The Many Different Kinds of Debt

In Chapters 17 and 18 we discussed how much a company should borrow. But companies also need to think about what *type* of debt to issue. They can choose to issue short- or long-term debt, straight or convertible bonds; they can issue in the United States or in the international debt market; and they can sell the debt publicly or place it privately with a few large investors.

As a financial manager, you need to choose the type of debt that makes sense for your company. For example, if a firm has only a temporary need for funds, it should generally issue short-term debt. Firms with a substantial overseas business may prefer to issue foreign currency debt. Sometimes competition between lenders opens a window of opportunity in a particular sector of the debt market. The effect may be only a few basis points reduction in yield, but on a large issue that can translate into savings of several million dollars. Remember the saying, "A million dollars here and a million there—pretty soon it begins to add up to real money."[1]

Our focus in this chapter is on long-term debt.[2] We begin our discussion by looking at different types of bonds. We examine the differences between senior and junior bonds and between secured and unsecured bonds. Then we describe how bonds may be repaid by means of a sinking fund and how the borrower or the lender may have an option for early repayment. In Section 24-6 we look at convertible bonds and at their close relative, the package of bonds and warrants.

Debt may be sold to the public or placed privately with large financial institutions. Because privately placed bonds are broadly similar to public issues, we do not discuss them at length. However, we do discuss another form of private placement known as project finance. This is the glamorous part of the debt market. The words *project finance* conjure up images of multi-million-dollar loans to finance huge ventures in exotic parts of the world. You'll find there's something to the popular image, but it's not the whole story.

We conclude with a look at a few unusual bonds and consider the reasons for innovation in the debt market.

As we look at these different features of corporate debt, we try to explain why sinking funds, repayment options, convertible securities, and the like exist. They are not simply matters of custom or neutral mutations; there are generally good reasons for their use.

We should point out that many debts are not shown on the company's balance sheet. For example, companies may be able to disguise the debt by establishing *special purpose entities (SPEs),* which raise cash by a mixture of equity and debt and then use that cash to help fund the parent company. By making use of SPEs, Enron kept a large amount of its debt off-balance-sheet, but that did not stop the company from going bankrupt. Since the Enron scandal accountants have moved to tighten up the rules on disclosing SPE debt.

Companies have other important long-term liabilities that we do *not* discuss in this chapter. For instance, long-term leases are very similar to debt. The user of the equipment agrees to make a series of lease payments and, if it defaults, it may be forced into bankruptcy. We discuss leases in Chapter 25.

Postretirement health benefits and pension promises can also be huge liabilities. For example, in 2003 General Motors had a pension deficit of $19 billion. To reduce this deficit, GM made a large issue of bonds

[1] The remark was made by the late Senator Everett Dirksen. However, he was talking billions.

[2] Short-term debt is discussed in Chapter 30.

and invested the majority of the proceeds in its pension fund. You could say that the effect was to increase the company's debt, but the economic reality was that it substituted one long-term obligation (the new debt) for another (its pension obligation). Management of pension plans is outside the scope of this book, but financial managers spend a good deal of time worrying about the pension "debt."

24-1 Domestic Bonds, Foreign Bonds, and Eurobonds

A firm can issue a bond either in its home country or in another country. Bonds that are sold to local investors in another country's bond market are known as *foreign bonds*. The United States is by far the largest market for foreign bonds, but Japan and Switzerland are also substantial markets. Foreign bonds have a variety of nicknames: A bond sold by a foreign company in the United States is known as a *yankee bond;* a bond sold by a foreign firm in Japan is a *samurai*.

Of course, any firm that raises money in a foreign country is subject to the rules of that country. For example, any issue in the United States of publicly traded bonds needs to be registered with the SEC. However, foreign firms commonly avoid registration by complying with the SEC's Rule 144A for bond issues in the United States. Rule 144A bonds can be bought and sold only by large financial institutions.[3]

We have seen that a firm may issue a bond in its home country or in another country. In each case the offer is subject to local laws governing the sale and is overseen by the country's financial regulator. Instead of issuing a bond in a particular country's market, a bond issue may also be sold internationally. For example, IBM could issue a dollar bond to investors outside the United States. Because the issue is not marketed to U.S. investors, it does not need to be registered with the SEC.

International issues that are marketed outside any domestic jurisdiction are known as *eurobonds,* and are usually made in one of the major currencies, such as the U.S. dollar, the euro, or the yen. Eurobond issues are marketed by international syndicates of underwriters, such as the London branches of large U.S., European, and Japanese banks and security dealers. Be careful not to confuse a eurobond (which is outside the jurisdiction of any domestic market and may be in any currency) with a bond that is marketed in a European country and denominated in euros.

The eurobond market arose during the 1960s because the U.S. government imposed a tax on the purchase of foreign securities and discouraged American corporations from exporting capital. Therefore both European and American multinationals were forced to tap an international market for capital.

The tax was removed in 1974. Since firms can now choose whether to borrow in New York or London, the interest rates in the two markets are usually similar. However, the eurobond market is not directly subject to regulation by the U.S. authorities, and therefore the financial manager needs to be alert to small differences in the cost of borrowing in one market rather than another.

These days very large bond issues are often marketed both internationally (that is, in the eurobond market) and in individual domestic markets. For example, IBM could sell its dollar bonds internationally and also register the issue for sale in the United States. Such bonds are called *global bonds*.

[3] We described Rule 144A in Section 15-5.

24-2 The Bond Contract

To give you some feel for the bond contract (and for some of the language in which it is couched), we have summarized in Table 24.1 the terms of an issue of 30-year bonds by J.C. Penney. We will look at the principal items in turn.

Indenture, or Trust Deed

The J.C. Penney bond offering was a public issue of bonds, which was registered with the SEC. In the case of a public issue, the bond agreement is in the form of an **indenture,** or **trust deed,** between the bondholder and a trust company.[4] Bank of America National Trust and Savings Association, which is the trust company for the issue, represents the bondholders. It must see that the terms of the indenture are observed and look after the bondholders in the event of default. The bond indenture is a turgid legal document.[5] A copy of it is included in the registration statement and the main provisions are summarized in the prospectus to the issue.

TABLE 24.1 Summary of terms of 8.25% sinking fund debenture 2022 issued by J.C. Penney.

Trustee	Bank of America National Trust and Savings Association
Rights on default	The trustee or 25% of debenture holders may declare the principal due and payable.
Registered	Fully registered
Denomination	$1,000
Amount issued	$250 million
Issue date	August 26, 1992
Offered	Issued at a price of 99.489% plus accrued interest (proceeds to company 98.614%) through First Boston Corporation
Interest	At a rate of 8.25% per annum, payable February 15 and August 15
Seniority	Ranks pari passu with other unsecured unsubordinated debt
Security	Not secured. Company will not permit to have any lien on its property or assets without equally and ratably securing the debt securities
Maturity	August 15, 2022
Sinking fund	Annually from August 15, 2003, sufficient to redeem $12.5 million principal amount, plus an optional sinking fund of up to $25 million
Callable	At whole or in part on or after August 15, 2002, at the option of the Company with at least 30 days, but not more than 60 days notice to each August 14 as follows:
	2003 103.870% 2004 103.485 2005 103.000
	2006 102.709 2007 102.322 2008 101.955
	2009 101.548 2010 101.161 2011 100.774
	2012 100.387
	and thereafter at 100% plus accrued interest
	Also callable for the mandatory and optional sinking funds on August 15, 2003, and thereafter.
Moody's rating	B

[4] In the case of a eurobond issue, there is a *fiscal agent,* who carries out some of the same functions as the bond trustee.

[5] For example, the indenture for an earlier J.C. Penney bond stated: "In any case where several matters are required to be certified by, or covered by an opinion of, any specified Person, it is not necessary that all matters be certified by, or covered by the opinion of, only one such Person, or that they be certified or covered by only one document, but one such Person may certify or give an opinion with respect to some matters and one or more such other Persons as to other matters, and any such Person may certify or give an opinion as to such matters in one or several documents." Try saying that three times fast.

Moving down Table 24.1, you see that the J.C. Penney bonds are *registered.* This means that the company's registrar records the ownership of each bond and the company pays the interest and final principal amount directly to each owner.[6]

Almost all bonds in the United States are issued in registered form, but in many countries bonds may be issued in *bearer* form. In this case the certificate constitutes the primary evidence of ownership, so the bondholder must send the certificate itself to claim the final repayment of principal. Eurobonds almost invariably allow the owner to hold them in bearer form. However, because the ownership of bearer bonds cannot be traced, the IRS has made it difficult for U.S. residents to hold them.

The Bond Terms

Like most dollar bonds, the J.C. Penney bonds have a face value of $1,000. Notice, however, that the bond price is shown as a percentage of face value. Also the price is stated before adding *accrued interest.* This means that the bond buyer must pay not only the quoted price but also the amount of any future interest that has accumulated. For example, investors who bought bonds for delivery on (say) December 15, would have only two months to wait before receiving their first interest payment. Therefore, the four months of accrued interest would be $120/360 \times 8.25 = 2.75\%$, and the investor would pay the purchase price of the bond plus 2.75%.[7]

The J.C. Penney bonds were offered to the public at a price of 99.489%, but the company received only 98.614%. The difference represents the underwriters' spread. Of the $248.7 million raised, about $246.5 million went to the company and $2.2 million (or .9%) went to the underwriters.

The annual interest or *coupon* payment on each bond is 8.25% of $1,000, or $82.50. This interest is payable semiannually, so every six months investors receive interest of $82.50/2 = $41.25. Most U.S. bonds pay interest semiannually, but in many other countries it is common to pay interest annually.[8]

The regular interest payment on a bond is a hurdle that the company must keep jumping. If the company ever fails to make the payment, lenders can demand their money back instead of waiting until matters may deteriorate further.[9] Thus, coupon payments provide added protection for lenders.[10]

Sometimes bonds are sold with a lower coupon payment but at a larger discount on their face value, so investors receive a significant part of their return in the form of capital appreciation.[11] The ultimate is the zero-coupon bond, which pays no interest at all; in this case the entire return consists of capital appreciation.[12]

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[6] Generally, investors do not physically hold the security; instead their ownership is represented by a book entry. The "book" is in practice a computer.

[7] In the U.S. corporate bond market accrued interest is calculated on the assumption that a year is composed of twelve 30-day months; in some other markets (such as the U.S. Treasury bond market) calculations recognize the actual number of days in each calendar month.

[8] If a bond pays interest semiannually, investors usually calculate a *semiannually* compounded yield to maturity on the bond. In other words, the yield is quoted as twice the six-month yield. When bonds pay interest annually, it is conventional to quote their yields to maturity on an *annually* compounded basis. Remember this when comparing yields.

[9] There is one type of bond on which the borrower is obliged to pay interest only if it is covered by the year's earnings. These so-called income bonds are rare and have largely been issued as part of railroad reorganizations. For a discussion of income bonds, see J. J. McConnell and G. G. Schlarbaum, "Returns, Risks, and Pricing of Income Bonds, 1956–1976 (Does Money Have an Odor?)," *Journal of Business* 54 (January 1981), pp. 33–64.

[10] Interest payments would be a trivial hurdle if the company could sell assets to make the payment. Such sales are therefore restricted.

[11] Any bond that is issued at a discount is known as an *original issue discount bond.* A zero-coupon bond is often called a "pure discount bond." The capital appreciation on a discount bond is not taxed as income as long as it amounts to less than .25% a year (IRS Code Section 1272).

[12] The ultimate of ultimates was an issue of a perpetual zero-coupon bond on behalf of a charity.

The J.C. Penney interest payment is fixed for the life of the bond, but in some issues the payment varies with the general level of interest rates. For example, the payment may be set at 1% over the U.S. Treasury bill rate or (more commonly) over the **London interbank offered rate (LIBOR),** which is the rate at which international banks lend to one another. Sometimes these *floating-rate notes* specify a minimum (or floor) interest rate or they may specify a maximum (or cap) on the rate.[13] You may also come across "collars," which stipulate both a maximum and a minimum payment.

24-3 Security and Seniority

Almost all debt issues by industrial and financial companies are general unsecured obligations. Short-term unsecured issues are usually called **notes;** longer-term issues like the J.C. Penney bond are called **debentures** (though in some countries, such as the U.K. and Australia, "debenture" means a *secured* bond).

Utility company bonds are more often secured. This means that if the company defaults on its debt, the trustee or lender may take possession of the relevant assets. If these are insufficient to satisfy the claim, the remaining debt will have a general claim, alongside any unsecured debt, on the other assets of the firm.

The majority of secured bonds are **mortgage bonds.** These sometimes provide a claim against a specific building, but they are more often secured on all the firm's property.[14] Of course, the value of any mortgage depends on the extent of alternative uses of the property. A custom-built machine for producing buggy whips will not be worth much when the market for buggy whips dries up.

Companies that own securities may use them as collateral for a loan. For example, holding companies are firms whose main assets consist of common stock in a number of subsidiaries. So, when holding companies wish to borrow, they generally use these investments as collateral. The problem for the lender is that the stock is junior to all other claims on the assets of the subsidiaries, and so these *collateral trust bonds* usually include detailed restrictions on the freedom of the subsidiaries to issue debt or preferred stock.

A third form of secured debt is the **equipment trust certificate.** This is most frequently used to finance new railroad rolling stock but may also be used to finance trucks, aircraft, and ships. Under this arrangement a trustee obtains formal ownership of the equipment. The company makes a down payment on the cost of the equipment, and the balance is provided by a package of equipment trust certificates with different maturities that might typically run from 1 to 15 years. Only when all these debts have finally been paid off does the company become the formal owner of the equipment. Bond rating agencies such as Moody's or Standard & Poor's usually rate equipment trust certificates one grade higher than the company's regular debt.

Bonds may be senior claims or they may be subordinated to the senior bonds or to *all* other creditors.[15] If the firm defaults, the senior bonds come first in the pecking order. The subordinated lender gets in line behind the general creditors but ahead of the preferred stockholders and the common stockholders.

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[13] Instead of issuing a capped floating-rate loan, a company sometimes issues an uncapped loan and at the same time buys a cap from a bank. The bank pays the interest in excess of the specified level.

[14] If a mortgage is *closed,* no more bonds may be issued against the mortgage. However, usually there is no specific limit to the amount of bonds that may be secured (in which case the mortgage is said to be *open*). Many mortgages are secured not only by existing property but also by "after-acquired" property. However, if the company buys only property that is already mortgaged, the bondholder would have only a junior claim on the new property. Therefore, mortgage bonds with after-acquired property clauses also limit the extent to which the company can purchase additional mortgaged property.

[15] If a bond does not specifically state that it is junior, you can assume that it is senior.

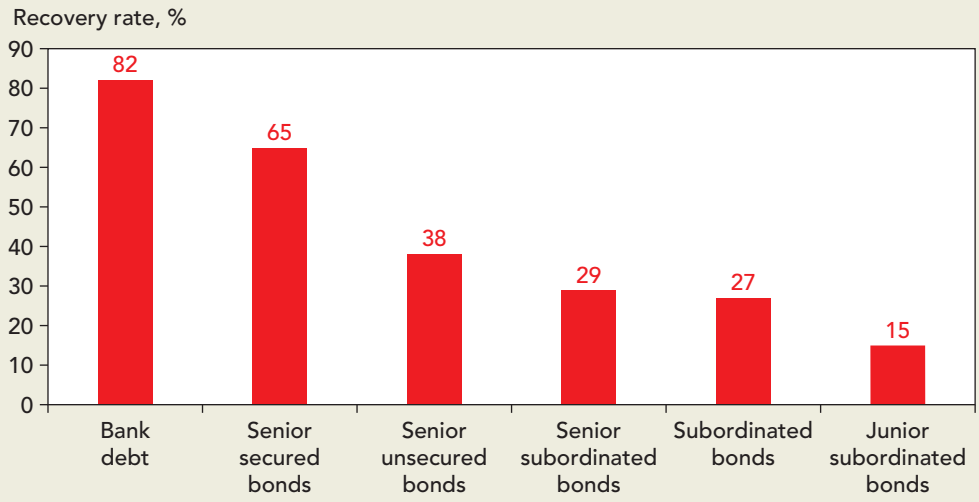


FIGURE 24.1

Ultimate percentage recovery rates on defaulting debt by seniority and security, 1987–2006.

Source: Moody's, "Moody's Ultimate Recovery Database."

As you can see from Figure 24.1, if default does occur, it pays to hold senior secured bonds. On average, investors in these bonds can expect to recover nearly two-thirds of the amount of the loan. At the other extreme, recovery rates for junior unsecured bondholders are only 15% of the face value of the debt.

Asset-Backed Securities

Instead of borrowing money directly, companies sometimes bundle up a group of assets and then sell the cash flows from these assets. This issue is known as an *asset-backed security*, or *ABS*.

Suppose your company has made a large number of mortgage loans to buyers of homes or commercial real estate. However, you don't want to wait until the loans are paid off; you would like to get your hands on the money now. Here is what you do. You establish a separate company that buys a package of the mortgage loans. To finance this purchase, the company sells *mortgage pass-through certificates*. The holders of these certificates simply receive a share of the mortgage payments. For example, if interest rates fall and the mortgages are repaid early, holders of the pass-through certificates are also repaid early. That is not generally popular with these holders, for they get their money back just when they don't want it—when interest rates are low.

Sometimes, instead of issuing one class of pass-through certificates, the company will issue several different classes of security, known as *collateralized mortgage obligations* or *CMOs*. For example, any mortgage payments might be used first to pay off one class of security holders and only then will other classes start to be repaid. As we will see in Chapter 30, these CMOs ran into heavy weather during the credit crisis of 2007–2009.

Real estate companies are not unique in wanting to turn future cash receipts into upfront cash. Automobile loans, student loans, and credit card receivables are also often bundled and remarketed as an asset-backed security. Indeed, investment bankers seem able to repackage any set of cash flows into a loan. In 1997 David Bowie, the British rock star, established a company that then purchased the royalties from his current albums.

The company financed the purchase by selling $55 million of 10-year notes. The royalty receipts were used to make the principal and interest payments on the notes. When asked about the singer's reaction to the idea, his manager replied, "He kind of looked at me cross-eyed and said 'What?' "[16]

24-4 Repayment Provisions

Sinking Funds

Back to our J.C. Penney bond. Its maturity date is 2022, but the issue is repaid on a regular basis before maturity. To do this, the company makes a series of payments into a *sinking fund.*[17] If the payment is in the form of cash, the trustee selects bonds by lottery and uses the cash to redeem them at their face value.[18] Alternatively, the company can choose to buy bonds in the marketplace and pay these into the fund.[19] This is a valuable option for the company. If the bond price is low, the firm will buy the bonds in the market and hand them to the sinking fund; if the price is high, it will call the bonds by lottery.

Generally, there is a mandatory fund that *must* be satisfied and an optional fund that can be satisfied if the borrower chooses. For example, J.C. Penney *must* contribute at least $12.5 million each year to the sinking fund but has the option to contribute a further $25 million.

The J.C. Penney "sinker" begins to operate after about 10 years, and the payments on the fund are sufficient to redeem the entire issue over the bond's life. We saw earlier that interest payments provide a regular test of solvency. A sinking fund provides an additional hurdle that the firm must keep jumping. If it cannot pay the cash into the sinking fund, the lenders can demand their money back. That is why long-dated, lower-quality issues involve larger sinking funds. Higher-quality bonds generally have a lighter sinking fund requirement if they have one at all.

Unfortunately, a sinking fund is a weak test of solvency if the firm is allowed to repurchase bonds in the market. Since the *market* value of the debt declines as the firm approaches financial distress, the sinking fund becomes a hurdle that gets progressively lower as the hurdler gets weaker.

Call Provisions

The J.C. Penney bond includes a call option that allows the company to repay the debt early. Sometimes you come across bonds that give the *investor* the repayment option. Retractable (or puttable) bonds give investors the right to demand early repayment; extendible bonds give them the option to extend the bond's life.

For some companies callable bonds offer a natural form of insurance. For example, Fannie Mae and Freddie Mac offer fixed-rate mortgages to home buyers. When interest rates fall, home owners are likely to repay their fixed-rate mortgage and take out a new mortgage at the lower interest rate. This can severely dent the income of the two agencies. Therefore, to protect themselves against the effect of falling interest rates, they have traditionally issued large quantities of long-term callable debt. When interest rates fall, the agencies can reduce their funding costs by calling their bonds and replacing them with new

[16] See J. Matthews, "David Bowie Reinvents Himself, This Time as a Bond Issue," *Washington Post,* February 7, 1997.

[17] A number of private placements (particularly those in extractive industries) require a payment only when net income exceeds some specified level.

[18] Every investor dreams of buying up the entire supply of a sinking-fund bond that is selling way below face value and then forcing the company to buy the bonds back at face value. Cornering the market in this way is fun to dream about but difficult to do.

[19] If the bonds are privately placed, the company cannot repurchase them in the marketplace; it must call them at their face value.

bonds at a lower rate. Ideally, the fall in bond interest payments should exactly offset the reduction in mortgage income.

J.C. Penney's bonds provide investors with 10 years of *call protection*. During this period the company is not permitted to call the bonds at all. Sometimes a company may not be allowed to call the bonds in the first few years if it then replaces the bonds with new debt at a lower interest rate. In some bond issues the call provision is combined with an increasing coupon payment. For example, Bank of America has issued a 10-year step-up bond. The bond's coupon starts out at 4.5% in the first year and then climbs progressively to 6.5% by the tenth year. Those higher interest rates may sound mouthwatering. The catch is that the company can call the bonds whenever the coupon is about to step up.

How does a company know when to call its bonds? The answer is simple: Other things equal, if it wishes to maximize the value of its stock, it must minimize the value of its bonds. Therefore, a company should never call the bonds if their market value is less than the call price, for that would just be giving a present to the bondholders. Equally, a company *should* call the bond if it is worth *more* than the call price.

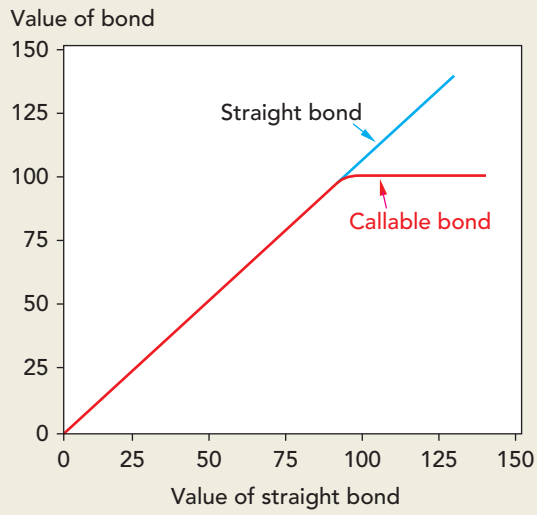
Of course, investors take the call option into account when they buy or sell the bond. They know that the company will call the bond as soon as it is worth more than the call price, so no investor will be willing to pay more than the call price for the bond. The market price of the bond may, therefore, reach the call price, but it will not rise above it. This gives the company the following rule for calling its bonds: *Call the bond when, and only when, the market price reaches the call price.*[20]

If we know how bond prices behave over time, we can modify the basic option-valuation model of Chapter 21 to find the value of the callable bond, *given* that investors know that the company will call the issue as soon as the market price reaches the call price. For example, look at Figure 24.2. It illustrates the relationship between the value of a straight 8% five-year bond and the value of a comparable callable bond. Suppose that the value of the straight bond is very low. In this case there is little likelihood that

FIGURE 24.2

Relationship between the value of a callable bond and that of a straight (noncallable) bond. Assumptions: (1) Both bonds have an 8% coupon and a five-year maturity; (2) the callable bond may be called at face value any time before maturity; (3) the short-term interest rate follows a random walk, and the expected returns on bonds of all maturities are equal.

Source: M. J. Brennan and E. S. Schwartz, "Savings Bonds, Retractable Bonds, and Callable Bonds," *Journal of Financial Economics* 5 (1977), pp. 67–88. © 1977 Elsevier Science, with permission.



[20] Of course, this assumes that the bond is correctly priced, that investors are behaving rationally, and that investors expect the *firm* to behave rationally. Also we ignore some complications. First, you may not wish to call a bond if you are prevented by a nonrefunding clause from issuing new debt. Second, the call premium is a tax-deductible expense for the company but is taxed as a capital gain to the bondholder. Third, there are other possible tax consequences to both the company and the investor from replacing a high-coupon bond with a lower-coupon bond. Fourth, there are costs and delays to calling and reissuing debt.

the company will ever wish to call its bonds. (Remember that it will call the bonds only when their price equals the call price.) Therefore the value of the callable bond will be almost identical to the value of the straight bond. Now suppose that the straight bond is worth exactly 100. In this case there is a good chance that at some time the company will wish to call its bonds. Therefore the value of our callable bond will be slightly less than that of the straight bond. If interest rates decline further, the price of the straight bond will continue to rise, but nobody will ever pay more than the call price for the callable bond.

A call provision is not a free lunch. It provides the issuer with a valuable option, but that is recognized in a lower issue price. So why do companies bother with a call provision? One reason is that bond indentures often place a number of restrictions on what the company can do. Companies are happy to agree to these restrictions as long as they know that they can escape from them if the restrictions prove too inhibiting. The call provision provides the escape route.

We mentioned earlier that some bonds also provide the *investor* with an option to demand early repayment. *Puttable* bonds exist largely because bond indentures cannot anticipate every action the company may take that could harm the bondholder. If the value of the bonds is reduced, the put option allows the bondholders to demand repayment.

Puttable loans can sometimes get their issuers into BIG trouble. During the 1990s many loans to Asian companies gave their lenders a repayment option. Consequently, when the Asian crisis struck in 1997, these companies were faced by a flood of lenders demanding their money back.

24-5 Debt Covenants

Investors in corporate bonds know that there is a risk of default. But they still want to make sure that the company plays fair. They don't want it to gamble with their money. Therefore, the loan agreement usually includes a number of *debt covenants* that prevent the company from purposely increasing the value of its default option.[21]

Lenders worry that after they have made the loan, the company may pile up more debt and so increase the chance of default. They protect themselves against this risk by prohibiting the company from making further debt issues unless the ratio of debt to equity is below a specified limit.

Not all debts are created equal. If the firm defaults, the senior debt comes first in the pecking order and must be paid off in full before the junior debtholders get a cent. Therefore, when a company issues senior debt, the lenders will place limits on further issues of senior debt. But they won't restrict the amount of *junior* debt that the company can issue. Because the senior lenders are at the front of the queue, they view the junior debt in the same way that they view equity: They would be happy to see an issue of either. Of course, the converse is not true. Holders of the junior debt *do* care both about the total amount of debt and the proportion that is senior to their claim. As a result, an issue of junior debt generally includes a restriction on both total debt and senior debt.

All bondholders worry that the company may issue more secured debt. An issue of mortgage bonds often imposes a limit on the amount of secured debt. This is not necessary when you are issuing unsecured debentures. As long as the debenture holders are given an equal claim, they don't care how much you mortgage your assets. Therefore, unsecured

[21] We described in Section 18-3 some of the games that managers can play at the expense of bondholders.

bonds usually include a so-called negative-pledge clause, in which the unsecured holders simply say, "Me too."[22]

Instead of borrowing money to buy an asset, companies may enter into a long-term agreement to rent or lease it. For the debtholder this is very similar to secured borrowing. Therefore debt agreements also include limitations on leasing.

We have talked about how an unscrupulous borrower can try to increase the value of the default option by issuing more debt. But this is not the only way that such a company can exploit its existing bondholders. For example, we know that the value of an option is reduced when the company pays out some of its assets to stockholders. In the extreme case a company could sell all its assets and distribute the proceeds to shareholders as a bumper dividend. That would leave nothing for the lenders. To guard against such dangers, debt issues may restrict the amount that the company may pay out in the form of dividends or repurchases of stock.[23]

Take a look at Table 24.2, which summarizes the principal covenants in a large sample of senior bond issues. Notice that investment-grade bonds tend to have fewer restrictions than high-yield bonds. For example, restrictions on the amount of any dividends or repurchases are less common in the case of investment-grade bonds.

These debt covenants *do* matter. Asquith and Wizman, who studied the effect of leveraged buyouts on the value of the company's debt, found that when there were no restrictions on further debt issues, dividend payments, or mergers, the buyout led to a 5.2% fall in the value of existing bonds.[24] Those bonds that were protected by strong covenants against excessive borrowing increased in price by 2.6%.

Unfortunately, it is not always easy to cover all loopholes, as the bondholders of Marriott Corporation discovered in 1992. They hit the roof when the company announced plans to divide its operations into two separate businesses. One business, Marriott International, would manage Marriott's hotel chain and receive most of the revenues, while the other, Host Marriott, would own all the company's real estate and be responsible for servicing essentially all of the old company's $3 billion of debt. As a result the price of Marriott's bonds plunged nearly 30%, and investors began to think about how they could protect themselves against such *event risks*. As you can see from Table 24.2 it is now more common for bondholders to insist on *poison-put* clauses that oblige the borrower to repay the debt if there is a change of control and the bonds are downrated.

TABLE 24.2 Percentage of sample of bonds with covenant restrictions. Sample consists of 4,478 senior bonds issued between 1993 and 2007.

	Percentage of Bonds with Covenants	
Type of Covenant	**Investment-Grade Bonds**	**Other Bonds**
Merger restrictions	92%	93%
Dividends or other payment restrictions	6	44
Debt covenants	74	67
Default-related events[a]	52	71
Change in control	24	74

[a] For example, default on other loans, rating changes, or declining net worth.

Source: S. Chava, P. Kumar, and A. Warga, "Managerial Agency and Bond Covenants," *Review of Financial Studies*, forthcoming.

[22] "Me too" is not acceptable legal jargon. Instead the bond agreement may state that the company "will not consent to any lien on its assets without securing the existing bonds equally and ratably."

[23] A dividend restriction might typically prohibit the company from paying dividends if their cumulative amount would exceed the sum of (1) cumulative net income, (2) the proceeds from the sale of stock or conversion of debt, and (3) a dollar amount equal to one year's dividend.

[24] P. Asquith and T. Wizman "Event Risk, Covenants, and Bondholder Returns in Leveraged Buyouts," *Journal of Financial Economics* 27 (September 1990), pp. 195–213. Leveraged buyouts (LBOs) are company acquisitions that are financed by large issues of (usually unsecured) debt. We describe LBOs in Chapter 32.

U.S. Shoe's Owner Riles Bondholders with Its Debt Moves

Imagine a company trying to push its bonds into technical default just so it can redeem them before maturity. Some bond analysts assert that this is exactly what Luxottica Group SpA of Italy—the new owner of U.S. Shoe Corp.—is doing with U.S. Shoe's 8 5/8% note issue.

Luxottica's strategy, which the company asserts wasn't deliberately designed to hurt bondholders, is shaping to be the newest wrinkle in corporate America's scramble to pry high-interest-bearing bonds from the hands of investors before they mature, some analysts say. As interest rates have fallen, a host of corporate issuers—from stodgy utilities to fleet-footed finance companies—have rushed to redeem their high-interest bonds with lower coupon issues. As long as the bonds are "callable," or redeemable, there is usually no problem. Increasingly, however, corporate issuers are trying to redeem noncallable bonds—securities that can't be wrested from investors before maturity—using unusual tactics.

Bond analysts say Luxottica has been trying to put U.S. Shoe's 8 5/8% note issue, maturing in 2002, in technical default by piling $1.4 billion of secured debt onto the company earlier this year. That's because a little-noticed covenant in U.S. Shoe's bond indenture says its bonds are in technical default if it adds secured debt to its financial ledger without simultaneously adding collateral to back the 8 5/8% securities so they're on the same level as the bank debt.

What's riling bondholders is that Luxottica hasn't been willing to secure its 8 5/8% notes even though it took on a load of secured debt earlier this year. Now Luxottica is trying to redeem its bonds early, which the company says it can do under the covenants when the issue is in technical default.

"This action is 10 times worse than Marriott on its worst day, because Marriott never violated an explicit covenant," contends Max Holmes, a securities analyst.

However, there are always nasty surprises round the next corner. The above box describes one such surprise for bond investors of U.S. Shoe.

24-6 Convertible Bonds and Warrants

Unlike the common or garden bond, a convertible security can change its spots. It starts life as a bond (or preferred stock), but subsequently may turn into common stock. For example, in Febuary 2008 Chiquita Brands issued $200 million of 4.25% unsecured senior convertible notes due in 2016. Each bond can be converted at any time into 44.5524 shares of common stock. Thus the owner has an eight-year option to return the bond to the company and receive 44.5524 shares of common stock in exchange. The number of shares into which each bond can be converted is called the bond's **conversion ratio.** The conversion ratio of the Chiquita bond is 44.5524.

To receive these shares, the owner of the convertible must surrender bonds with a face value of $1,000. This means that to receive *one* share, the owner needs to surrender a face amount of $1,000/44.5524 = $22.45. This is the bond's **conversion price.** Anybody who bought the bond at $1,000 to convert it into stock paid the equivalent of $22.45 a share, nearly 33% above the stock price at the time of the convertible issue.

You can think of a convertible bond as equivalent to a straight bond plus an option to acquire common stock. When convertible bondholders exercise this option, they do not pay cash; instead they give up their bonds in exchange for shares. If Chiquita's bonds had not been convertible, they would probably have been worth about $670 at the time of issue. The difference between the price of a convertible bond and the price of an equivalent straight bond represents the value that investors place on the conversion option. For example, an investor who paid $1,000 in 2008 for the Chiquita convertible would have paid about $1,000 − $670 = $330 for the option to acquire 44.5524 shares.

The Value of a Convertible at Maturity

By the time that the Chiquita convertible matures, investors need to choose whether to stay with the bond or convert to common stock. Figure 24.3(*a*) shows the possible bond values at maturity.[25] Notice that the bond value is simply the face value as long as Chiquita does not default. However, if the value of Chiquita's assets is sufficiently low, the bondholders will receive *less* than the face value and, in the extreme case that the assets are worthless, they will receive nothing. You can think of the bond value as a lower bound, or "floor," to the price of the convertible. But that floor has a nasty slope and, when the company falls on hard times, the bond may not be worth much.

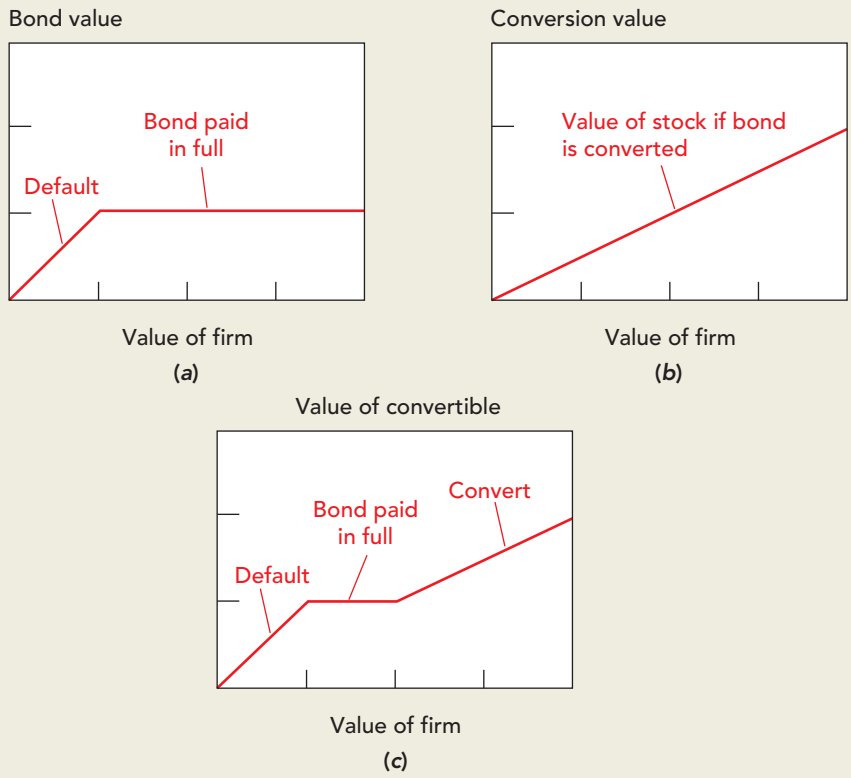
Figure 24.3(*b*) shows the value of the shares that investors receive if they choose to convert. If Chiquita's assets at that point are worthless, the shares into which the convertible

FIGURE 24.3

(*a*) The bond value when Chiquita's convertible bond matures. If firm value is at least equal to the face value of Chiquita's debt, the bond is paid off at face value.

(*b*) The conversion value at maturity. If converted, the value of the convertible rises in proportion to firm value.

(*c*) At maturity the convertible bondholder can choose to receive the payment on the bond or convert to common stock. The value of the convertible bond is therefore the higher of its bond value and its conversion value.



[25] You may recognize this as the position diagram for a default-free bond *minus* a put option on the assets with an exercise price equal to the face value of the bonds. See Section 23-2.

can be exchanged are also worthless. But, as the value of the assets rises, so does the conversion value.

Chiquita's convertible cannot sell for less than its conversion value. If it did, investors would buy the convertible, exchange it rapidly for stock, and sell the stock. Their profit would be equal to the difference between the conversion value and the price of the convertible. Therefore, there are two lower bounds to the price of the convertible: its bond value and its conversion value. Investors will not convert if the convertible is worth more as a bond; they *will* do so if the conversion value at maturity exceeds the bond value. In other words, the price of the convertible at maturity is represented by the higher of the two lines in Figures 24.3(*a*) and (*b*). This is shown in Figure 24.3(*c*).

Forcing Conversion

Beginning in 2014 Chiquita has an option to buy back (or *call*) its convertible bonds at their face value whenever its stock price is at least 30% above the bond's conversion price. If Chiquita does announce that it will call the bonds, it makes sense for investors to convert immediately. Thus a call can *force conversion*.

As we saw earlier, calling a bond does not affect the total size of the company pie, but it can affect the size of the individual slices. Chiquita can minimize the value of the bondholder's slice by forcing conversion and terminating the bondholder's option.[26]

Why Do Companies Issue Convertibles?

You are approached by an investment banker who is anxious to persuade your company to issue a convertible bond with a conversion price set somewhat above the current stock price. She points out that investors would be prepared to accept a lower yield on the convertible, so that it is "cheaper" debt than a straight bond.[27] You observe that if your company's stock performs as well as you expect, investors will convert the bond. "Great," she replies, "in that case you will have sold shares at a much better price than you could sell them for today. It's a win-win opportunity."

Is the investment banker right? Are convertibles "cheap debt"? Of course not. They are a package of a straight bond and an option. The higher price that investors are prepared to pay for the convertible represents the value that they place on the option. The convertible is "cheap" only if this price overvalues the option.

What then of the other argument, that the issue represents a deferred sale of common stock at an attractive price? The convertible gives investors the right to buy stock by giving up a bond.[28] Bondholders may decide to do this, but then again they may not. Thus issue of a convertible bond *may* amount to a deferred stock issue. But if the firm needs equity capital, a convertible issue is an unreliable way of getting it.

John Graham and Campbell Harvey surveyed companies that had seriously considered issuing convertibles. In 58% of the cases management considered convertibles an inexpensive way to issue "delayed" common stock. Forty-two percent of the firms viewed convertibles as less expensive than straight debt.[29] Taken at their face value, these arguments don't

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[26] The financial manager might delay calling if interest payments on the convertible are less than the extra dividends that would be paid after conversion. This delay would reduce cash payments to bondholders. Nothing is lost if the financial manager calls on the way down. Note that investors may convert voluntarily if they would thereby increase their income.

[27] She might even point out to you that in 2002 several Japanese companies issued convertible bonds at a negative yield. Investors actually *paid* the companies to hold their debt.

[28] That is much the same as already having the stock together with the right to sell it for the convertible's bond value. In other words, instead of thinking of a convertible as a bond plus a call option, you could think of it as the stock plus a put option. Now you can see why it is wrong to think of a convertible as equivalent to the sale of stock; it is equivalent to the sale of both stock and a put option. If there is any possibility that investors will want to hold onto their bond, that put option has value.

[29] See J. R. Graham and C. R. Harvey, "The Theory and Practice of Finance: Evidence from the Field," *Journal of Financial Economics* 61 (2001), pp. 187–243.

make sense. But we suspect that these phrases encapsulate some more complex and rational motives.

Notice that convertibles tend to be issued by the smaller and more speculative firms. They are almost invariably unsecured and generally subordinated. Now put yourself in the position of a potential investor. You are approached by a firm with an untried product line that wants to issue some junior unsecured debt. You know that if things go well, you will get your money back, but if they do not, you could easily be left with nothing. Since the firm is in a new line of business, it is difficult to assess the chances of trouble. Therefore you don't know what the fair rate of interest is. Also, you may be worried that once you have made the loan, management will be tempted to run extra risks. It may take on additional senior debt, or it may decide to expand its operations and go for broke on your money. In fact, if you charge a very high rate of interest, you could be encouraging this to happen.

What can management do to protect you against a wrong estimate of the risk and to assure you that its intentions are honorable? In crude terms, it can give you a piece of the action. You don't mind the company running unanticipated risks as long as you share in the gains as well as the losses.[30] Convertible securities make sense whenever it is unusually costly to assess the risk of debt or whenever investors are worried that management may not act in the bondholders' interest.[31]

The relatively low coupon rate on convertible bonds may also be a convenience for rapidly growing firms facing heavy capital expenditures.[32] They may be willing to provide the conversion option to reduce immediate cash requirements for debt service. Without that option, lenders might demand extremely high (promised) interest rates to compensate for the probability of default. This would not only force the firm to raise still more capital for debt service but also increase the risk of financial distress. Paradoxically, lenders' attempts to protect themselves against default may actually increase the probability of financial distress by increasing the burden of debt service on the firm.

Valuing Convertible Bonds

We have seen that a convertible bond is equivalent to a package of a bond and an option to buy stock. This means that the option-valuation models that we described in Chapter 21 can also be used to value the option to convert. We don't want to repeat that material here, but we should note three wrinkles that you need to look out for when valuing a convertible:

1. *Dividends.* If you hold the common stock, you may receive dividends. The investor who holds an option to convert into common stock misses out on these dividends. In fact the convertible holder loses out every time a cash dividend is paid because the dividend reduces the stock price and thus reduces the value of the conversion option. If the dividends are high enough, it may even pay to convert before maturity to capture the extra income. We showed how dividend payments affect option value in Section 21-5.

[30] In the survey referred to above a further 44% of the respondents reported that an important factor in their decision was the fact that convertibles were attractive to investors who were unsure about the riskiness of the company.

[31] Changes in risk are more likely when the firm is small and its debt is low-grade. Therefore, we should find that convertible bonds of such firms offer their holders a larger potential ownership share. This is indeed the case. See C. M. Lewis, R. J. Rogalski, and J. K. Seward, "Understanding the Design of Convertible Debt," *Journal of Applied Corporate Finance* 11 (Spring 1998), pp. 45–53.

[32] Of course, the firm could also make an equity issue rather than an issue of straight debt or convertibles. However, a convertible issue sends a better signal to investors than an issue of common stock. As we explained in Chapter 15, announcement of a stock issue prompts worries of overvaluation and usually depresses the stock price. Convertibles are hybrids of debt and equity and send a less negative signal. If the company is likely to need equity, its willingness to issue a convertible and take the chance that the stock price will rise enough to lead to conversion also signals management's confidence in the future. See J. Stein, "Convertible Bonds as Backdoor Equity Financing," *Journal of Financial Economics* 32 (1992), pp. 3–21.

2. *Dilution.* The second complication arises because conversion increases the number of outstanding shares. Therefore, exercise means that each shareholder is entitled to a smaller proportion of the firm's assets and profits.[33] This problem of *dilution* never arises with traded options. If you buy an option through an option exchange and subsequently exercise it, you have no effect on the number of shares outstanding. We showed how dilution affects option value in the Appendix to Chapter 21.
3. *Changing bond value.* When investors convert to shares, they give up their bond. The exercise price of the option is therefore the value of the bond that they are relinquishing. But this bond value is not constant. If the bond value at issue is less than the face value (and it usually is less), it is likely to change as maturity approaches. Also the bond value varies as interest rates change and as the company's credit standing changes. If there is some possibility of default, investors cannot even be certain of what the bond will be worth at maturity. In Chapter 21 we did not get into the complication of uncertain exercise prices.

A Variation on Convertible Bonds: The Bond–Warrant Package

Instead of issuing a convertible bond, companies sometimes sell a package of straight bonds and warrants. Warrants are simply long-term call options that give the investor the right to buy the firm's common stock. For example, each warrant might allow the holder to buy a share of stock for $50 at any time during the next five years. Obviously, the warrant holders hope that the company's stock will zoom up, so that they can exercise their warrants at a profit. But, if the company's stock price remains below $50, holders will choose not to exercise, and the warrants will expire worthless.

Convertible bonds consist of a package of a straight bond and an option. An issue of bonds and warrants also contains a straight bond and an option. But there are some differences:

1. *Warrants are usually issued privately.* Packages of bonds with warrants tend to be more common in private placements. By contrast, most convertible bonds are issued publicly.
2. *Warrants can be detached.* When you buy a convertible, the bond and the option are bundled together. You cannot sell them separately. This may be inconvenient. If your tax position or attitude to risk inclines you to bonds, you may not want to hold options as well. Warrants are sometimes also "nondetachable," but usually you can keep the bond and sell the warrant.
3. *Warrants are exercised for cash.* When you convert a bond, you simply exchange your bond for common stock. When you exercise warrants, you generally put up extra cash, though occasionally you have to surrender the bond or can choose to do so. This means that the bond-warrant package and the convertible bond have different effects on the company's cash flow and on its capital structure.
4. *A package of bonds and warrants may be taxed differently.* There are some tax differences between warrants and convertibles. Suppose that you are wondering whether to issue a convertible bond at 100. You can think of this convertible as a package of a straight bond worth, say, 90 and an option worth 10. If you issue the bond and option separately, the IRS will note that the bond is issued at a discount and that its price will rise by 10 points over its life. The IRS will allow you, the issuer, to spread this prospective price appreciation over the life of the bond and deduct it from your taxable profits. The IRS will also allocate the prospective price appreciation to the

[33] In their financial statements companies recognize the possibility of dilution by showing how earnings would be affected by the issue of the extra shares.

taxable income of the bondholder. Thus, by issuing a package of bonds and warrants rather than a convertible, you may reduce the tax paid by the issuing company and increase the tax paid by the investor.

5. *Warrants may be issued on their own.* Warrants do not have to be issued in conjunction with other securities. Often they are used to compensate investment bankers for underwriting services. Many companies also give their executives long-term options to buy stock. These executive stock options are not usually called warrants, but that is exactly what they are. Companies can also sell warrants on their own directly to investors, though they rarely do so.

24-7 Private Placements and Project Finance

The J.C. Penney debentures were registered with the SEC and sold to the public. However, debt is often placed privately with a small number of financial institutions. As we saw in Section 15-5, it costs less to arrange a private placement than to make a public debt issue. But there are three other differences between a privately placed bond and its public counterpart.

First, if you place an issue privately with one or two financial institutions, it may be necessary to sign only a simple promissory note. This is just an IOU that lays down certain conditions that the borrower must observe. However, when you make a public issue of debt, you must worry about who is supposed to represent the bondholders in any subsequent negotiations and what procedures are needed for paying interest and principal. Therefore, the contract has to be somewhat more complicated.

The second characteristic of publicly issued bonds is that they are somewhat standardized products. They *have* to be—investors are constantly buying and selling without checking the fine print in the agreement. This is not so necessary in private placements and so the debt can be custom-tailored for firms with special problems or opportunities. The relationship between borrower and lender is much more intimate. Imagine a $200 million debt issue privately placed with an insurance company, and compare it with an equivalent public issue held by 200 anonymous investors. The insurance company can justify a more thorough investigation of the company's prospects and therefore may be more willing to accept unusual terms or conditions.[34]

As we saw earlier, all bond agreements seek to protect the lender by imposing conditions on the borrower. Because covenants are more easily renegotiated in the case of privately placed debt, the conditions tend to be more severe. For example, the loan agreement may state that the borrower will be in default if interest payments ever exceed a certain multiple of earnings or if the company fails to maintain a minimum level of liquid assets. In many cases the loan contains restrictions on the firm's capital expenditures. Since privately placed debt keeps the borrower on a fairly short leash, it is quite common for a covenant to be breached.[35] This is not as calamitous as it may sound. As long as the borrower is in good financial health, the bank may simply readjust the terms of the covenant. Only if covenants continue to be violated will the lender choose to take more drastic action.

These features of private placements give them a particular niche in the corporate debt market, namely, loans to small- and medium-sized firms. These are the firms that face the

[34] Of course debt with the same terms could be offered publicly, but then 200 separate investigations would be required—a much more expensive proposition.

[35] In a study of large, private placements, Dichev and Skinner found that 30% of the loans resulted in covenant violations. See I. D. Dichev and D. J. Skinner, "Large-Sample Evidence on the Debt Covenant Hypothesis," *Journal of Accounting Research* 40 (2002), pp. 1091–1123.

highest costs in public issues, that require the most detailed investigation, and that may require specialized, flexible loan arrangements. However, many large companies also use private placements.

Of course, the advantages of private placements are not free, for the lenders demand a higher rate of interest to compensate them for holding an illiquid asset. It is difficult to generalize about the difference in interest rates between private placements and public issues, but a typical differential is 50 basis points, or .50 percentage points.

Project Finance

We are not going to dwell further on the topic of private placement bonds, because the greater part of what we have had to say about public issues is also true of private placements. However, we do need to discuss a different form of private loan, one that is tied as closely as possible to the fortunes of a particular project and that minimizes the exposure of the parent. Such a loan is usually referred to as **project finance** and is a specialty of large international banks.

Project finance means debt supported by the project, not by the project's sponsoring companies. Debt ratios are nevertheless very high for most project financings. They can be high because the debt is supported not just by the project's assets but also by a variety of contracts and guarantees provided by customers, suppliers, and local governments as well as by the project's owners.

EXAMPLE 24.1 ● Project Finance for a Power Station

Here is how project finance was used to construct a $1.8 billion oil-fired power plant in Pakistan. First, a separate firm, the Hub Power Company (Hubco) was established to own the power station. Hubco then engaged a consortium of companies, headed by the Japanese company Mitsui & Co., to build the power station, while the British company International Power became responsible for managing and running it for an initial period of 12 years. Hubco agreed to buy the fuel from the Pakistan State Oil Company and to sell the power station's output to another government body, the Water and Power Development Authority (WAPDA).

Hubco's lawyers drew up a complex series of contracts to make certain that each of these parties came up to scratch. For example, the contractors agreed to deliver the plant on time and to ensure that it would operate to specifications. International Power, the plant manager, agreed to maintain the plant and operate it efficiently. Pakistan State Oil Company entered into a long-term contract to supply oil to Hubco, and WAPDA agreed to buy Hubco's output for the next 30 years.[36] Since WAPDA would pay for the electricity with rupees, Hubco was concerned about the possibility of a fall in the value of the rupee. The State Bank of Pakistan therefore arranged to provide Hubco with foreign exchange for debt service at guaranteed exchange rates. The Pakistan government guaranteed that WAPDA, Pakistan State Oil, and the State Bank would honor their agreements.

The effect of these contracts was to ensure that each risk was borne by the party that was best able to measure and control it. For example, the contractors were best placed to ensure that the plant was completed on time, so it made sense to ask them to bear the risk

[36] WAPDA entered into a *take-or-pay* agreement with Hubco; if it did not take the electricity, it still had to pay for it. In the case of pipeline projects the contract with the customer is often in the form of a *throughput* agreement, whereby the customer agrees to make a minimum use of the pipeline. Another arrangement for transferring revenue risk to a customer is the *tolling contract*, whereby the customer agrees to deliver to the project company materials that the company is to process and return to the customer. One purpose of transferring revenue risk to customers is to encourage them to estimate their demand for the project's output thoroughly.

of construction delays. Similarly, the plant operator was best placed to operate the plant efficiently and would be penalized if it failed to do so. The contractors and the plant manager were prepared to take on these risks because the project involved an established technology and there was relatively little chance of unpleasant surprises.

While these contracts sought to be as precise as possible about each party's responsibilities, they could not cover every eventuality; inevitably the contracts were incomplete. Therefore, to buttress the formal legal agreements, the contractors and the plant manager became major shareholders in Hubco. This meant that if they cut corners in building and running the plant, they would share in the losses.

The equity in Hubco was highly levered. Over 75% of the $1.8 billion investment in the project was financed by debt. Just under $600 million was junior debt provided by a fund that was set up by the World Bank and the export credit agencies of France, Italy, and Japan. The remainder was senior debt provided in seven different currencies by 58 local and international banks.[37] The banks were encouraged to invest because they knew that the World Bank and several governments were in the front line and would take a hit if the project were to fail. But they were still concerned that the government of Pakistan might prevent Hubco from paying out foreign currency or it might impose a special tax or prevent the company from bringing in the specialist staff it needed. Therefore, to protect Hubco against these political risks, the government promised to pay compensation if it interfered in such ways with the operation of the project. Of course, the government could not be prevented from tearing up that agreement, but, if it did, Hubco could call on a $360 million guarantee by the World Bank and the Japan Bank for International Cooperation. This was supposed to keep the Pakistan government honest once the plant was built and operating. Governments can be surprisingly relaxed when faced with the wrath of a private corporation but are usually reluctant to break an agreement that lands the World Bank with a large bill.

The arrangements for the Hubco project were complex, costly, and time-consuming. Over 200 person-years were spent in setting up the project. Not everything was plain sailing. The project was suspended for over a year by a Pakistani court ruling that the interest on the loans contravened Islamic law. Ten years after the start of the discussions the final agreement on financing the project was signed and within a short time Hubco was producing a fifth of all Pakistan's electricity.

That was not the end of the Hubco story. WAPDA was obliged by its contract to make regular payments to Hubco regardless of whether it took the electricity, and as a result found itself on the brink of collapse. After the fall of Benazir Bhutto's government in Pakistan, the new government terminated the contract with Hubco and announced a 30% cut in electricity tariffs. After three years of painful dispute, which threatened Pakistan's relationships with the World Bank, Hubco finally agreed to a new tariff. The feud with the government was finally over, and by 2006 Hubco had fully repaid its senior debts.

Project Finance—Some Common Features

No two project financings are alike, but they have some common features:

- The project is established as a separate company.
- Equity ownership is privately held by a small group of investors. These usually include the contractors and the plant manager, who therefore share in the risk of the project's failure.

[37] Notice that, although most of Hubco's debt had a maturity of about 12 years, the project was not financed by a public bond issue. The concentrated ownership of bank debt induces the lenders to evaluate the project carefully and to monitor its subsequent progress. It also facilitates the renegotiation of the debt if the project company runs into difficulties.

- The project company enters into a complex series of contracts that distribute risk among the contractors, the plant manager, the suppliers, and the customers.
- The government may guarantee that it will provide the necessary permits, allow the purchase of foreign exchange, and so on.
- The detailed contractual arrangements and the government guarantees typically allow about 70% of the capital for the project to be provided in the form of bank debt or other privately placed borrowing. This debt is supported by the project cash flows; if these flows are insufficient, the lenders do not have any recourse against the parent companies.

The Role of Project Finance

Project finance is widely used in developing countries to fund power, telecommunications, and transportation projects, but it is also used in the major industrialized countries. In the United States project finance has been most commonly used to fund power plants. For example, an electric utility company may get together with an industrial company to construct a cogeneration plant that provides electricity to the utility and waste heat to a nearby industrial plant. The utility stands behind the cogeneration project and guarantees its revenue stream. Banks are happy to lend a high proportion of the cost of the project because they know that once the project is up and running, the cash flow is insulated from most of the risks facing normal businesses.[38]

Project financing is costly to arrange[39] and the project debt usually carries a relatively high interest rate. So why don't companies simply finance the projects by borrowing against their existing assets? Notice that most of the projects have limited lives and employ established technologies. They generate substantial free cash flow, and there are few options to make profitable follow-on investments. If such investments are funded with project finance, management has little discretion over how the cash flows are used. Instead, the debt-service requirements ensure that the cash must be returned to investors rather than frittered away on unprofitable future ventures.[40]

Our example of the Hubco power station illustrates another important motivation for project finance. The success of the project depends on the performance of a number of different parties. For example, Hubco had only one source of fuel and one customer. To prevent any of the parties from changing the rules of the game after the project has begun, all of them need to enter into a complex set of contracts that are designed to ensure that risks are borne by those best able to control them. And because project viability is often dependent on the goodwill of the government, the government is also often a party to these contracts and the financing is structured to reduce the chance of punitive government action.

24-8 Innovation in the Bond Market

Domestic bonds and eurobonds, fixed- and floating-rate bonds, coupon bonds and zeros, callable and puttable bonds, privately placed bonds and project finance—you might think that this would give you as much choice as you need. Yet almost every day some new type of bond seems to be issued.

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[38] There are some interesting regulatory implications to this arrangement. When a utility builds a power plant, it is entitled to a fair return on its investment: Regulators are supposed to set customer charges that will allow the utility to earn its cost of capital. Unfortunately, the cost of capital is not easily measured and is a natural focus for argument in regulatory hearings. But when a utility buys electric power, the cost of capital is rolled into the contract price and treated as an operating cost. In this case the pass-through to the customer may be less controversial.

[39] Total transaction costs for infrastructure projects average 3% to 5% of the amount invested. See M. Klein, J. So, and B. Shin, "Transaction Costs in Private Infrastructure Projects—Are They Too High?" The World Bank Group, October 1996.

[40] Because the project is an independent company, it cannot drag down the parent company if something does go badly wrong with the project.

TABLE 24.3
Some examples of innovation in bond design.

Liquid yield option notes (LYONs)	Puttable, callable, convertible, zero-coupon debt.
Floating-price (death-spiral) convertibles	Convertible debt where the bondholder can convert into a fixed *value* of shares.
Asset-backed securities	Many small loans are packaged together and resold as a bond.
Catastrophe (CAT) bonds	Payments are reduced in the event of a specified natural disaster.
Reverse floaters (yield-curve notes)	Floating-rate bonds that pay a higher rate of interest when other interest rates fall and a lower rate when other rates rise.
Equity-linked bonds	Payments are linked to the performance of a stock market index.
Pay-in-kind bonds (PIKs)	Issuer can choose to make interest payments either in cash or in more bonds with an equivalent face value.
Rate-sensitive bonds	Coupon rate changes as company's credit rating changes.
Mortality bonds	Bonds whose payments are reduced or eliminated if there is a jump in mortality rates.

Table 24.3 lists some of the more interesting bonds that have been invented in recent years.[41] Earlier in the chapter we cited the "Bowie bonds" as an example of asset-backed securities, and in Chapter 26 we discuss catastrophe bonds whose payoffs are linked to the occurrence of natural disasters.

Some financial innovations appear to serve little or no economic purpose; they may flower briefly but then wither. For example, toward the end of the 1990s in the United States there was a bout of new issues of *floating-price convertibles*, or, as they were more commonly called, death-spiral, or toxic, convertibles. When death-spiral convertibles are issued, the conversion price is set below the current stock price. Moreover, each bond is convertible not into a fixed *number* of shares but into shares with a fixed *value*. Therefore, the more the share price falls, the more shares that the convertible bondholder is entitled to. With a normal convertible, the value of the conversion option falls whenever the value of the firm's assets falls; so the convertible holder shares some of the pain with the stockholders. With a death-spiral convertible, the holder is entitled to shares with a fixed value, so the entire effect of the decrease in the asset price falls on the common stockholders. Death-spiral convertibles were issued largely by companies that were already in desperate straits, and, when the issuers failed to recover, the toxic chicken came home to roost. After the initial flurry of issues in the United States, death-spiral convertibles seem now to have been consigned to the garbage heap of unsuccessful innovations.

Many other innovations seem to have a more obvious purpose. Here are some important motives for creating new securities:

1. *Investor choice.* Sometimes new financial instruments are created to widen investor choice. Economists refer to such securities as helping to "complete the market." This was the idea behind the 2006 issue of nearly €350 million of *mortality bonds* by the French insurance company Axa. One of the big risks for a life insurance company is a pandemic or other disaster that results in a sharp increase in the death rate. Axa's bond, therefore, offers investors a higher interest rate for taking on some of that risk. Holders of the bond will lose their entire investment if death rates for two consecutive years are 10% or more above expectations.

Pension funds are in the opposite position to insurance companies. Their worry is that the scheme's members will continue to draw their pensions into a ripe old age.

[41] For a more comprehensive list of innovations, see K. A. Carrow and J. J. McConnell, "A Survey of U.S. Corporate Financing Innovations: 1970–1997," *Journal of Applied Corporate Finance* 12 (Spring 1999), pp. 55–69.

Investment bankers have therefore been working to design *longevity bonds* that pay a higher rate of interest if an unusually high proportion of the population survives to a particular age. A pension fund that held these bonds would be protected against an unexpected increase in longevity.[42]

Both mortality and longevity bonds widen investor choice. They allow insurance companies and pension funds to protect themselves against adverse changes in mortality and they spread the risk widely around the market.

2. *Government regulation and tax.* Merton Miller has described new government regulations and taxes as the sand in the oyster that stimulates the design of new types of security. For example, we have already seen how the eurobond market was a response to the U.S. government's imposition of a tax on purchases of foreign securities.

   Asset-backed securities provide another instance of a market that has been encouraged by regulation. To reduce the likelihood of failure, banks are obliged to finance part of their loan portfolio with equity capital. Many banks have sought to reduce the amount of capital that they need to hold by packaging up their loans or credit card receivables and selling them off as bonds. Bank regulators worry about this. They think that banks may be tempted to sell off their riskiest loans and to keep their safest ones. They have therefore introduced new regulations that will link the capital requirement to the riskiness of the loans.

3. *Reducing agency costs.* At the turn of the century investors were worried by the huge spending plans of telecom companies. So when BT, the British telecom giant, decided to sell $10 billion of bonds in 2000, it offered a *step-up* provision to reassure investors. Under this arrangement, BT was required to increase the coupon rate on the bonds by 25 basis points if ever its bonds were downgraded a notch by Moody's or Standard & Poor's. BT's rate-sensitive bonds protected investors against possible future attempts by the company to exploit existing bondholders by loading on more debt.

Dreaming up new financial instruments is only half the battle. The other problem is to produce them efficiently. Think, for example, of the problems of packaging together several hundred million dollars' worth of credit card receivables and allocating the cash flows to a diverse group of investors. That requires good computer systems. The deal also needs to be structured so that, if the issuer goes bankrupt, the receivables will not be part of the bankruptcy estate. That depends on the development of legal structures that will stand up in the event of a dispute.

[42] The French bank BNP Paribas attempted to launch a $1 billion issue of longevity bonds in 2004, but had difficulty attracting buyers.

SUMMARY

You should now have a fair idea of what you are letting yourself in for when you make an issue of bonds. You can issue bonds in the domestic U.S. market, in a foreign bond market, or in the eurobond market. Eurobonds are marketed simultaneously in a number of foreign countries, usually by the London branches of international banks and security dealers.

The detailed bond agreement is set out in the indenture between your company and a trustee, but the main provisions are summarized in the prospectus to the issue. The indenture states whether the bonds are senior or subordinated, and whether they are secured or unsecured. Most bonds are unsecured debentures or notes. This means that they are general claims on the corporation. The principal exceptions are utility mortgage bonds, collateral trust bonds, and equipment trust certificates. In the event of default, the trustee to these issues can repossess the company's assets to pay off the debt.

Some long-term bond issues have a sinking fund. This means that the company must set aside enough money each year to retire a specified number of bonds. A sinking fund reduces the average life of the bond, and it provides a yearly test of the company's ability to service its debt. It therefore helps to protect the bondholders against the risk of default.

Long-dated bonds may be callable before maturity. The option to call the bond may be very valuable. If interest rates decline and bond value rises, you may be able to call a bond that would be worth substantially more than the call price. Of course, if investors know that you may call the bond, the call price will act as a ceiling on the market price. Your best strategy, therefore, is to call the bond as soon as the market price hits the call price. You are unlikely to do better than that.

Lenders usually seek to prevent the borrower from taking actions that would damage the value of their loans. Here are some examples of debt covenants:

1. The loan agreement may limit the amount of additional borrowing by the company.
2. Unsecured loans may incorporate a negative pledge clause, which prohibits the company from securing additional debt without giving equal treatment to the existing unsecured bonds.
3. Lenders may place a limit on the company's dividend payments or repurchases of stock.

Bank loans and other privately placed debt tend to impose more restrictive conditions, but these conditions are more easily changed if it makes sense to do so.

Most bonds start and finish their lives as bonds, but convertible bonds give their owner the option to exchange the bond for common stock. The *conversion ratio* measures the number of shares into which each bond can be exchanged. You can think of a convertible bond as equivalent to a straight bond plus a call option on the stock. Sometimes, instead of issuing a convertible, companies may decide to issue a package of bonds and options (or *warrants*) to buy the stock. If the stock price rises above the exercise price, the investor may then keep the bond and exercise the warrants for cash.

Private placements are less standardized than public issues, but otherwise they are generally close counterparts of publicly issued bonds. Sometimes private debt takes the form of project finance. In this case the loan is tied to the fortunes of a particular project.

There is an enormous variety of bond issues and new forms of bonds are spawned almost daily. By a process of natural selection, some of these new instruments become popular and may even replace existing species. Others are ephemeral curiosities. Some innovations succeed because they widen investor choice or reduce agency costs. Others owe their origin to tax rules and government regulation.

FURTHER READING

A useful general work on debt securities is:

F. J. Fabozzi (ed.), *The Handbook of Fixed Income Securities,* 6th ed. (New York: McGraw-Hill, 2005).

For nontechnical discussions of the pricing of convertible bonds and the reasons for their use, see:

M. J. Brennan and E. S. Schwartz, "The Case for Convertibles," *Journal of Applied Corporate Finance* 1 (Summer 1988), pp. 55–64.

C. M. Lewis, R. J. Rogalski, and J. K. Seward, "Understanding the Design of Convertible Debt," *Journal of Applied Corporate Finance* 11 (Spring 1998), pp. 45–53.

Discussions of project finance include:

B. C. Esty, *Modern Project Finance: A Casebook* (NewYork: John Wiley, 2003).

B. C. Esty, "Returns on Project-Financed Investments: Evolution and Managerial Implications," *Journal of Applied Corporate Finance* 15 (Spring 2002), pp. 71–86.

R. A. Brealey, I. A. Cooper, and M. Habib, "Using Project Finance to Fund Infrastructure Investments," *Journal of Applied Corporate Finance* 9 (Fall 1996), pp. 25–38.

The readings listed at the end of Chapter 17 include several articles on financial innovation.

Select problems are available in McGraw-Hill Connect. Please see the preface for more information.

PROBLEM SETS

BASIC

1. Select the most appropriate term from within the parentheses:

a. (High-grade utility bonds/Low-grade industrial bonds) generally have only light sinking-fund requirements.

b. Collateral trust bonds are often issued by (utilities/industrial holding companies).

c. (Utility bonds/Industrial bonds) are usually unsecured.

d. Equipment trust certificates are usually issued by (railroads/financial companies).

e. Mortgage pass-through certificates are an example of (an asset-backed security/project finance).

2. For each of the following sinking funds, state whether the fund increases or decreases the value of the bond at the time of issue (or whether it is impossible to say):

a. An optional sinking fund operating by drawings at par.

b. A mandatory sinking fund operating by drawings at par *or* by purchases in the market.

c. A mandatory sinking fund operating by drawings at par.

3. a. As a senior bondholder, would you like the company to issue more junior debt to finance its investment program, would you prefer it not to do so, or would you not care?

b. You hold debt secured on the company's existing property. Would you like the company to issue more unsecured debt to finance its investments, would you prefer it not to do so, or would you not care?

4. Use Table 24.1 (but not the text) to answer the following questions:

a. Who are the principal underwriters for the J.C. Penney bond issue?

b. Who is the trustee for the issue?

c. How many dollars does the company receive for each debenture after deduction of the underwriters' spread?

d. Is the debenture "bearer" or "registered"?

e. At what price was the issue callable in 2005?

5. Look at Table 24.1:

a. Suppose the debenture was issued on September 1, 1992, at 99.489%. How much would you have to pay to buy one bond delivered on September 15? Don't forget to include accrued interest.

b. When is the first interest payment on the bond, and what is the amount of the payment?

c. On what date do the bonds finally mature, and what is the principal amount of the bonds that is due to be repaid on that date?

d. Suppose that the market price of the bonds rises to 102 and thereafter does not change. When should the company call the issue?

6. Explain the three principal ways in which the terms of private placement bonds commonly differ from those of public issues.
7. True or false? Briefly explain in each case.
   a. Lenders in project financings rarely have any recourse against the project's owners if the project fails.
   b. Many new and exotic debt securities are triggered by government policies or regulations.
   c. Call provisions give a valuable option to debt investors.
   d. Restrictive covenants have been shown to protect debt investors when takeovers are financed with large amounts of debt.
   e. Privately placed debt issues often include stricter covenants than public debt. However, public debt covenants are more difficult and expensive to renegotiate.
8. Maple Aircraft has issued a 4 ¾% convertible subordinated debenture due 2014. The conversion price is $47.00 and the debenture is callable at 102.75% of face value. The market price of the convertible is 91% of face value, and the price of the common is $41.50. Assume that the value of the bond in the absence of a conversion feature is about 65% of face value.
   a. What is the conversion ratio of the debenture?
   b. If the conversion ratio were 50, what would be the conversion price?
   c. What is the conversion value?
   d. At what stock price is the conversion value equal to the bond value?
   e. Can the market price be less than the conversion value?
   f. How much is the convertible holder paying for the option to buy one share of common stock?
   g. By how much does the common have to rise by 2014 to justify conversion?
   h. When should Maple call the debenture?
9. True or false?
   a. Convertible bonds are usually senior claims on the firm.
   b. The higher the conversion ratio, the more valuable the convertible.
   c. The higher the conversion price, the more valuable the convertible.
   d. Convertible bonds do not share fully in the price of the common stock, but they provide some protection against a decline.

INTERMEDIATE

10. Suppose that the J.C. Penney bond was issued at face value and that investors continue to demand a yield of 8.25%. Sketch what you think would happen to the bond price as the first interest payment date approaches and then passes. What about the price of the bond plus accrued interest?
11. Find the terms and conditions of a recent bond issue and compare them with those of the J.C. Penney issue.
12. Bond prices can fall either because of a change in the general level of interest rates or because of an increased risk of default. To what extent do floating-rate bonds and puttable bonds protect the investor against each of these risks?
13. Proctor Power has fixed assets worth $200 million and net working capital worth $100 million. It is financed partly by equity and partly by three issues of debt. These consist of $250 million of First Mortgage Bonds secured only on the company's fixed assets, $100 million of senior debentures, and $120 million of subordinated debentures. If the debt were due today, how much would each debtholder be entitled to receive?

14. Elixir Corporation has just filed for bankruptcy. Elixir is a holding company whose assets consist of real estate worth $80 million and 100% of the equity of its two operating subsidiaries. It is financed partly by equity and partly by an issue of $400 million of senior collateral trust bonds that are just about to mature. Subsidiary A has issued directly $320 million of debentures and $15 million of preferred stock. Subsidiary B has issued $180 million of senior debentures and $60 million of subordinated debentures. A's assets have a market value of $500 million and B's have a value of $220 million. How much will each security holder receive if the assets are sold and distributed strictly according to precedence?

15. a. Residential mortgages may stipulate either a fixed rate or a variable rate. As a *borrower,* what considerations might cause you to prefer one rather than the other?

b. Why might holders of mortgage pass-through certificates wish the mortgages to have a floating rate?

16. After a sharp change in interest rates, newly issued bonds generally sell at yields different from those of outstanding bonds of the same quality. One suggested explanation is that there is a difference in the value of the call provisions. Explain how this could arise.

17. Suppose that a company simultaneously issues a zero-coupon bond and a coupon bond with identical maturities. Both are callable at any time at their face values. Other things equal, which is likely to offer the higher yield? Why?

18. a. If interest rates rise, will callable or noncallable bonds fall more in price?

b. Sometimes you encounter bonds that can be repaid after a fixed interval at the option of *either* the issuer or the bondholder. If the exercise price of each option is the same and both the issuer and bondholder act rationally, what will happen when the options can be exercised? (Ignore refinements such as transactions or issue costs.)

19. A puttable bond is a bond that may be repaid before maturity at the investor's option. Sketch a diagram similar to Figure 24.2 showing the relationship between the value of a straight bond and that of a puttable bond.

20. Alpha Corp. is prohibited from issuing more senior debt unless net tangible assets exceed 200% of senior debt. Currently the company has outstanding $100 million of senior debt and has net tangible assets of $250 million. How much more senior debt can Alpha Corp. issue?

21. Explain carefully why bond indentures may place limitations on the following actions:

a. Sale of the company's assets.

b. Payment of dividends to shareholders.

c. Issue of additional senior debt.

22. Explain when it makes sense to use project finance rather than a direct debt issue by the parent company.

23. The Surplus Value Company had $10 million (face value) of convertible bonds outstanding in 2010. Each bond has the following features.

Face value	$1000
Conversion price	$25
Current call price	105 (percent of face value)
Current trading price	130 (percent of face value)
Maturity	2017
Current stock price	$30 (per share)
Interest rate	10% (coupon as percent of face value)

a. What is the bond's conversion value?
b. Can you explain why the bond is selling above conversion value?
c. Should Surplus call? What will happen if it does so?

24. Piglet Pies has issued a zero-coupon 10-year bond that can be converted into 10 Piglet shares. Comparable straight bonds are yielding 8%. Piglet stock is priced at $50 a share.
a. Suppose that you had to make a now-or-never decision on whether to convert or to stay with the bond. Which would you do?
b. If the convertible bond is priced at $550, how much are investors paying for the option to buy Piglet shares?
c. If after one year the value of the conversion option is unchanged, what is the value of the convertible bond?

25. Iota Microsystems' 10% convertible is about to mature. The conversion ratio is 27.
a. What is the conversion price?
b. The stock price is $47. What is the conversion value?
c. Should you convert?

26. In 1996 Marriott International made an issue of unusual bonds called Liquid Yield Option Notes, or LYONS. The bond matures in 2011, has a zero coupon, and was issued at $532.15. It could be converted into 8.76 shares. Beginning in 1999 the bonds could be called by Marriott. The call price was $603.71 in 1999 and increased by 4.3% a year thereafter. Holders had an option to put the bond back to Marriott in 1999 at $603.71 and in 2006 at $810.36. At the time of issue the price of the common stock was about $50.50.
a. What was the yield to maturity on the bond?
b. Assuming that comparable nonconvertible bonds yielded 10%, how much were investors paying for the conversion option?
c. What was the conversion value of the bonds at the time of issue?
d. What was the initial conversion price of the bonds?
e. What was the conversion price in 2005? Why did it change?
f. If the price of the bond in 2006 was less than $810.36, would you have put the bond back to Marriott?
g. At what price could Marriott have called the bonds in 2006? If the price of the bond in 2006 was more than this, should Marriott have called them?

CHALLENGE

27. Dorlcote Milling has outstanding a $1 million 3% mortgage bond maturing in 10 years. The coupon on any new debt issued by the company is 10%. The finance director, Mr. Tulliver, cannot decide whether there is a tax benefit to repurchasing the existing bonds in the marketplace and replacing them with new 10% bonds. What do you think? Does it matter whether bond investors are taxed?

28. Refer back to the Hub Power project in Section 24-7. There were many other ways that the Hubco project could have been financed. For example, a government agency could have invested in the power plant and hired National Power to run it. Alternatively, National Power could have owned the power plant directly and funded its cost by a mixture of new borrowing and the sale of shares. What do you think were the advantages of setting up a separately financed company to undertake the project?

29. This question illustrates that when there is scope for the firm to vary its risk, lenders may be more prepared to lend if they are offered a piece of the action through the issue of a convertible bond. Ms. Blavatsky is proposing to form a new start-up firm with initial assets of $10 million. She can invest this money in one of two projects. Each has the same

expected payoff, but one has more risk than the other. The relatively safe project offers a 40% chance of a $12.5 million payoff and a 60% chance of an $8 million payoff. The risky project offers a 40% chance of a $20 million payoff and a 60% chance of a $5 million payoff.

Ms. Blavatsky initially proposes to finance the firm by an issue of straight debt with a promised payoff of $7 million. Ms. Blavatsky will receive any remaining payoff. Show the possible payoffs to the lender and to Ms. Blavatsky if (a) she chooses the safe project and (b) she chooses the risky project. Which project is Ms. Blavatsky likely to choose? Which will the lender want her to choose?

Suppose now that Ms. Blavatsky offers to make the debt convertible into 50% of the value of the firm. Show that in this case the lender receives the same expected payoff from the two projects.

30. Occasionally it is said that issuing convertible bonds is better than issuing stock when the firm's shares are undervalued. Suppose that the financial manager of the Butternut Furniture Company does have inside information indicating that the Butternut stock price is too low. Butternut's future earnings will in fact be higher than investors expect. Suppose further that the inside information cannot be released without giving away a valuable competitive secret. Clearly, selling shares at the present low price would harm Butternut's existing shareholders. Will they also lose if convertible bonds are issued? If they do lose in this case, is the loss more or less than it would be if common stock were issued?

Now suppose that investors forecast earnings accurately, but still undervalue the stock because they overestimate Butternut's actual business risk. Does this change your answers to the questions posed in the preceding paragraph? Explain.

MINI-CASE

The Shocking Demise of Mr. Thorndike

It was one of Morse's most puzzling cases. That morning Rupert Thorndike, the autocratic CEO of Thorndike Oil, was found dead in a pool of blood on his bedroom floor. He had been shot through the head, but the door and windows were bolted on the inside and there was no sign of the murder weapon.

Morse looked in vain for clues in Thorndike's bedroom and office. He had to take another tack. He decided to investigate the financial circumstances surrounding Thorndike's demise. The company's capital structure was as follows:

- 5% debentures: $250 million face value. The bonds mature in 10 years and offer a yield of 12%.
- Stock: 30 million shares, which closed at $9 a share the day before the murder.
- 10% subordinated convertible notes: The notes mature in one year and are convertible at any time at a conversion ratio of 110. The day before the murder these notes were priced at 5% more than their conversion value.

Yesterday Thorndike had flatly rejected an offer by T. Spoone Dickens to buy all of the common stock for $10 a share. With Thorndike out of the way, it appeared that Dickens's offer would be accepted, much to the profit of Thorndike Oil's other shareholders.[43]

[43] Rupert Thorndike's shares would go to a charitable foundation formed to advance the study of financial engineering and its crucial role in world peace and progress. The managers of the foundation's endowment were not expected to oppose the takeover.

Thorndike's two nieces, Doris and Patsy, and his nephew John all had substantial investments in Thorndike Oil and had bitterly disagreed with Thorndike's dismissal of Dickens's offer. Their stakes are shown in the following table:

	5% Debentures (Face Value)	Shares of Stock	10% Convertible Notes (Face Value)
Doris	$4 million	1.2 million	$0 million
John	0	.5	5
Patsy	0	1.5	3

All debt issued by Thorndike Oil would be paid off at face value if Dickens's offer went through. Holders of the convertible notes could choose to convert and tender their shares to Dickens.

Morse kept coming back to the problem of motive. Which niece or nephew, he wondered, stood to gain most by eliminating Thorndike and allowing Dickens's offer to succeed?

QUESTION

1. Help Morse solve the case. Which of Thorndike's relatives stood to gain most from his death?