indenture**[7], which is the contract which stipulates all of the specific details of the bond, including conditions for repayment

3. The periodic payments of a bond, typically paid semiannually.
4. The date on which the final coupon payment and the principal of the bond is due.
5. The pricipal amount of the bond.
6. The annual total of the coupon payments expressed as a percentage of the par value.
7. The contract which stipulates all of the sepcific details of a bond, including conditions for repayment and default.

and default, when bondholders can usually seek legal recourse for greater control of the company. Specific items in the bond indenture are referred to as **covenants**[8].

KEY TAKEAWAYS

- Bonds make coupon payments until the maturity date, at which point the final coupon payment and the par value are due.
- The coupon rate is the annual coupon payments of the bond divided by the par value of the bond.
- Coupon rates don't change over the life of the bond for almost all bonds.

EXERCISES

1. List the key features of a bond and what they represent.
2. A typical bond is issued with a 5% coupon. If interest rates change to 6%, what happens to the coupon for this typical bond?

8. Specific items in a bond indenture.

9.2 Credit Risk

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe credit risk.
2. Explain why US government securities are used as a proxy for a risk-free asset.
3. Explain how ratings agencies help to identify credit risk.

Not all bonds are created equal. For example, which seems like the safer investment: loan $1,000 to the US government, or loan $1,000 to a small company that hasn't paid interest to its current investors for over a year? Investing in the world's largest economy probably seems like the better bet, all other things being equal. But what if the small company offered you three or four times the return on your investment? Now the decision is not so straightforward....

The major difference between our government bond and the small company's bond is our expectation of the borrower's creditworthiness. We label the uncertainty in future cash flows due to possibility that the borrower will not pay **credit risk**[9]. The most common credit risk is **default risk**[10], which in the extreme occurs when the company doesn't have the cash to pay the necessary scheduled payment (or chooses not to). This is not the only reason; bonds can be determined to be in default for breeching specific covenants (for example, a covenant specifying that certain liquidity ratios be maintained), even if all payments have been made.

Since, as of the time of this writing, the US government is the largest government on Earth with the largest potential revenue stream, it has been considered the borrower with the least amount of credit risk. While not truly without credit risk (in 1979, for instance, the US government was late in a small portion of its debt payments, due to a supposed paper error!), as a proxy, we consider US government bonds to be the "risk-free" asset, in terms of credit risk.

9. The uncertainty in future cash flows due to possibility that the borrower will not pay.

10. The most common credit risk, which in the extreme occurs when the company doesn't have the cash to pay the necessary scheduled payment (or chooses not to).

Sometimes, credit risk can be reduced through the use of **collateral**[11], or assets pledged to secure repayment. The most familiar collateral arrangement is the standard home mortgage, where the property itself is collateral against the amount borrowed. Corporations can also pledge certain assets when they choose to issue bonds, with the anticipation that the lower credit risk will correspond to a lower cost of borrowing.

To aid investors in their assessment of the credit risk of bond issuers, there exist ratings agencies which attempt to qualify the creditworthiness of each bond issue. Some of the larger agencies include: Standard and Poor's (S&P), Moody's, and Fitch. Ratings range from AAA (or Aaa, as different agencies have slightly different scales) for the most creditworthy debt, to D for debt that is already in default. Bonds rated at least BBB- (or Baa3) are considered "investment grade", which can be an important distinction for many mutual funds that invest in bonds to allow the bonds to be held in their portfolios. Any bonds rated lower (BB+/Ba1 or below) are considered not investment grade, or "speculative". These bonds are sometimes called "junk bonds" as well (though it would be important to remember that even "junk bonds" have a higher claim on a company's assets than any shares of stock).

Table 9.1 Bond Ratings

	Moody's	S&P	Fitch
High Grade	Aaa to Aa3	AAA to AA-	AAA to AA-
Medium Grade	A1 to Baa3	A+ to BBB-	A+ to BBB-
Speculative	Ba1 to B3	BB+ to B-	BB+ to B-
Very Risky or In Default	Caa1 to C	CCC+ to D	CCC to D

There have been some concerns over the accuracy of the ratings provided by these providers, especially after the credit crisis of 2008. Some highly rated securities ended up having default rates much higher than would have been expected, given their assigned ratings. One argument is that these securities were so complex that the ratings agencies couldn't accurately evaluate them. Another claim was that, since ratings agencies earn their revenues by charging for assigning a rating to a security's issue, there is a potential conflict of interest that encourages the agencies to give higher ratings than they otherwise should. Regardless of the cause, confidence in ratings agencies has been shaken, and, while the information provided by such companies is undoubtedly useful, an investor is wise to not blindly take ratings as absolute truth, especially when more complex instruments are involved.

11. Assets pledged to secure repayment.

KEY TAKEAWAYS

- Credit risk should be a major consideration when evaluating bonds.
- US Government securities are used as a proxy for the risk-free rate.
- Ratings agencies help to evaluate credit risk, but should not be taken as absolute truth.

EXERCISES

1. When can a bond be determined to be in default?
2. Which has more credit risk: investment grade debt or speculative debt?

9.3 Bond Yield

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the relationship between the real interest rate, the nominal interest rate, and inflation.
2. Calculate a nominal interest rate, given the real interest rate and an inflation rate, using the Fisher equation and the more common approximation.
3. Describe the relationship between bond prices and yields.
4. Calculate the risk premium of an asset, given the risk free return and the expected return of the asset.

All investments have a certain amount of risk (even stuffing dollars under your mattress is vulnerable to house fire!), and, in a perfect world, we would be able to completely assess the risk of each investment. There are many employees, companies, and consultants whose entire focus is on evaluating risk. Arguably, all of finance boils down to the study of risk and return.

The value of a bond, like any series of future cash flows, is intrinsically related to the perceived opportunity cost of the investment, as we discussed in Chapter 6 "Time Value of Money: One Cash Flow". This cost, called the **real interest rate**[12], is determined by the market by causing the price of the bond to rise or fall. When we hear newscasters speaking of "interest rates falling", what they are really saying is that the relevant bonds have changed in price, exposing a belief by investors that the opportunity costs of holding the bond are going down. So, as a shortcut we can talk about interest rates changing, but we should remember that, ultimately, these rates are derived from the price of the bonds! An investor buying a bond at a certain price point will yield a certain return on her investment; in bond parlance, this expected return is called the bond's **yield**[13]. Specifically, **yield to maturity (YTM)**[14] is the annualized rate of return on a bond, assuming the bond is held to maturity and all the expected cash flows occur.

12. The interest rate that only compensates for the perceived opportunity cost of the investment.
13. A bond's expected return.
14. The annualized rate of retun on a bond, assuming the bond is held to maturity and all the expected cash flows occur.

Bond Yields vs. Prices

A bond's yield is determined by its price, but we often speak of "investors require a yield of 5%". What we are really saying in this case is that investors will only pay a price for the bond that will give them a 5% return on their money.

If investors determine they need a higher yield, then they won't be willing to pay as much up front, and bond prices should fall. Thus, as yields rise, prices fall (and vice-versa). Bond prices and yields are inversely related!

Each bond faces a host of additional factors, all of which must be accounted for to properly assess the value of a bond. As time goes by, the purchasing power of a dollar (or whichever unit of currency we are using) could deteriorate; this we call **inflation**[15]. Opportunity cost and inflation factored together are typically labeled the **nominal interest rate**[16].

If both the inflation rate and the real rate of interest are low (that is, < 5% each), then we can safely approximate the nominal interest rate as:

Equation 9.2 Approximate Nominal Interest Rate

Real Rate of Interest + Inflation Rate ≈ Nominal Rate of Interest

$$r^* + \pi \approx r$$

We use r^* (pronounced "r-star") to represent the real rate of interest and π (the Greek letter "pi"), which here is **not** the circle constant of 3.14, to represent inflation. Why have finance scholars chosen to use π? Because we thought using *i* would be too confusing, since both "interest" and "inflation" start with the same letter....

This equation has the benefit of being easy to remember and can be used for fairly accurate results. While historically it has been safe to assume a real interest rate at or below 5%, there have been many occurrences of large rates of inflation much larger than 5% throughout the world. When this is the case, it is more prudent to utilize the more accurate Fisher equation for interest rates:

15. The deterioration of the purchasing power of a currency.
16. The interest rate that compensates for opportunity cost and inflation factored together.

Equation 9.3 Fisher Equation for Interest Rates

$$(1 + \textit{Real Rate of Interest}) \times (1 + \textit{Inflation Rate}) = (1 + \textit{Nominal Rate of Interest})$$

$$(1 + r^*) \times (1 + \pi) = (1 + r)$$

While a little more cumbersome to remember and use, it is the more accurate, especially if inflation is high.

This combination of the real rate of interest and the inflation rate should be the return required on an asset that is free of any other risks; we call this the risk-free rate of return and designate it: r_{RF}. As of the time of this writing, standard practice is to use US government bonds as a proxy for such a risk-free asset.

We already know of one risk, credit risk, that will cause investors to demand higher yields, but there are many other potential sources of risk. For example, if a bond isn't likely to be easily tradable, then investors could want higher yields to compensate. All of these will contribute to the investment's **risk premium**[17], or amount of return required by investors over the risk-free asset.

Equation 9.4 Risk Premium

$$\textit{Required Rate of Risk-Free Asset} + \textit{Risk Premium} = \textit{Required Rate of Asset}$$

$$r_{RF} + RP_A = r_A$$

therefore: $RP_A = r_A - r_{RF}$

KEY TAKEAWAYS

- Real interest rate + Inflation = Nominal Interest Rate (when inflation is reasonable).
- Bond prices go up, yields go down. Bond prices go down, yields go up.
- The risk premium of an asset is the extra amount of yield needed above the risk-free rate to compensate for the higher level of risk.

17. The amount of return required by investors over the risk-free asset.

EXERCISES

1. If the expected rate of inflation increases, what will happen to the nominal rate of interest? What should happen to bond prices?
2. If the real interest rate is 2% and expected inflation is 3%, what is the approximate nominal interest rate? Using the Fisher equation, what is the exact nominal interest rate? Repeat with an expected inflation rate of 15%.
3. A company just issued a poor earnings report, throwing into doubt their ability to continue their debt payments. What should happen to their risk premium? What should happen to the price of their bonds?

9.4 Bond Valuation

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Calculate the price of a bond.
2. Explain how bond prices are quoted.
3. Calculate the YTM of a bond.

The financial value of any asset is the present value of its future cash flows, so we already have the tools necessary to start valuing bonds. If we know the periodic coupon payments, the par value, and the maturity of the bond, then we can use our time value of money skills from Chapter 7 "Time Value of Money: Multiple Flows" to solve for either price or YTM, given the other.

For example, if I know that a bond with a 5% annual coupon has 7 years to maturity, a $1,000 par value, and has a YTM of 6.5%, I can figure out its price. Since payments are yearly: n = 7 years, r = 6.5% per year, PMT = ($1,000 × 5%) = $50 per year, and FV = $1,000.

Figure 9.1 *Bond Timeline—Annual Coupon*

Using a financial calculator or excel, or solving by hand, we should get a PV = $917.73.

Quoting Bond Prices

Bond prices, by convention, are quoted as a percentage of the par value. In our above example, the result of $917.73 would be quoted as 917.73 / 1,000 = .91773 = 91.77%. And because we know they are percentages by convention, we don't include the percent sign. So our bond quote is 91.77.

If a bond is quoted at exactly 100, we say it is trading at par (since it costs the par value). Above 100, we say the bond is trading at a premium, and below 100, it is at a discount.

If our bond paid its coupon semiannually, we need to calculate the value in terms of semiannual (six month) periods. By convention, bond yields are quoted like an APR, in that they are always equal to the rate over the period times the periods in a year. Thus, our inputs should be: $n = 7 \times 2 = 14$ semi-years, $r = 6.5\% / 2 = 3.25\%$ per semi-year, PMT = ($1,000 × 5% / 2) = $25 every semi-year, and FV = $1,000.

Figure 9.2 *Bond Timeline—Semiannual Coupon*

Our result is a PV of $916.71, which is only slightly different than our annual coupon bond.

Clean vs. Dirty

For ease, we have only used example bonds with whole years left until maturity. A bond that was traded part of the way through the year would have accrued interest due to the bond seller (since the entire coupon payment will now go to the new owner).

By convention, bond prices in US markets are quoted as “clean prices”, meaning they ignore this accrued interest. This makes it easier to compare bonds day-to-day, since the accrued interest changes every day (and resets to zero when the coupon payment is made). When a trade actually occurs, the clean price plus the accrued interest will be combined to make the actual payment (the “dirty” price).

Solving for YTM is similar. If the price of our above semiannual coupon bond rose to a quoted 94.35, what is the YTM?

Figure 9.3 Bond Timeline—Semiannual Coupon Solving for YTM

n = 14 semi-years, PMT = \$25, FV = \$1,000, and PV = – (\$1,000 × .9435) = –\$943.50. We represent the price as a negative number since it is a cash outflow. Solving for *r* gives a result of 3.00% for the semiannual period, or 3.00% × 2 = 6.00% for the quoted YTM.

Excel has two functions that can be used to directly solve for bond prices and yields. Both require actual calendar dates for settlement and maturity of the bond; since all we know of our bond is that it has 7 years to maturity, we’ll pick dates that are 7 years apart. Both also require an input of how much of the par value is received at redemption, quoted as a % of par. Since we are receiving all of the par value at redemption, this number will be 100.

=PRICE(settlement date, maturity date, coupon rate, yield, redemption, pmts per year)

=PRICE(“1/1/2010”, “1/1/2017”, 5%, 6.5%, 100, 2)

91.67

=YIELD(settlement date, maturity date, coupon rate, price, redemption, pmts per year)

=YIELD("1/1/2010", "1/1/2017", 5%, 94.35, 100, 2)

.0600 or 6.00%

KEY TAKEAWAYS

- Use TVM equations or excel functions to solve for the price or yield of bonds.
- Bond prices are quoted as a percent of par, so they should be near 100. Above 100, the bond is trading at a premium, and, below 100, at a discount.

EXERCISES

1. A bond is trading at a premium. What does that say about its YTM relative to its coupon rate?
2. A 7% annual coupon bond has a YTM of 8% and has 5 years until maturity. What is the quoted price if the par value is $1,000? What is the quoted price if the par value is $5,000?
3. A 6% semiannual coupon bond has 8 years until maturity. Its quoted price is 107.50. If its YTM stays constant, what should be its quoted price 1 year from now?

9.5 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe how bonds fit into the larger picture of finance.
2. Explain ethical considerations regarding bonds.

Bonds allow entities to borrow money easily from investors. When banks demand too much return or are unwilling to accept more risk, bonds can be the avenue to raising more capital. Corporations (or govenments, municipalities, etc.) can then use the capital raised to invest in new projects or pay for ongoing projects.

As managers, we need to consider how our actions will influence our ability to issue bonds and raise capital. As investors, we need to consider bonds as an investment class.

One side benefit of bond markets is that we can witness the perceived current value of the bond as they trade. From these prices, we can deduce the return demanded by the market, and use this information to learn more about the market (for example, risk tolerance or inflation expectation) or the issuer (for example, perceived risk of default) of the bond.

Ethical Considerations

When issuing bonds, companies have an incentive to look like safe investments, since this will lower the return demanded by the market. Some companies will make decisions based upon how their balance sheet will appear (and how they believe it will affect the rating!) for an upcoming bond issue. The legitamacy of such manipulations can be difficult to distinguish, especially if it is solely a matter of transparency.

Ratings companies are meant to be objective judges of risk, but their revenue comes from fees paid for each bond issue, raising the specter of conflict of interest. Also, while ratings companies also include details about the risk of an issue, many investors fail to look beyond the assigned ratings, despite the potential complexity of some bonds.

Investors need to consider that buying a bond is, in effect, supporting the borrowing of the issuer. If a government is engaging in policies contrary to the conscience of the investor, or a company's revenue source is objectionable, an investor should consider avoiding the investment.

KEY TAKEAWAYS

- Bonds allow entities to raise capital.
- Companies can try to manipulate perception to influence ratings agencies and potential cost of borrowing.
- Investors should remember that buying a bond is, at least indirectly, supporting the operations of the corporation, government, etc. that issued the bond.

EXERCISES

1. A large government recently embarked on a campaign of silencing "dissidents". It periodically issues bonds to fund its debt, which includes food programs for the needy and its military payroll. How might this affect an investor's decision to buy a bond?
2. If a bond is purchased on the secondary market, it isn't directly purchased from the company. Would buying such a bond still be supporting the company's funding? Why or why not?

9.6 End-of-Chapter Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

EXERCISES

1. A 4.25% coupon bond is currently yielding 4.5%. If the par value of this bond is $1,000, what is the annual coupon payment?
2. If comparable bonds are currently yielding 3.5%, what coupon rate should a bond have if the company wishes to issue it at par?
3. If the par value of a 3% semi-annual coupon bond is 500,000 yen, what is the payment received every six months?
4. You receive $50 every half year from your XYZ corporate bond. It has a face value of $1,000. What is its coupon rate?
5. Two bonds are rated B+ and BB–. Which is probably the riskier investment? Which would you expect to have the higher yield? Is it possible to predict which would have the higher coupon rate?
6. If the real rate of return is 2.5% and the expected inflation is 4%, what is the approximate real interest rate? What is the more accurate rate found using the Fisher equation?
7. If the risk free rate is 5% and a security is yielding 9%, what is the risk premium?
8. If security A is yielding 7% and security B is yielding 7.5%, which has the larger risk premium (if we are comparing to the same risk free asset)?
9. An 11% bond pays its coupon annually and has 12 years left to maturity. If its quoted price is 106.50, what is its yield to maturity?
10. An 8% bond pays its coupon annually and has 9 years left to maturity. If its current YTM is 8.16%, what is its quoted price?
11. A bond has 15 years left to maturity and pays a semi-annual coupon. If its current YTM is 7.5% and its quoted price is 82.17, what is its coupon rate?
12. A bond was issued one year ago at par with a 4% semi-annual coupon. Today, the YTM is 5%. What should be its price?
13. Bond A has an annual coupon of 6% and bond B has an annual coupon of 9%. Both have 7 years until maturity. The market demanded interest rates for these bonds moves from 4.5% to 5.5%. What are the prices for the bonds before and after the interest rate change? Which bond is more sensitive to interest rate changes (that is, which had the greater price increase as a percentage of the pre-change price)?
14. A zero coupon bond is a bond that doesn't pay periodic coupons; it only pays the face value at maturity. A $1,000 par zero coupon bond matures in 6 years. If comparable bonds have a YTM of 7%, what should be its quoted price?

Chapter 10

Stock Valuation

How Much Is a Piece of a Company Worth?

PLEASE NOTE: This book is currently in draft form; material is not final.

It is truly amazing that almost anyone can, with minimal difficulty, become an owner of a multi-billion dollar corporation in just a few seconds by purchasing shares of stock using an internet broker. By the end of the day, that investment can change in market value, for better of for worse. But what is the "right" price for that piece of a company?

In this chapter we will compare various fundamental methods for valuing a share of stock. As a fair admission: if we could use these techniques to 100% accurately gauge the value of every stock (or even just a handful), we'd be living on a private island sailing a giant gold-plated yacht. Alas, not even Warren Buffett is right 100% of the time, though his investment strategy has been built from these fundamental principles we will discuss. Rather, the goal of this chapter is to provide a deeper understanding of what drives the value of a company's equity, and to provide a foundation upon which accurate stock analysis techniques can be built. And, as future managers of corporations, if we understand what drives investors' valuations, we can better understand how to increase our company's share price.

10.1 Common and Preferred Stocks

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the typical features of and differences between preferred stock and common stock.
2. Contrast the key differences between equity and debt.
3. Describe why managers care about a company's stock price.

Equity in a public corporation is divided into shares of stock. Typically, shares of stock have some key features. The first is the right to receive **dividends**[1], which are payouts (usually in cash) to the owners of a company proportional to their ownership of the company. Dividends are typically paid quarterly, though exceptions are not uncommon. The company's board of directors decides when dividends are to be issued and how much they are to be. The board of directors is elected by the shareholders, as determined by the company's corporate charter.

Shares of stock can be divided into different classes, and these can have different features. For example, one class of shares might have more voting power than a second class. Each class of stock will trade separately (or some might not trade at all) and, potentially, have a different price. The most common division of equity is between preferred shares of stock and common stock.

Preferred stock[2] is equity, but behaves as almost a hybrid between bonds and common stock. In fact, at many investment banks, the fixed income traders handle bonds and preferred stock, and the equity traders only work with common stock. Preferred stock usually doesn't have a maturity date, and, like a bond, has a dividend that is at a fixed. Preferred stock has a nominal par value (typically $100 per share), and the annualized dividend is quoted as a percentage of this par value. Thus, one share of 5% preferred stock will pay $5 total in dividends over a year. Like a bond, if these dividends are insufficient to provide the required return to investors, the stock will trade at a price below the nominal par value. Unlike a bond, if the dividend isn't paid, stockholders can't send the company into bankruptcy. If, however, the full dividend isn't paid to the preferred shareholders, than no

1. Payouts (usually in cash) to the owners of a company proportional to their ownership of the company.
2. A type of equity that acts as hybrid of bonds and common stock, with no maturity date and fixed dividend payments.

dividend is allowed to be paid to the owners of the common stock until all missed payments are paid in full. If the company is driven into bankruptcy and liquidation by the bondholders, the preferred shareholders have a superior claim to the assets compared to common shareholders (though both are subordinate to the bondholders). Typically, preferred shareholders get no votes for the board of directors.

Many corporations don't issue preferred stock, so the bulk of equity issues are called **common stock**[3]. Common stock also has a nominal par value, but it is mostly an accounting/legal relic and has no bearing on the dividends or price of the stock. Since dividends on common stock are determined by the board, their cash flows are the most uncertain of the financial instruments discussed so far. Shareholders have a **residual claim**[4] on the firm's assets, which is the value leftover after all other claims have been paid. Thus, any earnings remaining after all other obligations are met, are either paid out in dividends or retained by the firm, ostensibly to be used as capital for the firm's growth. These retained earnings increase the residual claim, potentially increasing the value of stock shares.

When a firm is doing poorly, and liabilities are larger than the value of the assets, the residual claim is zero and share prices understandably drop. If the company isn't driven into bankruptcy and can increase the assets to an amount more than liabilities, the residual claim grows and share prices rise. Since liabilities are relatively fixed but asset prices are potentially unbounded, the equity share similarly has unbounded growth potential.

From the company's perspective, it is important to note that equity only directly raises cash when the shares are issued. After the initial issue, trading occurs in the secondary markets, so any increase in value of the shares will be captured by the owners of the stock. It the company has positive earnings but chooses not to pay out all of those earnings as dividends, then the company is able to retain those earnings for use as capital. This is an indirect way of raising equity capital, though it does not come without a cost: the retained earnings should lead to an expectation of increased earnings in the future, allowing for an eventual increase in dividends. If this is the case, the share price should rise in anticipation of the expected higher future dividends.

Increasing the value of those outstanding shares is one of the primary goals of management, for a few key reasons. First, shareholders have voting power, and if they aren't receiving the returns they desire, they might replace the board with the intention of replacing senior management. Second, any additional offerings of equity will benefit from the increased share price, so the company will have access to a larger source of capital, if necessary. As an additional incentive, senior

3. The bulk of equity issues, representing a residual claim on firm assets.

4. The value of assets leftover after all other claims have been paid.

management will often receive a portion of their compensation tied to the value of equity, through stock grants, restricted shares, or stock options.

KEY TAKEAWAYS

- Fundamentally, the value of stock is dependent on the value of the residual claim of the firm's assets.
- Preferred stock dividends are quoted as a percentage of their $100 par value. Common stock dividends are decided by the board and thus tend to fluctuate more.
- Managers care about stock prices because they can be replaced if shareholders are displeased, the company may need to raise equity financing in the future, and they may have been given shares themselves as compensation.

EXERCISES

1. What is the annual dividend on 6% preferred stock?
2. If a company is doing extremely well, would you rather own preferred stock or common stock in the company?

10.2 Dividend Discount Model

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain where the value of a stock is ultimately derived.
2. Calculate a stock valuation given a dividend growth rate or a stream of dividends.

The financial value of anything is the present value of all future cash flows. If we knew with certainty what the future dividends of a stock will be, we should be able to determine the value of a share of stock. Hence the dividend discount model (DDM). It is useful for us to consider this method of valuing securities, since, ultimately, this is the driver of value in stock ownership. In practice, however, the uncertainty of future dividend payments, especially with common stock, limits the usefulness of using this method. For preferred stock, where the dividend is fixed when it is paid, this method has a bit more accuracy.

Constant Dividend Stream

If our dividend stream is constant, we can use the perpetuity formula from chapter 7 to arrive at the financial value:

Figure 10.1 *Constant Dividend Timeline*

Equation 10.1 Perpetuity Equation

$$PV = \frac{PMT}{r}$$

Since the dividend payments are constant, the value of a share of preferred stock should be inversely proportional to our required rate of return.

Equation 10.2 Preferred Stock Price

$$P_{pref} = \frac{D}{r}$$

D and *r* should be in matching time units, so if dividends are quarterly, a quarterly rate of return needs to be used. Note that if the required rate of return doesn't change, then this implies that the stock price should likewise never change. The corollary to this is: if the dividends are a known constant, then any changes in the stock price must be due to changes in the required rate of return!

Suppose we have a 5% preferred stock and investors require a 6% rate of return. Since par is assumed to be $100, our stock pays $5 in dividends per year. Our expected price would be (.05 × $100) / .06 = $83.33.

Dividend Stream with Constant Growth

If our dividend stream isn't constant, as is more likely with common stocks, but is growing steadily with a constant growth rate, then we can use another formula from chapter 7:

Figure 10.2 *Constant Dividend Growth Timeline*

Equation 10.3 Perpetuity with Constant Growth

$$PV_n = \frac{PMT_{n+1}}{(r-g)} = \frac{PMT_n(1+g)}{(r-g)} \left\{ for\ g < r) \right.$$

Equation 10.4 Stock Price with Constant Dividend Growth

$$P_n = \frac{D_{n+1}}{(r-g)} = \frac{D_n(1+g)}{(r-g)} \left\{ for\ g < r) \right.$$

Again, D, r, and g should all be in matching time units. Typically we are interested in the price now (that is, at time 0), but this equation could be used to find our expected stock price in a future year by calculating the expected dividend for that year. Also note that D_0 is the dividend that was just paid, and thus is no longer factored into the stock price.

If a company's most recent dividend (D_0) was $0.60, dividend growth is expected to be 4% per year, and investors require 10%, we can find the expected current stock price (P_0). $0.60 × (1 + .04) / (.10 – .04) = $10.40.

If we use the current price (P_0) and rearrange our equation to solve for returns, we find an interesting result:

Equation 10.5 Components of Stock Returns

$$P0 = \frac{D_1}{(r-g)} \left\{ for\ g < r \right\}$$

$$\left(r - g\right) = \frac{D_1}{P_0}$$

$$r = \frac{D_1}{P_0} + g$$

$$r = dividend\ yield + capital\ gains\ yield$$

With this result, we can clearly see the tradeoff between dividends now and growth (which should lead to future dividends). If expected return is steady over time, then a constant capital gains yield (g) implies a constant dividend yield. A constant dividend yield means that the stock price must grow proportionally to the dividends; that is, both should grow by g.

Dividend Stream with Varied Dividends

Without constant growth, determining the present value of the stock requires finding the present value of each of the future cash flows. While the most flexible and realistic, this also is the most difficult to execute properly. The best way to think about this method is to imagine holding the stock for a specific number of years, with the intention of selling the stock at the end of the period.

Figure 10.3 Varied Dividends Timeline

If we know the dividends and have an expectation for the future stock's price, we can discount everything to find the price today. The difficulty, of course, is in getting an accurate expectation for the future stock price. The traditional solution is to assume that, at some point in the future, dividend growth will be steady, and to use the constant dividend growth formula to calculate an expected future price.

Equation 10.6 Stock Price with Constant Dividend Growth

$$P0 = PV\ of\ Future\ Dividends + PV\ of\ Future\ Price\ of\ Stock$$
$$P0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \ldots + \frac{D_n}{(1+r)^n} + \frac{P_n}{(1+r)^n}$$

A common mistake is to neglect the discounting on the future price of the stock. Once the cash flows are found, the discounting can also be accomplished using NPV functions on a calculator or spreadsheet, as discussed in chapter 7.

Suppose our stock will pay out $0.50 flat per year for 4 years, and then dividends are expected to grow at 5% afterwards. If investors expect a 9% return, we can find the expected price of the stock:

Figure 10.4 *Varied Dividends Example Timeline*

Our terminal value (P_4) should be $0.50 × (1 + .05) / (.09 – .05) = $13.13. Once we add this to the above cash flows and discount appropriately, we arrive at a stock value of $10.92.

We can use this to method value a corporation that is not a going concern (that is, going out of business) or expected to be acquired. In this case, we should use the liquidation value of the shares or the acquisition price as our P_n.

Stocks Not Currently Paying a Dividend

How do we handle stocks that aren't currently paying a dividend, like many growth stocks? The assumption is that some point in the future they will need to start paying dividends, so we figure out the price of the stock at that time, and discount it back to today. Note that this is the same as the above equation, using 0 for each dividend until the company begins to pay them.

Because of the extra uncertainty of when to expect a company to begin paying dividends, such companies are typically valued using another approach. Two of the most popular are the market multiples approach and the free cash flow approach, which will be covered in the upcoming sections.

KEY TAKEAWAYS

- Every stock must be fundamentally worth the present value of the future cash flows.
- Since many stocks pay in perpetuity, the perpetuity formulas are useful for dividends growing at a constant rate. This formula will only work accurately with a constant rate.
- For stocks with dividends not currently growing at a constant rate, the individual dividends need to be accounted for first, then a future value for the stock can be used for when the dividends are in the constant growth period.

EXERCISES

1. Investors only require an 8% annual return on a 9% preferred stock. What should the stock's price be?
2. A company's most recent quarterly dividend was $0.25. This dividend is expected to grow by 3% a year. If investors require an 11% annual return on the stock, what should the stock's price be?
3. A stock is currently not paying dividends. Three years from now, it is expected to start paying a quarterly dividend of $0.10 per share, with growth of 5% per year thereafter. If investors require a 10% annual return, what should the stock's price be?
4. A stock will pay a $1 dividend next year, a $2 dividend the year following, and a $3 dividend in year 3, at which time it will be acquired for $12 per share. If investors require a 12% return, what is the current value of the stock?

10.3 Market Multiples Approach

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain how to use a market multiple to evaluate a stock price.
2. Calculate a stock valuation given the necessary data using a market multiple.

If we try to compare two companies that are in the same line of buisness and approximately the same size, we would expect them to have certain features in common and, perhaps, behave in similar ways. This is the basis for a popular approach to stock valuation based called the market multiples approach.

"Market multiples" is a generic term for a class of many different indicators that can be used to value a stock. Probably the most familiar is using the price to earnings (P/E) ratio (first discussed in chapter 4), and it is used in the following manner: if we know that the average P/E ratio for companies in our sector is 25, and we know the expected earnings (that is, net income) per share of our company is $2 per year, then an appropriate valuation for our stock should be $2 × 25 = $50.

Of course, we can use a competitor's P/E ratio, if we think it more appropriate than an industry average. Or we can use our company's historic P/E ratio. Or a trending average over years. This approach is both versatile and simple to use, which might explain its popularity with the financial press.

But what do we do if earnings are expected to be negative? Does this imply that our stock price is also negative? Of course not! Many companies have emerged from negative earnings (perhaps due to a slumping economy) only to skyrocket in value. The simplicity of ratio analysis is its major weakness, as it is impossible to capture everything about a company in one ratio. Other ratios and metrics can be used, if we believe them to be a good indicator of the company's value. Common ratios (many are mentioned in chapter 5) are price to book, price to EBIT, price to EBITDA, price to sales, etc. but virtually anything can be used if it is justifiable (price to headcount, price to watermelons…). It is important, however, that we don't attempt to use ratios solely because they are convenient or only because they support the result we desire; we should try to use reason to explain why a given metric is useful, and examine the data to determine if a meaningful relationship exists to aid is in our valuation efforts.

KEY TAKEAWAYS

- Though using P/E ratios to value a stock is the most common approach, any key metric can be chosen (though some will be more appropriate than others!).
- Comparing to the industry, a competitor, or the same company over time can all yield valuable information about the stock's value.
- Garbage in, garbage out. The accuracy of this method will depend upon the usefulness of the metric used, and no one measure can fully capture the complexity of a company.

EXERCISES

1. A competitor has 25 million shares outstanding at a stock price of $36 and expected annual net income of $50 million dollars. What is the competitor's P/E ratio? If our company's expected annual net income is $100 million and our shares outstanding total 20 million, what is an appropriate valuation for our stock?
2. Why might a company's P/E ratio change over time?
3. A company has rapid sales growth, but has yet to turn a profit. Why would the price to sales (P/S) ratio be a superior metric to the P/E ratio for arriving at a stock price?

10.4 Free Cash Flow Approach

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Calculate the valuation of a company based on FCFs and WACC.
2. Calculate the value of a share of stock using the FCF method.

The free cash flow (FCF) approach for valuing a company is very much related to the dividend discount model explained in section 2. The key difference is that we look at all of the cash flows available for distribution to the investors and use them to arrive at a value for the entire company. Since we are using the cash flows for all investors, we need to discount them not using just our expected return on equity, but on the **weighted average cost of capital (WACC)**[5]. As the name implies, this is an average of the returns required by equity holders and debt holders weighted by the company's relative usage of each. Arriving at the WACC will be the topic of a later chapter.

Equation 10.7 Value of Company Using Discounted FCF

$$V_C = \; PV\ of\ Future\ FCFs + PV\ of\ Terminal\ Value\ of\ Company$$

$$V_C = \frac{FCF_1}{(1 + WACC)^{1}} + \frac{FCF_2}{(1 + WACC)^{2}} + \ldots + \frac{FCF_n}{(1 + WACC)^{n}} + \frac{V_T}{(1 + W}$$

Finding the terminal value for a company has some of the same headaches as finding the future expected stock price. A common method is to assume a long-term growth rate for FCF, and use a variation of the perpetuity with growth formula:

Equation 10.8 Terminal Value of Company Using Discounted FCF

$$V_{Terminal} = \frac{FCF_{n+1}}{WACC - g} = \frac{FCF_n\left(1 + g\right)}{WACC - g} \left\{ \text{for g} < WACC \right\}$$

5. An average of the returns required by equity holders and debt holders weighted by the company's relative usage of each.

This method can be extremely sensitive to the assumption used for the long-term growth rate. Once the value of the entire company is determined, we need to subtract the market values of our debt and preferred stock to arrive at the value of the residual due to common shareholders:

Equation 10.9 Value of Stock

Value of Company = Value of Debt + Value of Equity

= Value of Debt + (Value of Pref. Stock + Value of Common Stock)

$V_C = V_D + V_E = V_D + (V_{ps} + V_s)$

therefore $V_C - V_D - V_{ps} = V_s$

Once the value of the common stock is obtained, dividing by the number of shares outstanding should lead to an appropriate price per share.

Of course, a company might have a negative FCF currently but still be a good investment, if FCF is expected to turn positive in the future. This can happen particularly with corporations that are experiencing rapid growth, necessitating a large investment in capital to support future revenues. Since FCF for such companies tends to turn positive well before dividends are paid, this approach typically provides a superior estimate for stock value over the DDM.

KEY TAKEAWAYS

- Calculating the value of a company using the FCF method tends to be more accurate, so it is used in practice much more than the DDM.
- The FCF method can be very sensitive to assumed long-term growth rates.

EXERCISES

1. Our company projects the following FCFs for the next 3 years: $5 million, $5.5 million, $6 million. Future growth is expected to slow to 5% beyond year 3. What is the terminal value of the company in year 3 if the WACC is 8%? What is the value of the company today? What is the company worth if the projected growth rate is only 3% beyond year 3?
2. If a company's value is $250 million, and the company has $100 million market value of debt outstanding and no preferred stock, what is the value of its common stock? If there are ten million shares of stock outstanding, what is should be the price of one share of stock?

10.5 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe how stock fits into the larger picture of finance.
2. Explain ethical considerations regarding stock.

Like bonds, selling stock allows the issuer to raise capital for new or ongoing projects. Unlike bonds, selling shares of common stock is effectively selling a "piece" of the company. Equity financing tends to command a higher risk premium, so the expected returns by investors is higher. If a company is considered risky, particularly in its early stages, equity financing might be the only reasonable way to raise the necessary funds, even if it entails possibly losing voting control over the board.

Through the election of board members, shareholders can exercise their power to approve or disapprove of the company's actions. This exercise of corporate governance, combined with the effect of the cost of financing, causes managers to have multiple reasons to consider the desires of shareholders when taking action.

Investors must understand what drives stock prices if they are to properly assess the risk and return of adding stocks to their portfolios.

Ethical Considerations

Since the board of directors is elected by the shareholders, owners of stock must feel some responsibility for the companies in which they have invested. Activist shareholders have become more commonplace, introducting ballot measures and contesting board elections to push corporations for or against various agendas. Of course, a dissatisfied shareholder can always choose to sell the stock and invest elsewhere, but through their ballot they have an extra means of influence over the direction of the company. Some companies make provisions to discourage too much shareholder intervention, for example, by making it more difficult to replace the entire board at once. Since many senior managers are board members at other companies, there can be a level of “cronyism” between companies as board members support their management friends.

Another area of concern is that many managers believe that stock prices are particularly sensitive to short-term news like quarterly earnings, and this can influence them to try to manipulate the numbers to their perceived advantage, either legally or, in some cases, fraudulently. In an extreme case, managers can buy or sell stock based upon their knowledge of information not yet revealed to the public (or they can “tip off” their friends or relatives). While in many cases these actions can be illegal, there are many countries and circumstances where regulation is absent or under-enforced.

KEY TAKEAWAY

- Shareholders are both a source of capital and enactors of corporate governance. Through both of these can they influence management’s behavior.

EXERCISES

1. Some managers attempt to “smooth out” earnings over time, to minimize the volatility of the stock price. Is this damaging or beneficial to the stockholders?
2. Sarah owns many shares of stock in ABC Corp. Recently, ABC has been cited for excessive pollution. What actions could Sarah take if she wishes to influence the future actions of ABC’s management?
3. Bill is a manager at XYZ, and he recommends to the board that they nominate Chris for the open board seat because he is highly experienced in the field. Chris is currently a manager at FGH Inc., where Bill is a member of the board. Are there any potentially issues with Bill’s recommendation?

10.6 End-of-Chapter Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

EXERCISES

1. 8% preferred stock is currently trading at $133.33. What implicit return is the market demanding?
2. If the market demands a return of 11% on a preferred stock with a 7% coupon, at what price will it trade?
3. A stock is expected to pay $2 in dividends every year. At what price must it trade to yield a return on equity of 9%?
4. A stock is expected to pay $1 in dividends next year. Dividends are expected to grow in future years at a rate of 5% per year. If the market demands a return of 11%, at what price should the stock trade? If the market demanded return drops to 10%, at what price should the stock trade?
5. A stock paid $1.50 in dividends last year. The dividends have been growing by 3% on average over the past 10 years, and this trend is expected to continue indefinitely. If other comparable stocks are returning 9%, at what price should the stock trade?
6. A $30 stock is expected to pay a dividend of $2 next year, and dividends are expected to grow at 2% per year thereafter. What is the expected market return for this stock?
7. ABC Company has hit on hard times, and is expected to shut down. As inventory is liquidated, yearly dividends are expected to be $2, $3, and $4 in years 1, 2, and 3, respectively. After year 3, the company will have no value. What should the stock be worth if the market demands an 8% return?
8. DEF Inc. is expected to pay dividends of $1, $1.50, and $2 during the next three years. After that, dividends are expected to grow at 5% per year. If the market demands a return of 11%, what should be the price of DEF in three years? What should be its stock price today?
9. GHI Ltd. is not currently paying a dividend. In five years, it expects to pay a dividend of $0.50, and dividends are expected to grow at 6% a year afterward. If the return demanded is 12%, what should GHI be worth today?
10. JKL Corp. has earnings of $1.38 per share. MNO Corp. is a close competitor, with $1.59 earnings per share. If MNO stock is currently trading at $39.75 and you believe that the stocks are comparable, what would be a reasonable price expectation for JKL stock?
11. Analysts expect PQR Inc. to earn $1.15 per share this year. The stock is currently trading at $33.35. When PQR surprises analysts by outperforming by $0.30 per share, by how much should the stock price increase? (Assume the P/E ratio will remain constant.)
12. STU Company expects $2 million of FCF next year. Growth is expected to be 3% per year, and the WACC is 7%. What is the value of the company?

If the company has no debt and 2 million shares of stock outstanding, what should be its stock price?

13. VWX Ltd. had FCF of $1.5 million last year. Over the next five years, FCF is expected to grow at 10% per year. Afterward, FCF growth will slow to 4% per year. If the WACC is 9%, there are 1 million shares outstanding, and the company has issued $10 million market value of debt and $5 million market value of preferred stock, what is a share of VWX stock worth?

Chapter 11

Assessing Risk

Nothing ventured, nothing gained.

PLEASE NOTE: This book is currently in draft form; material is not final.

Life is full of uncertainty. It would be wonderful if we could accurately predict tomorrow's weather (or the questions on next week's exam!). Thankfully, we can take measures to protect ourselves from uncertainty, such as carrying an umbrella (or studying), thus mitigating the risk involved.

In this chapter, we will study how risk can be accounted for in financial decision making. We will discuss some measures of risk and how we can control our exposure to it. The study of finance is, at its core, about the tradeoff between accepting a degree of risk for a potentially higher return.

11.1 Risk and Return Basics

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain risk and risk aversion.
2. Calculate the rate of return and expected rate of return for an investment.

If you are given a choice between these two following options, which would you pick (assume you only get to pick once):

1. You receive $1,000.
2. You flip a coin. If it lands heads, you receive $2,000, but if it lands tails, you get nothing.

Option A is guaranteed, while option B has some uncertainty: we don't know for certain what our outcome will be. Thus, we say that option A is risk free, while option B entails a certain degree of **risk**[1], or uncertainty in outcome.

The option that you prefer will depend upon your level of **risk aversion**[2]. This is the tendency for most people to prefer less risk to more risk, all else being equal. Most people presented with this problem (with these dollar amounts) prefer option A. Some people might prefer to take the risk and prefer option B, in which case we say they are **risk seeking**[3] (an entity who prefers a more risky alternative to a less risky one, all else being equal). And some might not care which of the two they pick, in which case we say they are **risk neutral**[4] (an entity who is ambivalent between choices with different levels of risk, all else being equal).

Different people have different levels of risk aversion, and even the same person can exhibit different amounts, depending upon the specifics of the question! For example, many more are willing to take the gamble if the amounts of money are smaller (say $10 in option A vs. $0 or $20 in option B), or if the wording of the questions are framed differently.

1. Uncertainty in outcome.
2. The tendency for most people to prefer less risk to more risk, all else being equal.
3. An entity who prefers a more risky alternative to a less risky one, all else being equal.
4. An entity who is ambivalent between choices with different levels of risk, all else being equal.

Much of finance involves changing risk exposure, especially the transfer of risk from those who are more risk averse to those who are less. Usually, the more risk averse party rewards, directly or indirectly, the bearer of more risk. The classic example is buying insurance: a policy holder will pay the insurance provider to bear the risk that something unfortunate will happen (like a fire or car accident).

When we talk about financial risk, the outcomes we compare are solely the monetary **returns**[5] that are possible in the different outcomes. These returns are the amount of money we end with, less our invested money. They can be positive or negative (which would occur if the money received is less than our investment). When figuring returns, we need to include any payments received or made (such as interest or dividends) as well of the selling price of the asset. To compare investments of different sizes easily, we will typically discuss the **rate of return**[6], which is the ratio of our return to our investment.

Equation 11.1 Rate of Return

$$\begin{aligned} Rateof Return &= \frac{Return}{Investment} \\ &= \frac{(CashInflows - CashOutflows)}{CashOutflows} \end{aligned}$$

Expected Return

Often, we will want to know what an investment's **expected rate of return**[7] is. When we talk of expected return, we will use the weighted mean of the possible investment outcomes; that is, each possible outcome weighted by the probability of that outcome.

Equation 11.2 Expected Rate of Return (weighted mean)

Expected Rate of Return = (probability of outcome 1 × rate of return of outcome 1) + (probability of outcome 2 × rate of return of outcome 2) + ... + (probability of outcome n × rate of return of outcome n) = $p_1 r_1 + p_2 r_2 + \ldots + p_n r_n$

For example, consider an investment that has a 25% chance of gaining 10%, a 50% chance of gaining 5%, and a 25% chance of losing 10% (a return of −10%). Our expected rate of return is .25 × .10 + .50 + .25 × (−.10) = 0.25 = 2.5%.

Other potential ways of thinking about the expectations surrounding the rate of return are also valid, and investors should be encouraged to think about more than

5. For an investment, the amount of money we end with, less our invested money.

6. The ratio of our return to our investment.

7. The weighted mean of the possible investment outcomes; that is, each possible outcome weighted by the probability of that outcome.

just the weighted mean. We could consider the most likely outcome (in our above example a gain of 5%). We could consider the range of outcomes (a return between +10% and –10%). We could plot our expected returns on a graph, and try to consider the shape of the graph. Each gives us a different insight about the uncertainty involved in the investment.

Of course, we rarely know with this level of precision what the future will hold, so we have to make our best educated guess. A common way to guess is to look at the historical returns from similar investments and find the yearly average, usually assuming each year has equal weight (the arithmetic mean). There are some downsides to this: just because an investment behaved one way in the past is no guarantee that it will continue to behave that way! For example, as of this writing, your authors have successfully not died each day of our lives (so far). If we extrapolate these results into the future, we should expect to live forever! While an extreme example, it should underscore a key financial maxim: historical results are not a guarantee of future performance.

KEY TAKEAWAYS

- Dealing with risk is a key part of finance, especially since most people are risk averse.
- Expected future returns are the weighted average of the possible outcomes. Historical results are often used as a proxy for future expected results.
- Historical results are not a guarantee of future performance!

EXERCISES

1. Genny invested $500. She received two payments of $100 and then sold her stake in the investment for $400. What was her rate of return?
2. An investment has a 10% chance of returning 20%, a 70% chance of returning 10%, and a 20% chance of returning nothing. What is the expected rate of return?
3. An investment has returned 5%, 3%, –4%, 6%, and –7% in each of the last five years, respectively. We have decided that we want to use historical returns as a proxy for expected future returns. What is the expected rate of return? Why might the historical results be a poor estimate of future returns?

11.2 Portfolios

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Calculate the returns for a portfolio of securities.
2. Explain the benefits of diversification.

Determining the risk of holding a single asset is a difficult task in itself. In reality, investors will typically hold many different assets of potentially different types. Another common alternative is that investors hand their money over to a manager that pools all the investors' contributions to purchase such, which we call a **portfolio**[8] (a collection of financial assets).

While individual stocks or bonds might rise or fall in value, ultimately an investor cares about the performance of the whole portfolio. If we make one bad investment but five good ones, we might come out ahead and be satisfied. Since investors tend to hold stocks as parts of their portfolios, managers need to understand how their company's performance will affect the risk and return of the portfolio.

Determining the return of the portfolio is a simple matter of taking the average of the returns of the components, weighted by the portion of the portfolio initially invested in each. Thus, if we invest $20 thousand in ABC stock and $80 thousand in FEG stock, our weights would be 20/(20+80) = 20/100 = .2 and 80/(20+80) = 80/100 = .8, respectively.

Equation 11.3 Portfolio Return (weighted mean)

Portfolio Return = (weight of security 1 × rate of return of security 1) + (weight of security 2 × rate of return of security 2) + ... + (weight of security n × rate of return of security n) = $w_1 r_1 + w_2 r_2 + \ldots + w_n r_n$

If the return on ABC was 10% and the return on FEG was −2%, the return of our portfolio would be (.2 × .10) + (.8 × −.02) = .004 or 0.4%. We can confirm that this is

8. A collection of financial assets.

correct: we earn 10% on our $20 thousand investment for a return of $2 thousand, and we lose 2% on our $80 thousand investment for a return of –$1,600. Adding the returns together gives a positive $400, which is precisely 0.4% of our original $100 thousand investment.

Notice that our portfolio return lies somewhere between the two extremes. Almost always, some investments will do better than others, so that our portfolio's returns won't be as good as our best investments. But the benefit is that our portfolio's returns won't be as bad as our worst investments. This is the key to **diversification**[9] (holding a portfolio of different assets so as not to concentrate exposure on one particular asset). This is embodied by the old saying, "Don't put all your eggs in one basket." Diversification can lower risk to a point, and is the closest thing to a "free lunch" in finance! To see this more concretely, we need to have a specific measure for our risk, which we will introduce later in this chapter.

KEY TAKEAWAYS

- Portfolio returns are a weighted (by % of investment) average of the components.
- Diversification causes the portfolio's returns to be less extreme than our best or worst investments.

EXERCISES

1. We have 30% invested in JKL stock, 40% in MNO stock, and 30% in PQR stock. Returns are 2%, 5%, and –1% respectively. What was our portfolio's return?
2. We have $25 thousand invested in ABC stock, $50 thousand in DEF stock, and $15 thousand in GHI stock. What are the portfolio weights?
3. ABC returned 10%, DEF returned 5%, and GHI returned 7%. Given the weights in #2, what is our portfolio's return?

9. Holding a portfolio of different assets so as not to concentrate exposure on one particular asset.

11.3 Market Efficiency

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe the process of price discovery.
2. Explain market efficiency.

Talking about risk only makes sense if we are dealing with uncertainty. If we truly are superior investors, able to always “pick the winners”, then we have no need to diversify significantly. For example, Bill Gates earned most of his fortune by owning a significant stake in one company (Microsoft).

A key difference, however, is that Bill Gates wasn’t just an investor, he was also the CEO for a significant portion of Microsoft’s history (and thus much more in control of the investment). And his tenure certainly wasn’t without uncertainty: for every Microsoft, Google, or Facebook there are numerous other companies that have failed, losing much of their investors’ capital. Unfortunately, many investors and managers only remember the success stories and forget those that lost their gamble. We constantly hear of these companies that were successful, but rarely hear of the former high-fliers of the internet bubble.

Furthermore, just as most people think they are “above-average drivers”, most investors are deluded into thinking they know more than everyone else in the market. Natural overconfidence, selective memory (we tend to remember our successes better than our failures), and a self-attribution bias (we tend to credit successes with skill but failures to “bad luck”) cause investors to believe they are better than they, in actuality, are. There is debate about whether Warren Buffett is a truly skilled investor, or whether he has “gotten lucky” because the market happened to fit his investment style during the years he was active. Given all of the numerous investors over the years, perhaps someone was bound to get as lucky as Buffett and make billions. Of course, many other investors were doomed to failure: many through lack of skill, but undoubtedly many also who were just “unlucky”. “It is better to be lucky than good” is a trading proverb that holds much truth.

Thus it is an open question whether skilled investors can **reliably** outperform the market. The argument for market efficiency goes as follows: investors sell or buy an asset based upon their valuation of the asset. This will cause the price to shift until the equilibrium price is reached (this process is called **price discovery**[10]). Once the proper price is reached, abnormal profits can no longer be earned. Furthermore, the market, in aggregate, has more information than any one investor could possibly have. The market price will be reached by this information, so an investor should not be able to abnormally profit from his or her private information. We call this the **Efficient Market Hypothesis (EMH)**[11].

Studies have shown that those with insider knowledge (that is, material **non-public** financial information) about companies can profitably trade on this information, thus offering one refutation of complete market efficiency (in what we term the **strong form of the EMH**[12]). Given that trading on insider information is typically against the law, this is of little benefit to the typical investor!

The **semi-strong form of the EMH**[13] argues that all **public** information has been accounted for by the market (including financial analysis of released statements and analysts' forecasts). If the semi-strong form is true, than investments based upon the fundamentals of a company shouldn't be able to earn excess profits. Successful investors such as Warren Buffett and Peter Lynch are often put forth as counter-examples to the semi-strong form; proponents of the semi-strong form have put forth arguments that these investors were either lucky or had access to investment opportunities or information not available to the market as a whole. Other arguments against the semi-strong form include the existence of anomalies such as asset bubbles (such as the technology bubble and the real estate bubble) and post-earnings drift (the tendency for stock prices to not immediately jump to a new price based upon earnings surprise but slowly "drift" to their new level).

Most academics tend to embrace the semi-strong form, though many Wall Street traders reject it. One reasonable question to ask is, even if public information can be exploited for gain, can a typical investor access and make use of the data? Believers of the semi-strong form (or those who reject it but believe typical investors can't benefit) advocate investing in "passive" broad market funds that don't invest in particular companies based on analysis (unlike most "actively managed" funds).

KEY TAKEAWAY

- If the market is at least semi-strong efficient, then analyzing public information won't provide a trading advantage (since the price should already reflect all publically available data).

10. The process by which investors sell or buy an asset based upon their valuation of the asset. This will cause the price to shift until the equilibrium price is reached.
11. The theory that the market, in aggregate, has more information than any one investor could possibly have. The market price will be reached by this information, so an investor should not be able to abnormally profit from his or her private information.
12. The belief that all public and non-public information has been accounted for by the market. Those with insider knowledge (that is, material non-public financial information) about companies cannot profitably trade on the information if the market is strongly efficient.
13. The belief that all public information has been accounted for by the market (including financial analysis of released statements and analysts' forecasts). If the semi-strong form is true, than investments based upon the fundamentals of a company shouldn't be able to earn excess profits

EXERCISE

1. Jane believes that by calculating a company's ratios from their past financial statements, she can deduce whether the company's stock price is cheap or expensive. Does Jane believe the market is efficient?

11.4 Standard Deviation

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain how standard deviation is a measure of risk.
2. Calculate the standard deviation of a set of returns.

There are many potential sources of risk, and not all methods of assessing risk are the same. One popular method (though certainly not the only one) for trying to quantify risk is to examine the standard deviation of the outcome returns. Standard deviation is a term from statistics that helps explain to what degree our results are expected to be different from the averge result. We are, in a sense, finding the "average" size of the "miss". For a full treatment of standard deviation as a statistical measure, please consult a statistics text; for our purposes, a basic understanding will suffice.

Figure 11.1 *Standard Deviation Comparison*

Source: JRBrown / Wikimedia Commons / Public Domain

The blue investment has results that are less "clumped" around the mean than in the red investment. The blue investment has a correspondingly higher standard deviation.

Finding standard deviation involves a few steps; if we know all the outcomes and their probabilities, standard deviation is found as follows:

1. Find the expected rate of return.
2. For each outcome, find the difference between the outcome's rate of return and the expected rate, and square the difference. So if the expected outcome is 2.5%, but the outcome's return is -10%, then the

difference is (−.10 – (.025) = −.125. This result squared is $-.125^2$ = .015625. Notice that the squaring effectively eliminates the negative numbers (so it doesn't matter if we miss high or low, just how much we miss by).

3. Find the weighted mean of these: multiply each by the probability of the outcome and sum.
4. Take the square root of this weighted mean to find the standard deviation.

Equation 11.4 Standard Deviation of Returns (all outcomes known)

$$\text{Standard Deviation}=\sqrt{p_1(r_1-\overline{r})^2+p_2(r_2-\overline{r})^2\ldots+p_n(r_n-\overline{r})^2}$$

$$\text{where}\overline{r}\text{istheexpectedrateofreturn(weightedmean)}$$

If we are using historical returns to estimate our expected return, then we need to make a slight adjustment to the formula. Typically, we assume each past observation (usually daily, weekly, monthly, or yearly returns) to have equal weight. Thus, the expected rate of return is just the arithmetic mean. But since we have just estimated the expected rate of return, we need to adjust our standard deviation calculation (for a detailed reason why, please see any standard statistics text, as it is beyond the scope of this text):

Equation 11.5 Standard Deviation of Returns (estimating expected return from historical)

$$\text{Standard Deviation}=\sqrt{\frac{(r_1-\overline{r})^2+(r_2-\overline{r})^2\ldots+(r_n-\overline{r})^2}{n-1}}$$

$$\text{where}\overline{r}\text{istheexpectedrateofreturn(weightedmean)}$$

On the bright side, spreadsheet programs can quickly do this calculation for us.

=STDEV.S(outcome1, outcome2, outcome3...)

Thus, if our outcomes for the past 5 years are 5%, 2%, −6%, −2%, and 4%, we can enter:

=STDEV.S(.05,.02,−.06,−.02,.04)

and receive the correct result of 0.0456 or 4.56%.

Most financial calculators can also solve for standard deviation; please consult the instruction manual of your calculator for details.

There are some downsides to using standard deviation as the measure of risk. Standard deviation tells us the most when our outcomes are normally distributed (the "bell curve"). If our outcomes have some extreme outliers (for example, a decent chance for a large positive or negative result), then standard deviation tells us very little about the risk associated with these results. If our results are skewed toward positive or negative outcomes, standard deviation tells us nothing of the effect.

Portfolio Standard Deviation

Figuring out the standard deviation of a portfolio can be done using the same procedure as above: just solve for the portfolio returns and then use them to find the standard deviation. What **won't work** is trying to take the weighted average of the standard deviations of the individual assets! The reason for this is simple, if the assets don't move in perfect tandem, then the diversification will cause the returns of the portfolio to be less volatile (that is, have a lower standard deviation).

Often, when constructing portfolios, investors will try to use investments that specifically behave differently from each other to try to maximize the benefits of diversification (in turn, minimizing risk). For example, consider the following: asset ABC had returns of 6%, 4%, and 2% over the past 3 years, respectively. DEF had returns of 3%, 5%, and 7%, respectively. The standard deviation of both investments is thus 2%. An equal weighted portfolio (that is, 50% of each) will have returns of 4.5% each year, for a standard deviation of 0%!

In reality, we can rarely find assets that behave so differently from each other (most assets, for example will increase in value as the overall economy improves), so there is a limit to the benefits of diversification. We will explore this further in a following section. Additionally, it seems that in times of crisis (for example, in 2008), many types of assets that typically behave in different ways can all lose value together; in other words, right when we need the benefits of diversification most is when the effect is smallest.

KEY TAKEAWAYS

- Standard deviation is one common measure of risk, but not the only one. It does not represent all aspects of risk.
- Standard deviation of a portfolio is not the weighted average of the standard deviations of the components. It must be computed from the portfolio returns.

EXERCISES

1. An investment has a 10% chance of returning 20%, a 70% chance of returning 10%, and a 20% chance of returning nothing. What is the standard deviation of expected returns?
2. An investment has returned 5%, 3%, –4%, 6%, and –7% in each of the last five years, respectively. We have decided that we want to use historical returns as a proxy for expected future returns. What is the standard deviation of these returns?
3. Why isn't a portfolio's standard deviation the same as its components?

11.5 Market History

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVE

1. Describe the historical relationship between return and risk for various financial assets.

Over the past few chapters, we have explored different types of financial assets. At this point, it is worth looking at how some of these assets have performed historically.

Table 11.1 Historical Returns and Standard Deviations: Summary Statistics of Annual Total Return, 1926–2010

	Arithmetic Mean	Standard Deviation
Small Company Stocks	16.7%	32.6%
Large Company Stocks	11.9%	20.4%
Long-Term Corporate Bonds	6.2%	8.3%
Long-Term Government Bonds	5.9%	9.5%
Immediate-Term Government Bonds	5.5%	5.7%
U.S. Treasury Bills	3.7%	3.1%
Inflation	3.1%	4.2%

Source: Ibbotson SBBI, 2011 Classic Yearbook: Market Results for Stocks, Bonds, Bills, and Inflation, 1926–2010 (Chicago: Morningstar, 2011).

We see that there is a very strong relationship between the average return and the level of risk (as measured by standard deviation). This corresponds with our understanding that most investors are risk averse; that is, to accept a larger degree of risk (a higher standard deviation) investors demand a larger return. Also, this figure matches our intuition that stocks are riskier than bonds.

While this data is a good starting point for those trying to determine future investor expectations, there are some large caveats. Remember that, during this time period, the United States rose to be one of (if not the only) world "superpowers". We have no idea what this data would look like if, for instance, the Axis nations won WWII or the Soviet Union still existed. Depending upon these trends to continue might be a mistake, since the world continues to change politically, economically, and culturally.

KEY TAKEAWAYS

- The higher the risk, the higher the expected return (usually).
- Historical results are not a guarantee of future performance! (We realize we're repeating ourselves, but we want to underscore this very crucial fact.)

EXERCISES

1. Is there any portion of the historical data that has a surprising result (that is, contrary to our expectations)?

11.6 The Capital Asset Pricing Model (CAPM)

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the difference between market risk and firm-specific risk.
2. Calculate a portfolio's beta from its components.
3. Calculate an asset's expected return using CAPM.

Riskier assets should demand higher returns. But not all risk is the same, because of diversification. For example:

Figure 11.2 Standard Deviation of a Stock Portfolio vs. Number of Random US Securities

Once we approach about 40 stocks in a portfolio (assuming they are relatively random and not, for example, all technology stocks) we cease to see significant reductions in standard deviation. There are some mutual funds and ETFs that attempt to own virtually the entire market of available securities! Nonetheless, there is a certain minimum amount of risk that must be borne by those investing in stocks due to factors that affect the entire market, which we call **market risk**[14] (also called systematic risk or non-diversifiable risk). Only by adding other asset types (for example, bonds or real estate) can we gain some additional diversification benefits.

The additional risk that any stock has above its market risk is called **firm-specific risk**[15] (also called unsystematic, diversifiable, or unique risk). This encompasses all factors that would affect the company's stock price, but not the market in general. For example, the CEO being indicted for fraud or the approval of a new popular pharmaceutical would be firm-specific event. Diversification reduces firm-specific risk but leaves market risk.

Since firm-specific risk can be virtually eliminated by diversification, investors shouldn't demand a higher return to compensate for it. Market risk, however, can't

14. Minimum amount of risk that must be borne by those investing in stocks due to factors that affect the entire market. Also called systematic risk or non-diversifiable risk.

15. The additional risk that any stock has above its market risk, that encompasses all factors that would affect the company's stock price, but not the market in general. Also called unsystematic, diversifiable, or unique risk.

be diversified away, so investors should demand higher returns for those securities which have a larger sensitivity to broad market events (like the state of the economy). For example, airlines tend to do poorly when the economy tanks (since in a bad economy, people travel less for both business and leisure), so investors should demand a higher return for airlines. Discount retailers, like Walmart, tend to be relatively less affected by a downturn in the economy, so they have less market risk; as a result, investors should demand a lower return for Walmart than an airline. Specifically, we are looking at a stock's **risk premium**[16] (the expected return in excess of the risk free rate), as this is the portion of the return compensating investors for bearing the extra market risk associated with holding the stock.

One way to attempt to quantify a company's market risk is to calculate its historical **beta**[17]. Beta represents the ratio of a company's risk premium versus the market's risk premium. Typically, beta is found by some method of statistical regression of past company returns in excess of the risk-free rate compared to a broad market index's returns in excess of the risk-free rate on a daily, weekly, or monthly basis. Of course, what investors really want is a company's beta going forward, so the historical beta will be a proxy for this value. Most financial sites provide their projection of public companies' betas and will usually describe any adjustments they make from the historical calculation.

So how is beta used? A stock that tends to move in the same direction as the market (most stocks) will have a positive beta. Stocks with a beta of 1.0 will move in the same proportion as the market: if the market is up 1% over the risk-free rate, these stocks will also tend to be up 1% (statistically speaking). Stocks with betas higher than 1.0 are more sensitive to market moves; betas lower than 1.0 indicate less sensitivity. The beta of the broad market index must be, by definition 1.0 (since it must move in perfect tandem with itself).

Since the betas of all stock are perfectly correlated with market risk (and, hence, each other), the beta of a portfolio of stocks is the average (weighted mean) of the betas of the components.

Equation 11.6 Portfolio Beta (weighted mean)

$$\text{Portfolio Beta} = (\text{weight of security 1} \times \text{beta of security 1}) + (\text{weight of security 2} \times \text{beta of security 2}) + \ldots + (\text{weight of security n} \times \text{beta of security n}) = w_1\beta_1 + w_2\beta_2 + \ldots + w_n\beta_n$$

16. The expected return in excess of the risk free rate.

17. The ratio of a company's risk premium versus the market's risk premium.

For example, if we have $20 thousand invested in ABC stock (which has a beta of 1.5) and $80 thousand invested in DEF stock (which has a beta of 0.7), then our portfolio's beta is:

$$(\frac{20}{20+80} \times 1.5) + (\frac{80}{20+80} \times 0.7) = (0.2 \times 1.5) + (0.8 \times 0.7) = 0.86$$

A portfolio holding every stock in the same weights as the market overall should have a risk premium equal to the market's risk premium (also called the equity risk premium). It should also have a beta of exactly 1.0. Since the relationship of each component to both the portfolio's return and beta is the same (weighted mean), the two measures must be proportional to each other. Specifically, each component's contribution to the risk premium of the overall market portfolio must be proportional to the component's market risk (the beta):

Equation 11.7 Proportional Risk Premium

$$\begin{aligned}
\frac{RiskPremiumofStockA}{BetaofStockA} &= RiskPremiumofMarket \\
\frac{RP_A}{\beta_A} &= RP_{MKT} \\
\frac{r_A - r_{RF}}{\beta_A} &= r_{MKT} - r_{RF}
\end{aligned}$$

Continuing with our example stocks: if the market risk premium was 4.0%, then ABC (beta=1.5) should have a risk premium of 1.5×0.04=0.06 or 6%, and DEF (beta=0.7) should have a risk premium of 0.7×0.04=0.028 or 2.8%.

Of course, any given observation might deviate from the relationship predicted (beta is a statistical number), but the key idea is that our **expected** returns should hold to this relationship. If we rearrange this equation to solve for the expected return of stock A, we get what is called the Capital Asset Pricing Model (CAPM):

Equation 11.8 Capital Asset Pricing Model (CAPM)

$$\begin{aligned}
\frac{r_A - r_{RF}}{\beta_A} &= r_{MKT} - r_{RF} \\
r_A &= \beta_A \times (r_{MKT} - r_{RF}) \\
r_A &= r_{RF} + \beta_A \times (r_{MKT} - r_{RF})
\end{aligned}$$

This is a very important result, as it implies that we can predict a stock's expected return if we know the risk-free rate, beta of the stock, and the market risk premium.

Thus, if stock GHI has a beta of 1.2, and we know that the risk-free rate is 2% and the expected market returns are 7%, the expected returns for GHI should be 0.02 + 1.2 × (0.07 – 0.02) = 0.08 or 8%.

We can also use the relationship to compare two stocks directly:

Equation 11.9 Proportional Risk Premiums (two stocks)

$$\frac{Risk Premium of Stock A}{Beta of Stock A} = \frac{Risk Premium of Stock B}{Beta of Stock B}$$
$$\frac{RP_A}{\beta_A} = \frac{RP_B}{\beta_B}$$
$$\frac{r_A - r_{RF}}{\beta_A} = \frac{r_B - r_{RF}}{\beta_B}$$

Issues with CAPM

While the realationship embodied in CAPM is very important to understand, the theory is not without its limitations. While determining the expected risk-free rate is fairly accurately obtained from observing the bond market (typically using long-term US government bond yields as a proxy), figuring an accurate forward looking beta and equity risk premium is much more difficult. The bulk of estimates of the equity risk premium in the US fall in the 2%–5% range, though arguments for rates well outside this range are not unheard of!

As a more general critique, there are proposals that there are systematic risk factors beyond just market risk. For example, some multi-factor models (such as including a variable for company size) seem to be better predictors of expected returns. Ideally, the market portfolio shouldn't just include stocks, but the entire field of investments (including real estate, fine art, and even baseball cards). Empirically, CAPM is not as accurate as we wish it to be in predictive power.

KEY TAKEAWAYS

- Firm-specific risk can be diversified away, but market risk can't.
- The risk premium of assets should be proportional to their betas.
- The beta of a portfolio is the average (weighted mean) of the betas of its components.

EXERCISES

1. Are the following examples of firm-specific or market risk?
   a. An oil company failing to find oil in one of its oil fields.
   b. GDP numbers beating expectations.
   c. The SEC finding accounting irregularities with a company.
2. How might a drop in the price of oil cause both firm-specific and market risk effects?
3. We have $25 thousand invested in ABC stock (beta=1.5), $50 thousand in DEF stock (beta=0.7), and $15 thousand in GHI stock (beta=1.2). What is the portfolio's beta?
4. Long term gov't bonds are returning 4%. The equity risk premium is 5%. If XYZ stock has a beta of 0.6, what is its expected return?

11.7 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain how risk and return play a role in financial management.
2. Describe some ethical considerations regarding risk and return.

At the core of all of finance is the question of appropriate tradeoff between risk and return. We have looked in detail at one measure of risk, standard deviation, and further separated the portion due to the market and the portion that can be "diversified away". As financial managers, we will need to evaluate projects based upon their returns and their potential contribution to non-diversifiable risk, since our investors will expect appropriate returns for the risk assumed. This will play a key part in our investigation of the cost of captial, which in turn will affect our evaluation of which projects our companies should undertake.

Furthermore, the concepts introduced in this chapter are the foundation of much of modern portfolio theory. Any who plan to study investments further will use these principles in constructing efficient portfolios.

Ethical Considerations

Analysis of risk involves many assumptions and calculations, and those who do not have the appropriate background can be very dependent upon the advice of we who have studied finance. An unscrupulous actor could misrepresent the actual risk of an investment to the detriment of clients, customers, investors, or management. For example, there are many cases of traders at large banks trying to hide the actual amount of risk they have in their portfolios, and they often aren't discovered until their positions have lost much money. Or a dishonest investment advisor could put clients into assets that are overly risky given the clients' age, income, or risk tolerance. Misrepresenting the risk of an investment is just as bad for the investor as misrepresenting the potential return.

Another area where ethics can play a part regards diversification. If we are trying to emulate a market portfolio, we might introduce stock positions in companies that engage in business practices that we disagree with. Thankfully, we don't need to have a position in every company to reap most of the benefits of diversification, but ethical diversification is not just as simple as purchasing any broad market ETF.

KEY TAKEAWAYS

- Risk and return play a key part in determining a company's cost of capital.
- Misrepresenting risk is potentially as damaging as misrepresenting return!

EXERCISE

1. You learn of an investment opportunity that expects great returns, but also has great risk associated with it. To raise the capital needed, you decide to ask your grandfather, who lives on a fixed income, to contribute. What questions might need to be considered to determine if this is an ethical course of action?

11.8 End-of-Chapter Exercises

PLEASE NOTE: This book is currently in draft form; material is not final.

End-of-Chapter Problems

1.
2.
3.
4.
5.

Chapter 12

Cost of Capital

What Is the Cost of Capital?

PLEASE NOTE: This book is currently in draft form; material is not final.

Investors expect a profit. Very few investors would be willing to hand over money if they didn't expect to receive more back! Therefore, each dollar of capital raised by a company has a cost associated with it.

12.1 The Cost of Capital Overview

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define the cost of capital.
2. Identify the costs associated with the costs of capital such as flotation, administrative and underwriting.

The **cost of capital**[1] is the rate of return that a firm must supply to its investors. If a corporation doesn't provide enough return, market forces will decrease the prices og their stock and bonds to restore the balance. The cost of capital acts as a link between a firm's long-run and short-run financial decisions because it ties long-run returns with current costs. We should undertake only projects where the return is greater than the associated cost.

Flotation Costs

Flotation costs[2] are the costs of issuing and selling a security. Typical costs include both underwriting and administrative costs. **Administrative costs**[3] are any expenses incurred by the issuer of the security including legal, accounting etc. **Underwriting costs**[4] are payment to investment bankers for selling the security. When we discuss the cost of capital we are discussing the net proceeds from the sale of any security (bond, stock or any other security). So net proceeds are the total amount received minus any of the above described flotation costs.

Components of WACC

There are several components to the cost of capital for a firm. These are:

1. Cost of debt
2. Cost of preferred stock
3. Cost of common stock

1. The rate of return a firm must supply to investors.
2. Cost of issuing and selling a security.
3. Any additional costs such as legal, accounting or printing.
4. Payments to the investment banker for issuing the security.

Together these three components are then "weighted" based on the percentages they are used in the company.

KEY TAKEAWAYS

The cost of capital is the return a company must earn on its investment projects to maintain its market value.

- Flotation costs are the costs of issuing a security.
- The components of the cost of capital are 1) debt, 2) preferred stock, 3) common stock.

EXERCISES

1. What are flotation costs?
2. What are administrative costs?
3. What are underwriting costs?

12.2 Cost of Debt

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Understand the components of the cost of debt.
2. Identify the tax implications of debt.
3. Explain how debt plays into the weighted average cost of capital.

The cost of long-term debt, r_d, is the after-tax cost of raising long-term funds through borrowing. The important cost is our **marginal debt cost**[5] which is the next dollar of debt. If we were to issue another dollar (an additional dollar) of debt, how much would it cost us? The cost of new issuance of debt will probably not be the same as other debt we have issued in the past (our **historical debt cost**[6]), as we will need to satisfy the current market demand.

How to Calculate the Cost of Debt

There are a few methods to calculate the cost of debt. We are looking for the yield to maturity (YTM), since this is the most accurate gauge of market demand. How do we figure out the yield to maturity? If we have outstanding debt of an appropriate maturity, we can assume the YTM on this debt to be our cost.

If our company, however, has no publicly traded debt, we could look to the market to see what the yield is for other publicly traded debt of similar companies. Or, if we are completely using bank financing, we can simply ask the bank to provide us with an estimated rate.

Equation 12.1 Pre-Tax Cost of Debt

Component Cost of Debt = r_d

Since interest payments made on debt (the coupon payments paid) are tax deductible by the firm, the interest expense paid on debt reduces the overall tax

5. The cost for the next issue of debt.

6. The cost for debt the company issed in the past.

liability for the company, effectively lowering our cost. To calculate the real cost of debt we take out the tax liability.

Equation 12.2 After-Tax Cost of Debt

After-Tax Component Cost of Debt = $r_d - (r_d \times T) = r_d \times (1 - T)$

Here, r_d is the before tax return and T is the corporate tax rate.

Worked Example: Falcons Footwear

Falcons Footwear is a company that produces sneakers for children. Each sneaker has a black and red falcon head on it. Their marginal tax rate is 40%, and the have $100 million notional, 30 year bonds with a 7% coupon. The bonds currently sell for par. What's the after tax cost of debt?

Since the bonds are selling for par, we know that the YTM equals the coupon rate of 7%.

After-Tax Cost of Debt for Falcon Footwear = $0.07 \times (1 - 0.4)$

$= 0.042$ or 4.2%

KEY TAKEAWAYS

The debt component has important considerations.

- Tax considerations are important as interest payments are tax deductible.
- We can estimate the cost of debt either by looking at the market or by looking at our historical debt issuances.

EXERCISES

1. What's the cost of debt if the company has $20 million in 20 year debt that pays 11% and they are in the 40% tax bracket?
2. What's the cost of debt if the company has $50 million in 10 year debt that pays 6% and they are in the 40% tax bracket?

12.3 Cost of Preferred Stock

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Understand the components of preferred stock.
2. Explain how preferred stock is a part of the weighted average cost of capital.

Preferred stock dividends are *not* tax deductible to the company who issues them. Preferred stock dividends are paid out of *after-tax cash flows* so there is no tax adjustment for the issuing company.

When investors buy preferred stock they expect to earn a certain return. The return they expect to earn on preferred stock is denoted r_{ps}.

D_{ps} is the dividend from preferred stock, P_{ps} is the price of preferred stock.

Equation 12.3 Cost of Preferred Stock

$$\text{Component Cost of Preferred Stock} = r_{ps} = \frac{\mathrm{D_{ps}}}{\mathrm{P_{ps}}}$$

Worked Example: Falcons Footwear

Falcons Footwear has 2 million shares of preferred stock selling for $85/share. Its annual dividend is $7.50. What's the r_{ps}?

$$\text{Component Cost of Preferred Stock} = r_{ps} = \frac{\$7.50}{\$85.00} = 0.0882 \textit{ or } 8.82\%$$

Typically the cost of preferred stock is higher than the after-tax cost of debt. This is because of both the tax deductibility of interest and the fact that preferred stock is riskier than debt.

KEY TAKEAWAYS

- Preferred stock is a hybrid security—it's both debt and equity.
- Preferred stock return is calculated as its dividend divided by its price.

EXERCISES

1. Calculate the component cost of preferred stock given the following: Company A has $10 million in preferred stock selling for $100 each and pays a dividend of $7.80. What's the r_{ps}?
2. Why is there no tax-adjustment made to our calculation of preferred stock?

12.4 Cost of Common Stock

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Understand the components of common stock.
2. Explain how common stock is a part of the weighted average cost of capital.

New stock issues (IPOs) gain many headlines, as such companies are usually growing fast and require a large influx of capital. Secondary issues don't get as much press, but are also a sign that companies are raising capital. But these are actually **not** the most common way of raising equity financing!

Because dividends are not required to be increased (or even paid!) when a company is doing well, the company can instead retain excess earnings and reinvest them (hence the item on the balance sheet). Most capital is raised through reinvesting earnings, instead of through issuing new stock, because issuing new stock incurs flotation costs. We will assume that the cost to the firm, r_s, is the same.

The cost of equity is the most difficult source of capital to value properly. We will present three basic methods to calculate r_s: the Dividend Discount Model (DDM), the Capital Asset Pricing Model (CAPM), and the Debt plus Risk Premium Model (D+RP).

Using the Dividend Discount Model (DDM)

In Chapter 10 "Stock Valuation", we explored the DDM model.

Equation 12.4 Cost of Common Stock

$$r_s = \frac{D_1}{P_0} + g$$

P_0 is the price of the share of stock now, D_1 is our expected next dividend, r_s is the required return on common stock and g is the growth rate of the dividends of common stock. This model assumes that the value of a share of stock equals the present value of all future dividends (which grow at a constant rate). This equation states that the cost of stock equals the dividend expected at the end of year one divided by the current price (dividend yield) plus the growth rate of the dividend (capital gains yield).

Worked Example: Falcons Footwear—Constant Growth to calculate r_s

Falcons Footwear has 12 million shares of common stock. The stock is currently selling for $60/share. It pays a dividend of $3 this year and the dividend is growing at 4%. What is r_s?

First we must calculate D_1. $D_1 = D_0*(1+g) = \$3*(1+.04) = \$3.12$

$$r_s = \frac{D_1}{P_0} + g = \frac{\$3.12}{\$60} + 0.04 = 0.52 + 0.04 = 0.092 = 9.2\%$$

If our stock isn't currently paying dividends, then the equation reduces to our capital gains yield, which should be proportional to our expected long term growth rate.

Using the Capital Asset Pricing Model (CAPM)

We learned that the Capital Asset Pricing Model (CAPM) was a relationship between the return for a given stock and the nondiversifiable risk for that stock using beta (β). The basic equation (from Chapter 11 "Assessing Risk") is:

Equation 12.5 CAPM Equation

Required return on stock = risk free rate + (market risk premium)*(Beta of stock)

$r_s = R_F + [R_M - R_F] \times \beta$

Equation 12.6 Market Risk Premium

market risk premium = expected market return – risk free rate

Where R_F is the risk free rate, R_M is the market return or the return on the market portfolio and β is beta. If our company has yet to issue stock, then beta will need to be estimated (perhaps by looking at a public competitor's).

Worked Example: Falcons Footwear—CAPM to calculate r_s

Falcons Footwear wants to calculate r_s using the CAPM. They estimate the risk free rate (R_F) to be 4%. The firm's beta is 1.3 and the market return is 9%.

$r_s = 0.04 + [0.09 - 0.04] * (1.3) = 0.105 = 10.5\%$

Using the Debt plus Risk Premium Model (D+RP)

If we know that, historically, our stock has traded at a particular premium to our cost of debt, we can use that relationship to estimate our cost of equity. If our stock isn't publically traded, we can estimate based upon competitors or industry averages.

$r_s = r_d + \textit{Risk Premium}$

Worked Example: Falcons Footwear—D+RP to calculate r_s

We know that current Falcons Footwear bonds are yielding 7%. If we know that comperable companies have cost of equity about 4% higher than their cost of debt, what is a good estimate of Falcons Footwear's cost of equity?

$r_s = 0.07 + 0.04 = 0.11 = 11\%$

Which Method Is Best?

Each method has its strengths and weaknesses, and all are subject to the quality of the inputs. DDM is very sensitive to the estimation of the growth rate. CAPM depends upon an accurate estimate of the firm's beta. D+RP assumes that the risk premium is accurate.

Often, the best method is to calculate all three results and make an informed judgment based on the results. If one result varies wildly from the other two, perhaps it is best omitted. Estimating the cost of equity is one of the most difficult tasks in finance, and it can end up being equal parts art and science.

Final Thoughts on r_s

1. If a firm's only investors were common stockholders, then the cost of capital would be the required rate of return on equity.
2. The cost of retained earnings is the same as r_s.
3. Tax implications of common stock are also large. The dividends issued by the company are not tax deductible (just like preferred stock dividends), and the company bears the full cost.

KEY TAKEAWAYS

- The cost of common stock can be calculated either using the constant growth model or using CAPM.
- The cost of using retained earnings is assumed to be the same as r_s.

EXERCISES

1. Calculate r_s using CAPM given the following:

   R_F = 5%, R_M = 4%, b = 1.4

2. Calculate r_s using Constant Growth Model given the following:

   D1 = $5, Selling price is $35, Dividend is growing at 2%.

12.5 Weighted Average Cost of Capital (WACC)

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Compile the WACC equation.
2. Solve for WACC.

Now that we have calculated all of our component costs, calculating the WACC is simple. We plug into our formula and solve.

Table 12.1 Components of WACC

Variable	=	Definition
r_d	=	Interest rate on firm's debt. Or the return on debt.
$r_d(1 - T)$	=	After-tax cost of debt.
r_{ps}	=	Return on preferred stock
r_s	=	Return on common stock
w_d	=	Weight (%) of debt used by company
w_{ps}	=	Weight (%) of preferred stock used by company
w_s	=	Weight (%) of common stock used by company
WACC	=	Weighted Average Cost of Capital
D_{PS}	=	Dividend of Preferred Stock
P_{PS}	=	Price of Preferred Stock
g	=	Growth rate of dividends of common stock
P_0	=	Price in time zero of a share of common stock
D_0	=	Dividend in time zero

Variable	=	Definition
D_1	=	Dividend in time 1

The **weighted average cost of capital (WACC)**[7] takes the return from each component and then appropriately 'weights' it based on the percentage used for financing. The weights must sum to one and it is easiest to use decimals. In words the equation is:

Equation 12.7 WACC components (words)

WACC = (% of debt)(After-tax cost of debt) + (% of preferred stock)(cost of preferred stock) + (% of common stock)(cost of common stock)

Or

WACC = (% of debt)(Before-tax cost of debt)(1–T) + (% of preferred stock)(cost of preferred stock) + (% of common stock)(cost of common stock)

Using symbols, the equation is:

Equation 12.8 WACC components (symbols)

$$WACC = w_d r_d (1 - T) + w_{ps} r_{ps} + w_s r_s$$

Worked Example: Falcons Footwear—CAPM to calculate r_s

Falcons Footwear has 12 million shares of common stock selling for $60/share. They have 2 million shares of preferred stock selling for $85/share and $100 million in bonds trading at par. They are in the 40% tax bracket.

First we calculate the total market value:

Total market value of common stock = 12 million*$60 each = $720 million

Total market value of preferred stock = 2 million shares*$85 each = $170 million

Total market value of bonds = $100 million trading at par = $100 million

Total market value = 720 + 170 + 100 = $990 million

7. The average of the returns required by equity holders and debt holders, weighted by the company's relative usage of each.

From this we get the weights:

Percentage of common stock = $720 / $990 = 72.7%

Percentage of preferred stock = $170 / $990 = 17.2%

Percentage of debt = $100 / $990 = 10.1%

Total equals = 100%

Then we plug in the weights and the component costs.

$WACC = w_d r_d(1 - T) + w_{ps} r_{ps} + w_s r_s$

$WACC = (0.101)(0.07)(1-0.4) + (0.172)(0.0882) + (0.727)(0.092)$

$WACC = 0.0042 + 0.0152 + 0.0668 = 0.0862$ or 8.62%

For Falcons Footwear the WACC is 8.62%.

KEY TAKEAWAY

- The Weighted Average Cost of Capital is the component returns multiplied by their respective weights.

EXERCISES

1. Calculate WACC given the following:

   r_s = 6 percent%, r_d = 10%, r_{ps} = 4%, w_d = 40%, w_s = 50%, w_{ps} = 10%

2. Calculate WACC given the following:

   r_s = 5.5%, r_d = 4.5%, r_{ps} = 7%, w_d = 35%, w_s = 45%, w_{ps} = 20%

12.6 WACC and Investment Decisions

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain how WACC plays into investment decisions.
2. Avoid common mistakes with WACC.
3. Distinguish between what the firm can and cannot control.

Once we have calculated the WACC, it is vital that it is used properly. Our main objective is to maximize stakeholders' value. Anything that increases shareholder value is good and should be done. From a financial perspective, if the return from a project is greater than its cost, we should undertake the project. If the cost of the project is greater than its expected return, we should not undertake the project. WACC is the cost of the capital used to complete the project and is as such our cost of capital. If the return earned from the project is 12% and our WACC is 10%, the project will add value. If the WACC is 14%, the project destroys value. Thus, if our calculation of WACC is in error, then so are our investment decisions.

Common Mistakes

In using WACC there are some common pitfalls including:

1. Historical vs. Marginal Rates
2. Book vs. Market Values

Historical vs. Marginal Rates

It is tempting to assume that the cost for the next dollar of investment will be the same as the cost of the prior investments. If we assume that because our prior debt issue was at 7% interest that our next cost of debt will be 7%, it could significantly affect the WACC. With even bigger numbers, a corporation could grossly underestimate (or overestimate) their costs. Inaccuracy in cost calculation may result in missed opportunities. We must look to current market conditions to accurately estimate our cost of capital.

Book vs. Market Values

Book values are what a firm purchased something for. Market values are what it is currently worth if it were to be sold in the market. So which should be used in calculating WACC? Market values are the most accurate, especially when considering how widely equity values can vary from their stated book values. As demonstrated in the recent financial crisis, market values can have wide fluctuations but they are still the chosen value.

Factors Beyond a Firm's Control

Certainly having some knowledge about the future would be helpful. Or having some control over certain conditions. There are several factors which are beyond a firm's control. These include:

1. State of financial markets and market conditions
2. Investor's risk aversion
3. Taxes

All of these factors impact a firm's WACC, and yet they have no control over any of them.

Factors the Firm Can Control

There are several factors a firm can control. They are:

1. Capital Structure
2. Dividend Policy
3. Investment Policy

While the firm cannot control certain effects, they are able to make internal decisions about other items.

Adjusting WACC for Project Risk

Not all projects have the same amount of risk. There are many uncertainties with any project, and, all other things being equal, a less risky project is preferable to a more risky one. Many firms will adjust the discount rate used for NPV analysis (or the hurdle rate for IRR) based upon the perceived risk of the project. If a project has less risk (or offsets existing risk) in the company, a lower discount rate is used; riksier project get a higher rate. These rates can be assigned per division or per project, based upon the granularity that a company desires.

Technically, the risk we should care about most is the project's contribution to our systematic risk (see Chapter 11 "Assessing Risk"), as risk that is firm (or project) specific can be diversified away by investors. In theory, we could try to estimate a beta for our project and recalculate the WACC! In practice, however, most firms that adjust for risk tend to use judgment to determine the approximate risk of the project, and consequently choose and appropriate discount rate.

Worked Example: Falcons Footwear—Adjusting WACC for risk

Falcons Footwear has a WACC of 8.62%. Management has decided that a division's projects tend to increase the company's risk, so all projects must be discounted at 2% + WACC. Thus, their projects will be discounted at 10.62%.

KEY TAKEAWAYS

A correctly calculated WACC needs to be used properly.

- Avoid common mistakes of using historical and book values.
- Be concerned with those items a firm can control such as capital structure, dividend policy and investment policy.

EXERCISES

1. What are the factors a firm can control? What are the factors a firm cannot control?
2. When might we use historical instead of market rates?
3. Might there be a time when it would be appropriate to use book values to calculate WACC?

12.7 Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain how WACC fits into the larger picture of finance.
2. Discuss the ethics of WACC.

The time value of money is at the heart of finance, and using the appropriate discount rate is essential. WACC gives us that disount rate. Even though most employees in the firm will never need to calculate the WACC, many key decisions will hinge upon the use of WACC in discounting the future cash flows of projects. Keeping WACC low drives stock prices higher (since future income streams become worth more), which is why it is vital not to take undue risk (that is, risk without appropriate return).

A note about non-profit organizations: calculating an appropriate WACC is much more difficult. What is the return desired by our donors? Instead, management will have to select a rate that represents the trade-off between projects now and in the future (the opportunity cost). Some will look toward the for-profit sector to provide examples of WACC, while some rely solely on the judgment of senior management. This will enable comparisons amongst projects competing for the donor's resources.

Ethical Considerations

Like all methods for computing a result: garbage in means garbage out. Some managers will determine ahead of time the desired outcome for a project, and try to calculate WACC to "tip the scales" on the financial decision. Using a firm-wide WACC can eleviate this somewhat, but if the estimate for beta is too low or the wrong YTM on debt is used, the difference can cause a slew of projects to be accepted or rejected. If risk adjusted discount rates are used, managers could misrepresent the true risk of their projects to attempt to have them accepted.

KEY TAKEAWAYS

- WACC is central to proper discounting for projects.
- Since WACC does potentially leave some room for interpretation, setting firm or division wide rules for WACC before projects are considered can help prevent managers from "tipping the scales".

EXERCISES

1. Why should a non-profit entity care about the idea of WACC?
2. Depending upon how you calculate the WACC for your corporation (for example, using DDM vs. CAPM for the equity component), you get a range of outcomes from 9.2% to 10.1%. You know a project that your friend is working on needs a 10% or lower discount rate to be financially profitable. What are some of the factors that should be considered in evaluating the project ethically?

12.8 End-of-Chapter Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

END-OF-CHAPTER EXERCISES

1.
2.
3.
4.
5.

Chapter 13

Capital Budgeting Decision Making

Which Project(s) Should We Undertake?

PLEASE NOTE: This book is currently in draft form; material is not final.

Life is full of choices. Should we spend our money or save it? Should we buy a new DVD or a book? Should we loan money to our unemployed cousin? All of these examples involve a tradeoff; because we did one thing, we can't do another. Businesses face the same type of decisions. Should we buy a new machine or fix the old one? Should we build the new plant in Kansas or in Mexico? To help decide which project to do, we need a framework with which to evaluate them.

Companies, like people, have many goals but limited resources. If the objective is to maximize stakeholder value, how do we choose the project with the greatest return? Capital budgeting decision making techniques are a series of analyses to help us decide which project is best. To decide which project will add the most value to the company, managers use capital budgeting techniques. This way, decisions are made based on financial data, instead of political pressure or gut instinct.

13.1 Introduction to Capital Budgeting Techniques

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the difference between independent and mutually exclusive projects.
2. Apply the ideas of capital budgeting techniques to different projects.

The goal with capital budgeting is to select the projects that bring the most value to the firm. Ideally, we'd like to select all of the projects that add value, and avoid those that lose value. In an ideal situation, we can raise sufficient financing to undertake all of these value adding projects. By default, we will assume most firms are operating in this environment.

Some firms, however, have the additional limitation of using **capital rationing**[1], in that they have a determined amount of funds available to allocate to capital projects, and the projects will compete for these funds. This can occur if the firm has difficulty accessing capital markets, for example. Under capital rationing, some projects that add value might not have sufficient funds to proceed, so the goal is to select the subset of profitable projects that maximizes value. There exist linear programming techniques that can be used when faced with a capital rationing constraint; they are, however, beyond the scope of this text.

We'll look at three popular decision making techniques: Payback Period, Net Present Value (NPV), and internal rate of return (IRR). There exist a multitude of lesser used techniques, many of which are variants of these three most popular, but these three are the most commonly used today.

Independent vs. Mutually Exclusive Projects

When we shop for our first car, we might find many available options that meet our minimum criteria of price, model, color, etc. Will we purchase all of those that meet the cutoff? Of course not! We only need one car, so we will pick only the best one.

1. When a firm has limited funds to dedicate to capital projects, and projects compete for these limited funds.

We have no need of a second car, at this point in our lives, so the purchase of one car *excludes* the purchase of a second.

If only one project can be selected from a set of projects (usually by making the other options unnecessary), they are **mutually exclusive projects**[2]. For example, consider if our company needs more capacity to make product, and we decide to build one new plant. If we build the plant in Mexico, then we won't also want to build one in Canada, since we only need one. Projects that compete with each other or eliminate the need for the other projects are mutually exclusive. In this case, we will only select the option that is best by our decision criteria.

If, instead, we consider projects that are operationally unrelated to each other, we can choose to do none of them, all of them, or some subset of the projects. These projects are **independent projects**[3], where the cash flows of one project are not influenced by the selection of other projects. If the project meets the minimum capital budgeting requirements then we should undertake the project.

KEY TAKEAWAYS

Capital budgeting techniques help us determine which project to undertake. First we need to determine the relevant cash flows and whether or not the projects are independent or mutually exclusive.

- Capital budgeting techniques are a series of tools to help us determine which projects to undertake.
- Only the best of mutually exclusive projects should be selected.
- All projects that meet the minimum criteria should be selected if the projects are independent.

EXERCISE

1. Are these mutually exclusive or independent projects?

    a. Deciding between repairing a machine or replacing it.
    b. Deciding which market to enter next.

2. A decision where only one project can be selected from a set of projects (usually by making the other options unnecessary).
3. A decision where the cash flows of one project are not influenced by the selection of other projects.

13.2 Payback Period

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain Payback Period.
2. Calculate payback period for a project.

Our first decision making technique is very intuitive and very easy to calculate. **Payback period**[4] is the amount of time until the initial investment is recovered. For example, a project costs $100 and we earn $20 (after tax) a year. We will have our $100 back in five years. Simple enough!

Cash flows may be uneven, but this barely adds to the complexity. Consider the same project that cost $100, but earns $40 the first year (all after-tax), $30 the second year, $25 the third year, $20 the fourth year and $20 the fifth year? What is our payback period now? We receive our $100th investment during the 4th year, so our payback period is between 3 and 4 full years. Some companies will always round up to the next higher year ("Our investment will be fully paid back in four years…"). Others will add some "precision" by attempting to figure out what fraction of the year has passed. The result is comprised of two parts: the number of full years and the partial year. The number of full years is our initial result, rounded down (in our example, three). If a balance remains then the partial year is the remaining cost at the beginning of the year divided by the cash flow that year. That gives us a portion of the year that it takes to get the balance of the project paid off.

Equation 13.1 Payback Period

Payback Period = Number of Full Years + Partial Year

Equation 13.2 Partial Year

$$\text{Partial Year} = \frac{\text{Unrecovered Cost Beginning of Year}}{\text{Cash Flow that Year}}$$

4. The amount of time until our initial investment is recovered.

In our example, \$95 has been recovered in the first three years, leaving \$100 – \$95 = \$5. Since we will receive \$25 dollars in the fourth year, our partial year is \$5 / \$20 = 0.25. Our total payback period is then 3 + 0.25 = 3.25 years.

Companies that utilize payback period will set a maximum threshold that all accepted projects must remain under. If projects are mutually exclusive, then typically the one with the shortest payback period is chosen.

Payback Period in Action

Gator Lover's Ice Cream is a small ice cream manufacturer. Gator Lover's Ice Cream wants to either open a new store (Project A) or buy a new machine to mass produce ice cream to sell to supermarkets (Project B). The relevant cash flows are shown in Table 13.1 "Gator Lover's Ice Cream Project Analysis".

Table 13.1 Gator Lover's Ice Cream Project Analysis

	Project A	Project B
Initial Investment	(\$48,000)	(\$52,000)
Year	**Operating Cash Inflows (after-tax)**	
1	\$15,000	\$18,000
2	\$15,000	\$20,000
3	\$15,000	\$15,000
4	\$15,000	\$12,000
5	\$15,000	\$10,000
Total Years 1–5	\$75,000	\$75,000

Figure 13.1 *Timeline for Project A*

Figure 13.2 *Timeline for Project B*

Let's calculate the payback period for both projects. Project A cost \$48,000 and earns \$15,000 every year. So after three years we have earned \$45,000, leaving only

$3,000 remaining of the initial $48,000 investment. The cash flow in year four is $15,000. The $3,000 divided by $15,000 gives us 0.2.

$$\text{Payback Period Project A} = 3 + \frac{3{,}000}{15{,}000} = 3.2 \text{ years}$$

Project B cost $52,000 and earns back uneven cash flows. In year one the project earns $18,000, in year two it earns $20,000 and it earns $15,000 in the third year. At the end of the second year it has earned back $18,000 + $20,000 = $38,000, leaving $52,000 – $38,000 = $14,000. In the third year the project earns $15,000. The balance of $14,000 will be paid off by the $15,000 earned that year. The $14,000 is divided by the $15,000 to give us 0.93.

$$\text{Payback Period Project B} = 2 + \frac{14{,}000}{15{,}000} = 2.93 \text{ years}$$

If our threshold is 4 years, then both projects would be viable. If the projects are independent, then both should be undertaken. If the projects are mutually exclusive, then we would pick Project B, as the payback period is shorter.

Shortfalls of Payback Period

Payback period may not tell the whole story. Consider a project such as researching a new drug? Development can take over a decade before positive cash flows are seen, but the potential upside could be huge! What about the cash flows that happen after the end of the payback period? Payback period is a popular tool because it's quick to calculate and easy to explain, but it is not always appropriate, and can lead to the rejection of long-term projects that add value. Often, companies will use payback period on only projects requiring smaller investments where the risk is small, and use a more complex method, such as NPV or IRR, for more involved projects.

KEY TAKEAWAYS

Payback period is a quick and easy way to determine how long until we get our money back.

- Payback period calculates the number of whole years, plus the partial year until we are paid back.
- Payback period is a quick and easy calculation, but needs reinforcement from other capital budgeting decision methods when evaluating complex projects.

EXERCISES

1. Calculate the payback period for the following:

   Project A: Initial Cost $80,000 earns $19,000 per year.

   Project B: Initial Cost $100,000 earns $25,000 per year.
2. What are the downsides of using of using payback period to analyze a project?

13.3 Net Present Value

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define and calculate Net Present Value.
2. Apply the accept/reject decision rule of NPV.
3. Explain the limitations of Net Present Value.

Our next capital budgeting method we introduced when we discussed time value of money, and have used it to value stocks and bonds. Discounting all of the cash flows for an investment to the present, adding inflows and subtracting outflows, is called finding the **net present value (NPV)**[5]. The larger the NPV, the more financial value the project adds to our company; NPV gives us the project amount of value that a project will add to our company. Projects with a positive NPV add value, and should be accepted. Projects with negative NPVs destroy value, and should be rejected. It is generally regarded as the single best criterion for screening projects.

NPV considers the time value of money, because the cash flows are discounted back at the firm's rate of capital (r). This rate, also called the discount rate or the required return, is the minimum return a firm must earn on a project to have the firm's market value remain unchanged. If the amount earned on the project exceeds the cost of capital, NPV is positive, so the project adds value and we should do the project.

NPV decision criteria (independent projects):

- If the NPV is greater than zero (NPV > 0) than **accept** the project
- If the NPV is less than zero (NPV < 0) than **reject** the project.

If funds are unlimited then we would accept any project with a positive NPV. With mutually exclusive projects, we pick the *highest* NPV (or the least negative, if we need to pick one and all are below zero). Under capital rationing, we usually want to pick the set of projects with the highest combined NPV that we can afford.

5. Discounting all of the cash flows for an investment to the present, adding inflows and subtracting outflows.

Let’s look at the NPV for the two Gator Lover’s Ice Cream projects. Assume a discount rate of 10%.

Project A

$$\text{NPV Project A} = (\$48{,}000) + \frac{\$15{,}000}{(1+.10)} + \frac{\$15{,}000}{(1+.10)^2} + \frac{\$15{,}000}{(1+.10)^3} + \frac{\$}{(1}$$

NPV Project A = ($48,000) + $13,636.36 + $12,396.69 + $11,269.72 + $10,245.20 + $9,313.82 = $8,861.80

Also written as:

NPV Project A = $13,636.36 + $12,396.69 + $11,269.72 + $10,245.20 + $9,313.82 − $48,000 = $8,861.80

NPV can be calculated by hand, by a financial calculator, or in a spreadsheet. The keystrokes for a financial calculator are as follows:

<CF> <2ND> <CLR WORK> −48000 <ENTER> <DOWN ARROW> 15000 <ENTER> <DOWN ARROW> 5 <ENTER> <NPV> 10 <ENTER> <DOWN ARROW> <CPT>

Note: Excel and other spreadsheet programs are tricky with regard to year 0. The NPV function expects flows to start at year 1. So any cash flows from year 0 need to be added separately.

To solve in a spreadsheet, the corresponding spreadsheet formula is:

=NPV(periodic rate, cash flows from period 1 to *n*) + net of initial cash flows

Using the numbers for Project A, the spreadsheet function looks like this:

=NPV(.10, 15000, 15000, 15000, 15000, 15000) + (−48000) = 8861.80

Project B

$$\text{NPV Project B} = (\$52{,}000) + \frac{\$18{,}000}{(1+.10)} + \frac{\$20{,}000}{(1+.10)^2} + \frac{\$15{,}000}{(1+.10)^3} + \frac{\$}{(1}$$

NPV Project B = ($52,000) + $16,363.64 + $16,528.93 + $11,269.72 + $8,196.16 + $6,209.21 = $6,567.66

In this case, **Project A** has **the higher NPV by $2,294.14** ($8,861.80–6,567.66). So we would pick Project A over Project B if they are mutually exclusive. If they are independent, we would accept both projects, since both NPVs are positive.

Figure 13.3 *Project A NVP*

Figure 13.4 *Project B NVP*

Net Present Value is the preferred tool by many financial managers, as it properly accounts for the time value of money and the cost of capital. The NPV rule easily handles both mutually exclusive and independent projects.

Shortfalls of NPV

NPV is a little less intuitive than payback period, so it might be more difficult to explain to others who aren't as well versed in finance. To use NPV requires a discount rate; if we don't have an accurate guage of the cost of capital, it can be difficult to calculate an NPV.

KEY TAKEAWAYS

Net Present Value is the most important tool in capital budgeting decision making. It projects the financial value of the project for the company.

- Net Present Value is the discounted value of all cash flows.
- It is considered to be the best single criterion.
- Positive NPV adds value to a company.
- Accept any project with positive NPV for independent projects.
- Accept the highest NPV project from mutually exclusive projects.

EXERCISES

1. Calculate the NPV for the following projects with a discount rate of 12%:

   Project 1 costs $100,000 and earns $50,000 each year for three years.

   Project 2 costs $200,000 and earns $150,000 in the first year, and then $75,000 for each of the next two years.

   Project 3 costs $25,000 and earns $20,000 each year for three years.
2. If the projects are mutually exclusive, which should we accept?
3. If the projects are independent, which should we accept?

13.4 Internal Rate of Return

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Define and calculate the internal rate of return (IRR).
2. Apply the accept/reject decision rule for IRR.
3. Explain the limitations of IRR.

Internal rate of return (IRR)[6] is another widely used capital budgeting technique; essentially, it is the return we will receive over the life of our investment. It is calculated as the discount rate at which NPV equals zero. In other words, we set NPV equal to $0 and solve for *r*. This is the rate that makes the present value of the cash flows equal to the initial investment. Unfortunately, for some projects there is no easy way to arrive at this rate without using a "guess and check" method; thankfully, computers can do this quite quickly.

How do we know if the project is acceptable or not? Each project that uses internal funds has a cost of capital. If the rate we earn is more than the rate it costs us, then we should undertake the project as it adds to corporate value. If what we earn is less than what it cost us, then the project subtracts from corporate value, and we should not undertake it. To do this we compare IRR to the cost of capital. If the IRR is greater than the cost of capital we should undertake the project.

This decision criterion will only work if the cash flows are ordinary, meaning net outflows early in the project followed by inflows afterward. When cash flows are not ordinary, IRR can produce unusual, sometimes multiple, results.

Here are our decision rules:

IRR decision criteria (ordinary cash flows ONLY):

6. The discount rate where the NPV of an investment equals zero.

- If the IRR is greater than cost of capital (IRR > WACC) than **accept** the project
- If the IRR is less than cost of capital (IRR < WACC) than **reject** the project.

Let's find the IRR for Gator Lover's Ice Cream potential projects by taking a look at Table 13.2 "Gator Lover's Ice Cream: Internal Rate of Return".

Table 13.2 Gator Lover's Ice Cream: Internal Rate of Return

Firm's Cost of Capital = 10%		
	Project A	**Project B**
Initial Investment	($48,000.00)	($52,000.00)
Year	**Operating Cash Inflows(after-tax)**	
1	$15,000.00	$18,000.00
2	$15,000.00	$20,000.00
3	$15,000.00	$15,000.00
4	$15,000.00	$12,000.00
5	$15,000.00	$10,000.00
IRR	16.99%	15.43%

If our WACC is 10%, then both projects should be accepted. IRR is, however, not acceptable for mutually exclusive projects! To see why, consider the following example—Which investment would you rather have:

1. Invest $10,000 now and receive a guaranteed $20,000 in one year.
2. Invest $1 now and receive a guaranteed $10 in one year.

Investment A is double your money (IRR = 100%) while investment B is ten times your money (IRR = 900%). But investment A is on a larger starting sum! We'd love to do investment B over and over again, since it has the higher return, but if we can only pick one of the two, then A is superior. Thus, the higher IRR doesn't necessarily indicate the better investment.

IRR can be calculated by hand, by a financial calculator, or in a spreadsheet. The keystrokes for a financial calculator are similar as those for NPV, but at the conclusion we ask for IRR instead of entering an interest rate. For example, IRR for Project A is as follows:

<CF> <2ND> <CLR WORK> –48000 <ENTER> <DOWN ARROW> 15000 <ENTER> <DOWN ARROW> 5 <ENTER> <IRR> <CPT>

The answer of 16.99% is returned.

To solve in a spreadsheet, the corresponding spreadsheet formula is:

=IRR(cash flows from period 0 to *n*)

Using the numbers for Project A, the spreadsheet function looks like this:

=IRR(–48000, 15000, 15000, 15000, 15000, 15000) = 16.99%

Shortfalls of IRR

IRR is more difficult than NPV to calculate by hand because we are calculating a rate of return. Our calculators or spredsheets 'search' for the interest rate. For us to calculate, it would take iterations where we try one interest rate, see if it's too high or too low and then try again.

Cash flows that aren't ordinary can produce unusual, sometimes multiple, results. Sadly, most calculators won't alert the user to this fact, so care must be taken. And in the case of mutually exclusive projects, IRR fails to rank them properly. For these reasons, NPV is typically the preferred criteria, or is at least used to "double check" that IRR isn't failing because of one of these unusual reasons.

KEY TAKEAWAYS

IRR is another method of capital budgeting techniques. We prefer NPV to IRR because of IRR's potential shortfalls.

- IRR is defined as the discount rate where NPV = 0.
- IRR should never be used if cash flows aren't ordinary, or if the projects are mutually exclusive.

EXERCISES

1. Calculate the IRR for the projects listed in NPV exercises.
2. Which has the highest IRR?
3. If our hurdle rate is 10%, which should we accept?

13.5 Other Methods

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Evaluate some other methods to evaluating capital budgeting.
2. Calculate Profitability Index.
3. Discuss MIRR.

So far we have learned payback period, NPV and IRR. These three are the most widely used and methods to evaluate capital projects, and are sufficient for most companies, but many other methods exist. Here we'll discuss two other methods: Profitability index and MIRR.

Profitability index (PI)[7] shows the relative profitability of any project: in essence, a 'bang for your buck' calculation. It is the present value per dollar of initial cost. The higher the profitability index, the better, and any PI greater than 1.0 indicates that the project is acceptable because it adds to corporate value.

Equation 13.3 Profitability Index

$$\text{Profitability Index} = \frac{\text{Present Value of Future Cash Flows}}{\text{Initial Cost}}$$

For Gator Lover's the PI's are as follows:

$$\text{Profitability Index Project A} = \frac{\$58{,}861.80}{\$48{,}000} = 1.22$$

$$\text{Profitability Index Project B} = \frac{\$56{,}567.66}{\$52{,}000} = 1.08$$

7. Present value return per dollar of investment.

The profitability index is higher for Project A. PI doesn't work as well if the initial investment is spread out over time, or if the cash flows aren't ordinary, which is why we prefer NPV.

Our final method of evaluating capital projects worth discussing is **modified internal rate of return (MIRR)**[8]. IRR is the expected rate of return if the NPV = 0. This assumes that early inflows will be reinvested at the return of the project itself! Often, the funds earned from a project cannot be reinvested at IRR, but instead earn a lower rate. Therefore, *IRR can overstate the expected rate of return*. To compensate for this overstatement, modified internal rate of return (MIRR) was created. MIRR assumes that funds can be reinvested at the weighted average cost of capital (WACC) or some other specifically stated rate.

In our IRR example, we used a hurdle rate of 10%. But what if the inflows could only be reinvested at 8%? To calculate MIRR, we would use the 8%. Lucky for us, spreadsheets have a function to do this quite easily:

=MIRR(cash flows from period 0 to *n*, rate for outflows, reinvestment rate)

Project A MIRR (reinvested at 8%) = 12.89%

Project B MIRR (reinvested at 8%) = 11.63%

Compared with our original IRRs of 12.88% for Project A and 15.43% for Project B, it's easy to see that the reinvestment rate has a large impact. Some shortfalls, however: it's harder to calculate (esp. without technology), and requires knowledge of the WACC. If we have the WACC, however, why not calculate NPV?

So Which Project Wins?

Table 13.3 "Gater Lover's Ice Cream: Summary Chart for Capital Budgeting Decision Making Techniques" a summary chart for the capital budgeting decision making techniques for Gator Lover's Ice Cream's potential projects: Project A and Project B.

Table 13.3 Gater Lover's Ice Cream: Summary Chart for Capital Budgeting Decision Making Techniques

	Project A	Project B
Initial Investment	($48,000)	($52,000)

8. Internal rate of return assuming that the funds earned cannot be reinvested at IRR.

	Project A	Project B
Technique		
Payback Period	3.2 years	2.8 years
NPV	$8,861.80	$6,567.66
IRR	16.99%	15.43%
Profitability Index	1.22	1.08
MIRR	12.89%	11.63%
Winner!	**Project A**	

And the winner is...Project A. While Project B has a faster payback period, Project A wins in every other category, especially the critical NPV category. If we can only choose one project, Gator Lover's Ice Cream should open a new store (Project A) instead of investing in a new machine (Project B). Of course, if we can do both, that should be our choice.

KEY TAKEAWAYS

There exist other methods to evaluate projects. We learned Profitability Index and MIRR

- Profitability index is bang for your buck.
- MIRR assumes a different reinvestment rate than IRR.

EXERCISES

1. Calculate PI for Exercises 1 & 2 in Section 13.3 "Net Present Value".
2. Explain how the MIRR would compare to IRR for the projects in Exercises 1 & 2 in Section 13.3 "Net Present Value" if the reinvestment rate is 8%.

13.6 Comparing Projects with Unequal Lives

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the difficulty in choosing between mutually exclusive projects with unequal lives.
2. Calculate the equivalent annual annuity (EAA) of a project and use it evaluate which project is superior.

Ruth is deciding which shingles to put on her roof. Shingle A costs $1 per sq. ft. and is rated to last 10 years. Shingle B costs $1.40 per sq. ft. and is rated to last 15 years. If Ruth intends to stay in her house for the rest of her life, which shingle should Ruth select?

One particularly troublesome comparison that arises often is when two repeatable mutually exclusive projects have different time lengths. For example, we can use a cheaper substitute, but it won't last as long, so we'll need to replace it more frequently. How do we know which project is better?

If the projects are either independent or not repeatable, we can use NPV confidently. All positive NPVs should be selected if they are independent, and the highest NPV will indicate the best choice if they aren't repeatable. But it can be the case that the highest NPV project can be inferior to a shorter project with a lower NPV.

To analyze this problem, we need to calculate the **equivalent annual annuity (EAA)**[9], which is the steady cash payment received by an annuity with the same length and NPV as the project. For example, we know that Gator Lover's Ice Cream Project A lasted for 5 years and had an NPV of $8,861.80 at a rate of 10%. If we solve for the yearly payment of an annuity with a PV of $8,861.80, r = 10%, n = 5 years, and FV = 0, we get an EAA of $2,337.72. Thus, we should be indifferent between receiving the cash flows of Project A and receiving $2,337.72 per year for 5 years (since they both have the same NPV)!

9. The steady cash payment received by an annuity with the same length and NPV as the project.

Once EAAs are calculated for all projects being considered, it's a simple matter of picking the higher one.

KEY TAKEAWAYS

- If projects are independent or not repeatable, the impact of differing life is irrelevant.
- If the projects are mutually exclusive and repeatable, than the impact of the differing life must be accounted for by comparing their EAA.

EXERCISES

1. Compute and compare the following projects' NPVs and EAAs at a 10% discount rate.

   Project J costs $100,000 and earns $50,000 each year for five years.

   Project K costs $200,000 and earns $150,000 in the first year and then $75,000 for each of the next three years.

   Project L costs $25,000 and earns $20,000 each year for two years.
2. Which project should be selected if they are mutually exclusive and repeatable?

13.7 Approaches for Dealing with Risk

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain risk in capital budgeting.
2. Describe and implement scenario analysis.
3. Describe and implement sensitivity analysis.

We have estimated the potential earnings from our projects, but what about the risk involved? What's the likelihood that we estimated these cash flows properly? What the numbers are much worse? Ideally, the sytematic risk involved with our project has been accounted for by our WACC used (see previous chapter for discussion of this), but managers still need to account for projection errors and evaluate the potential range of outcomes. There are several ways to deal with risk in capital budgeting. We present two of the most common here: scenario analysis and sensitivity analysis.

Sensitivity analysis[10] measures the sensitivity of our project to a change in one variable. Also called "what-if" analysis, it looks at how sensitive our outcome is to a change in one variable (for example, projected sales). Intuitively we know that our outcome is more dependent on certain inputs to our equation than to other inputs. If we change just that one variable (holding everything else constant), how much does the outcome change? Sensitivity analysis tells us by how much are we more sensitive to a change in sales than we are to a change in, say, WACC or some other variable. We can then dedicate resources to ensure a more accurate estimate for the inputs with the larger effects.

Scenario analysis[11] gives us several different 'scenarios' or likely outcomes for our project. We can analyze what will happen if we have a best-case, worst-case and most-likely-case scenario. This measures the variability of the returns and can present us with a variety of situations and financial outcomes so that we are adequately prepared for each one. In scenario analysis we can change many variables and estimate a new outcome. We can then look at the 'range' of possible

10. Indicates how much NPV will change if we change one particular variable.

11. Uses several possible scenarios to determine the range of possible NPV outcomes.

outcomes by analyzing the difference between the best-case and worst-case scenarios.

For Project A, we had annual cash inflows (after-tax) of $15,000 for five years. But what if our worst-case scenario occurred and the annual cash flows were only $10,000 per year? Or what if, best case, we earned $20,000 per year? What would our NPV be under each of these different scenarios? Let's calculate.

Table 13.4 Gator Lover's Ice Cream: Best Case, Worst Case, and Likely Scenarios

		Project A	
Initial Investment		($48,000)	r = 10%
	Operating Cash Inflows		
Year	**Best Case**	**Most Likely**	**Worst Case**
1	$20,000	$15,000	$10,000
2	$20,000	$15,000	$10,000
3	$20,000	$15,000	$10,000
4	$20,000	$15,000	$10,000
5	$20,000	$15,000	$10,000
Total	$100,000	$75,000	$50,000
NPV	**$27,815.74**	**$8,861.80**	**($10,092.13)**

From Table 13.4 "Gator Lover's Ice Cream: Best Case, Worst Case, and Likely Scenarios", we see that our previous NPV calculation was the most likely case and it had a positive NPV of $8,861.80. The best case provides NPV equal to $27,815.74 and the worst-case has a negative NPV of $10,092.13. The **NPV range**[12] is the difference between the best case and the worst-case or in this situation a range of $37,907.87. We can hopefully earn somewhere between a negative $10,092 and a positive $27,815. Obviously we hope for the $27,815! But it's helpful to know that we may lose $10,092 under the worst-case scenario.

There are several other techniques a company can use to deal with risk in capital budgeting. Other, more sophisticated techniques exist (such as simulation analysis), but they are beyond the scope of this text.

12. The difference between the best-case scenario and the worst-case scenario NPV.

KEY TAKEAWAYS

Risk is important to consider in capital budgeting. Fortunately we have several techniques to deal with risk.

- Sensitivity Analysis tells us how sensitive our NPV is to changes in one key input.
- Scenario Analysis gives us a NPV range between the best and worst case scenarios, and models the most likely outcomes.

EXERCISES

1. Project J costs $100,000 and is projected to earn $50,000 each year for five years, with a discount rate of 10%. Calculate how sensitive NPV is to our discount rate if it might be as high as 12%.
2. Compute the NPV for the best case scenario if Project J earns $75,000 per year and the discount rate is only 9%.

13.8 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain how capital budgeting decisions fit into the larger picture of corporate finance.
2. Evaluate the ethical implication of capital budgeting decisions.

In many ways, this chapter is the culmination of all that has come before in the text. All of our discussion has given us the tools to evaluate projects and be informed about the financial value of projects that we might undertake. Managers can use these criteria to approve positive value projects, which should increase the value of the company. In future chapters, we examine what make up the cash flows that we are analyzing, and how we might influence the inputs of a project.

Every successful business argument for going forward with a project should be rooted in the information presented in this chapter. While there might be considerations beyond the finances, without a financial valuation it is impossible for a manager to grasp the implication on stakeholders' value.

Ethical Considerations

It is tempting to proclaim "NPV positive means accept the project" without thinking of the ramifications of such a decision. Purchasing a new machine might mean that jobs will be lost or pollution reduced. It is impossible to accurately put a financial value on a life lost, and yet every day we must make decisions that account for a trade-off among these types of factors.

Just as it is important not to make a decision without understanding the financial impact, it would be folly to limit ourselves to only this perspective.

KEY TAKEAWAYS

- Making decisions is ultimately what everyone in business does. These tools allow us to properly factor in financial value to make decisions.
- When making decisions, we need the numbers, but we also need to look beyond the numbers.

EXERCISES

1. Even factoring in potential litigation costs, the NPV for recalling a car with a faulty gas tank is lower than the decision to do nothing. What are some other considerations a manager should incorporate into the decision making process?
2. We have the technology to build a car that would eliminate deaths in car crashes. Granted, it would look and drive like a tank and cost $1 million. Should we mandate that all cars be so designed? If not, haven't we put a price on those lives that will be lost in future car crashes?

13.9 End-of-Chapter Assessment Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

END-OF-CHAPTER EXERCISES

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Chapter 14

Capital Budgeting Cash Flows

PLEASE NOTE: This book is currently in draft form; material is not final.

14.1 Which Cash Flows Should I Include?

PLEASE NOTE: This book is currently in draft form; material is not final.

14.2 Capital Spending and Salvage Value

PLEASE NOTE: This book is currently in draft form; material is not final.

14.3 Operating Cash Flows

PLEASE NOTE: This book is currently in draft form; material is not final.

14.4 Changes in Net Working Capital

PLEASE NOTE: This book is currently in draft form; material is not final.

14.5 Making the Investment Decision

PLEASE NOTE: This book is currently in draft form; material is not final.

Chapter 15

Raising Capital and Capital Structure

PLEASE NOTE: This book is currently in draft form; material is not final.

“Give me a lever…”

PLEASE NOTE: This book is currently in draft form; material is not final.

Give me a lever long enough and a place to stand, and I shall move the world.

- Archimedes

Archimedes may have been explaining the power of physical levers, but his sentiment is just as apropos when discussing leverage caused by employing debt to finance companies. A little leverage is a powerful thing, and companies with access to debt capital can utilize it to grow a spark of income into an inferno of profitability. With debt, however, comes risk, and a capital structure that might work for one firm might be perilous for another. Even the same company, throughout its lifespan, can have different needs and access to capital markets.

15.1 Life Cycle of a Firm

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVE

1. Describe potential sources of investment for a growing firm.

Many companies are founded with no more capital than what a propriator has on hand. Some will use inherited money or resources saved from a successful career in another occupation. A mortgaged house is often the collateral used to provide the initial funding for a myriad of small businesses. A propriator will invest their **sweat equity**[1] in the form of working for long hours with little or no initial compensation, as the fledgling business demands a reinvestment of initial profits. In this embryonic stage, many small businesses fail or stagnate, but some will thrive and grow, leading to different problems and needs.

An owner of a small but growing business will often face the question of how quickly growth can be sustained. Conservative growth might cause lost business to competitors or foregone sales from customers whose demand can't be met. Aggressive growth demands more capital and can potentially lead to over-reaching and a stretching of resources too thinly. Fortunately, developed economies can provide sources of capital for growing businesses to the potential benefit of current owners and new investors.

The first avenue for many entrepreneurs seeking capital is a small business loan from a bank. By taking on debt for a negotiated interest rate and repayment schedule, a cash-hungry business can expand without a reduction in an owner's control. Many banks also provide services for small businesses, such as treasury management, payroll administration, or bill collection services.

Particularly in service type professions, partnerships are also way for businesses to expand, bringing in capital, more skilled labor, or both. Lawyers, doctors, accountants, and dentists, among others, are common partnership candidates, as a growing customer base can tax the professional and capital resources of a sole

1. An owner of a company investing in a company by working for long hours with little or no initial compensation.

proprietor. Sometimes partners bring a different skill set than the existing owners, perhaps managing the "business" end of operations. And some partners will prefer to be "silent" partners, contributing capital only but enjoying the limited liability of such an arrangement.

Venture capital (VC)[2] firms are a different avenue for start-ups; these firms seek out investments in young companies, typically matching with investors who are looking for a private equity arrangement. Different VC firms specialize in different types of companies, and can also specialize in different stages of a company's growth. For example, some firms focus on the first rounds of funding (sometimes called **"A" round financing**[3]) and some provide **mezzanine financing**[4] (typically a hybrid of debt that can potentially be converted to equity). Other venture capital firms specialize on distressed companies, making investments with the intention of turning around the business to make it again successful.

As a company continues to grow, other avenues of capital become possibilities. Bonds can be issued, either through a private placement to large investors (typically pensions, endowments, or similar investment funds) or publicly. A public bond issuance in the US requires registration with the SEC, and is typically underwritten by investment banks (often as part of a syndicate of banks).

While shares of stock can be privately placed, a milestone for large companies comes when their shares are first registered with the SEC (or other authority, outside the US) and offered for public sale through a process called the **initial public offering (IPO)**[5]. Since the cost of meeting regulations, including annual and quarterly reports, can be prohibitive, a corporation needs a certain level of maturity to make a successful IPO a possibility. After "going public", VC firms and other early investors can more easily exit their ownership positions, typically after a required holding period. At this stage, though relatively mature, a company might still grow at a fast pace, but has access through many different avenues of capital.

KEY TAKEAWAYS

- Proprietors and partners supply the capital for very young companies, often in the form of "sweat" equity.
- Bank loans and venture capital funding can bring in capital for a growing business.
- Public issues of bonds and stocks are the sources of capital for maturing companies.

2. Firms that seek out investments in young companies, typically matching with investors who are looking for a private equity arrangement.
3. The earliest rounds of venture funding.
4. Venture funding after the earliest round of venture funding, typically a hybrid of debt that can potentially be converted to equity.
5. When shares of a corporation are first registered with the SEC (or other authority, outside the US) and offered for public sale.

EXERCISES

1. Frances owns a bake shop. A new dessert he recently developed is meeting with great customer demand, and he would like to consider expanding his operations. Contrast some financing possibilities for Frances, discussing which is most feasible.

15.2 Leverage

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Explain the effects of leverage on variability of returns.
2. Define and calculate degree of operating leverage and degree of financial leverage.

Little Jamie wants to put out a lemonade stand, to take advantage of the hot weather. She has $5 in her piggy bank with which to buy supplies. She expects to be able to sell that amount of lemonade for $10, for a nice $5 profit. But she knows that she could sell even more lemonade if she could afford to buy more supplies, so she asks her mother for a loan of $5. Now, with $10 of supplies, she can generate $20 worth of sales! After paying back her mother, she'll have $15 left, for a profit of $10!

Unfortunately, little Jamie has terrible luck, and a summer thunderstorm roars through the neighborhood, scattering her supplies and ruining her product. She had only sold $2 worth of lemonade before the storm. In tears, she offers the $2 to her mother, knowing that she has lost her own $5 and can't even return what she borrowed. The loving mother consoles her daughter, and tells her that she can try again when the weather turns better.

Little Jamie has learned some important lessons from this experience (and, thankfully, her mother is more generous than most banks would be!). The first is that, by borrowing money, she has the potential for a larger reward for her invested capital ($10 profit vs. $5 profit). The second lesson is that not everything goes exactly to plan, leading to the third lesson: when the business was in trouble, she lost more money because she borrowed. If she had only used her own money, she would have only lost $3 (her $5 investment less the $2 she took in before the storm). Since she borrowed, she lost her entire investment, plus most of her mother's to boot (debt holders, barring maternal love, have claims to the money before the equity holders)! This effect, in which debt increases the variability of potential returns, we call **leverage**[6].

6. The effect in which debt increases the variability of potential returns.

Leverage isn't only caused by debt: any time we take on fixed costs, we increase our risk. If we purchase a new machine that is able to make our product more cheaply, we need to be certain that we'll sell enough product to make the purchase worthwhile. If we sell more, then the added efficiency will increase our potential for profit. Or we might choose to build our own warehouse rather than pay for storage space. If business drops, we'll be stuck with an empty warehouse, but still have the warehouse payments. Typically we call this leverage caused by fixed costs of operations **operating leverage**[7] (as opposed to leverage caused by borrowing, which we call **financial leverage**[8]). The firm's total leverage is a combination of the two.

Equation 15.1 Degree of Operating Leverage

$$DegreeofOperatingLeverage = \frac{\%changeinEBIT}{\%changeinRevenues}$$

Equation 15.2 Degree of Financial Leverage

$$DegreeofFinancialLeverage = \frac{\%changeinNetIncome}{\%changeinEBIT}$$

Equation 15.3 Degree of Total Leverage

$$\begin{aligned} DegreeofTotalLeverage &= \frac{\%changeinNetIncome}{\%changeinRevenues} \\ &= DegreeofOperatingLeverage \times DegreeofF \end{aligned}$$

KEY TAKEAWAYS

- Leverage increases potential gains and potential losses.
- Operating leverage is caused by large fixed costs.
- Financial leverage is caused by interest payments due to debt.

7. Leverage caused by fixed costs of operations.

8. Leverage caused by borrowing.

EXERCISES

1. A manager believes that her company will do extremely well in the upcoming year, surpassing others' expectations. Should she increase or decrease her leverage?
2. A firm believes that if sales increase by 2%, their EBIT will increase by 3%. What is their degree of operating leverage?
3. A firm believes that if sales increase by 3%, their Net Income will increase by 5%. What is there degree of total leverage?

15.3 Capital Structure

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVE

1. Explain why capital structure decisions influence firm valuation.

The mix of debt and equity that a firm uses to finance its operations is called its **capital structure**[9]. The more debt employed, the more leverage a firm will have, and the larger the potential variation in earnings for shareholders. But there are other factors involved which can also affect what is the optimal capital structure for a firm.

The largest factor will be the firm's confidence in being able to make timely debt payments. Different businesses lend themselves to very different capital structures. A company with a steady customer base, large amounts of fixed capital or other good collateral, and insensitivity to the business cycle and other shocks to revenue all will point to a company having the capacity for more debt. The paragon of such a company would be a utility company: revenues will be very steady, since even financially strapped customers don't want to freeze in the winter. Companies with uncertain, highly-variable revenues or a lack of good collateral will not be able to raise as much debt financing.

Another key factor is that interest paid on debt is tax deductible in most countries. If all else were equal, companies would probably choose to carry more debt vs. less debt because of the tax benefits.

Too much debt, however, and the costs of additional debt can outweigh the tax benefits. As debt level increases, so does the cost of debt that investors will charge in higher expected yields. The added risk is also a factor for equity investors: leverage multiplies the systematic risk of a company, causing investors to demand a higher return on equity. Potential financial distress can also cause a loss of customers (who wants to buy a car with a warranty if the company won't be around

9. The mix of debt and equity that a firm uses to finance its operations.

to back it up) or suppliers (will the company be able to pay for the raw materials received?).

In theory, every project should be evaluated with a WACC using a capital structure utilizing costs of capital that reflect the risks of the project considered. Likewise, the capital structure (that is, weights) utilized in the calculation should ideally reflect the optimal mix for the marginal capital required for the project. In reality, most firms determine their target capital structure based on the overall nature of the firm's operations, and only consider the effects of specific projects if they a relatively larger in scale (for example, if a large capital purchase would provide collateral that would facilitate more debt).

KEY TAKEAWAYS

- Since debt is typically tax deductible, in addition to having a lower cost of capital, there is a benefit to having some debt.
- As debt increases, the chance of bankruptcy causes the cost of both debt and equity to rise.

EXERCISE

1. If there was a zero chance of a firm ever going bankrupt, what would be the likely level of debt employed by the firm?

15.4 Choosing the Optimal Capital Structure

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe the process of determining the optimal capital structure.
2. Given costs of capital for various capital structures, determine the optimal capital structure for a firm.

Primarily, the choice of capital structure affects the cost of capital for each of the components of WACC. On the whole, companies tend to avoid the extreme amounts of debt that can have drastic influence on operating cash flows; only in extremely distressed companies do we need to consider significant changes to free cash flows. Therefore, the decision on optimizing capital structure is relatively independent from capital budgeting decisions.

Specifically, it is a goal of financial managers to choose a capital structure that minimizes WACC, which will, in turn, maximize the value of the firm. Since our WACC is the basis for discounting used in finding the NPV of projects (or the hurdle rate with which IRR is compared), a lower WACC will increase the value of our conventional positive NPV projects, and cause some conventional projects that were originally rejected to cross the threshold into value-adding propositions.

Consider the following projections by financial managers at firm XYZ:

Table 15.1 Cost of Capital Projections

% debt	cost of debt	after-tax cost of debt	% equity	cost of equity	WACC
0%	5.0%	3.0%	100%	7.0%	7.00%
10%	5.0%	3.0%	90%	7.3%	6.84%
20%	5.2%	3.1%	80%	7.6%	6.70%
30%	5.5%	3.3%	70%	8.0%	6.61%

% debt	cost of debt	after-tax cost of debt	% equity	cost of equity	WACC
40%	5.8%	3.5%	60%	8.6%	6.55%
50%	6.2%	3.7%	50%	9.4%	6.56%
60%	6.8%	4.1%	40%	10.6%	6.69%
70%	7.5%	4.5%	30%	12.6%	6.93%
80%	8.5%	5.1%	20%	16.6%	7.40%
90%	10.0%	6.0%	10%	28.6%	8.26%
100%	16.0%	9.6%	0%	45.0%	9.60%

Assuming firm XYZ’s tax rate to be 40% and given the projected costs of capital at each level of debt and equity, we can see that WACC is minimized at a 40%/60% debt/equity mix. Below this mix, we aren’t utilizing enough of the cheaper debt. Above this level, the increased costs of both debt and equity cause WACC to increase as we add more debt to the mix.

In practice, we are rarely able to precisely know what the cost of capital will be for our company at specific levels of debt. We can create estimates based upon observed costs at other companies, but short of trying a new capital structure, it is impossible to know for certain what the precise WACC will be.

KEY TAKEAWAY

- The optimal capital structure is the one that maximizes firm value by minimizing WACC.

EXERCISE

1. What is the optimal level of debt given the following projected WACC values:

   0% debt = 7.8% WACC

   10% debt = 7.5% WACC

   20% debt = 7.4% WACC

   30% debt = 7.3% WACC

   40% debt = 7.4% WACC

   50% debt = 7.6% WACC

   60% debt = 8% WACC

   70% debt = 8.6% WACC

   80% debt = 10% WACC

15.5 The Bigger Picture

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe how capital structure decisions can influence firm value.
2. Explain some ethical consideration surrounding capital structure decisions.

While there is potential to increase a firm's value by tweaking the target capital structure, most managers believe the bulk of value-added results will come from proper capital budgeting decisions. Nevertheless, it is important to consider the tradeoffs involved in adding more financial leverage.

Ethical Considerations

Leverage creates risk, and some would argue that firms, in general, tend to take on too much. Since many stakeholders are adversely affected when a firm is near bankruptcy, it seems that caution should be practised when determining how much debt can be safely utilized. In some cultures, the very practice of loaning money for interest is considered immoral (and can even be illegal!), necessitating a larger use of equity financing.

If a manager is compensated for outperformance only, they might have an incentive to take on too much leverage! Consider an extreme case of a manager that will be fired if the firm underperforms, but will be compensated positively relative to the degree of outperformance should the firm exceed expectations. Since leverage will magnify both the gains and losses, the manager may seek higher leverage to reap greater rewards if the firm has a good year. If the firm has a poor year, the leverage will cause a worse result, but either way the manager can only be fired once!

Another concern with leverage is that firms can employ strategies intended to mask the true degree of leverage employed. Strategies to move debt "off the balance sheet" could potentially mislead investors as to the degree of risk, causing them to seek too low of a return.

KEY TAKEAWAY

- Leverage adds risk to a company, so the ethical manager needs to consider what is most appropriate for the all the stakeholders.

EXERCISE

1. A manager believes that her company will do extremely well in the upcoming year, surpassing others' expectations. If she is wrong, however, added leverage could cause the company to enter financial distress in a year of poor performance. What ethical considerations should be considered?

15.6 End-of-Chapter Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

End-of-Chapter Exercises

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3.
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Chapter 16

Dividend Policy

PLEASE NOTE: This book is currently in draft form; material is not final.

16.1 Dividend Basics

PLEASE NOTE: This book is currently in draft form; material is not final.

16.2 Dividend Policy

PLEASE NOTE: This book is currently in draft form; material is not final.

16.3 Other Forms of Dividends

PLEASE NOTE: This book is currently in draft form; material is not final.

Chapter 17

Cash and Cash Conversion Cycle

Cash is King

PLEASE NOTE: This book is currently in draft form; material is not final.

During the financial crisis of 2008 many of the very wealthy were doing the unthinkable: they were flying commercial! Instead of taking the private jet to Aspen or Monaco, the wealthy were arriving two hours early for flights and going through security (just like us commonfolk). The rich were reducing spending in other ways as well: luxury car sales were down, as were vacation home sales and purchases of art and collectables. The affluent were looking for “bargains”. Why such austere measures amongst those whose assets were valued in the millions? The collapse of financial markets and the decline in real estate values, among other factors, created a situation of having wealth on paper, but lacking liquid assets, that is, cash.

Cash flow is important in business, too. Assets on financial statements do not always translate into money available to pay workers or suppliers. The financial crisis took its toll on many companies as well and led to bankruptcies for large companies such as Lehman Brothers, General Motors, and CIT Group, Inc. Cash management is like a see-saw that companies need to balance between keeping cash on hand and investing in assets. They need enough cash to be liquid enough to pay suppliers and please creditors, but demanding too much cash from investors can increase financing costs. In this chapter we discuss the cash flow of a firm, including taxes, and describe techniques that can be used to forecast future cash production or need.

Financial Planning

LEARNING OBJECTIVES

1. Describe a corporate financial plan.
2. Distinguish and explain the difference between short-term and long-term plans.

Proper financial planning is key to any financial manager's success. Financial planning is a process involving analyzation of the existing state of financial affairs and a realistic estimation of the future. Companies review current assets, expenses, income and sales and try to estimate potential opportunities and challenges. This analysis is compiled into a financial plan. A **financial plan**[1] is an evaluation of a company's current financial state and a projection for the future. Financial plans are either *short-term*, covering a 1–2 year period or *long-term*, typically two to ten years. Many companies (and universities and non-profits and others) use a five year plan and update it as needed. Without a solid financial plan, a new product or plant addition may not come to frutition.

There are two components to corporate financial planning: planning for cash flows and planning for profits. The first step is cash budget planning (remember cash is king). A good cash budget becomes the foundation for a profit plan. The second step is planning for profits. The profit plan involves pro forma statements. A pro forma statement is projected figures for a company to use in the financial planning process. Pro forma statements require more in depth analysis and are covered in a separate chapter. In this chapter we focus on cash. There are many parts involved with cash and its management. We begin here with cash budgeting.

KEY TAKEAWAYS

- A financial plan is an assessment of a company's current financial situation and a projection of their future situation.
- Short-term plans are 1–2 years and long-term plans are typically 2–10 years.

1. An evaluation of a company's current financial state and a plan for the future.

EXERCISES

1. Why does a company need a financial plan?
2. In what ways is a corporate financial plan similar to a personal financial plan? Do you have a personal financial plan? If not, do you have plans to create one?

17.1 Cash Budgets

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe a cash budget and its components.
2. Distinguish and explain the difference between cash inflows and outflows.
3. Identify the parts of a sales forecast.

Creating a cash budget is a way for a firm to estimate its short-term cash income and expenditure requirements. Typically cash budgets are for a one-year period, usually divided into months to capture the seasonality experienced by many businesses. Just like an individual would want to plan for higher heating bills in the winter, a business would want to plan for seasonal fluctuations, such as lower sales for snowblowers in the summer. A cash budget is very different from the cash flow statement.

Cash Inflows and Outflows

Any cash coming in to the company is a **cash inflow**[2]; for the sake of consistency and to avoid errors, we will always use positive numbers to represent inflows. Any cash leaving the company is a **cash outflow**[3], and will be represented by a negative number. Simply put, inflows are sources of cash while outflows are uses of cash.

When a company pays its advertising bill, it is a cash outflow. When the company receives payment from a customer, it is a cash inflow. Other accounts are a bit trickier. For example, if a firm's accounts payable increased by $2,000, it is a cash inflow. If inventory increased over the year by $3,000, the change would be negative and an outflow of cash. Let's start with the summary below.

2. A source of cash or an increase in the company's cash balance.

3. A use of cash or a decrease in the company's cash balance.

Figure 17.1 *Examples of Cash Inflows and Outflows*

Inflows (sources)	**Outflows (uses)**
Decrease in any asset	Increase in any asset
Cash	Cash
Accounts receivable	Accounts receivable
Depreciation	Depreciation
Inventory	Inventory
Increase in any liability	Decrease in any liability
Accounts payable	Accounts payable
Net profit after taxes	Net loss
Depreciation	Dividends paid
Other non-cash charges	
Sale of stock	Repurchase or retirement of stock

Cash *increases* occur anytime you have a *decrease* in any *asset* or an *increase* in *liabilities*. How is this? If any of your assets decrease (for example accounts receivable or inventory) this means that cash has been freed up to be held as cash instead of being tied up as AR or in inventory. In essence we put money in the safe (a cash inflow) and a have a decrease in our asset. Conversely, a company's cash balance *decreases* (cash outflow) if there is an *increase* in any of its assets. If accounts receivable or inventory increases, then that is more money held as that asset and therefore less money held as cash. So the company's cash balance decreases.

With liabilities the opposite is true. An *increase* in any *liability* such as accounts payable results in an *inflow* of cash. In other words, if accounts payable increases than that means we did not pay as much on our payables and therefore we are holding more cash. If accounts payable decreases, then we have a cash outflow because we used cash to pay our payables. Profit is a bit easier. So easy in fact we can sum it up in one sentence: Any profit is a cash inflow and any loss is a cash outflow.

KEY TAKEAWAYS

Cash management is vital to the health of any company. A cash budget is an vital tool in cash management as it helps with a company's financial planning, both short-term and long-term.

- A cash budget is an important tool in financial planning.
- Key in accurate prediction of a cash budget is the sales forecast and any other external or internal variables
- Cash inflows are positive, cash outflows are negative.

EXERCISES

1. Classify the following cash flows as a cash inflow or cash outflow.

   Sales

   Electric Supplier invoice

   mortgage

   payment from biggest customer

2. Create an internal cash budget based on the following information:

   Sales = $50,000

   Rent = $20,000

   Depreciation = $7,500

   Accounts Receivable = $20,000

   Accounts Payable = $15,000

17.2 Net Working Capital Basics

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Identify working capital and why working capital is needed.
2. Explain different strategies for determining the level of working capital.

Related to cash is net working capital. Net working capital is not specifically cash but instead the diference between what we currently owe and what we currently own. These are our immediate sources and uses of cash. To see if we can pay our bills we need to manage our current assets and liabilities; as these will all come due within a year. Working capital management is the creation of a working capital policy and the day to day management of cash, inventories, receivables, accruals and payables and is a large part of a financial manager's job. It includes the determinination of the level of each of these items and also the financing of these items. Working capital policy impacts a firm's balance sheet, financial ratios and possibly credit rating. Businesses risk defaulting if they don't have enough cash to pay their debts.

Net working capital[4] is the difference between current assets and current liabilities. Change in net working capital is most simply the *change in current assets minus the change in current liabilities*.

If Current Assets > Current Liabilties, then Net Working Capital is positive

If Current Assets < Current Liabilities, then Net Working Capital is negative

So is it better to have more or less Net Working Capital? It depends. If we are growing revenues, then our accounts receivable will probably increase as we loan more to our customers, thus increasing Net Working Capital (if we maintain the same levels for all of our other current items). On the other hand, if our customers are taking longer to pay us, accounts receivable will also increase (thus increasing Net Working Capital). In both cases, Net Working Capital increases, but the story is much better for our company in the former case.

4. The difference between current assets and current liabilities.

Negative Net Working Capital = Good?

Negative net working capital can be good. Since current liabilities are money owed but not paid, it means that your business is effectively using other people's money to run day-to-day operations. Walmart, for example, routinely has negative net working capital; it takes its time paying its suppliers (large accounts payable) but receives payment from most of its customers at the time of sale (small accounts receivable). Not a bad position to be in.

Risk and Net Working Capital

There is always a tradeoff between risk and return. Businesses want to minimize risk and maximixe return. Holding cash on the balance sheet provides a safety net, since the more cash available, the lower the chance of not having enough to pay bills as they come due. But cash is a terrible investment: it does not earn a return. Investing cash in projects, other business, securities, etc. can earn a return, but then we risk not having it available when it is needed. Companies try to maximize their return with minimum risk by making sure they hold enough cast to remain solvent, but investing excess cash.

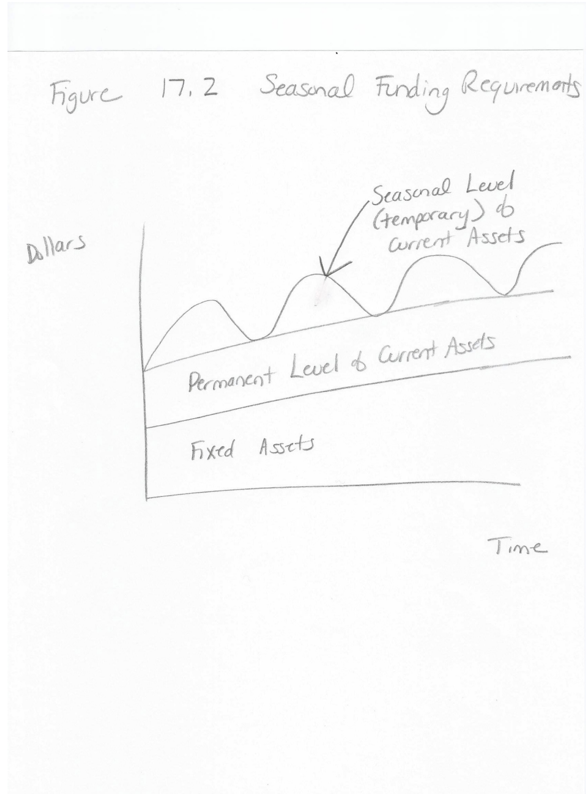
External Funding of Working Capital

Our company's investment in current assets has to come from somewhere; funding of current assets can be either with short-term or long-term debt, equity, or the sale of long-term assets. Primary sources include bank loans, credit terms from suppliers, accrued liabilities, bonds, and common equity. Each of these sources has advantages and disadvantages. Short-term loans need to be paid sooner, and are typically more sensitive to fluctuations in interest rates. Longer term debt is more predictable, but also typically more expensive.

Seasonal Requirements

Demand for working capital is not constant. We've discussed how net working capital can increase due to growth or new projects, but companies can also have seasonal current asset requirements. Ski resorts, ice cream shops, department stores, and many tourist businesses have seasonal funding requirements: they may have different levels of current assets at different times of the year.

Figure 17.2 Seasonal Funding Requirements



Jack Co. and Johnny Co. Seasonal Funding Example

Jack Co. has $25,000 in cash, $100,000 in inventory and $80,000 in Accounts Receivable (A/R). Their Accounts Payable (A/P) is stable at $55,000. What is their permanent funding requirement?

$25,000 + $100,000 + $80,000 = $205,000 – $55,000 = $150,000

Johnny Co. has the same current asset requirements for part of the year. The other part of the year their inventory peaks at $140,000 and their A/R peaks at $135,000. All other variables remain constant. Their permanent funding need is $150,000 (same as Jack Co.), but what is their seasonal funding need?

$25,000 + $140,000 + $135,000 = $300,000 – $55,000 = $245,000

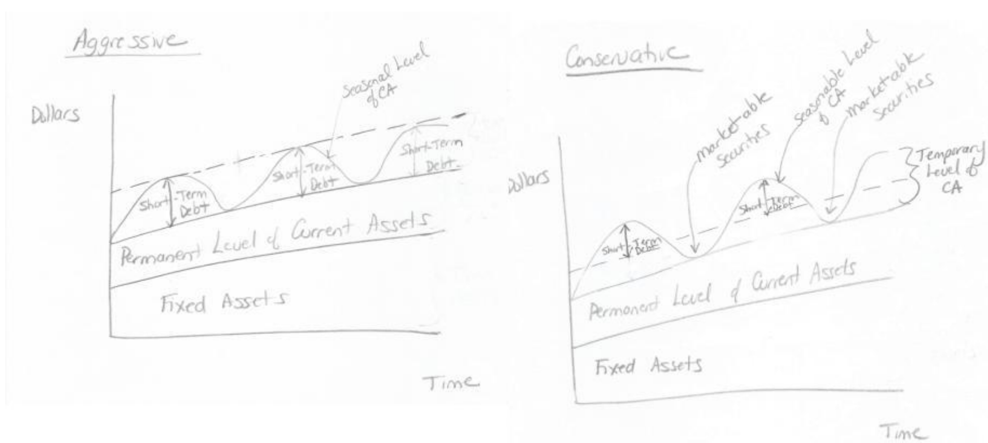
Thus, Johnny Co. needs to have access to $245,000 – $135,000 = $110,000 of extra funding during the peak season.

Aggressive vs. Conservative Strategies

Different people hold their money in different ways. Jane might have $10,000 in her checking account because she frequently travels for work and may need access to a lot of cash. Tim, however, holds only the minimum balance required by his bank in his checking account because he has invested in the stock market. Businesses too have different management strategies. Firms can be aggressive or conservative in their approach to the amount of cash they hold. Firms can follow aggressive (also called tight, restricted or lean) policies where holdings of current assets are minimized. Or they can follow a conservative (relaxed) policy where they hold more current assets. A ‘tight’ current assets policy is riskier, as a company may need to resort to scrambling for cash if unexpected expenses arise. Relaxed assures there is enough cash, but potentially trades off higher profitability due to the extra cash being “unproductive”. Many companies split the difference, using a more moderate or a maturity-matching policy, where fixed assets are financed with long-term debt and equity, and current assets are paid for with short-term financing.

Seasonal funding requirements will also differ by strategy. Conservative companies fund both seasonal and long-term requirements with long-term financing, keeping the extra cash on hand when it isn’t needed. Aggressive companies fund seasonal requirements with short-term financing as needed.

Figure 17.3 *Aggressive vs. Conservative Strategies*



KEY TAKEAWAYS

- Working capital is the difference between current assets and current liabilities.
- There are different strategies to manage working capital including aggressive and conservative.

EXERCISES

1. Determine the net working capital funding needs, given the following:

   Cash = $15,000

   Inventory = $30,000

   A/R = $20,000

   A/P = $25,000

2. Determine the seasonal funding needs, given the permanent NWC funding in problem 1 and the following peak needs:

   Cash = $15,000

   Inventory = $55,000

   A/R = $45,000

   A/P = $25,000

3. How might an aggressive strategy backfire? How might a conservative strategy backfire? When is it best to use each type of strategy?

17.3 Cash Conversion Cycle

PLEASE NOTE: This book is currently in draft form; material is not final.

LEARNING OBJECTIVES

1. Describe the parts of the cash conversion cycle.
2. Calculate the cash conversion cycle.
3. Explain how to manage the cash conversion cycle to manage operating capital.

Central to a firm's working capital management is an understanding of its **cash conversion cycle**[5], or how long it takes for the company to convert cash invested in operations into cash received. The cash conversion cycle measures the time passed from the beginning of the production process to collection of cash from the sale of the finished product. Typically a firm buys raw materials and produces a product. This product goes into inventory and then is sold. Once the product is sold then the firm waits to recieve payment, at which point the process begins again. How long does this take? Understanding this cycle is essential to successful working capital management.

Calculating the Cash Conversion Cycle

The cash conversion cycle is divided into three parts: the average payment period, the average collection period and the average age of inventory. The firm's **operating cycle**[6] is length of time from the receipt of raw materials to the collection of payment for the goods sold. This is, essentially, how long it takes from the start of making a new product until we receive cash (on average). The operating cycle is thus the sum of the **inventory conversion period**[7] (the average time between when raw materials are received into inventory and product is sold) and the **receivables conversion period**[8] (the average time between a sale and collection of the receipt).

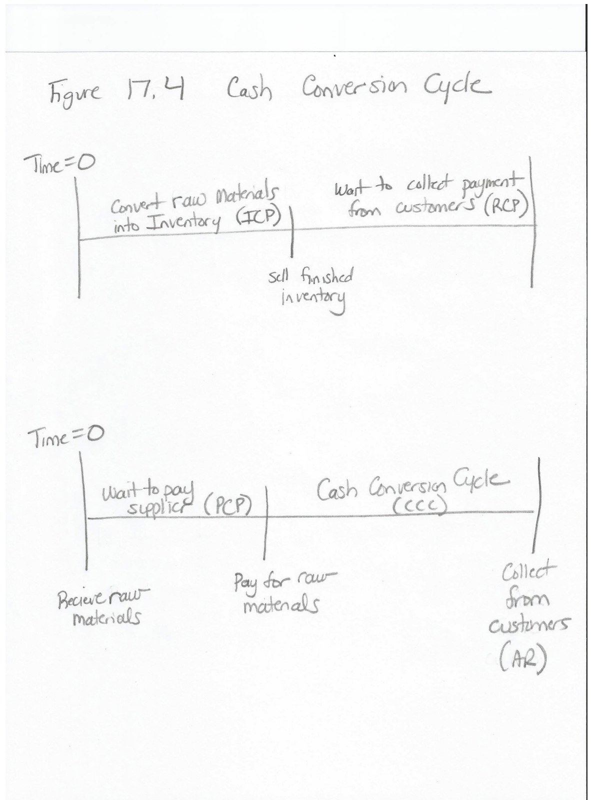
5. The length of time it takes a company to convert purchases of raw materials into cash received.

6. The time from the receipt of raw materials until the receipt of cash for the sale of the goods.

7. The average time between when raw materials are received into inventory and product is sold.

8. The average time between a sale and collection of the receipt.

Figure 17.4 Cash Conversion Cycle



The inventory conversion period can be estimated if we know the average balance of our inventory and the average value of goods sold each day of the year. The latter should be equal to cost of goods sold for the year divided by 365.

Equation 17.1 Inventory Conversion Period

$$InventoryConversionPeriod = \frac{Avg.\,Inventory}{Avg.\,DailyCostofGoodsSold} = \frac{Invent}{(COGS/}$$

As an example, if we have $60 thousand in inventory and sell $3 thousand worth of goods every day, then our inventory takes, on average, $60 thousand/$3 thousand per day = 20 days to sell. This, of course, includes production time as well as time that inventory "sits on the shelves".

Likewise, the receivables conversion period can be estimated if we know the average balance of our account receivables and the average revenues each day of the year. The latter should be equal to revenues for the year divided by 365.

Equation 17.2 Receivables Conversion Period

$$ReceivablesConversionPeriod = \frac{Avg.\,Receivables}{Avg.\,DailyRevenues} = \frac{A/R}{(Revenues/365)}$$

As an example, if we have $12 thousand in receivables and sell $4 thousand in revenues per day, then our receivables take, on average, $120 thousand/$4 thousand per day = 30 days to collect.

Equation 17.3 Operating Cycle

$$OperatingCycle = InventoryConversionPeriod + ReceivablesConversion$$

In our examples, the operating cycle is 20 days + 30 days = 50 days.

When we purchase raw materials, however, we don't typically pay for them immediately. Just as we offer customers credit, our suppliers will usually provide opportunities for credit to us. Therefore, our cash is not tied up for the entire operating cycle, but just the time from when we finally have to pay for raw materials. This length of time or **payables conversion period**[9] (the average time between acquiring raw materials and payment for them) is subtracted from the operating cycle to determine the entire cash conversion cycle. Unfortunately, total purchases are not readily available from the income statement, so we will often have to estimate them as a percentage of cost of goods sold.

Equation 17.4 Payables Conversion Period

$$PayablesConversionPeriod = \frac{Avg.\,Payables}{Avg.\,DailyPurchases} = \frac{A/P}{(Purchases/365)}$$

As an example, if we have $30 thousand in payables and purchase $2 thousand in raw materials per day, then our payables take, on average, $30 thousand/$2 thousand per day = 15 days.

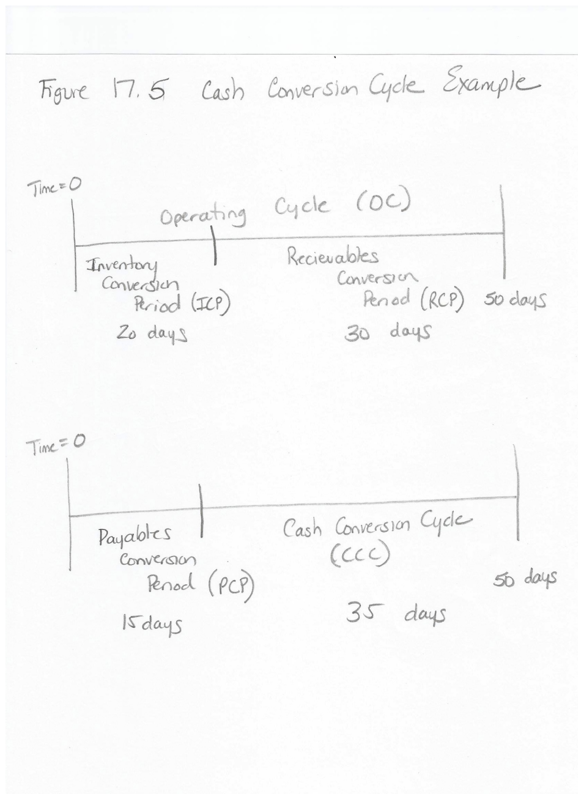
9. The average time between acquiring raw materials and payment for them.

Equation 17.5 Cash Conversion Cycle

$$\begin{aligned} CashConversionCycle &= OperatingCycle - Pa \\ &= InventoryConversionPeriod + ReceivablesC \\ &= \frac{Inventory}{(COGS/365)} + \frac{A}{(Revenu} \end{aligned}$$

Our examples cash conversion cycle is thus 20 days + 30 days – 15 days = 35 days.

Figure 17.5 Cash Conversion Cycle Example



Typically, the shorter the cash conversion cycle, the better, as it means we are keeping our cash moving instead of having it tied up in Net Working Capital. There are other considerations, however. Perhaps, extending collections of receivables, for example, might entice more sales from our customers. Then we need to balance the benefits from the extra sales with the additional costs in Net Working Capital due to the lengthening cash conversion cycle.

CABS Example

Figure 17.6 CABS Balance Sheet

Assets		2011	2010	Liabilities and equity			
Cash and cash equi	$	91	80.1	Accounts payable	$	135	132
Short-term investm		28.6	27.8	Accruals		13.5	12
Accounts Receivabl		162.5	168.9	Notes payable		21	23.4
Inventories		33.6	22.4	Total current liabilitie		169.5	167.4
Total current asset:		315.7	299.2	Long-term debt		72.6	60
Land and Buildings		103.2	101.8	Total liabilities		242.1	227.4
Machinery and Equ		62.4	58.9	Common stock		151.1	161.5
Total gross fixed as		165.6	160.7	Retained Earnings		65	55.9
Less: Depreciation		-23.1	-15.1	Total common equity		216.1	217.4
Net fixed assets		142.5	145.6				
Total assets		458.2	444.8	Total liabilities and eq		458.2	444.8

Figure 17.7 CABS Income Statement

		2011	2010
Sales	$	1680	1600
COGS		910.4	890.7
Gross Profits (EBITDA)		769.6	709.3
Less Operating Expenses			
SG&A		389	356
Depreciation		79	72
Total Ope		468	428
EBITDA		301.6	281.3
Depreciation and Amortizatio		79	68
EBIT		222.6	213.3
Interest Expense		25	20
EBT		197.6	193.3
Taxes (40%)		79	77.3
Net Income		118.6	116

Let's calculate the cash conversion cycle for 2011. Let's assume that purchases are 90% of the COGS.

First, need to determine the inventory conversion period. Average daily COGS is 910.4 thousand/365 days = 2.49 thousand per day. Ending inventory in 2011 was 33.6 thousand, so 33.6 thousand/2.49 thousand per day = 13.5 days.

What "average" should I take?

In this problem, we are using the ending balances as the average for inventory, A/R, and A/P. Another option would be to take the mean of the starting and end balances (that is, add them together and divide by 2). In reality, we need to use our best judgment as to what the appropriate representation for our company is.

Average daily revenues are 1,680 thousand/365 days = 4.60 thousand per day. Ending A/R in 2011 was 162.5 thousand, so 162.5 thousand/4.60 thousand per day = 35.3 days.

Annual purchases are 90% × 910.4 thousand = 819.4 thousand. Average daily purchases are 819.4 thousand/365 days = 2.24 thousand per day. Ending A/P in 2011 was 135 thousand, so 135 thousand/2.24 thousand per day = 60.3 days.

The cash conversion cycle is therefore 13.5 + 35.3 – 60.3 = –11.5 days. Since our payables conversion period is so long (almost twice the receivables conversion period), we end up paying for the materials **after** we've received payment from our customers!

How Do We Manage the Cash Conversion Cycle?

When a firm changes any of these variables, then their cash conversion cycle changes. Certain steps can be taken to reduce a firm's cash conversion cycle. These steps include:

1. Reduce the average age of inventory. Improve their inventory conversion period by making goods and selling them faster through more efficient processes. Avoiding inventory shortages or stockouts helps too.
2. Reduce the average collection period. Speed up collections on accounts receivable. Collect A/R as quickly as possible without losing customers but maintain good credit relations with customers.
3. Increase the payables deferral period. Pay A/P as slowly as possible without harming credit rating or relationship with supplier.

4. Use technology, strategic partnerships and other leverages effectively. Use technology to collect payments, make product or any other use of technology which improves efficiency.

KEY TAKEAWAY

- The shorter the cash conversion cycle, the better we are managing our cash flow.

EXERCISES

1. What does each of the components of the cash conversion cycle represent?
2. Calculate the cash conversion cycle given the following information:

   Inventory Conversion Period = 25.3 days

   Receivables Conversion Period = 19.9 days

   Payables Conversion Period = 14.7 days

17.4 The Bigger Picture

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LEARNING OBJECTIVES

1. Explain how cash and cash budgets fit into the larger picture of financial management.
2. Describe some ethical considerations of cash budgets and management.

Through efficient current asset management, necessary working capital can be reduced. By freeing up cash from working capital, we can employ it in more productive, and higher returning, endeavors. Particularly in service industries, where there is less dependency upon fixed captial, effective collections from customers can be the difference between success and failure. A company can have a large net income, but if they can't finance current assets (as can happen when a company grows too quickly), they can be driven to default. In a sense, they can be very profitably going bankrupt!

Ethical Considerations

When considering cash management, its tempting to try to decrease our cash conversion cycle at all costs. Some strategies may hurt our relationship with our customers: overly aggressive collections can alienate customers, or we might deny credit to customers when they need our support most.

Unscrupulous managers might also manipulate reporting of current assets to falsely represent the state of the company. They might not properly account for bad debts; net income will consequently be higher, but only as accounts receivable swells into a "ticking time-bomb". If the manager is rewarded for raising revenue, he or she might relax credit standards and sell to customers who have no capacity to pay. Even if the customer can "scrape together" the payments, perhaps the burden would be too much (for example, a low-income customer leasing a luxury automobile).

Another possibility is overstating the value of inventory. Obsolescence or spoilage can cause the value of inventory to be less than what is represented on the balance sheet.

KEY TAKEAWAYS

- Proper cash management is vital.
- Policies regarding cash have the potential to alienate customers. Balance is key in proper cash management.

EXERCISE

1. Your company has a 90 day collection policy for receivables. A customer is having a cash flow issue, and asks for more lenient payment terms. What are some of the ethical considerations for this scenario?

17.5 End-of-Chapter Problems

PLEASE NOTE: This book is currently in draft form; material is not final.

EXERCISES

1. Calculate Inventory Conversion Period, Receivables Conversion Period, the Payment Conversion Period and the Operating Cycle for Persistence Inc. given the following information. Use 365 to get average:

   Inventory = 150

   COGS = 2200

   A/R = 80

   Revenues = 1460

   Purchases = 2555

   A/P = 100
2. Calculate the Cash Conversion Cycle for the above data from Persistence Inc. and graph on a timeline.
3. Can a Cash Conversion Cycle be negative? Why or why not? What does this mean?

Chapter 18

Current Liabilities Management

PLEASE NOTE: This book is currently in draft form; material is not final.

18.1 Accounts Payable Management

PLEASE NOTE: This book is currently in draft form; material is not final.

18.2 Accruals Management

PLEASE NOTE: This book is currently in draft form; material is not final.

18.3 Short-term Loans

PLEASE NOTE: This book is currently in draft form; material is not final.

18.4 Secured Sources of Funds

PLEASE NOTE: This book is currently in draft form; material is not final.

Chapter 19

International Considerations

PLEASE NOTE: This book is currently in draft form; material is not final.

19.1 Multinational Corporations and their Environments

PLEASE NOTE: This book is currently in draft form; material is not final.

19.2 Multinational vs. Domestic Financial Management

PLEASE NOTE: This book is currently in draft form; material is not final.

19.3 Exchange Rate Risk

PLEASE NOTE: This book is currently in draft form; material is not final.

19.4 Other Risk Factors

PLEASE NOTE: This book is currently in draft form; material is not final.

19.5 Investment Decisions

PLEASE NOTE: This book is currently in draft form; material is not final.

19.6 International Mergers and Joint Ventures

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Chapter 20

Derivatives and Hedging

PLEASE NOTE: This book is currently in draft form; material is not final.

20.1 Convertible Securities

PLEASE NOTE: This book is currently in draft form; material is not final.

20.2 Futures

PLEASE NOTE: This book is currently in draft form; material is not final.

20.3 Options

PLEASE NOTE: This book is currently in draft form; material is not final.

20.4 Hedging Risk

PLEASE NOTE: This book is currently in draft form; material is not final.

Chapter 21

Mergers, Acquisitions, and Divestitures

PLEASE NOTE: This book is currently in draft form; material is not final.

21.1 Mergers and Acquisitions

PLEASE NOTE: This book is currently in draft form; material is not final.

21.2 LBOs and Divestitures

PLEASE NOTE: This book is currently in draft form; material is not final.

21.3 Reorganization and Bankruptcy

PLEASE NOTE: This book is currently in draft form; material is not final.

Chapter 22

Self-Test Exam

PLEASE NOTE: This book is currently in draft form; material is not final.

22.1 Self-Test Exam Part I

PLEASE NOTE: This book is currently in draft form; material is not final.

22.2 Self-Test Exam Part II

PLEASE NOTE: This book is currently in draft form; material is not final.