CHAPTER 19

Hybrid Financing: Preferred Stock, Warrants, and Convertibles

The U.S. government's responses to the global economic crisis are being conducted through a wide variety of different programs administered by the Treasury Department, the Federal Reserve, the Federal Deposit Insurance Corporation, and the Congress. Each program has a different emphasis, but many of the programs provide cash to troubled companies in exchange for newly issued securities that are owned by the U.S. government. In many cases, these securities have been preferred stock and warrants that are convertible into common stock.

For example, the Treasury bought about $70 billion in preferred stock from AIG, some of which was later converted to noncumulative preferred. The Treasury bought preferred stock and warrants from hundreds of financial institutions, including Bank of America, Citigroup, and JPMorgan Chase. Some banks have repurchased the Treasury's investments, but there is still (mid-June 2009) about $128 billion outstanding.

The Treasury also made loans to GM ($21 billion), Chrysler ($15.5 billion), and other companies in the automotive industry. GM subsequently filed for bankruptcy (June 1, 2009), with the U.S. government pledging to put up another $30 billion. When the dust settles, the government is expected to own 60% of the restructured GM's common stock, plus an additional $8.8 billion in debt and preferred stock.

Two questions arise. First, has the government made profitable investments? The Congressional Budget Office and the Congressional Oversight Panel each stated in 2009 that the answer is "no": The Treasury paid too much for the preferred stock and warrants it bought. On the other hand, the U.S. financial system and economy have not (yet) collapsed as badly as they did in the Great Depression, so perhaps the money was well-spent.

Second, how much control will the government exert on the companies in which it has invested? As we will describe later in the chapter, preferred stock does not allow its owners to vote. This means that the government does not have any direct representation on the bank boards in which it invested. (This lack of control and access to information created public

outrage when AIG hosted a lavish retreat and when Merrill Lynch executives were awarded enormous bonuses.) The government will appoint the majority of GM's new directors, but President Obama indicated in late June 2009 that none of them will be government employees. Again, it appears as if the government intends to behave as a passive shareholder.

As you read this chapter, think about the government's investments in preferred stock and warrants, and decide for yourself whether they are good investments.

The textbook's Web site contains an Excel *file that will guide you through the chapter's calculations. The file for this chapter is* **Ch19 Tool Kit.xls**, *and we encourage you to open the file and follow along as you read the chapter.*

In previous chapters, we examined common stocks and various types of long-term debt. In this chapter, we examine three other securities used to raise long-term capital: (1) *preferred stock*, which is a hybrid security that represents a cross between debt and common equity, (2) *warrants*, which are derivative securities issued by firms to facilitate the issuance of some other type of security, and (3) *convertibles*, which combine the features of debt (or preferred stock) and warrants.

19.1 Preferred Stock

Preferred stock is a hybrid—it is similar to bonds in some respects and to common stock in other ways. Accountants classify preferred stock as equity; hence they show it on the balance sheet as an equity account. However, from a finance perspective preferred stock lies somewhere between debt and common equity: it imposes a fixed charge and thus increases the firm's financial leverage, yet omitting the preferred dividend does not force a company into bankruptcy. Also, unlike interest on debt, preferred dividends are not deductible by the issuing corporation, so preferred stock has a higher cost of capital than does debt. We first describe the basic features of preferred stock, after which we discuss the types of preferred stock and the advantages and disadvantages of preferred stock.

Basic Features

Preferred stock has a par (or liquidating) value, often either $25 or $100. The dividend is stated as either a percentage of par, as so many dollars per share, or both ways. For example, several years ago Klondike Paper Company sold 150,000 shares of $100 par value perpetual preferred stock for a total of $15 million. This preferred stock had a stated annual dividend of $12 per share, so the preferred dividend yield was $12/$100 = 0.12, or 12%, at the time of issue. The dividend was set when the stock was issued; it will not be changed in the future. Therefore, if the required rate of return on preferred, r_{ps}, changes from 12% after the issue date—as it did—then the market price of the preferred stock will go up or down. Currently, r_{ps} for Klondike Paper's preferred is 9%, and the price of the preferred has risen from $100 to $12/0.09 = $133.33.

If the preferred dividend is not earned, the company does not have to pay it. However, most preferred issues are **cumulative**, meaning that the cumulative total of unpaid preferred dividends must be paid before dividends can be paid on the common stock. Unpaid preferred dividends are called **arrearages**. Dividends in arrears do not earn interest; thus, arrearages do not grow in a compound interest sense, they only grow from additional nonpayments of the preferred dividend. Also, many preferred stocks accrue arrearages for only a limited number of years—so that, for example, the cumulative feature may cease after 3 years. However, the dividends in arrears continue in force until they are paid.

Preferred stock normally has no voting rights. However, most preferred issues stipulate that the preferred stockholders can elect a minority of the directors—say, three out of ten—if the preferred dividend is passed (omitted). Some preferreds even entitle their holders to elect a majority of the board.

Although nonpayment of preferred dividends will not trigger bankruptcy, corporations issue preferred stock with every intention of paying the dividend. Even if passing the dividend does not give the preferred stockholders control of the company, failure to pay a preferred dividend precludes payment of common dividends. In addition, passing the dividend makes it difficult to raise capital by selling bonds

The Romance Had No Chemistry, But It Had a Lot of Preferred Stock!

On April 1, 2009, Dow Chemical Company merged with Rohm & Haas after a bitter dispute over the interpretation of their previous merger agreement. So even though the two companies make a lot of chemicals, there apparently wasn't much chemistry by the time the merger was completed.

To raise cash for the $78.97 per share purchase of Rohm & Haas's outstanding shares, Dow borrowed over $9 billion from Citibank and also issued $4 billion in convertible preferred stock to Berkshire Hathaway and The Kuwait Investment Authority.

The Haas Family Trusts and Paulson & Company were large shareholders in Rohm & Haas. As part of the deal, they sold their shares to Dow with one hand and bought $3 billion in preferred stock from Dow with the other. This preferred stock pays a cash dividend of 7%. It also pays an 8% "dividend" that can either be in cash or in additional shares of the preferred stock, with the choice left to Dow; this is called a payment-in-kind (PIK) dividend.

These terms mean that Dow can conserve cash if it runs into difficult times: Dow can pay the 8% in additional stock and Dow can even defer payment of the 7% cash dividend without risk of bankruptcy. But if this happens, a troubled marriage is likely to cause even more grief.

Source: 8-K reports from the SEC filed on March 12, 2009 and April 1, 2009.

and virtually impossible to sell more preferred or common stock except at rock-bottom prices. However, having preferred stock outstanding does give a firm the chance to overcome its difficulties: If bonds had been used instead of preferred stock, a company could be forced into bankruptcy before it could straighten out its problems. Thus, *from the viewpoint of the issuing corporation, preferred stock is less risky than bonds.*

For an investor, however, preferred stock is riskier than bonds: (1) preferred stockholders' claims are subordinated to those of bondholders in the event of liquidation, and (2) bondholders are more likely to continue receiving income during hard times than are preferred stockholders. Accordingly, investors require a higher after-tax rate of return on a given firm's preferred stock than on its bonds. However, since 70% of preferred dividends is exempt from corporate taxes, preferred stock is attractive to corporate investors. Indeed, high-grade preferred stock, on average, sells on a lower pre-tax yield basis than high-grade bonds. As an example, Alcoa has preferred stock with an annual dividend of $3.75 (a 3.75% rate applied to $100 par value). In June 2009, Alcoa's preferred stock had a price of $53.50, for a market yield of about $3.75/$53.50 = 7.0%. Alcoa's long-term bonds that mature in 2037 provided a yield of 8.1%, which is 1.1 percentage points *more* than its preferred. The tax treatment accounted for this differential; the *after-tax yield* to corporate investors was greater on the preferred stock than on the bonds because 70% of the dividend may be excluded from taxation by a corporate investor.[1]

WWW

For updates, go to **http://finance.yahoo.com** *and get quotes for AA-P, Alcoa's 3.75% preferred stock. For an updated bond yield, use the bond screener and search for Alcoa bonds.*

About half of all preferred stock issued in recent years has been convertible into common stock. We discuss convertibles in Section 19.3.

Some preferred stocks are similar to perpetual bonds in that they have no maturity date, but most new issues now have specified maturities. For example, many preferred shares have a sinking fund provision that calls for the retirement of 2% of the issue each year, meaning the issue will "mature" in a maximum of 50 years.

[1]The after-tax yield on an 8.1% bond to a corporate investor in the 34% marginal tax rate bracket is 8.1%(1 – T) = 5.3%. The after-tax yield on a 7.0% preferred stock is 7.0%(1 – Effective T) = 7.0% [1 – (0.30)(0.34)] = 6.3%. Also, note that tax law prevents arbitrage. If a firm issues debt and uses the proceeds to purchase another firm's preferred stock, then the 70% dividend exclusion is voided.

Also, many preferred issues are callable by the issuing corporation, which can also limit the life of the preferred.[2]

Nonconvertible preferred stock is virtually all owned by corporations, which can take advantage of the 70% dividend exclusion to obtain a higher after-tax yield on preferred stock than on bonds. Individuals should not own preferred stocks (except convertible preferreds)—they can get higher yields on safer bonds, so it is not logical for them to hold preferreds.[3] As a result of this ownership pattern, the volume of preferred stock financing is geared to the supply of money in the hands of corporate investors. When the supply of such money is plentiful, the prices of preferred stocks are bid up, their yields fall, and investment bankers suggest that companies in need of financing consider issuing preferred stock.

For issuers, preferred stock has a tax *disadvantage* relative to debt: Interest expense is deductible, but preferred dividends are not. Still, firms with low tax rates may have an incentive to issue preferred stock that can be bought by high–tax-rate corporate investors, who can take advantage of the 70% dividend exclusion. If a firm has a lower tax rate than potential corporate buyers, then the firm might be better off issuing preferred stock than debt. The key here is that the tax advantage to a high–tax-rate corporation is greater than the tax disadvantage to a low–tax-rate issuer. As an illustration, assume that risk differentials between debt and preferred would require an issuer to set the interest rate on new debt at 10% and the dividend yield on new preferred stock 2% higher, or at 12% in a no-tax world. However, when taxes are considered, a corporate buyer with a high tax rate—say, 40%—might be willing to buy the preferred stock if it has an 8% before-tax yield. This would produce an 8%(1 – Effective T) = 8%[1 – 0.30(0.40)] = 7.04% after-tax return on the preferred versus 10%(1 – 0.40) = 6.0% on the debt. If the issuer has a low tax rate—say, 10%—then its after-tax costs would be 10%(1 – T) = 10%(0.90) = 9% on the bonds and 8% on the preferred. Thus, the security with lower risk to the issuer, preferred stock, also has a lower cost. Such situations can make preferred stock a logical financing choice.[4]

Other Types of Preferred Stock

In addition to "plain vanilla" preferred stock, there are two other variations: adjustable rate and market auction preferred stock.

Adjustable Rate Preferred Stock. Instead of paying fixed dividends, **adjustable rate preferred stocks (ARPs)** have their dividends tied to the rate on Treasury securities. ARPs are issued mainly by utilities and large commercial banks. When

[2]Prior to the late 1970s, virtually all preferred stock was perpetual and almost no issues had sinking funds or call provisions. Then insurance company regulators, worried about the unrealized losses the companies had been incurring on preferred holdings as a result of rising interest rates, made changes essentially mandating that insurance companies buy only limited life preferreds. From that time on, virtually no new preferred has been perpetual. This example illustrates the way securities change as a result of changes in the economic environment.

[3]Some financially engineered preferred stock has "dividends" that the paying company can deduct for tax purposes in the same way that interest payments are deductible. Therefore, the company is able to pay a higher rate on such preferred stock, making it potentially attractive to individual investors. These securities trade under a variety of colorful names, including MIPS (Modified Income Preferred Securities), QUIPS (Quarterly Income Preferred Securities), TOPrS (Trust Originated Preferred Stock), and QUIDS (Quarterly Income Debt Securities).

[4]For more on preferred stock , see Arthur L. Houston Jr. and Carol Olson Houston, "Financing with Preferred Stock," *Financial Management*, Autumn 1990, pp. 42–54; and Michael J. Alderson and Donald R. Fraser, "Financial Innovations and Excesses Revisited: The Case of Auction Rate Preferred Stock," *Financial Management*, Summer 1993, pp. 61–75.

ARPs were first developed, they were touted as nearly perfect short-term corporate investments because (1) only 30% of the dividends are taxable to corporations, and (2) the floating-rate feature was supposed to keep the issue trading at near par. The new security proved to be so popular as a short-term investment for firms with idle cash that mutual funds designed just to invest in them sprouted like weeds (and shares of these funds, in turn, were purchased by corporations). However, the ARPs still had some price volatility due to (1) changes in the riskiness of the issuers (some big banks that had issued ARPs, such as Continental Illinois, ran into serious loan default problems) and (2) fluctuations in Treasury yields between dividend rate adjustment dates. Therefore, the ARPs had too much price instability to be held in the liquid asset portfolios of many corporate investors.

Market Auction Preferred Stock. In 1984, investment bankers introduced **money market**, or **market auction**, **preferred**.[5] Here the underwriter conducts an auction on the issue every 7 weeks (to get the 70% exclusion from taxable income, buyers must hold the stock for at least 46 days). Holders who want to sell their shares can put them up for auction at par value. Buyers then submit bids in the form of the yields they are willing to accept over the next 7-week period. The yield set on the issue for the coming period is the lowest yield sufficient to sell all the shares being offered at that auction. The buyers pay the sellers the par value; hence holders are virtually assured that their shares can be sold at par. The issuer then must pay a dividend rate over the next 7-week period as determined by the auction. From the holder's standpoint, market auction preferred is a low-risk, largely tax-exempt, 7-week maturity security that can be sold between auction dates at close to par.

In practice, things may not go quite so smoothly. If there are few potential buyers, then an excessively high yield might be required to clear the market. To protect the issuing firms or mutual funds from high dividend payments, the securities have a cap on the allowable dividend yield. If the market-clearing yield is higher than this cap then the next dividend yield will be set equal to this cap rate, but the auction will fail and the owners of the securities who wish to sell will not be able to do so. This happened in February 2008, and many market auction preferred stockholders were left holding securities they wanted to liquidate.

Advantages and Disadvantages of Preferred Stock

There are both advantages and disadvantages to financing with preferred stock. Here are the major advantages from the issuer's standpoint.

1. In contrast to bonds, the obligation to pay preferred dividends is not firm, and passing (not paying) a preferred dividend cannot force a firm into bankruptcy.
2. By issuing preferred stock, the firm avoids the dilution of common equity that occurs when common stock is sold.
3. Since preferred stock sometimes has no maturity and since preferred sinking fund payments (if present) are typically spread over a long period, preferred issues reduce the cash flow drain from repayment of principal that occurs with debt issues.

There are two major disadvantages, as follows.

1. Preferred stock dividends are not normally deductible to the issuer, so the after-tax cost of preferred is typically higher than the after-tax cost of debt. However,

[5]Confusingly, market auction preferred stock is frequently referred to as *auction-rate preferred* stock and with the acronym ARP as well.

the tax advantage of preferreds to corporate purchasers lowers its pre-tax cost and thus its effective cost.

2. Although preferred dividends can be passed, investors expect them to be paid and firms intend to pay them if conditions permit. Thus, preferred dividends are considered to be a fixed cost. As a result, their use—like that of debt—increases financial risk and hence the cost of common equity.

Self-Test

Should preferred stock be considered as equity or debt? Explain.
Who are the major purchasers of nonconvertible preferred stock? Why?
Briefly explain the mechanics of adjustable rate and market auction preferred stock.
What are the advantages and disadvantages of preferred stock to the issuer?
A company's preferred stock has a pre-tax dividend yield of 7%, and its debt has a pre-tax yield of 8%. If an investor is in the 34% marginal tax bracket, what are the after-tax yields of the preferred stock and debt? **(6.29% and 5.28%)**

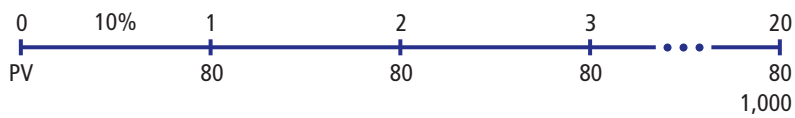
19.2 Warrants

A **warrant** is a certificate issued by a company that gives the holder the right to buy a stated number of shares of the company's stock at a specified price for some specified length of time. Generally, warrants are issued along with debt, and they are used to induce investors to buy long-term debt with a lower coupon rate than would otherwise be required. For example, when Infomatics Corporation, a rapidly growing high-tech company, wanted to sell $50 million of 20-year bonds in 2010, the company's investment bankers informed the financial vice president that the bonds would be difficult to sell and that a coupon rate of 10% would be required. However, as an alternative the bankers suggested that investors might be willing to buy the bonds with a coupon rate of only 8% if the company would offer 20 warrants with each $1,000 bond, each warrant entitling the holder to buy one share of common stock at a strike price (also called an *exercise price*) of $22 per share. The stock was selling for $20 per share at the time, and the warrants would expire in the year 2020 if they had not been exercised previously.

Why would investors be willing to buy Infomatics's bonds at a yield of only 8% in a 10% market just because warrants were also offered as part of the package? It's because the warrants are long-term *call options* that have value, since holders can buy the firm's common stock at the strike price regardless of how high the market price climbs. This option offsets the low interest rate on the bonds and makes the package of low-yield bonds plus warrants attractive to investors. (See Chapter 8 for a discussion of options.)

Initial Market Price of a Bond with Warrants

If the Infomatics bonds had been issued as straight debt, they would have carried a 10% interest rate. However, with warrants attached, the bonds were sold to yield 8%. Someone buying the bonds at their $1,000 initial offering price would thus be receiving a package consisting of an 8%, 20-year bond plus 20 warrants. Because the going interest rate on bonds as risky as those of Infomatics was 10%, we can find the straight-debt value of the bonds, assuming an annual coupon for ease of illustration, as follows:



Using a financial calculator, input N = 20, I/YR = 10, PMT = 80, and FV = 1000. Then press the PV key to obtain the bond's value of $829.73, or approximately $830. Thus, a person buying the bonds in the initial underwriting would pay $1,000 and receive in exchange a straight bond worth about $830 plus 20 warrants that are presumably worth about $1,000 – $830 = $170:

$$\text{Price paid for bond with warrants} = \text{Straight-debt value of bond} + \text{Value of warrants} \quad (19\text{-}1)$$

$$\$1{,}000 = \$830 + \$170$$

Because investors receive 20 warrants with each bond, each warrant has an implied value of $170/20 = $8.50.

The key issue in setting the terms of a bond-with-warrants deal is valuing the warrants. The straight-debt value can be estimated quite accurately, as we have shown. However, it is more difficult to estimate the value of the warrants. The Black-Scholes option pricing model (OPM), discussed in Chapter 8, can be used to find the value of a call option. There is a temptation to use this model to find the value of a warrant, since call options are similar to warrants in many respects: Both give the investor the right to buy a share of stock at a fixed strike price on or before the expiration date. However, there are major differences between call options and warrants. When call options are exercised, the stock provided to the option holder comes from the secondary market, but when warrants are exercised, the stock provided to the warrant holders is either newly issued shares or treasury stock the company has previously purchased. This means that the exercise of warrants dilutes the value of the original equity, which could cause the value of the original warrant to differ from the value of a similar call option. Also, call options typically have a life of just a few months, whereas warrants often have lives of 10 years or more. Finally, the Black-Scholes model assumes that the underlying stock pays no dividend, which is not unreasonable over a short period but is unreasonable for 5 or 10 years. Therefore, investment bankers cannot use the original Black-Scholes model to determine the value of warrants.

Even though the original Black-Scholes model cannot be used to determine a precise value for a warrant, there are more sophisticated models that work reasonably well.[6] In addition, investment bankers can simply contact portfolio managers of mutual funds, pension funds, and other organizations that would be interested in buying the securities to get an indication of how many they would buy at different prices. In effect, the bankers hold a presale auction and determine the set of terms that will just clear

[6]For example, see John C. Hull, *Options, Futures, and Other Derivatives*, 7th ed. (Upper Saddle River, NJ: Prentice-Hall, 2009). Hull shows that if there are m warrants outstanding, each of which can be converted into γ shares of common stock at an exercise price of X, as well as n shares of common stock outstanding, then the price ω of a warrant is given by this modification of the Black-Scholes option pricing formula from Chapter 8:

$$\omega = \left(\frac{n\gamma}{n + m\gamma}\right)[S^*N(d_1^*) - X_e^{-r_{RF}(T-t)}N(d_2^*)] \text{ where } d_1^* = \frac{\ln(S^*/X) + (r_{RF} + \sigma_Q^2/2)(T-t)}{\sigma_Q\sqrt{T-t}}$$

Here $d_2^* = d_1^* - \sigma_Q(T-t)^{1/2}$ and $S^* = S + m\omega/n$, where S is the underlying stock price, T is the maturity date, r_{RF} is the risk free rate, σ_Q is the volatility of the stock and the warrants together, and $N(\cdot)$ is the cumulative normal distribution function. See Chapter 8 for more on the Black-Scholes option pricing formula. If γ = 1 and n is very much larger than m, so that the number of warrants issued is very small compared to the number of shares of stock outstanding, then this simplifies to the standard Black-Scholes option pricing formula.

the market. If they do this job properly then they will, in effect, be letting the market determine the value of the warrants.

Use of Warrants in Financing

Warrants generally are used by small, rapidly growing firms as **sweeteners** when they sell debt or preferred stock. Such firms frequently are regarded by investors as being highly risky, so their bonds can be sold only at extremely high coupon rates and with very restrictive indenture provisions. To avoid such restrictions, firms like Infomatics often offer warrants along with the bonds.

Getting warrants along with bonds enables investors to share in the company's growth, assuming it does in fact grow and prosper. Therefore, investors are willing to accept a lower interest rate and less restrictive indenture provisions. A bond with warrants has some characteristics of debt and some characteristics of equity. It is a hybrid security that provides the financial manager with an opportunity to expand the firm's mix of securities and thereby appeal to a broader group of investors.

Virtually all warrants issued today are **detachable**. In other words, after a bond with attached warrants is sold, the warrants can be detached and traded separately from the bond. Further, even after the warrants have been exercised, the bond (with its low coupon rate) remains outstanding.

The strike price on warrants is generally set some 20% to 30% above the market price of the stock on the date the bond is issued. If the firm grows and prospers, causing its stock price to rise above the strike price at which shares may be purchased, then warrant holders could exercise their warrants and buy stock at the stated price. However, without some incentive, warrants would never be exercised prior to maturity—their value in the open market would be greater than their value if exercised, so holders would sell warrants rather than exercise them. There are three conditions that cause holders to exercise their warrants: (1) Warrant holders will surely exercise and buy stock if the warrants are about to expire and the market price of the stock is above the exercise price. (2) Warrant holders will exercise voluntarily if the company raises the dividend on the common stock by a sufficient amount. No dividend is earned on the warrant, so it provides no current income. However, if the common stock pays a high dividend, then it provides an attractive dividend yield but limits stock price growth. This induces warrant holders to exercise their option to buy the stock. (3) Warrants sometimes have stepped-up strike prices (also called stepped-up exercise prices), which prod owners into exercising them. For example, Williamson Scientific Company has warrants outstanding with a strike price of $25 until December 31, 2014, at which time the strike price rises to $30. If the price of the common stock is over $25 just before December 31, 2014, many warrant holders will exercise their options before the stepped-up price takes effect and the value of the warrants falls.

Another desirable feature of warrants is that they generally bring in funds only if funds are needed. If the company grows, it will probably need new equity capital. At the same time, growth will cause the price of the stock to rise and the warrants to be exercised; hence the firm will obtain the cash it needs. If the company is not successful and it cannot profitably employ additional money, then the price of its stock will probably not rise enough to induce exercise of the warrants.

The Component Cost of Bonds with Warrants

When Infomatics issued its bonds with warrants, the firm received $1,000 for each bond. The pre-tax cost of debt would have been 10% if no warrants had been attached, but each Infomatics bond has 20 warrants, each of which entitles its holder to buy one

share of stock for $22. The presence of warrants also allows Infomatics to pay only 8% interest on the bonds, obligating it to pay $80 interest for 20 years plus $1,000 at the end of 20 years. What is the percentage cost of each $1,000 bond with warrants? As we shall see, the cost is well above the 8% coupon rate on the bonds.

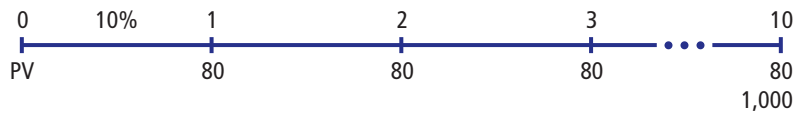
The best way to approach this analysis is to break the $1,000 into two components, one consisting of an $830 bond and the other consisting of $170 of warrants. Thus, the $1,000 bond-with-warrants package consists of $830/$1,000 = 0.83 = 83% straight debt and $170/$1,000 = 0.17 = 17% warrant. Our objective is to find the cost of capital for the straight bonds and the cost of capital for the warrant, then weight them to derive the cost of capital for the bond-with-warrants package.

The pre-tax cost of debt is 10% because this is the pre-tax cost of debt for a straight bond, so our task is to estimate the cost of capital for a warrant. Estimating the cost of capital for a warrant is fairly complicated, but we can use the following procedure to obtain a reasonable approximation.[7] The basic idea is to estimate the firm's expected cost of satisfying the warrant holders at the time the warrants expire. To do this, we need to estimate the value the firm, the value of the debt, the intrinsic value of equity, and the stock price at the time of expiration.

Assume that the total value of Infomatics's operations and investments, which is $250 million immediately after issuing the bonds with warrants, is expected to grow at 9% per year. When the warrants are due to expire in 10 years, the total value of Infomatics is expected to be $250(1.09)^{10} = $591.841 million.

Infomatics will receive $22 per warrant when exercised; with 1 million warrants, this results in a cash flow to Infomatics of $22 million. The total value of Infomatics will be equal to the value of operations plus the value of this cash. This will make the total value of Infomatics equal to $591.841 + $22 = $613.841 million.

When the warrants expire, the bonds will have 10 years remaining until maturity with a fixed coupon payment of $80. If the expected market interest rate is still 10%, then the time line of cash flows will be



Using a financial calculator, input N = 10, I/YR = 10, PMT = 80, and FV = 1000; then press the PV key to obtain the bond's value, $877.11. The total value of all of the bonds is 50,000($877.11) = $43.856 million.

The intrinsic value of equity is equal to the total value of the firm minus the value of debt: $613.841 – $43.856 = $569.985 million.

Infomatics had 10 million shares outstanding prior to the warrants' exercise, so it will have 11 million after the 1 million options are exercised. The previous warrant holders will now own 1/11 of the equity, for a total of $569.985(1/11) = $51.82 million dollars. We can also estimate the predicted intrinsic stock price, which is equal to the intrinsic value of equity divided by the number of shares: $569.985/11 = $51.82 per share.[8] These calculations are summarized in Table 19-1.

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[7]For an exact solution, see P. Daves and M. Ehrhardt, "Convertible Securities, Employee Stock Options, and the Cost of Equity," *The Financial Review*, Vol. 42, 2007, pp. 267–288.

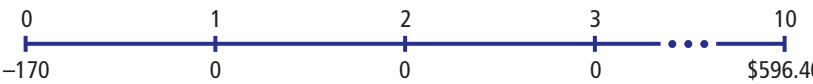
[8]If the stock price had been less than the strike price of $22 at expiration, then the warrants would not have been exercised. Based on the expected growth in the firm's value, there is little chance that the stock price will not be greater than $22.

TABLE 19-1 Valuation Analysis after Exercise of Warrants in 10 Years (Millions of Dollars, Except for Per Share Data)

	WARRANTS ARE EXERCISED
Expected value of operations and investments[a]	$591.841
Plus new cash from exercise of warrants[b]	22.000
Total value of firm	$613.841
Minus value of bonds	43.856
Value remaining for shareholders	$569.985
Divided by shares outstanding[c]	11.0
Price per share	$ 51.82

Notes:
[a]The value of operations and investments is expected to grow from its current $250 million at a rate of 9%: $250(1.09)^{10} = $591.841 million.
[b]The warrants will be exercised only if the stock price at expiration is above $22. If the stock price is less than $22, then the warrants will expire worthless and there will be no new capital. Our calculations show that the expected stock price is much greater than $22, so the warrants are expected to be exercised.
[c]Before the warrants are exercised, there are 10 million shares of stock. After the warrants are exercised, there will be 10 + 1 = 11 million shares outstanding.

To find the component cost of the warrants, consider that Infomatics will have to issue one share of stock worth $51.82 for each warrant exercised and, in return, Infomatics will receive the strike price, $22. Thus, a purchaser of the bonds with warrants, if she holds the complete package, would expect to realize a profit in Year 10 of $51.82 – $22 = $29.82 for each warrant exercised.[9] Since each bond has 20 warrants attached and since each warrant entitles the holder to buy one share of common stock, it follows that warrant holders will have an expected cash flow of 20($29.82) = $596.40 per bond at the end of Year 10. Here is a time line of the expected cash flow stream to a warrant holder:



The IRR of this stream is 13.35%, which is an approximation of the warrant holder's expected return on the warrants (r_w) in the bond with warrants. The overall pre-tax cost of capital for the bonds with warrants is the weighted average of the cost of straight debt and the cost of warrants:

$$\begin{aligned}\text{Pre-tax cost of bonds with warrants} &= r_d(\$830/\$1{,}000) + r_w(\$170/\$1{,}000)\\ &= 10\%(0.83) + 13.35\%(0.17) = 10.57\%\end{aligned}$$

The cost of the warrants is higher than the cost of debt because warrants are riskier than debt; in fact, the cost of warrants is greater than the cost of equity because warrants also are riskier than equity. Thus, the cost of capital for a bond

[9]It is not strictly accurate to say that the expected profit from the warrant position is the expected stock price less the strike price: $29.82 = $51.82 – $22. This is because if the stock price drops below the strike price, in this case $22, then the warrant profit is $0, regardless of how low the stock price goes. Thus the expected payoff will be somewhat more than $29.82. Although this expectation can be calculated using options techniques similar to those in Chapter 8, it is beyond the scope of this chapter. However, if there is a very small probability that the stock price will drop below the exercise price, then $29.82 is very close to the true expected payoff.

with warrants is weighted between the cost of debt and the much higher cost of equity. This means the overall cost of capital for the bonds with warrants will be greater than the cost of straight debt and will be much higher than the 8% coupon rate on the bonds-with-warrants package.[10]

Bonds with warrants and preferred stock with warrants have become an important source of funding for companies during the global economic crisis. But as our example shows, this form of financing has a much higher cost of capital than its low coupon and preferred dividend might lead you to think.[11]

Self-Test

What is a warrant?

Describe how a new bond issue with warrants is valued.

How are warrants used in corporate financing?

The use of warrants lowers the coupon rate on the corresponding debt issue. Does this mean that the component cost of a debt-plus-warrants package is less than the cost of straight debt? Explain.

Shanton Corporation could issue 15-year straight debt at a rate of 8%. Instead, Shanton issues 15-year debt with a coupon rate of 6%, but each bond has 25 warrants attached. The bonds can be issued at par ($1,000 per bond). Assuming annual interest payments, what is the implied value of each warrant? **($6.85)**

19.3 Convertible Securities

Convertible securities are bonds or preferred stocks that, under specified terms and conditions, can be exchanged for (that is, converted into) common stock at the option of the holder. Unlike the exercise of warrants, which brings in additional funds to the firm, conversion does not provide new capital; debt (or preferred stock) is simply replaced on the balance sheet by common stock. Of course, reducing the debt or preferred stock will improve the firm's financial strength and make it easier to raise additional capital, but that requires a separate action.

Conversion Ratio and Conversion Price

The **conversion ratio, CR**, for a convertible security is defined as the number of shares of stock a bondholder will receive upon conversion. The **conversion price, P_c**, is defined as the effective price investors pay for the common stock when conversion occurs. The relationship between the conversion ratio and the conversion price can

[10]In order to estimate the after-tax cost of capital, the after-tax cost of each component must be estimated. The after-tax cost of the warrant is the same as the pre-tax cost because warrants do not affect the issuer's tax liability. This is not true for the bond component. Because the straight bond is worth only $830 at the time of issue, it has an original issue discount (OID). This means that the after-tax cost of debt is not exactly equal to $r_d(1 - T)$. For long-term bonds, such as the one in this example, the difference is small enough to be neglected. See ***Web Extension 5A*** on the textbook's Web site for a general discussion of the after-tax cost of debt for zero coupon bonds and OID bonds. The ***Ch19 Tool Kit.xls*** calculates the after-tax cost of Infomatics' bond component, which is 6.3% rather than 10%(1 – 0.40) = 6%, assuming a 40% tax rate.

[11]For more on warrant pricing, see Michael C. Ehrhardt and Ronald E. Shrieves, "The Impact of Warrants and Convertible Securities on the Systematic Risk of Common Equity," *Financial Review*, November 1995, pp. 843–856; Beni Lauterbach and Paul Schultz, "Pricing Warrants: An Empirical Study of the Black-Scholes Model and Its Alternatives," *Journal of Finance*, September 1990, pp. 1181–1209; David C. Leonard and Michael E. Solt, "On Using the Black-Scholes Model to Value Warrants," *Journal of Financial Research*, Summer 1990, pp. 81–92; and Katherine L. Phelps, William T. Moore, and Rodney L. Roenfeldt, "Equity Valuation Effects of Warrant-Debt Financing," *Journal of Financial Research*, Summer 1991, pp. 93–103.

See **Ch19 Tool Kit.xls** *on the textbook's Web site for details.*

be illustrated by Silicon Valley Software Company's convertible debentures issued at their $1,000 par value in July of 2010. At any time prior to maturity on July 15, 2030, a debenture holder can exchange a bond for 18 shares of common stock. Therefore, the conversion ratio, CR, is 18. The bond cost a purchaser $1,000, the par value, when it was issued. Dividing the $1,000 par value by the 18 shares received gives a conversion price of $55.56 a share:

$$\text{Conversion price} = P_c = \frac{\text{Par value of bond given up}}{\text{Shares received}} \tag{19-2}$$

$$= \frac{\$1{,}000}{CR} = \frac{\$1{,}000}{18} = \$55.56$$

Conversely, by solving for CR, we obtain the conversion ratio:

$$\text{Conversion ratio} = CR = \frac{\$1{,}000}{P_c} \tag{19-3}$$

$$= \frac{\$1{,}000}{\$55.56} = 18 \text{ shares}$$

Once CR is set, the value of P_c is established, and vice versa.

Like a warrant's exercise price, the conversion price is typically set some 20% to 30% above the prevailing market price of the common stock on the issue date. Generally, the conversion price and conversion ratio are fixed for the life of the bond, although sometimes a stepped-up conversion price is used. For example, the 2010 convertible debentures for Breedon Industries are convertible into 12.5 shares until 2019, into 11.76 shares from 2020 until 2030, and into 11.11 shares from 2030 until maturity in 2040. The conversion price thus starts at $80, rises to $85, and then goes to $90. Breedon's convertibles, like most, have a 10-year call-protection period.

Another factor that may cause a change in the conversion price and ratio is a standard feature of almost all convertibles—the clause protecting the convertible against dilution from stock splits, stock dividends, and the sale of common stock at prices below the conversion price. The typical provision states that if common stock is sold at a price below the conversion price, then the conversion price must be lowered (and the conversion ratio raised) to the price at which the new stock was issued. Also, if the stock is split or if a stock dividend is declared, the conversion price must be lowered by the percentage amount of the stock dividend or split. For example, if Breedon Industries were to have a 2-for-1 stock split during the first 10 years of its convertible's life, then the conversion ratio would automatically be adjusted from 12.5 to 25 and the conversion price lowered from $80 to $40. If this protection were not contained in the contract, then a company could completely thwart conversion by the use of stock splits and stock dividends. Warrants are similarly protected against dilution.

However, this standard protection against dilution from selling new stock at prices below the conversion price can get a company into trouble. For example, assume that Breedon's stock was selling for $65 per share at the time the convertible was issued. Then suppose that the market went sour and that Breedon's stock price dropped to $30 per share. If Breedon needed new equity to support operations, a new common stock sale would require the company to lower the conversion price on the convertible debentures from $80 to $30. That would raise the value of the convertibles and, in

effect, transfer wealth from current shareholders to the convertible holders. This transfer would amount to a de facto additional flotation cost on the new common stock. Potential problems such as this must be kept in mind by firms considering the use of convertibles or bonds with warrants.

The Component Cost of Convertibles

See **Ch19 Tool Kit.xls** *on the textbook's Web site for details.*

For a more detailed discussion of call strategies, see **Web Extension 19A** *on the textbook's Web site.*

In the spring of 2010, Silicon Valley Software was evaluating the use of the convertible bond issue described earlier. The issue would consist of 20-year convertible bonds that would sell at a price of $1,000 per bond; this $1,000 would also be the bond's par (and maturity) value. The bonds would pay an 8% annual coupon interest rate, which is $80 per year. Each bond would be convertible into 18 shares of stock, so the conversion price would be $1,000/18 = $55.56. The stock was expected to pay a dividend of $1.40 during the coming year, and it sold at $35 per share. Further, the stock price was expected to grow at a constant rate of 9% per year. Therefore, $\hat{r}_s = D_1/P_0 + g = \$1.40/\$35 + 9\% = 4\% + 9\% = 13\%$. If the bonds were not made convertible then they would have to provide a yield of 10%, given their risk and the general level of interest rates. The convertible bonds would not be callable for 10 years, after which they could be called at a price of $1,050, with this price declining by $5 per year thereafter. If, after 10 years, the conversion value exceeded the call price by at least 20%, management would probably call the bonds.

Figure 19-1 shows the expectations of both an average investor and the company. Refer to the figure as you consider the following points.

1. The horizontal dashed line at $1,000 represents the par (and maturity) value. Also, $1,000 is the price at which the bond is initially offered to the public.
2. The bond is protected against a call for 10 years. It is initially callable at a price of $1,050, and the call price declines thereafter by $5 per year, as shown by the pink line in Figure 19-1.
3. Since the convertible has an 8% coupon rate and since the yield on a nonconvertible bond of similar risk is 10%, it follows that the expected "straight-bond" value of the convertible, B_t, must be less than par. At the time of issue and assuming an annual coupon, B_0 is $830:

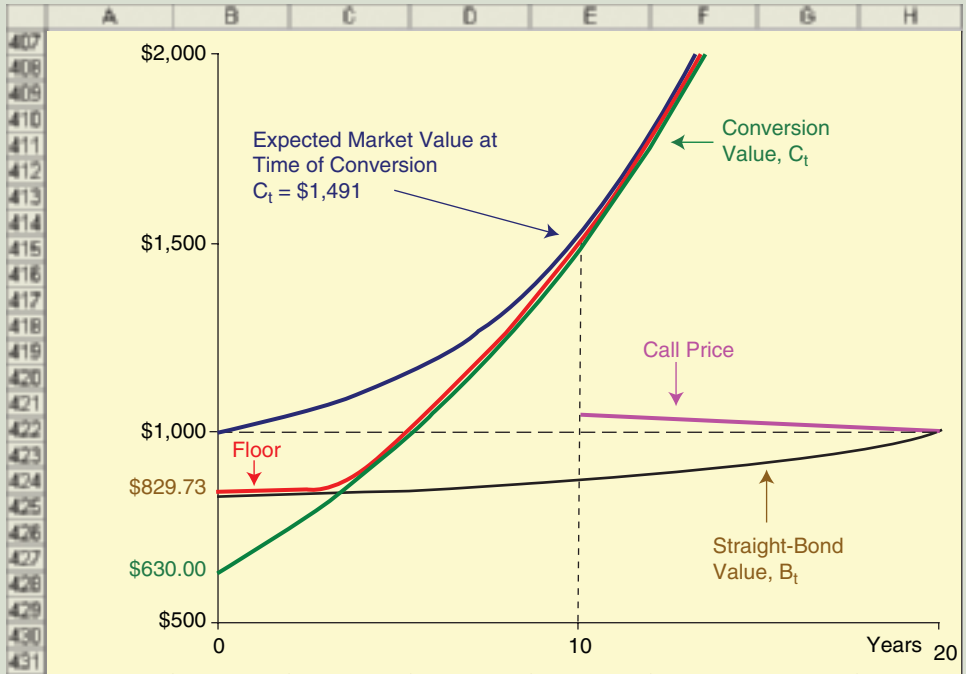
$$\text{Pure-debt value at time of issue} = B_0 = \sum_{t=1}^{N} \frac{\text{Coupon interest}}{(1+r_d)^t} + \frac{\text{Maturity value}}{(1+r_d)^N} \quad (19\text{-}4)$$

$$= \sum_{t=1}^{20} \frac{\$80}{(1.10)^t} + \frac{\$1{,}000}{(1.10)^{20}} = \$830$$

Note, however, that the bond's straight-debt value must be $1,000 at maturity, so the straight-debt value rises over time; this is plotted by the brown line in Figure 19-1.

4. The bond's initial **conversion value**, $\mathbf{C_t}$, or the value of the stock an investor would receive if the bonds were converted at t = 0, is $P_0(CR) = \$35(18 \text{ shares}) = \$630$. Since the stock price is expected to grow at a 9% rate, the conversion value should rise over time. For example, in Year 5 it should be $P_5(CR) = \$35(1.09)^5(18) = \$969$. The expected conversion value is shown by the green line in Figure 19-1.
5. If the market price dropped below the straight-bond value, then those who wanted bonds would recognize the bargain and buy the convertible as a bond. Similarly,

FIGURE 19-1 Silicon Valley Software: Convertible Bond Model



Year	Straight-Bond Value, B_t	Conversion Value, C_t	Maturity (Par) Value	Market Value	Floor Value	Premium	Call Price
0	$830	$630	$1,000	$1,000	$830	$170	N/A
1	$833	$687	$1,000	$1,017	$833	$184	N/A
2	$836	$749	$1,000	$1,038	$836	$202	N/A
3	$840	$816	$1,000	$1,063	$840	$224	N/A
4	$844	$889	$1,000	$1,094	$889	$205	N/A
5	$848	$969	$1,000	$1,132	$969	$163	N/A
6	$853	$1,057	$1,000	$1,178	$1,057	$122	N/A
7	$858	$1,152	$1,000	$1,235	$1,152	$83	N/A
8	$864	$1,255	$1,000	$1,304	$1,255	$49	N/A
9	$870	$1,368	$1,000	$1,388	$1,368	$20	N/A
10	$877	$1,491	$1,000	$1,491	$1,491	$0	$1,050
11	$885	$1,626	$1,000	$1,626	$1,626	$0	$1,045
20	$1,000	$3,531	$1,000	$3,531	$3,531	$0	$1,000

if the market price dropped below the conversion value, people would buy the convertibles, exercise them to get stock, and then sell the stock at a profit. Therefore, the higher of the bond value and conversion value curves in the graph represents a *floor price* for the bond. In Figure 19-1, the floor price is represented by the red line.

6. The convertible bond's market price will exceed the straight-bond value because the option to convert is worth something—an 8% bond with conversion possibilities is worth more than an 8% bond without this option. The convertible's price will also exceed its conversion value because holding the convertible is equivalent to holding a call option and, prior to expiration, the option's true value

is higher than its exercise (or conversion) value. Without using financial engineering models, we cannot say exactly where the market value line will lie, but as a rule it will be above the floor, as shown by the blue line in Figure 19-1.

7. If the stock price continues to increase, then it becomes more and more likely that the bond will be converted. As this likelihood increases, the market value line will begin to converge with the conversion value line.

   After the bond becomes callable, its market value cannot exceed the higher of the conversion value and the call price without exposing investors to the danger of a call. For example, suppose that 10 years after issue (when the bonds become callable) the market value of the bond is $1,600, the conversion value is $1,500, and the call price is $1,050. If the company called the bonds the day after you bought one for $1,600, you would choose to convert them to stock worth only $1,500 (rather than let the company buy the bond from you at the $1,050 call price), so you would suffer a loss of $100. Recognizing this danger, you and other investors would refuse to pay a premium over the higher of the call price or the conversion value after the bond becomes callable. Therefore, in Figure 19-1, we assume that the market value line hits the conversion value line in Year 10, when the bond becomes callable.
8. In our example, the call-protection period ends in 10 years. At this time, the expected stock price is so high that the conversion value is almost certainly going to be greater than the call price; hence we assume that the bond will be converted immediately prior to the company calling the bond, which would happen in 10 years.
9. The expected market value at Year 10 is $\$35(1.09)^{10}(18) = \$1{,}491$. An investor can find the expected rate of return on the convertible bond, r_c, by finding the IRR of the following cash flow stream:

   With a financial calculator, we set N = 10, PV = –1000, PMT = 80, and FV = 1491; we then solve for I/YR = r_c = IRR = 10.94%.[12]
10. A convertible is riskier than straight debt but less risky than stock, so its cost of capital should be somewhere between the cost of straight debt and the cost of equity. This is true in our example: $r_d = 10\%$, $r_c = 10.94\%$, and $r_s = 13\%$.[13]

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[12] As in the case with warrants, the expected conversion value is not precisely equal to the expected stock price multiplied by the conversion ratio. Here is the reason. If after 10 years the stock price happens to be low, so that the conversion value is less than the call price, then the bondholders would not choose to convert—instead, they would surrender their bonds if the company called them. In this example, conversion does not occur if the stock price is less than $1,050/18 = $58.33 after 10 years. Since the company makes a call in order to force conversion, it won't call the bonds if the stock price is less than $58.33. So when the stock price is low, the bondholders will keep the bonds, whose value will depend primarily on interest rates at that time. Finding the expected value in this situation is a difficult problem (and is beyond the scope of this text)! However, if the expected stock price is much greater than the conversion price when the bonds are called (in this case, $35[1.09]^{10} = \$82.86$ is much more than $58.33), then the difference between the true expected conversion value and the conversion value that we calculated using the expected stock price will be very small. Therefore, we can approximate the component cost reasonably accurately with the approach used in the example.

[13] To find the after-tax cost of the convertible, you can replace the pre-tax coupons with the after-tax coupons paid by the company. If the corporate tax rate is 40%, then we have N = 10, PV = –1000, PMT = 80(1 – 0.40) = 48, and FV = 1491; we solve for I/YR = $r_{c,AT}$ = 8.16%. Notice that this after-tax cost is not equal to $r_c(1 - T)$.

Use of Convertibles in Financing

Convertibles have two important advantages from the issuer's standpoint: (1) Convertibles, like bonds with warrants, offer a company the chance to sell debt with a low interest rate in exchange for giving bondholders a chance to participate in the company's success if it does well. (2) In a sense, convertibles provide a way to sell common stock at prices higher than those currently prevailing. Some companies actually want to sell common stock, not debt, but feel that the price of their stock is temporarily depressed. Management may know, for example, that earnings are depressed because of start-up costs associated with a new project, but they expect earnings to rise sharply during the next year or so, pulling the price of the stock up with them. Thus, if the company sold stock now, it would be giving up more shares than necessary to raise a given amount of capital. However, if it set the conversion price 20% to 30% above the present market price of the stock, then 20% to 30% fewer shares would be given up when the bonds were converted than if stock were sold directly at the current time. Note, however, that management is counting on the stock's price to rise above the conversion price, thus making the bonds attractive in conversion. If earnings do not rise and pull the stock price up, so that conversion does *not* occur, then the company will be saddled with debt in the face of low earnings, which could be disastrous.

How can the company be sure that conversion will occur if the price of the stock rises above the conversion price? Typically, convertibles contain a call provision that enables the issuing firm to force holders to convert. Suppose the conversion price is \$50, the conversion ratio is 20, the market price of the common stock has risen to \$60, and the call price on a convertible bond is \$1,050. If the company calls the bond, bondholders can either convert into common stock with a market value of 20(\$60) = \$1,200 or allow the company to redeem the bond for \$1,050. Naturally, bondholders prefer \$1,200 to \$1,050, so conversion would occur. The call provision thus gives the company a way to force conversion, provided the market price of the stock is greater than the conversion price. Note, however, that most convertibles have a fairly long period of call protection—10 years is typical. Therefore, if the company wants to be able to force conversion fairly early, it will have to set a short call-protection period. This will, in turn, require that it set a higher coupon rate or a lower conversion price.

From the standpoint of the issuer, convertibles have three important disadvantages: (1) Even though the use of a convertible bond may give the company the opportunity to sell stock at a price higher than the price at which it could be sold currently, if the stock greatly increases in price then the firm would be better off if it had used straight debt (in spite of its higher cost) and then later sold common stock and refunded the debt. (2) Convertibles typically have a low coupon interest rate, and the advantage of this low-cost debt will be lost when conversion occurs. (3) If the company truly wants to raise equity capital and if the price of the stock does not rise sufficiently after the bond is issued, then the company will be stuck with debt.

Convertibles and Agency Costs

A potential agency conflict between bondholders and stockholders is asset substitution, also known as "bait and switch." Suppose a company has been investing in low-risk projects, and because risk is low, bondholders charge a low interest rate. What happens if the company is considering a very risky but highly profitable venture that potential lenders don't know about? The company might decide to raise low–interest-rate debt without revealing that the funds will be invested in a risky project. After the funds have been raised and the investment is made, the value of the debt should fall because its interest rate will be too low to compensate debtholders for the high risk they bear. This is a "heads I win, tails you lose" situation, and it results in a wealth transfer from bondholders to stockholders.

Let's use some numbers to illustrate this scenario. The value of a company, based on the present value of its future free cash flows, is $800 million. It has $300 million of debt, based on market values. Therefore, its equity is worth $800 – $300 = $500 million. The company now undertakes some projects with high but risky expected returns, and its expected NPV remains unchanged. In other words, the actual NPV will probably end up much higher or much lower than under the old situation, but the firm still has the same expected value. Even though its total value is still $800 million, the value of the debt falls because its risk has increased. Note that the debtholders don't benefit if the venture's value is higher than expected, because the most they can receive is the contracted coupon and the principal repayment. However, they will suffer if the value of the projects turns out to be lower than expected, since they might not receive the full value of their contracted payments. In other words, risk doesn't give them any upside potential but does expose them to downside losses, so the bondholders' expected value must decline.

With a constant total firm value, if the value of the debt falls from $300 to $200 million, then the value of equity must increase from $500 to $800 – $200 = $600 million. Thus, the bait-and-switch tactic causes a wealth transfer of $100 million from debtholders to stockholders.

If debtholders think a company might employ the bait-and-switch tactic, they will charge a higher interest rate, and this higher interest rate is an agency cost. Debtholders will charge this higher rate even if the company has no intention of engaging in bait-and-switch behavior, since they can't know the company's true intentions. Therefore, they assume the worst and charge a higher interest rate.

Convertible securities are one way to mitigate this type of agency cost. Suppose the debt is convertible and the company does take on the high-risk project. If the value of the company turns out to be higher than expected, then bondholders can convert their debt to equity and benefit from the successful investment. Therefore, bondholders are willing to charge a lower interest rate on convertibles, and this serves to minimize the agency costs.

Note that if a company does not engage in bait-and-switch behavior by swapping low-risk projects for high-risk projects, then the chance of "hitting a home run" is reduced. Because there is less chance of a home run, the convertible bond is less likely to be converted. In this situation, the convertible bonds are actually similar to nonconvertible debt, except that they carry a lower interest rate.

Now consider a different agency cost, one due to asymmetric information between the managers and potential new stockholders. Suppose a firm's managers know that its future prospects are not as good as the market believes, which means the current stock price is too high. Acting in the interests of existing stockholders, managers can issue stock at the current high price. When the poor future prospects are eventually revealed, the stock price will fall, causing a transfer of wealth from the new shareholders to old shareholders.

To illustrate this, suppose the market estimates an $800 million present value of future free cash flows. For simplicity, assume the firm has no nonoperating assets and no debt, so the total value of both the firm and the equity is $800 million. However, its managers know the market has overestimated the future free cash flows and that the true value is only $700 million. When investors eventually discover this, the value of the company will drop to $700 million. But before this happens, suppose the company raises $200 million of new equity. The company uses this new cash to invest in projects with a present value of $200 million, which shouldn't be too hard, since these are projects with a zero NPV. Right after the new stock is sold, the company will have a market value of $800 + $200 = $1,000 million, based on the market's overly optimistic estimate of the company's future prospects. Observe that the new shareholders own 20% of the company ($200/$1,000 = 0.20) and the original shareholders own 80%.

As time passes, the market will realize that the previously estimated value of $800 million for the company's original set of projects was too high and that these projects are worth only $700 million. The new projects are still worth $200 million, so the total value of the company will fall to $700 + $200 = $900 million. The original shareholders' value is now 80% of $900 million, which is $720 million. Note that this is $20 million *more* than it would have been if the company had issued no new stock. The new shareholders' value is now 0.20($900) = $180 million, which is $20 million *less* than their original investment. The net effect is a $20 million wealth transfer from the new shareholders to the original shareholders.

Because potential shareholders know this might occur, they interpret an issue of new stock as a signal of poor future prospects, which causes the stock price to fall. Note also that this will occur even for companies whose future prospects are actually quite good, because the market has no way of distinguishing between companies with good versus poor prospects.

A company with good future prospects might want to issue equity, but it knows the market will interpret this as a negative signal. One way to obtain equity and yet avoid this signaling effect is to issue convertible bonds. Because the company knows its true future prospects are better than the market anticipates, it knows the bonds will likely end up being converted to equity. Thus, a company in this situation is issuing equity "through the back door" when it issues convertible debt.

In summary, convertibles are logical securities to use in at least two situations. First, if a company would like to finance with straight debt but lenders are afraid the funds will be invested in a manner that increases the firm's risk profile, then convertibles are a good choice. Second, if a company wants to issue stock but thinks such a move would cause investors to interpret a stock offering as a signal of tough times ahead, then again convertibles would be a good choice.[14]

Self-Test

What is a conversion ratio? A conversion price? A straight-bond value?
What is meant by a convertible's *floor value*?
What are the advantages and disadvantages of convertibles to issuers? To investors?
How do convertibles reduce agency costs?
A convertible bond has a par value of $1,000 and a conversion price of $25. The stock currently trades for $22 a share. What are the bond's conversion ratio and conversion value at t = 0? **(40, $880)**

19.4 A Final Comparison of Warrants and Convertibles

Convertible debt can be thought of as straight debt with nondetachable warrants. Thus, at first blush, it might appear that debt with warrants and convertible debt

[14]See Craig M. Lewis, Richard J. Rogalski, and James K. Seward, "Understanding the Design of Convertible Debt," *Journal of Applied Corporate Finance*, Vol. 11, No. 1, Spring 1998, pp. 45–53. For more insights into convertible pricing and use, see Paul Asquith and David W. Mullins Jr., "Convertible Debt: Corporate Call Policy and Voluntary Conversion," *Journal of Finance*, September 1991, pp. 1273–1289; Randall S. Billingsley and David M. Smith, "Why Do Firms Issue Convertible Debt?" *Financial Management*, Summer 1996, pp. 93–99; Douglas R. Emery, Mai E. Iskandor-Datta, and Jong-Chul Rhim, "Capital Structure Management as a Motivation for Calling Convertible Debt," *Journal of Financial Research*, Spring 1994, pp. 91–104; T. Harikumar, P. Kadapakkam, and Ronald F. Singer, "Convertible Debt and Investment Incentives," *Journal of Financial Research*, Spring 1994, pp. 15–29; and V. Sivarama Krishnan and Ramesh P. Rao, "Financial Distress Costs and Delayed Calls of Convertible Bonds," *Financial Review*, November 1996, pp. 913–925.

are more or less interchangeable. However, a closer look reveals one major and several minor differences between these two securities.[15] First, as we discussed previously, the exercise of warrants brings in new equity capital, whereas the conversion of convertibles results only in an accounting transfer.

A second difference involves flexibility. Most convertibles contain a call provision that allows the issuer either to refund the debt or to force conversion, depending on the relationship between the conversion value and call price. However, most warrants are not callable, so firms must wait until maturity for the warrants to generate new equity capital. Generally, maturities also differ between warrants and convertibles. Warrants typically have much shorter maturities than convertibles, and warrants typically expire before their accompanying debt matures. Warrants also provide for fewer future common shares than do convertibles, because with convertibles all of the debt is converted to stock, whereas debt remains outstanding when warrants are exercised. Together, these facts suggest that debt-plus-warrant issuers are actually more interested in selling debt than in selling equity.

In general, firms that issue debt with warrants are smaller and riskier than those that issue convertibles. One possible rationale for the use of option securities, especially the use of debt with warrants by small firms, is the difficulty investors have in assessing the risk of small companies. If a start-up with a new, untested product seeks debt financing, then it's difficult for potential lenders to judge the riskiness of the venture and so it's difficult to set a fair interest rate. Under these circumstances, many potential investors will be reluctant to invest, making it necessary to set a very high interest rate to attract debt capital. By issuing debt with warrants, investors obtain a package that offers upside potential to offset the risks of loss.

Finally, there is a significant difference in issuance costs between debt with warrants and convertible debt. Bonds with warrants typically require issuance costs that are about 1.2 percentage points more than the flotation costs for convertibles. In general, bond-with-warrant financings have underwriting fees that approximate the weighted average of the fees associated with debt and equity issues, whereas underwriting costs for convertibles are more like those associated with straight debt.

Self-Test

What are some differences between debt-with-warrant financing and convertible debt?

Explain how bonds with warrants might help small, risky firms sell debt securities.

19.5 Reporting Earnings When Warrants or Convertibles Are Outstanding

If warrants or convertibles are outstanding, the Financial Accounting Standard Board requires that a firm report basic earnings per share and diluted earnings per share.[16]

[15]For a more detailed comparison of warrants and convertibles, see Michael S. Long and Stephen F. Sefcik, "Participation Financing: A Comparison of the Characteristics of Convertible Debt and Straight Bonds Issued in Conjunction with Warrants," *Financial Management*, Autumn 1990, pp. 23–34.

[16]FAS 128 was issued in February of 1997. It simplified the calculations required by firms, made U.S. standards more consistent with international standards, and required the presentation of both basic EPS and diluted EPS for those firms with significant amounts of convertible securities. In addition, it replaced a measure called *primary EPS* with basic EPS. In general, the calculation of primary EPS required the company to estimate whether or not a security was "likely to be converted in the near future" and to base the calculation of EPS on the assumption that those securities would in fact have been converted. In June 2008 the FASB issued FSP APB 14-1, which (although not changing how EPS is reported under FAS 128) requires that convertibles be split into their implied equity and debt components for accounting purposes, in much the same way as we analyze them in this chapter.

1. *Basic EPS* is calculated as earnings available to common stockholders divided by the average number of shares actually outstanding during the period.
2. *Diluted EPS* is calculated as the earnings that would have been available to common shareholders divided by the average number of shares that would have been outstanding if "dilutive" securities had been converted. The rules governing the calculation of diluted EPS are quite complex; here we present a simple illustration using convertible bonds. If the bonds had been converted at the beginning of the accounting period, then the firm's interest payments would have been lower because it would not have had to pay interest on the bonds, and this would have caused earnings to be higher. But the number of outstanding shares of stock also would have increased because of the conversion. If the higher earnings and higher number of shares caused EPS to fall, then the convertible bonds would be defined as dilutive securities because their conversion would decrease (or dilute) EPS. All convertible securities with a net dilutive effect are included when calculating diluted EPS. Therefore, this definition means that diluted EPS always will be lower than basic EPS. In essence, the diluted EPS measure is an attempt to show how the presence of convertible securities reduces common shareholders' claims on the firm.

Under SEC rules, firms are required to report both basic and diluted EPS. For firms with large amounts of option securities outstanding, there can be a substantial difference between the basic and diluted EPS figures. This makes it easier for investors to compare the performance of U.S. firms with their foreign counterparts, which tend to use basic EPS.

Self-Test

What are the three possible methods for reporting EPS when warrants and convertibles are outstanding?
Which methods are most used in practice?
Why should investors be concerned about a firm's outstanding warrants and convertibles?

Summary

Although common stock and long-term debt provide most of the capital used by corporations, companies also use several forms of "hybrid securities." The hybrids include preferred stock, convertibles, and warrants, and they generally have some characteristics of debt and some of equity. The key concepts covered are listed below.

- **Preferred** stock is a hybrid—it is similar to bonds in some respects and to common stock in other ways.
- **Adjustable rate preferred stocks (ARPs)** pay dividends tied to the rate on Treasury securities. **Market auction (money market) preferred stocks** are low-risk, largely tax-exempt securities of 7-week maturity that can be sold between auction dates at close to par.
- A **warrant** is a long-term call option issued along with a bond. Warrants are generally detachable from the bond, and they trade separately in the market. When warrants are exercised, the firm receives additional equity capital, and the original bonds remain outstanding.
- A **convertible** security is a bond or preferred stock that can be exchanged for common stock at the option of the holder. When a security is converted, debt or preferred stock is replaced with common stock, and no money changes hands.
- Warrant and convertible issues generally are structured so that the **strike price** (also called the **exercise price**) or **conversion price** is 20% to 30% above the stock's price at time of issue.

- Although both warrants and convertibles are option securities, there are several differences between the two, including **separability**, **impact when exercised**, **callability**, **maturity**, and **flotation costs**.
- Warrants and convertibles are **sweeteners** used to make the underlying debt or preferred stock issue more attractive to investors. Although the coupon rate or dividend yield is lower when options are part of the issue, the overall cost of the issue is higher than the cost of straight debt or preferred, because option-related securities are riskier.
- For a more detailed discussion of **call strategies**, see ***Web Extension 19A*** on the textbook's Web site.

Questions

(19–1) Define each of the following terms.
a. Preferred stock
b. Cumulative dividends; arrearages
c. Warrant; detachable warrant
d. Stepped-up price
e. Convertible security
f. Conversion ratio; conversion price; conversion value
g. Sweetener

(19–2) Is preferred stock more like bonds or common stock? Explain.

(19–3) What effect does the trend in stock prices (subsequent to issue) have on a firm's ability to raise funds through (a) convertibles and (b) warrants?

(19–4) If a firm expects to have additional financial requirements in the future, would you recommend that it use convertibles or bonds with warrants? What factors would influence your decision?

(19–5) How does a firm's dividend policy affect each of the following?
a. The value of its long-term warrants
b. The likelihood that its convertible bonds will be converted
c. The likelihood that its warrants will be exercised

(19–6) Evaluate the following statement: "Issuing convertible securities is a means by which a firm can sell common stock for more than the existing market price."

(19–7) Suppose a company simultaneously issues $50 million of convertible bonds with a coupon rate of 10% and $50 million of straight bonds with a coupon rate of 14%. Both bonds have the same maturity. Does the convertible issue's lower coupon rate suggest that it is less risky than the straight bond? Is the cost of capital lower on the convertible than on the straight bond? Explain.

Self-Test Problem

Solution Appears in Appendix A

(ST–1) Warrants

Connor Company recently issued two types of bonds. The first issue consisted of 10-year straight debt with a 6% annual coupon. The second issue consisted of 10-year bonds with a 4.5% annual coupon and attached warrants. Both issues sold at their $1,000 par values. What is the implied value of the warrants attached to each bond?

Problems

Answers Appear in Appendix B

EASY PROBLEMS 1–2

(19–1) Warrants

Gregg Company recently issued two types of bonds. The first issue consisted of 20-year straight debt with an 8% coupon paid annually. The second issue consisted of 20-year bonds with a 6% coupon paid annually and attached warrants. Both issues sold at their $1,000 par values. What is the implied value of the warrants attached to each bond?

(19–2) Convertibles

Peterson Securities recently issued convertible bonds with a $1,000 par value. The bonds have a conversion price of $40 a share. What is the convertible issue's conversion ratio?

INTERMEDIATE PROBLEMS 3–4

(19–3) Warrants

Maese Industries Inc. has warrants outstanding that permit the holders to purchase 1 share of stock per warrant at a price of $25.

a. Calculate the exercise value of the firm's warrants if the common sells at each of the following prices: (1) $20, (2) $25, (3) $30, (4) $100. (*Hint:* A warrant's exercise value is the difference between the stock price and the purchase price specified by the warrant if the warrant were to be exercised.)
b. Assume the firm's stock now sells for $20 per share. The company wants to sell some 20-year, $1,000 par value bonds with interest paid annually. Each bond will have attached 50 warrants, each exercisable into 1 share of stock at an exercise price of $25. The firm's straight bonds yield 12%. Assume that each warrant will have a market value of $3 when the stock sells at $20. What coupon interest rate, and dollar coupon, must the company set on the bonds with warrants if they are to clear the market? (*Hint:* The convertible bond should have an initial price of $1,000.)

(19–4) Convertible Premiums

The Tsetsekos Company was planning to finance an expansion. The principal executives of the company all agreed that an industrial company such as theirs should finance growth by means of common stock rather than by debt. However, they felt that the current $42 per share price of the company's common stock did not reflect its true worth, so they decided to sell a convertible security. They considered a convertible debenture but feared the burden of fixed interest charges if the common stock did not rise enough in price to make conversion attractive. They decided on an issue of convertible preferred stock, which would pay a dividend of $2.10 per share.

a. The conversion ratio will be 1.0; that is, each share of convertible preferred can be converted into a single share of common. Therefore, the convertible's par value (and also the issue price) will be equal to the conversion price, which in turn will be determined as a premium (i.e., the percentage by which the conversion price exceeds the stock price) over the current market price of the common stock. What will the conversion price be if it is set at a 10% premium? At a 30% premium?
b. Should the preferred stock include a call provision? Why?

CHALLENGING PROBLEMS 5–7

(19–5) Convertible Bond Analysis

Fifteen years ago, Roop Industries sold $400 million of convertible bonds. The bonds had a 40-year maturity, a 5.75% coupon rate, and paid interest annually. They were sold at their $1,000 par value. The conversion price was set at $62.75, and the

common stock price was $55 per share. The bonds were subordinated debentures and were given an A rating; straight nonconvertible debentures of the same quality yielded about 8.75% at the time Roop's bonds were issued.

a. Calculate the premium on the bonds—that is, the percentage excess of the conversion price over the stock price at the time of issue.
b. What is Roop's annual before-tax interest savings on the convertible issue versus a straight-debt issue?
c. At the time the bonds were issued, what was the value per bond of the conversion feature?
d. Suppose the price of Roop's common stock fell from $55 on the day the bonds were issued to $32.75 now, 15 years after the issue date (also assume the stock price never exceeded $62.75). Assume interest rates remained constant. What is the current price of the straight-bond portion of the convertible bond? What is the current value if a bondholder converts a bond? Do you think it is likely that the bonds will be converted?
e. The bonds originally sold for $1,000. If interest rates on A-rated bonds had remained constant at 8.75% and if the stock price had fallen to $32.75, then what do you think would have happened to the price of the convertible bonds? (Assume no change in the standard deviation of stock returns.)
f. Now suppose that the price of Roop's common stock had fallen from $55 on the day the bonds were issued to $32.75 at present, 15 years after the issue. Suppose also that the interest rate on similar straight debt had fallen from 8.75% to 5.75%. Under these conditions, what is the current price of the straight-bond portion of the convertible bond? What is the current value if a bondholder converts a bond? What do you think would have happened to the price of the bonds?

(19–6)
Warrant/Convertible Decisions

The Howland Carpet Company has grown rapidly during the past 5 years. Recently, its commercial bank urged the company to consider increasing its permanent financing. Its bank loan under a line of credit has risen to $250,000, carrying an 8% interest rate. Howland has been 30 to 60 days late in paying trade creditors.

Discussions with an investment banker have resulted in the decision to raise $500,000 at this time. Investment bankers have assured the firm that the following alternatives are feasible (flotation costs will be ignored).

- *Alternative 1:* Sell common stock at $8.
- *Alternative 2:* Sell convertible bonds at an 8% coupon, convertible into 100 shares of common stock for each $1,000 bond (i.e., the conversion price is $10 per share).
- *Alternative 3:* Sell debentures at an 8% coupon, each $1,000 bond carrying 100 warrants to buy common stock at $10.

John L. Howland, the president, owns 80% of the common stock and wishes to maintain control of the company. There are 100,000 shares outstanding. The following are extracts of Howland's latest financial statements:

Balance Sheet

		Current liabilities	$400,000
		Common stock, par $1	100,000
		Retained earnings	50,000
Total assets	$550,000	Total claims	$550,000

Income Statement

Sales	$1,100,000
All costs except interest	990,000
EBIT	$ 110,000
Interest	20,000
EBT	$ 90,000
Taxes (40%)	36,000
Net income	$ 54,000
Shares outstanding	100,000
Earnings per share	$ 0.54
Price/earnings ratio	15.83
Market price of stock	$ 8.55

a. Show the new balance sheet under each alternative. For Alternatives 2 and 3, show the balance sheet after conversion of the bonds or exercise of the warrants. Assume that half of the funds raised will be used to pay off the bank loan and half to increase total assets.
b. Show Mr. Howland's control position under each alternative, assuming that he does not purchase additional shares.
c. What is the effect on earnings per share of each alternative, assuming that profits before interest and taxes will be 20% of total assets?
d. What will be the debt ratio (TL/TA) under each alternative?
e. Which of the three alternatives would you recommend to Howland, and why?

(19–7)
Convertible Bond Analysis

Niendorf Incorporated needs to raise $25 million to construct production facilities for a new type of USB memory device. The firm's straight nonconvertible debentures currently yield 9%. Its stock sells for $23 per share, has an expected constant growth rate of 6%, and has an expected dividend yield of 7%, for a total expected return on equity of 13%. Investment bankers have tentatively proposed that the firm raise the $25 million by issuing convertible debentures. These convertibles would have a $1,000 par value, carry a coupon rate of 8%, have a 20-year maturity, and be convertible into 35 shares of stock. Coupon payments would be made annually. The bonds would be noncallable for 5 years, after which they would be callable at a price of $1,075; this call price would decline by $5 per year in Year 6 and each year thereafter. For simplicity, assume that the bonds may be called or converted only at the end of a year, immediately after the coupon and dividend payments. Also assume that management would call eligible bonds if the conversion value exceeded 20% of par value (not 20% of call price).

a. At what year do you expect the bonds will be forced into conversion with a call? What is the bond's value in conversion when it is converted at this time? What is the cash flow to the bondholder when it is converted at this time? (*Hint:* The cash flow includes the conversion value and the coupon payment, because the conversion occurs immediately after the coupon is paid.)
b. What is the expected rate of return (i.e., the before-tax component cost) on the proposed convertible issue?

Spreadsheet Problem

(19-8) Build a Model: Convertible Bond Analysis

Start with the partial model in the file ***Ch19 P08 Build a Model.xls*** on the textbook's Web site. Maggie's Magazines (MM) has straight nonconvertible bond that currently yield 9%. MM's stock sells for $22 per share, has an expected constant growth rate of 6%, and has a dividend yield of 4%. MM plans on issuing convertible bonds that will have a $1,000 par value, a coupon rate of 8%, a 20-year maturity, and a conversion ratio of 32 (i.e., each bond could be convertible into 32 shares of stock). Coupon payments will be made annually. The bonds will be noncallable for 5 years, after which they will be callable at a price of $1,090; this call price would decline by $6 per year in Year 6 and each year thereafter. For simplicity, assume that the bonds may be called or converted only at the end of a year, immediately after the coupon and dividend payments. Management will call the bonds when their conversion value exceeds 25% of their par value (not their call price).

a. For each year, calculate (1) the anticipated stock price, (2) the anticipated conversion value, (3) the anticipated straight-bond price, and (4) the cash flow to the investor assuming conversion occurs. At what year do you expect the bonds will be forced into conversion with a call? What is the bond's value in conversion when it is converted at this time? What is the cash flow to the bondholder when it is converted at this time? (*Hint:* The cash flow includes the conversion value and the coupon payment, because the conversion occurs immediately after the coupon is paid.)
b. What is the expected rate of return (i.e., the before-tax component cost) on the proposed convertible issue?
c. Assume that the convertible bondholders require a 9% rate of return. If the coupon rate remains unchanged, then what conversion ratio will give a bond price of $1000?

Mini Case

Paul Duncan, financial manager of EduSoft Inc., is facing a dilemma. The firm was founded 5 years ago to provide educational software for the rapidly expanding primary and secondary school markets. Although EduSoft has done well, the firm's founder believes an industry shakeout is imminent. To survive, EduSoft must grab market share now, and this will require a large infusion of new capital.

Because he expects earnings to continue rising sharply and looks for the stock price to follow suit, Mr. Duncan does not think it would be wise to issue new common stock at this time. On the other hand, interest rates are currently high by historical standards, and the firm's B rating means that interest payments on a new debt issue would be prohibitive. Thus, he has narrowed his choice of financing alternatives to (1) preferred stock, (2) bonds with warrants, or (3) convertible bonds.

As Duncan's assistant, you have been asked to help in the decision process by answering the following questions.

a. How does preferred stock differ from both common equity and debt? Is preferred stock more risky than common stock? What is floating rate preferred stock?
b. How can a knowledge of call options help a financial manager to better understand warrants and convertibles?
c. Mr. Duncan has decided to eliminate preferred stock as one of the alternatives and focus on the others. EduSoft's investment banker estimates that EduSoft could issue a bond-with-warrants package consisting of a 20-year bond and 27 warrants. Each warrant would have a strike price of $25 and 10 years until expiration. It is estimated that each warrant, when detached and traded separately, would have a value of $5. The coupon on a similar bond but without warrants would be 10%.

(1) What coupon rate should be set on the bond with warrants if the total package is to sell at par ($1,000)?
(2) When would you expect the warrants to be exercised? What is a stepped-up exercise price?
(3) Will the warrants bring in additional capital when exercised? If EduSoft issues 100,000 bond-with-warrant packages, how much cash will EduSoft receive when the warrants are exercised? How many shares of stock will be outstanding after the warrants are exercised? (EduSoft currently has 20 million shares outstanding.)
(4) Because the presence of warrants results in a lower coupon rate on the accompanying debt issue, shouldn't all debt be issued with warrants? To answer this, estimate the anticipated stock price in 10 years when the warrants are expected to be exercised, then estimate the return to the holders of the bond-with-warrants packages. Use the corporate valuation model to estimate the expected stock price in 10 years. Assume that EduSoft's current value of operations is $500 million and it is expected to grow at 8% per year.
(5) How would you expect the cost of the bond with warrants to compare with the cost of straight debt? With the cost of common stock (which is 13.4%)?
(6) If the corporate tax rate is 40%, what is the after-tax cost of the bond with warrants?

d. As an alternative to the bond with warrants, Mr. Duncan is considering convertible bonds. The firm's investment bankers estimate that EduSoft could sell a 20-year, 8.5% coupon (paid annually), callable convertible bond for its $1,000 par value, whereas a straight-debt issue would require a 10% coupon (paid annually). The convertibles would be call protected for 5 years, the call price would be $1,100, and the company would probably call the bonds as soon as possible after their conversion value exceeds $1,200. Note, though, that the call must occur on an issue-date anniversary. EduSoft's current stock price is $20, its last dividend was $1, and the dividend is expected to grow at a constant 8% rate. The convertible could be converted into 40 shares of EduSoft stock at the owner's option.
(1) What conversion price is built into the bond?
(2) What is the convertible's straight-debt value? What is the implied value of the convertibility feature?
(3) What is the formula for the bond's expected conversion value in any year? What is its conversion value at Year 0? At Year 10?
(4) What is meant by the "floor value" of a convertible? What is the convertible's expected floor value at Year 0? At Year 10?
(5) Assume that EduSoft intends to force conversion by calling the bond as soon as possible after its conversion value exceeds 20% above its par value, or 1.2($1,000) = $1,200. When is the issue expected to be called? (*Hint:* Recall that the call must be made on an anniversary date of the issue.)
(6) What is the expected cost of capital for the convertible to EduSoft? Does this cost appear to be consistent with the riskiness of the issue?
(7) What is the after-tax cost of the convertible bond?

e. Mr. Duncan believes that the costs of both the bond with warrants and the convertible bond are close enough to call them even and also are consistent with the risks involved. Thus, he will make his decision based on other factors. What are some of the factors that he should consider?

f. How do convertible bonds help reduce agency costs?

Selected Additional Cases

The following cases from Textchoice, *Thomson Learning's online library, cover many of the concepts discussed in this chapter and are available at* **http://www.textchoice2.com.**

Klein-Brigham Series:
Case 27, "Virginia May Chocolate Company," which illustrates convertible bond valuation, and Case 98, "Levinger Organic Snack," which illustrates the use of convertibles and warrants.