

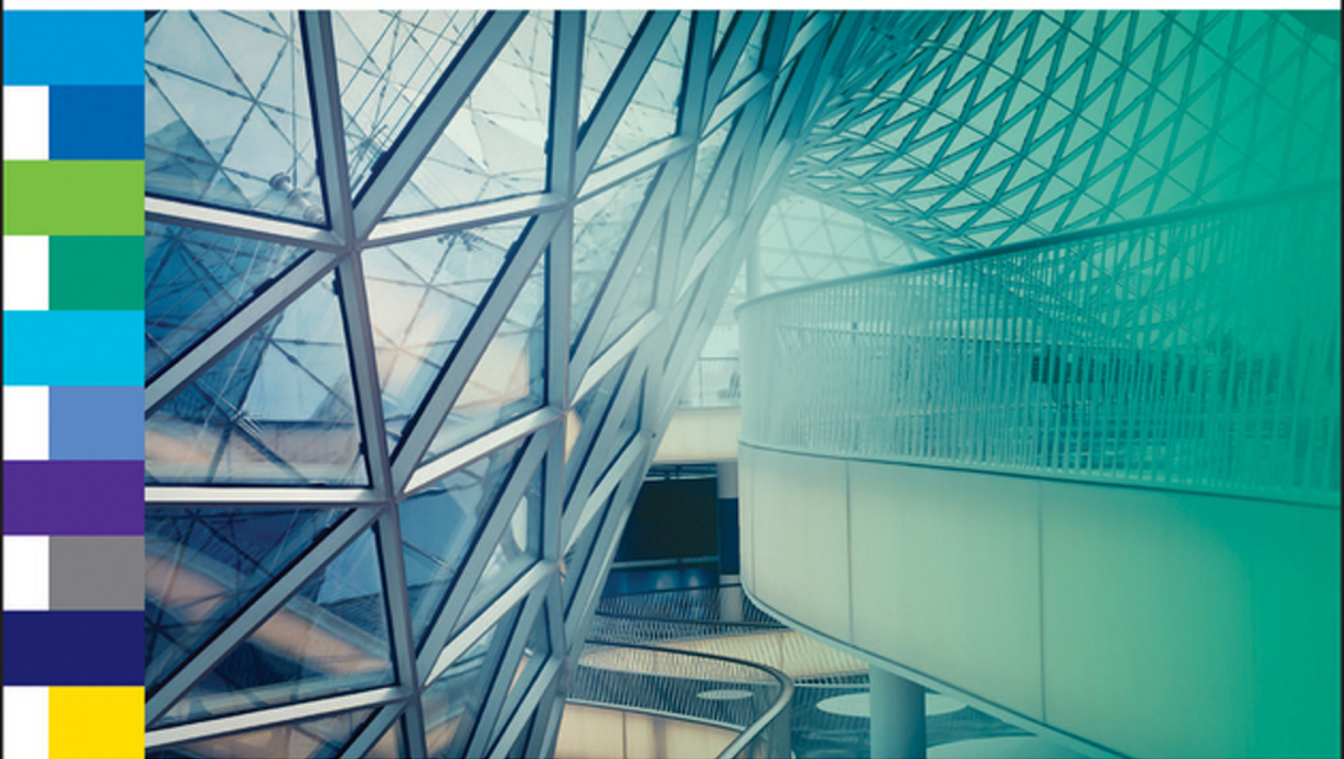


**CFA Institute**

**CFA INSTITUTE INVESTMENT SERIES**

# **FIXED INCOME ANALYSIS**

Third Edition



**Barbara Petitt, CFA ■ Jerald E. Pinto CFA**  
**Wendy L. Pirie, CFA**



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# FIXED INCOME ANALYSIS

**CFA Institute** is the premier association for investment professionals around the world, with over 124,000 members in 145 countries. Since 1963 the organization has developed and administered the renowned Chartered Financial Analyst® Program. With a rich history of leading the investment profession, CFA Institute has set the highest standards in ethics, education, and professional excellence within the global investment community and is the foremost authority on investment profession conduct and practice. Each book in the CFA Institute Investment Series is geared toward industry practitioners along with graduate-level finance students and covers the most important topics in the industry. The authors of these cutting-edge books are themselves industry professionals and academics and bring their wealth of knowledge and expertise to this series.

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# FIXED INCOME ANALYSIS

**Third Edition**

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with

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**WILEY**

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# FOREWORD

Recently, one of my colleagues took some shirts down to the One-Hour Dry Cleaner.

“They’ll be ready next Tuesday,” said the owner.

My friend said, “But I thought you did one-hour dry cleaning?”

“Oh, no,” said the owner, “that’s just our name.”

So it is in today’s “fixed income” market. It’s just a name. There was a time when that name accurately described the securities in that market, and it was certainly a much easier time to learn about the fixed-income world. Not much is fixed anymore. Maturities can vary, coupons can float, principal balances can pay down in unpredictable ways, and so on. And those are only the “normal” fixed-income securities. The market includes securities whose coupons go up when rates go down, securities that accrue interest only when certain conditions are met, and securities that pay off something other than par at maturity. We have so-called catastrophe bonds that may pay nothing at maturity, but that’s not why they’re called catastrophe bonds. How can you *possibly* learn about such a diverse market? This book is a good start.

It all begins with the first section, on the essentials. This section starts with “defining elements,” which surveys the breadth and diversity of fixed-income securities and provides details on the distinguishing features of all types of bonds. The next chapter, on issuance, trading, and funding, describes the markets, venues, and conventions for bond trading and, consistent with CFA Institute’s global reach, has a global focus. Next, the chapter introducing valuation provides a basic understanding of the methods used to value fixed-income securities and to determine relative values between them.

Owning fixed-income securities entails various risks. The second section of the book deals with identifying and quantifying those risks and explores some of the complex quantitative modeling now in use. Both interest rate risk and credit risk are covered here.

The third section deals with asset-backed securities. This broad category encompasses mortgage-backed securities and the many other types of assets that have been “securitized,” including home equity loans, car loans, credit card loans, boat loans, royalty payments, and more. Often, the securities are broken into tranches, which will typically have different priorities in terms of timing, credit, and stability of payments. A keen understanding of these securities is crucial to success in the fixed-income market. Many of the securities, especially collateralized mortgage obligations, are poster boys for uncertain cash flows.

In the fourth section comes detailed analysis of valuation methods for fixed-income securities. It starts with the general approach to valuing a set of cash flows and then extends into analysis that is useful for securities with uncertain cash flows.

Of course, valuation is impossible to do in a vacuum. Every new bond that is issued is positioned somewhere in a thick soup of all the existing bonds. Together, the bonds, their unique terms, their buyers and sellers, alternating waves of fear and greed, and of course, central banks determine the interest rate structure in the market. This “term structure of interest rates” is the subject of the fifth section of the book.

Finally, the last section deals with managing fixed-income portfolios. Long gone are the days when a simple “laddered” portfolio would meet most fixed-income investors’ needs. Over the years, a variety of techniques—many unique to the fixed-income market—have been developed to meet various objectives and constraints. This final section covers much of the landscape; indeed, a look at the learning outcomes gives a sense of the broad coverage in this section.

I received my CFA charter 34 years ago. Many of the security types mentioned in this book had not been created then, and of course, neither had the valuation approaches. Fixed income was at that time at the very beginning of its quantitative revolution. The fixed-income readings for Level II and Level III came largely from *Inside the Yield Book*, by Marty Leibowitz. Before reading that book, I had thought—and had even said aloud while teaching—“Bonds are boring.” That book opened my eyes, and less than two weeks after I took Level III, I started working for Marty at Salomon Brothers.

I can’t promise you that this book will have such a profound effect on your life, but I expect it will for many readers. I have had the good fortune to work with a number of the authors of this book over the years, and I know that their decades of educational and practical experience, together with active guidance by CFA Institute, make this book well worth reading for those studying for the CFA exam and anyone who wants grounding in today’s complex fixed-income market. Good luck!

BOB KOPPRASCH, PhD, CFA  
5 November 2014

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# PREFACE

We are pleased to bring you *Fixed Income Analysis*, which provides authoritative and up-to-date coverage of how investment professionals analyze and manage fixed-income portfolios. As with many of the other titles in the CFA Institute Investment Series, the content for this book is drawn from the official CFA Program curriculum. As such, readers can rely on the content of this book to be current, globally relevant, and practical.

The content was developed in partnership by a team of distinguished academics and practitioners, chosen for their acknowledged expertise in the field, and guided by CFA Institute. It is written specifically with the investment practitioner in mind and is replete with examples and practice problems that reinforce the learning outcomes and demonstrate real-world applicability.

The CFA Program curriculum, from which the content of this book was drawn, is subjected to a rigorous review process to assure that it is:

- Faithful to the findings of our ongoing industry practice analysis
- Valuable to members, employers, and investors
- Globally relevant
- Generalist (as opposed to specialist) in nature
- Replete with sufficient examples and practice opportunities
- Pedagogically sound

The accompanying workbook is a useful reference that provides Learning Outcome Statements, which describe exactly what readers will learn and be able to demonstrate after mastering the accompanying material. Additionally, the workbook has summary overviews and practice problems for each chapter.

We hope you will find this and other books in the CFA Institute Investment Series helpful in your efforts to grow your investment knowledge, whether you are a relatively new entrant or an experienced veteran striving to keep up to date in the ever-changing market environment. CFA Institute, as a long-term committed participant in the investment profession and a not-for-profit global membership association, is pleased to provide you with this opportunity.

## THE CFA PROGRAM

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If the subject matter of this book interests you, and you are not already a CFA charterholder, we hope you will consider registering for the CFA Program and starting progress toward earning the Chartered Financial Analyst designation. The CFA designation is a globally recognized standard of excellence for measuring the competence and integrity of investment professionals. To earn the CFA charter, candidates must successfully complete the CFA Program, a global

graduate-level self-study program that combines a broad curriculum with professional conduct requirements as preparation for a career as an investment professional.

Anchored by a practice-based curriculum, the CFA Program Body of Knowledge reflects the knowledge, skills, and abilities identified by professionals as essential to the investment decision-making process. This body of knowledge maintains its relevance through a regular, extensive survey of practicing CFA charterholders across the globe. The curriculum covers 10 general topic areas, ranging from equity and fixed-income analysis to portfolio management to corporate finance—all with a heavy emphasis on the application of ethics in professional practice. Known for its rigor and breadth, the CFA Program curriculum highlights principles common to every market so that professionals who earn the CFA designation have a thoroughly global investment perspective and a profound understanding of the global marketplace.

---

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---

# ABOUT THE CFA INSTITUTE SERIES

CFA Institute is pleased to provide you with the CFA Institute Investment Series, which covers major areas in the field of investments. We provide this best-in-class series for the same reason we have been chartering investment professionals for more than 50 years: to lead the investment profession globally by promoting the highest standards of ethics, education, and professional excellence for the ultimate benefit of society.

The books in the CFA Institute Investment Series contain practical, globally relevant material. They are intended both for those contemplating entry into the extremely competitive field of investment management as well as for those seeking a means of keeping their knowledge fresh and up to date. This series was designed to be user friendly and highly relevant.

We hope you find this series helpful in your efforts to grow your investment knowledge, whether you are a relatively new entrant or an experienced veteran ethically bound to keep up to date in the ever-changing market environment. As a long-term, committed participant in the investment profession and a not-for-profit global membership association, CFA Institute is pleased to provide you with this opportunity.

## THE TEXTS

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*Corporate Finance: A Practical Approach* is a solid foundation for those looking to achieve lasting business growth. In today's competitive business environment, companies must find innovative ways to enable rapid and sustainable growth. This text equips readers with the foundational knowledge and tools for making smart business decisions and formulating strategies to maximize company value. It covers everything from managing relationships between stakeholders to evaluating merger and acquisition bids, as well as the companies behind them. Through extensive use of real-world examples, readers will gain critical perspective into interpreting corporate financial data, evaluating projects, and allocating funds in ways that increase corporate value. Readers will gain insights into the tools and strategies used in modern corporate financial management.

*Equity Asset Valuation* is a particularly cogent and important resource for anyone involved in estimating the value of securities and understanding security pricing. A well-informed professional knows that the common forms of equity valuation—dividend discount modeling, free cash flow modeling, price/earnings modeling, and residual income modeling—can all be reconciled with one another under certain assumptions. With a deep understanding of the underlying assumptions, the professional investor can better understand what other investors assume when calculating their valuation estimates. This text has a global orientation, including emerging markets.

*International Financial Statement Analysis* is designed to address the ever-increasing need for investment professionals and students to think about financial statement analysis from a global perspective. The text is a practically oriented introduction to financial statement analysis that is distinguished by its combination of a true international orientation, a structured presentation style, and abundant illustrations and tools covering concepts as they are introduced in the text. The authors cover this discipline comprehensively and with an eye to ensuring the reader's success at all levels in the complex world of financial statement analysis.

*Investments: Principles of Portfolio and Equity Analysis* provides an accessible yet rigorous introduction to portfolio and equity analysis. Portfolio planning and portfolio management are presented within a context of up-to-date, global coverage of security markets, trading, and market-related concepts and products. The essentials of equity analysis and valuation are explained in detail and profusely illustrated. The book includes coverage of practitioner-important but often neglected topics, such as industry analysis. Throughout, the focus is on the practical application of key concepts with examples drawn from both emerging and developed markets. Each chapter affords the reader many opportunities to self-check his or her understanding of topics.

One of the most prominent texts over the years in the investment management industry has been Maginn and Tuttle's *Managing Investment Portfolios: A Dynamic Process*. The third edition updates key concepts from the 1990 second edition. Some of the more experienced members of our community own the prior two editions and will add the third edition to their libraries. Not only does this seminal work take the concepts from the other readings and put them in a portfolio context, but it also updates the concepts of alternative investments, performance presentation standards, portfolio execution, and, very importantly, individual investor portfolio management. Focusing attention away from institutional portfolios and toward the individual investor makes this edition an important and timely work.

*The New Wealth Management: The Financial Advisor's Guide to Managing and Investing Client Assets* is an updated version of Harold Evensky's mainstay reference guide for wealth managers. Harold Evensky, Stephen Horan, and Thomas Robinson have updated the core text of the 1997 first edition and added an abundance of new material to fully reflect today's investment challenges. The text provides authoritative coverage across the full spectrum of wealth management and serves as a comprehensive guide for financial advisers. The book expertly blends investment theory and real-world applications and is written in the same thorough but highly accessible style as the first edition.

*Quantitative Investment Analysis* focuses on some key tools that are needed by today's professional investor. In addition to classic time value of money, discounted cash flow applications, and probability material, there are two aspects that can be of value over traditional thinking. The first involves the chapters dealing with correlation and regression that ultimately figure into the formation of hypotheses for purposes of testing. This gets to a critical skill that challenges many professionals: the ability to distinguish useful information from the overwhelming quantity of available data. Second, the final chapter of *Quantitative Investment Analysis* covers portfolio concepts and takes the reader beyond the traditional capital asset pricing model (CAPM) type of tools and into the more practical world of multifactor models and arbitrage pricing theory.

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# FIXED INCOME ANALYSIS



PART I

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# FIXED-INCOME ESSENTIALS



## FIXED-INCOME SECURITIES: DEFINING ELEMENTS

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### LEARNING OUTCOMES

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*After completing this chapter, you will be able to do the following:*

- describe the basic features of a fixed-income security;
- describe functions of a bond indenture;
- compare affirmative and negative covenants and identify examples of each;
- describe how legal, regulatory, and tax considerations affect the issuance and trading of fixed-income securities;
- describe how cash flows of fixed-income securities are structured;
- describe contingency provisions affecting the timing and/or nature of cash flows of fixed-income securities and identify whether such provisions benefit the borrower or the lender.

### 1. INTRODUCTION

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Judged by total market value, fixed-income securities constitute the most prevalent means of raising capital globally. A fixed-income security is an instrument that allows governments, companies, and other types of issuers to borrow money from investors. Any borrowing of money is debt. The promised payments on fixed-income securities are, in general, contractual (legal) obligations of the issuer to the investor. For companies, fixed-income securities contrast to common shares in not having ownership rights. Payment of interest and repayment of principal (amount borrowed) are a prior claim on the company's earnings and assets compared with the claim of common shareholders. Thus, a company's fixed-income securities have, in theory, lower risk than that company's common shares.

In portfolio management, fixed-income securities fulfill several important roles. They are a prime means by which investors—individual and institutional—can prepare to fund, with some

degree of safety, known future obligations such as tuition payments or pension obligations. The correlations of fixed-income securities with common shares vary, but adding fixed-income securities to portfolios including common shares is usually an effective way of obtaining diversification benefits.

Among the questions this chapter addresses are the following:

- What set of features define a fixed-income security, and how do these features determine the scheduled cash flows?
- What are the legal, regulatory, and tax considerations associated with a fixed-income security, and why are these considerations important for investors?
- What are the common structures regarding the payment of interest and repayment of principal?
- What types of provisions may affect the disposal or redemption of fixed-income securities?

Embarking on the study of fixed-income securities, please note that the terms “fixed-income securities,” “debt securities,” and “bonds” are often used interchangeably by experts and non-experts alike. We will also follow this convention, and where any nuance of meaning is intended, it will be made clear.<sup>1</sup>

The remainder of this chapter is organized as follows. Section 2 describes, in broad terms, what an investor needs to know when investing in fixed-income securities. Section 3 covers both the nature of the contract between the issuer and the bondholders as well as the legal, regulatory, and tax framework within which this contract exists. Section 4 presents the principal and interest payment structures that characterize fixed-income securities. Section 5 discusses the contingency provisions that affect the timing and/or nature of a bond’s cash flows. The final section provides a conclusion and summary of the chapter.

## 2. OVERVIEW OF A FIXED-INCOME SECURITY

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There are three important elements that an investor needs to know about when investing in a fixed-income security:

- The bond’s features, including the issuer, maturity, par value, coupon rate and frequency, and currency denomination. These features determine the bond’s scheduled cash flows and, therefore, are key determinants of the investor’s expected and actual return.
- The legal, regulatory, and tax considerations that apply to the contractual agreement between the issuer and the bondholders.
- The contingency provisions that may affect the bond’s scheduled cash flows. These contingency provisions are options; they give the issuer or the bondholders certain rights affecting the bond’s disposal or redemption.

This section describes a bond’s basic features and introduces yield measures. The legal, regulatory, and tax considerations and contingency provisions are discussed in Sections 3 and 5, respectively.

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<sup>1</sup>Note that the term “fixed income” is not to be understood literally: Some fixed-income securities have interest payments that change over time. Some experts include preference shares as a type of fixed-income security, but none view them as a type of bond. Finally, in some contexts, bonds refer to the longer-maturity form of debt securities in contrast to money market securities.

## 2.1. Basic Features of a Bond

All bonds, whether they are “traditional” bonds (i.e., non-securitized bonds) or securitized bonds, are characterized by the same basic features. **Securitized bonds** are created from a process called securitization, which involves moving assets into a special legal entity. This special legal entity then uses the assets as guarantees to back (secure) a bond issue, leading to the creation of securitized bonds. Assets that are typically used to create securitized bonds include residential and commercial mortgages, automobile loans, student loans, and credit card debt, among others.

### 2.1.1. Issuer

Many entities issue bonds: private individuals, such as the musician David Bowie; national governments, such as Singapore or Italy; and companies, such as BP, General Electric, or Tata Group.

Bond issuers are classified into categories based on the similarities of these issuers and their characteristics. Major types of issuers include the following:

- Supranational organizations, such as the World Bank or the European Investment Bank;
- Sovereign (national) governments, such as the United States or Japan;
- Non-sovereign (local) governments, such as the state of Minnesota in the United States, the region of Catalonia in Spain, or the city of Edmonton in Canada;
- Quasi-government entities (i.e., agencies that are owned or sponsored by governments), such as postal services in many countries—for example, Correios in Brazil, La Poste in France, or Pos in Indonesia; and
- Companies (i.e., corporate issuers). Market participants often distinguish between financial issuers (e.g., banks and insurance companies) and non-financial issuers.

Bondholders are exposed to credit risk—that is, the risk of loss resulting from the issuer failing to make full and timely payments of interest and/or repayments of principal. Credit risk is inherent to all debt investments. Bond markets are sometimes classified into sectors based on the issuer’s creditworthiness as judged by credit rating agencies. One major distinction is between investment-grade and non-investment-grade (also called high-yield or speculative) bonds.<sup>2</sup> Although a variety of considerations enter into distinguishing the two sectors, the promised payments of investment-grade bonds are perceived as less risky than those of non-investment-grade bonds because of profitability and liquidity considerations. Some regulated financial intermediaries, such as banks and life insurance companies, may face explicit or implicit limitations of holdings of non-investment-grade bonds. The investment policy statements of some investors may also include constraints or limits on such holdings. From the issuer’s perspective, an investment-grade credit rating generally allows easier access to bond markets, especially in conditions of limited credit, and at lower interest rates than does a non-investment-grade credit rating.<sup>3</sup>

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<sup>2</sup>The three largest credit rating agencies are Moody’s Investors Service, Standard & Poor’s, and Fitch Ratings. Bonds rated Baa3 or higher by Moody’s and BBB– or higher by Standard & Poor’s and Fitch are considered investment grade.

<sup>3</sup>Several other distinctions among credit ratings are made. They are discussed in depth in the chapter on fundamentals of credit analysis.

### 2.1.2. Maturity

The maturity date of a bond refers to the date when the issuer is obligated to redeem the bond by paying the outstanding principal amount. The **tenor**, also known as the term to maturity, is the time remaining until the bond's maturity date. The tenor is an important consideration in the analysis of a bond. It indicates the period over which the bondholder can expect to receive the coupon payments and the length of time until the principal is repaid in full.

Maturities typically range from overnight to 30 years or longer. Fixed-income securities with maturities at issuance (original maturity) of one year or less are known as **money market securities**. Issuers of money market securities include governments and companies. Commercial paper and certificates of deposit are examples of money market securities. Fixed-income securities with original maturities that are longer than one year are called **capital market securities**. Although very rare, **perpetual bonds**, such as the consols issued by the sovereign government in the United Kingdom, have no stated maturity date.

### 2.1.3. Par Value

The **principal amount**, **principal value**, or simply **principal** of a bond is the amount that the issuer agrees to repay the bondholders on the maturity date. This amount is also referred to as the par value, or simply par, face value, nominal value, redemption value, or maturity value. Bonds can have any par value.

In practice, bond prices are quoted as a percentage of their par value. For example, assume that a bond's par value is \$1,000. A quote of 95 means that the bond price is \$950 ( $95\% \times \$1,000$ ). When the bond is priced at 100% of par, the bond is said to be trading at par. If the bond's price is below 100% of par, such as in the previous example, the bond is trading at a discount. Alternatively, if the bond's price is above 100% of par, the bond is trading at a premium.

### 2.1.4. Coupon Rate and Frequency

The coupon rate or nominal rate of a bond is the interest rate that the issuer agrees to pay each year until the maturity date. The annual amount of interest payments made is called the coupon. A bond's coupon is determined by multiplying its coupon rate by its par value. For example, a bond with a coupon rate of 6% and a par value of \$1,000 will pay annual interest of \$60 ( $6\% \times \$1,000$ ).

Coupon payments may be made annually, such as those for German government bonds or Bunds. Many bonds, such as government and corporate bonds issued in the United States or government gilts issued in the United Kingdom, pay interest semi-annually. Some bonds make quarterly or monthly interest payments. The acronyms QUIBS (quarterly interest bonds) and QUIDS (quarterly income debt securities) are used by Morgan Stanley and Goldman Sachs, respectively, for bonds that make quarterly interest payments. Many mortgage-backed securities pay interest monthly to match the cash flows of the mortgages backing these bonds. If a bond has a coupon rate of 6% and a par value of \$1,000, the periodic interest payments will be \$60 if coupon payments are made annually, \$30 if they are made semi-annually, \$15 if they are made quarterly, and \$5 if they are made monthly.

A **plain vanilla bond** or **conventional bond** pays a fixed rate of interest. In this case, the coupon payment does not change during the bond's life. However, there are bonds that pay a floating rate of interest; such bonds are called **floating-rate notes** (FRNs) or **floaters**. The coupon rate of an FRN includes two components: a reference rate plus a spread. The spread, also called margin, is typically constant and expressed in basis points (bps). A **basis point** is equal to 0.01%; put another way, there are 100 basis points in 1%. The spread is set when the bond



is issued based on the issuer's creditworthiness at issuance: The higher the issuer's credit quality, the lower the spread. The reference rate, however, resets periodically. Thus, as the reference rate changes, the coupon rate and coupon payment change accordingly.

A widely used reference rate is the London interbank offered rate (Libor). Libor is a collective name for a set of rates covering different currencies for different maturities ranging from overnight to one year. Other reference rates include the Euro interbank offered rate (Euribor), the Hong Kong interbank offered rate (Hibor), or the Singapore interbank offered rate (Sibor) for issues denominated in euros, Hong Kong dollars, and Singapore dollars, respectively. Euribor, Hibor, and Sibor are, like Libor, sets of rates for different maturities up to one year.

For example, assume that the coupon rate of an FRN that makes semi-annual interest payments in June and December is expressed as the six-month Libor + 150 bps. Suppose that in December 20X0, the six-month Libor is 3.25%. The interest rate that will apply to the payment due in June 20X1 will be 4.75% (3.25% + 1.50%). Now suppose that in June 20X1, the six-month Libor has decreased to 3.15%. The interest rate that will apply to the payment due in December 20X1 will decrease to 4.65% (3.15% + 1.50%). More details about FRNs are provided in Section 4.2.1.

All bonds, whether they pay a fixed or floating rate of interest, make periodic coupon payments except for **zero-coupon bonds**. Such bonds do not pay interest, hence their name. Instead, they are issued at a discount to par value and redeemed at par; they are sometimes referred to as **pure discount bonds**. The interest earned on a zero-coupon bond is implied and equal to the difference between the par value and the purchase price. For example, if the par value is \$1,000 and the purchase price is \$950, the implied interest is \$50.

#### 2.1.5. Currency Denomination

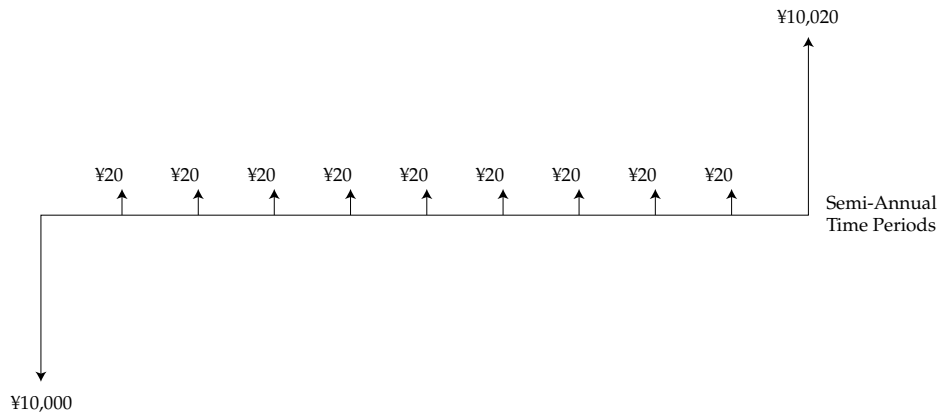
Bonds can be issued in any currency, although a large number of bond issues are made in either euros or US dollars. The currency of issue may affect a bond's attractiveness. If the currency is not liquid or freely traded, or if the currency is very volatile relative to major currencies, investments in that currency will not appeal to many investors. For this reason, borrowers in developing countries often elect to issue bonds in a currency other than their local currency, such as in euros or US dollars, because doing so makes it easier to place the bond with international investors. Issuers may also choose to issue in a foreign currency if they are expecting cash flows in the foreign currency because the interest payments and principal repayments can act as a natural hedge, reducing currency risk. If a bond is aimed solely at a country's domestic investors, it is more likely that the borrower will issue in the local currency.

**Dual-currency bonds** make coupon payments in one currency and pay the par value at maturity in another currency. For example, assume that a Japanese company needs to finance a long-term project in the United States that will take several years to become profitable. The Japanese company could issue a yen/US dollar dual-currency bond. The coupon payments in yens can be made from the cash flows generated in Japan, and the principal can be repaid in US dollars using the cash flows generated in the United States once the project becomes profitable.

**Currency option bonds** can be viewed as a combination of a single-currency bond plus a foreign currency option. They give bondholders the right to choose the currency in which they want to receive interest payments and principal repayments. Bondholders can select one of two currencies for each payment.

Exhibit 1 brings all the basic features of a bond together and illustrates how these features determine the cash flow pattern for a plain vanilla bond. The bond is a five-year Japanese government bond (JGB) with a coupon rate of 0.4% and a par value of ¥10,000. Interest payments are made semi-annually. The bond is priced at par when it is issued and is redeemed at par.

## EXHIBIT 1 Cash Flows for a Plain Vanilla Bond



The downward-pointing arrow in Exhibit 1 represents the cash flow paid by the bond investor (received by the issuer) on the day of the bond issue—that is, ¥10,000. The upward-pointing arrows are the cash flows received by the bondholder (paid by the issuer) during the bond's life. As interest is paid semi-annually, the coupon payment is ¥20  $[(0.004 \times ¥10,000) \div 2]$  every six months for five years—that is, 10 coupon payments of ¥20. The last payment is equal to ¥10,020 because it includes both the last coupon payment and the payment of the par value.

### EXAMPLE 1

1. An example of sovereign bond is a bond issued by:
  - A. the World Bank.
  - B. the city of New York.
  - C. the federal German government.
2. The risk of loss resulting from the issuer failing to make full and timely payment of interest is called:
  - A. credit risk.
  - B. systemic risk.
  - C. interest rate risk.
3. A money market security *most likely* matures in:
  - A. one year or less.
  - B. between one and 10 years.
  - C. over 10 years.
4. If the bond's price is higher than its par value, the bond is trading at:
  - A. par.
  - B. a discount.
  - C. a premium.

5. A bond has a par value of £100 and a coupon rate of 5%. Coupon payments are made semi-annually. The periodic interest payment is:
  - A. £2.50, paid twice a year.
  - B. £5.00, paid once a year.
  - C. £5.00, paid twice a year.
6. The coupon rate of a floating-rate note that makes payments in June and December is expressed as six-month Libor + 25 bps. Assuming that the six-month Libor is 3.00% at the end of June 20XX and 3.50% at the end of December 20XX, the interest rate that applies to the payment due in December 20XX is:
  - A. 3.25%.
  - B. 3.50%.
  - C. 3.75%.
7. The type of bond that allows bondholders to choose the currency in which they receive each interest payment and principal repayment is a:
  - A. pure discount bond.
  - B. dual-currency bond.
  - C. currency option bond.

*Solution to 1:* C is correct. A sovereign bond is a bond issued by a national government, such as the federal German government. A is incorrect because a bond issued by the World Bank is a supranational bond. B is incorrect because a bond issued by a local government, such as the city of New York, is a non-sovereign bond.

*Solution to 2:* A is correct. Credit risk is the risk of loss resulting from the issuer failing to make full and timely payments of interest and/or repayments of principal. B is incorrect because systemic risk is the risk of failure of the financial system. C is incorrect because interest rate risk is the risk that a change in market interest rate affects a bond's value. Systemic risk and interest rate risk are defined in Sections 5.3 and 4.2.1, respectively.

*Solution to 3:* A is correct. The primary difference between a money market security and a capital market security is the maturity at issuance. Money market securities mature in one year or less, whereas capital market securities mature in more than one year.

*Solution to 4:* C is correct. If a bond's price is higher than its par value, the bond is trading at a premium. A is incorrect because a bond is trading at par if its price is equal to its par value. B is incorrect because a bond is trading at a discount if its price is lower than its par value.

*Solution to 5:* A is correct. The annual coupon payment is  $5\% \times £100 = £5.00$ . The coupon payments are made semi-annually, so £2.50 paid twice a year.

*Solution to 6:* A is correct. The interest rate that applies to the payment due in December 20XX is the six-month Libor at the end of June 20XX plus 25 bps. Thus, it is 3.25% ( $3.00\% + 0.25\%$ ).

*Solution to 7:* C is correct. A currency option bond gives bondholders the right to choose the currency in which they want to receive each interest payment and principal repayment. A is incorrect because a pure discount bond is issued at a discount to par value and redeemed at par. B is incorrect because a dual-currency bond makes coupon payments in one currency and pays the par value at maturity in another currency.