

THE CASE FOR CONVERTIBLES*

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THE CONVERTIBLE SECURITY

Until fairly recently, the popularity of convertible securities was something of a mystery to financial economists. To those well-versed in the literature of "efficient markets," there seemed no convincing reason why convertible bonds—which, after all, represent nothing more than straight debt securities combined with options on the company's stock—should provide issuing companies with financing benefits. Why, the question was asked, should sophisticated investors be willing to pay more (thus costing the corporate issuer less) for these securities in combination than for separate offerings of straight debt and straight equity?

The characteristic response from the business schools was to attribute the use of convertibles to a widespread, but relatively harmless delusion entertained by corporate treasurers and fostered (unwittingly or otherwise) by their financial advisors. This popular misconception, which continues to captivate a good number of investment bankers and their corporate clients, is that convertible bonds (or preferreds) are a cheap source of capital because (1) they carry coupon rates below the market rates of interest on straight debt (or preferred) and (2) they allow companies to sell stock at a premium over the current price.

The astute corporate treasurer has probably long suspected that such an apparent "free lunch" is tainted. And if he has had any exposure to theoretical finance and the modern conception of "cost of capital," his suspicions will have been confirmed. For there is general agreement—among academics, at least—that the real economic cost of convertibles to

the issuing corporation is not reflected by the explicit interest rate (just as the dividend yield on common fails to represent the corporate "cost of equity"). The real cost of a convertible bond is considerably higher than the coupon rate; and, because of the conversion rights, it is also higher than the company's borrowing rate on straight and, for that matter, on

* This article was originally published in the *Chase Financial Quarterly* (Vol. 1 No. 3) and is reprinted with the permission of the Chase Manhattan Bank.

subordinated debt. In fact, because of its hybrid nature—part debt, part equity—the cost of convertible debt is best thought of as a weighted average of the explicit interest charges, and the implicit opportunity costs associated with the conversion or equity option.

A New Explanation

It is probably true to say that the slow spread of the “gospel” of modern finance has had a modest success in dispelling the popular illusions surrounding convertibles. And that many corporate managers now perceive convertibles to be more expensive than they look. To the perplexity of academics, however, the popularity of convertibles has shown little sign of abating. Consequently, as “positive” financial economists, we have been faced with the task of finding a *convincing* explanation—one that is consistent with rational investors and sophisticated financial markets.

In this article, after first examining the conventional arguments more closely, we offer a relatively new rationale for the use of convertibles. Instead of relying on the naivete of corporate financial officers or the marketing facility of investment bankers, our explanation centers largely on an important feature of convertibles: *the relative insensitivity of their value to the risk of the issuing company*. This insensitivity makes it easier for the bond issuer and purchaser to agree on the value of the bond—even when they disagree on the risk of the company—and, thus, to come to terms. It also protects the bondholder against the adverse consequences of management policies which would increase the risk of the company.

The market, as a general rule, exacts a premium for bearing additional uncertainty. Companies unable to provide investors with assurance about the level and stability of their risks may be forced to bear interest costs on straight debt that are considerably higher than management’s expectations would warrant. The advantage of a well-designed convertible, as we will argue, is that its value is not much affected by changes in company risk; and that investors are willing to provide funds on better terms when their uncertainties about risk are allayed.

The available evidence, moreover, supports our theory by suggesting that the companies issuing convertibles tend to be those for which uncertainty about risk is likely to be greatest; that is, the companies for which the costs of straight debt appear

prohibitively (and needlessly) expensive. For large, mature corporations with strong credit ratings, however, there still appears to be no good reason for issuing convertibles.

The Call Question

In the third section of this article, we explore the issue of when companies should call their convertibles. The call provision, which is a feature of most corporate bonds, takes on added significance in the case of convertibles because of the holder’s rights to convert into common stock.

But, if our theory is now better able to account for the corporate decision to issue convertibles, some mystery still surrounds the call decision—both the conventional corporate practice and the market’s response to the announcement of calls. Our theory provides a fairly simple rule for the corporation to follow in exercising its call option: namely, to call a convertible as soon as the conversion price exceeds the call price, while providing enough of a margin to ensure conversion.

The actual call policies of corporations, however, depart significantly from this apparently optimal policy. Convertible securities, whether bonds or preferreds, are not generally called until their premium over the call price is significantly larger. Moreover, when corporations actually do call their convertibles, their stock prices tend to decline, which seems to suggest that the decision to call convertibles is in general a mistake.

We provide answers to both of the questions: Why do companies delay so long in forcing conversion? Why does the market respond negatively when they finally do? But neither are completely satisfying. We can account for companies’ actual call behavior only as the result of a common, but misguided concern with the effects of conversion on reported (undiluted) earnings per share. In response to the second of these puzzles, our best guess is that the market has come to associate forced conversions with companies anticipating hard times. As a result, announcements of convertible calls may be conveying negative information about management’s outlook for the company.

In the final part of the article, we present the outlines of a model we have recently devised for the pricing and valuation of convertible securities. Our model, which incorporates the insights of the Black-Scholes Options Pricing Model (now widely used by

professional option traders on the Chicago Exchange), permits analysis of the contributions of various features to the value of convertibles.

In designing a convertible bond contract, the corporate treasurer (and or his investment banker) faces the complex problem of juggling conversion and call price schedules, coupon rates, maturity and other bond characteristics. The potential application of our model is to assess the value of a convertible with a given set of features or, alternatively, to estimate the effect of a change in one or more provisions on the value of the bond. It is also useful in arriving at decisions to force conversion.

THE COMMON MISCONCEPTION

The idea that the convertible offers a cheap source of finance stems from arguments of the following kind. Suppose, as might reasonably be the case, that if a company can float senior debt at 14 percent, it can also issue a convertible debenture with a conversion premium of 15 percent carrying a coupon rate of only 11 percent. The 15 percent conversion premium means that if the current stock price is \$40, the bondholder has the right to convert into common at \$46, or 15 percent above the current stock price.

Now if, as the conventional argument runs, the company performs poorly and the stock price does not rise, the bondholders will not find it advantageous to exercise their conversion option. The issuing company will then have obtained debt financing at a cost of 11 percent, or 300 basis points below the going rate for senior debt. On the other hand, if the firm prospers and the share price rises, bondholders will convert. For each \$1000 raised, the company will have to issue 21.74 ($\$1000/\46) shares. In this case, management will in effect have sold common stock at the conversion price of \$46, or 15 percent above the stock price at the time the funds were raised.

Thus, whether the bond is converted or not, the company will have done better with convertibles than with the alternative source of funds. Or so it seems.

The argument is beguiling because it involves sleight of hand. Notice that it compares the convertible to straight debt only when the company performs poorly, but compares the convertible to common stock when the firm performs well. This is similar to the argument that it is best to buy fire insurance on only 50 percent of the value of your house. If the house burns down, 50 percent insur-

ance is better than none; and if the house does not burn down, 50 percent insurance is cheaper than full insurance.

This argument is clearly fallacious since it neglects to point out that 50 percent insurance is worse than full insurance if the house burns down, and more expensive than no insurance if the house does not burn down. Similarly, the convertible will turn out to be more expensive than common stock if the company does poorly, because the debt will still have to be serviced. If the company does very well, the convertible will have been more expensive than straight debt, for then the convertible bond purchasers will participate in the stockholders' profits.

It is clear that the case for the convertible cannot be made on the basis of this "heads you win, tails you also win" kind of argument. The convertible bondholder is perhaps best thought of as a kind of fair-weather stockholder and foul-weather bondholder. To compensate for the fact that he is not the ideal type of business partner, the convertible purchaser accepts less advantageous terms for the debt or stock with which he will finally end up: thus is the convertible coupon below the straight debt coupon, and the conversion price above the current stock price.

A somewhat stronger case can be made for the cost advantage of the convertible if it is assumed that the company's stock is significantly overpriced or underpriced. Suppose, for example, that the stock at \$40 is so overpriced that management can be *sure* that the bond will not be converted. By issuing the convertible, the company would then be selling 14 percent debt at a cost of only 11 percent.

This is certainly an attractive proposition. But how often can management be sure that the conversion option is worthless, unless they are fraudulently concealing information about the company? Moreover, in such circumstances, it would almost certainly be better to sell the overpriced stock itself.

Suppose, on the other hand, that the stock is so underpriced that management can be sure that the bondholders will convert. Then, by issuing the convertible, the company is in effect selling stock at the higher conversion price. In these circumstances, however, it would be even better to issue straight debt, retiring it with proceeds of a stock issue after the stock price has risen.

In general, arguments for convertibles based on the assumed mispricing of the common stock come down to nothing more than the observation that the convertible is a hybrid security—part stock, part

EVEN IF THE MARKET AND MANAGEMENT AGREE THAT THE STOCK IS CORRECTLY PRICED, THE CONVERTIBLE IS STILL USEFUL IN RESOLVING THEIR DISAGREEMENT OVER THE RISK OF THE COMPANY'S OPERATIONS

bond. Therefore, if the stock is undervalued and so a costly source of funds, the convertible will be less undervalued. But straight debt, in this case, will be even less undervalued. If the stock is overvalued, the convertible will also be overvalued, and therefore a less costly source of funds than straight debt. Common stock, however, will be even less costly. In short, the argument that the company's stock is improperly valued does not provide a sensible justification for issuing convertibles.

WHY, THEN, CONVERTIBLES?

If the traditional argument for convertibles does not deserve serious attention, is there another explanation for their popularity? And, furthermore, is this explanation consistent with the financing behavior of companies in American capital markets?

The institutional explanation of convertibles is that certain financial institutions are restricted as to the amount of common stock they can hold, and that convertibles provide a means by which such institutions can increase their equity position. There may be an element of truth in this. But the further suggestion that such institutions bid up the price of convertibles so that companies can reduce their financing costs by appealing to this restricted segment of the market is unlikely to be true.

A more reasonable account of capital market behavior would show that firms in aggregate supply enough convertibles to satisfy the demand of this segment of the market, so that there are no "scarcity rents"—or, in this case, major cost reductions—to be had. After all, chocolate manufacturers do not expect to make more money on sugarless chocolate because diabetics are prohibited from consuming the regular kind. By the same logic, this preference for convertibles by some institutions should not provide any significant cost reduction to companies issuing them.

A more convincing rationale for convertibles—one that has received a good deal of support in the academic finance community—centers on the effect of changes in risk on the value of securities. Recall that, as a general rule, the higher the risk associated with a company's operations (and the greater the market's uncertainty about that risk), the higher the interest cost that a company will be forced to pay. At least, on its straight debt. In the case of convertibles, however, higher risk may not mean a correspondingly greater burden of financing costs for the issuing company. That is, the use of convertibles may

effectively shelter companies of high and indeterminate risk from prohibitively high costs of straight debt capital.

To see why this is true, note that a convertible is roughly equivalent to a package of straight debt and warrants. Instead of issuing a \$1,000 bond which is convertible into 21.74 shares at a conversion price of \$46, a corporation could issue a package of one \$1,000 straight bond and 21.74 warrants with an exercise price of \$46; and the consequences would be almost identical. Such bond-warrant combinations are indeed a quite popular alternative to convertible bonds.

How, then, would warrants in combination with a debt offering affect investors' perception of the risks involved in holding such securities? Although there are exceptions to this rule, companies with higher operating and financial risk tend to have more volatile stock prices. As noted earlier, companies with higher risk and, hence, greater price volatility pay higher rates for straight debt. And increases in the market's perception of a company's risk will cause a reduction in the value of its straight bonds.

The effect of increased risk and volatility on a warrant, however, is the opposite. Remember that the holder of a warrant profits from increases in the stock price above the exercise price, but is protected against declines below the exercise price. That is, there is an "asymmetry" in the return to the warrant which *increases* as the spread of possible future stock prices widens. In other words, as the risk and price volatility of the company increases, the value of the warrant increases. For instance, a warrant on the shares of an electronics company will be worth considerably more than a warrant (with the same conditions) on a utility's shares.

In the case of a convertible security, then, the effect of an increase in risk on the cost of a straight debt offering is offset, to an extent, by its effect on the value of the warrant. As a result, the value of an appropriately designed convertible security (or its equivalent package of straight debt and warrants) will be largely unaffected by the risk of the issuing firm.

Practically, this means that two companies at different points along the risk spectrum, facing very different costs of straight debt, could issue convertibles with nearly identical maturities, conversion premiums and coupon rates. Such a case is illustrated in Table 1. Note that while the terms of the convertible debt sold by the medium- and high-risk companies are almost identical, the proportions of the convertible's value which are accounted for by

WHEN THERE IS DOUBT ABOUT THE FUTURE POLICIES OF THE COMPANY, THE CONVERTIBLE IS LIKELY TO BE THE PREFERRED INSTRUMENT

TABLE 1
COUPON RATES REQUIRED ON NEW ISSUES OF STRAIGHT AND CONVERTIBLE DEBT

	Company Risk	
	Medium	High
Convertible Debt	11 1/4%	11.25%
Straight Debt	14%	16%

the straight debt element and by the conversion feature will be quite different. For the higher-risk company, less of the convertible's value will be accounted for by the straight debt component, and correspondingly more by the conversion or warrant element.

We are not suggesting, in this example, that convertibles offer higher-risk companies a "free lunch."¹ We are arguing, however, that the inclusion of warrants in a debt package provides a kind of financing "synergy" which allows companies with high and uncertain risk to raise capital on more advantageous terms.

Consider the further case of a company whose managers believe it to be one of medium risk, but which is perceived by the market to be high risk. Facing a 16 percent coupon rate, when companies of what it deems comparable risk are paying only 14 percent, the management of such a company may find straight debt prohibitively expensive. Although convertible debt will also appear expensive, because the company must pay 11 1/4 percent coupon instead of the 11 percent it considers reasonable, the effect of the divergence in risk assessment between management and the market is much less for the convertible than for the straight debt.

In such a situation, management will undoubtedly prefer to issue the convertible. Notice that the role of the convertible in this situation is independent of any mispricing of the stock. Even if the market and management agree that the stock is correctly

priced, the convertible is still useful in resolving their disagreement over the risk of the company's operations.

The relevant risk is not only the risk of the company's existing operations, but also the risk of any future operations in which the firm may become involved over the life of the bond. It has been pointed out that the management of a company with straight debt outstanding will have an incentive to increase the risk of the firm, since the downside risk is borne by the bondholders while the upside returns accrue solely to the stockholders. In reasonably sophisticated capital markets, purchasers of straight debt issued by companies for which this behavior is a real possibility will demand a correspondingly higher coupon rate to compensate for this anticipated future risk. In this case also, the cost of straight debt will look high relative to the risk of the company's existing operations.

Because of their option on the firm's equity, however, purchasers of a convertible issue are likely to be much less concerned by the prospect of increases in the future risk of the company. For although an increase in risk would reduce the straight debt value of their bonds, it would also increase the value of the warrant element. Consequently, when there is doubt about the future policies of the company, the convertible is likely to be the preferred instrument. It should also be noted that because the convertible holders are protected against this type of expropriation, managements issuing convertible, rather than straight debt reduce their own incentive to increase the risk of the firm simply to transfer wealth from the bondholders to the existing stockholders.²

For the reasons offered above, convertibles are most likely to be used by companies which the market perceives as risky, whose risk is hard to assess, and whose investment policy is hard to predict.

The Evidence

The data on the corporate use of convertibles seem to be consistent with our theory. In a study

1. This example is not meant to suggest that because the terms of the two convertible issues are nearly identical, the cost of the convertible is identical for the two companies. Remember that convertible debt is a hybrid security, partly straight debt and partly (a call option on the company's) equity. The opportunity cost of a convertible debt issue should thus be thought of as a weighted average of the company's cost of debt and equity capital. For the higher-risk company in this example, the fact that it has both a higher cost of straight debt and a higher implicit cost of equity suggests that its convertible will have a higher implicit cost. But

more important, the fact that a much greater portion of the value of its convertible rests in the warrant or equity component means that the convertible holder has been promised a more substantial equity stake in the higher-risk company, this, of course, translates into a higher opportunity cost of capital.

2. This argument was first presented formally by Michael C. Jensen and William H. Meckling in "Theory of the Firm: Managerial Behavior, Agency Costs, and Capital Structure," *Journal of Financial Economics*, Volume 3, pp. 305-360 (1976).

CONVERTIBLE ISSUERS TENDED TO HAVE HIGHER MARKET AND EARNINGS VARIABILITY AND TO BE HIGHER GROWTH COMPANIES. THEY WERE ALSO, ON AVERAGE, CONSIDERABLY SMALLER, YOUNGER, AND GROWING MORE RAPIDLY.

published in 1980. Wayne Mikkelsen found that highly-levered and high-growth companies were more likely to issue convertibles.³ High leverage is certainly related to risk, and it is high-growth firms whose future investment is hardest to predict. Mikkelsen also found that the longer the term of the issue, the more likely it was to contain a conversion feature. This is also consistent with the theory because longer maturities involve greater risks of a shift in companies' investment policies.

Interestingly enough, Mikkelsen also found that convertibles are much more frequently offered publicly than placed privately. This is evidence against the institutional explanation of convertibles, which would have the demand for them coming primarily from institutions. It is also consistent with the stress our theory lays on uncertainty in risk assessment, since it is undoubtedly easier for the financial institutions involved in private placements to assess the risks of individual companies than for the public at large.

A more recent study by Donald Chew provides further confirmation of Mikkelsen's findings. In an attempt to identify some of the financial characteristics which distinguish companies issuing convertibles from those issuing straight debt only, this study reported that over the period 1977-1980, convertible issuers tended to have higher market and earnings variability. They were also, on average, considerably smaller, younger, and growing more rapidly. All of these characteristics translate fairly directly into greater investor uncertainty about risk, and higher potential rewards associated with the conversion privilege.

CONVERSION AND CALL POLICIES

Having offered a corporate motivation for issuing convertibles, we now want to consider the question of conversion—first from the perspective of investors, and then from the standpoint of management formulating call policies for convertible issues.

A rational bondholder will not convert his bond as long as the coupon on the bond exceeds the dividends on the shares into which the bond is convertible—not unless the conversion privilege is about to expire or change adversely. By postponing conversion the bondholder continues to enjoy a greater income, and literally keeps his options open. Indeed,

even if the dividend forgone exceeds the bond coupon, the investor may yet decide to postpone conversion because of the greater flexibility he retains.

The issuing company can, of course, induce bondholders to convert simply by raising the dividend on the common stock sufficiently high. At some point the opportunity cost of forgoing the higher dividend will ensure that bondholders voluntarily choose to convert.

If the bond is callable, and if the conversion value of the bond exceeds the call price, the bondholders can also be induced to convert by calling the bond for redemption. For example, if each \$1000 bond is convertible into 25 shares of stock, and the share price is \$50, the conversion value of the bond is $25 \times \$50 = \1250 . Suppose that each bond is callable at \$1100. If the company calls the bond, the bondholder may either redeem the bond at the call price of \$1100 or convert the bond into common stock with market value of \$1250. Faced with these alternatives, the bondholders will have no difficulty in deciding to convert the bond, and the company would be said to have "forced conversion" by calling the convertible.

When should a company call its convertibles? Assuming that management's objective is to maximize the value of the common stock, the appropriate policy—at least, in theory—is to call as soon as the value of the convertible reaches the call price. This will typically occur when the conversion value of the bonds is equal to the call price. Such a call policy minimizes the value of the convertible by putting the lowest possible lid on its value. That is, by forcing conversion or redeeming the issue, management effectively limits the value of the convertible by eliminating the warrant component—and the flexibility it provides the investor. Because the convertible represents a liability of the existing stockholders, acting to minimize its value increases the value of the common stock.

There are a couple of considerations which would make the proposed call policy somewhat impractical. First, bondholders typically must be given 30 days notice of call. Secondly, management may wish to avoid the costs associated with issuing new securities if the bonds are redeemed rather than converted into stock. The effect of these considerations on the optimal policy is to delay the call until the con-

3. Mikkelsen, W.H. "Convertible Security Calls and Securityholder Returns: Evidence on Agency Costs, Effects of Capital Structure Change, and Supply Effects." *Journal of Financial Economics* (1980).

BY FORCING CONVERSION OF RECEIVING THE ISSUANCE OF NEW COMMON STOCK, THE VALUE OF THE CORPORATION INCREASES. IN A WAY THAT DOES NOT INCREASE THE CONVERSION VALUE OF THE EXISTING STOCKHOLDERS, AND INSTEAD INCREASES THE VALUE OF THE COMMON STOCK.

version value is sufficiently above the call price—high enough such that management can be reasonably assured that fluctuations in the stock price during the call notice period will not cause the investors to redeem rather than to convert the bonds.

A study by Jonathan Ingersoll has shown that using this modification of the original rule, the optimal timing for calling a convertible would be when the conversion values were, at most, 6-8 percent above the call price.⁴

The actual call policies of corporations, however, do not even approximate this proposed optimal policy. In a 1965 survey of corporations with convertibles outstanding, Eugene Brigham found that only 23 percent planned to force conversion as soon as conversion could be assured (the optimal policy); another 23 percent planned to encourage conversion by raising dividends; and the remaining 54 percent had no clear plans to force conversion. Ingersoll confirmed Brigham's results, finding that the median company among all firms calling convertibles between 1968 and 1975 waited until the conversion values of its bonds was 43.9 percent higher than the call price.⁵

It is difficult to explain such behavior on a rational basis. It has been suggested that, by forcing conversion, the company loses the advantage of the tax deductibility of interest payments on the bonds. While, in principle, this tax advantage could be regained by making a new issue of bonds and retiring stock, this kind of recapitalization involves additional underwriting costs. (Mikkelson found that only 23 of his 113 corporations forcing conversion replaced the debt.)

This tax-based rationalization of corporate call policies is further weakened by Ingersoll's finding that companies calling their convertible preferreds behaved in roughly the same way: the median corporation delayed call until the conversion value exceeded the call price by 38.5 percent. There is no corporate tax advantage associated with preferred shares.

Alternative explanations rely on notions of fair play and management concern with (undiluted) earnings per share. It is argued that it is unfair to deprive the bondholders of the full benefit of their conversion privilege; and that if the company enforces its call rights, it may experience difficulty in selling convertibles in the future. The idea, however, that

corporate treasurers are constrained by these misdirected scruples (which, after all, will reward convertible holders only at the expense of the existing stockholders) seems far-fetched. Furthermore, the supposedly adverse consequences for future issues can be avoided by placing appropriate restrictions on the call privilege for those issues. Some convertibles, for example, restrict the corporation's right to call to periods during which the conversion value of the bonds exceeds the call price by a stated percentage. In the absence of such provisions, though, self-imposed restrictions on the use of the call privilege seem just silly.

Another motive for deferring conversion is management's concern with the effect on reported (undiluted) earnings per share. Conversion of outstanding bonds or preferreds will typically reduce this figure, spreading the company's earnings over a larger number of shares. To the extent that management believes the market value of its shares responds to announcements of accounting transactions without any economic consequences, it may wish to postpone this formal declaration that all future cash flows are now to be divided among a larger group of stockholders. In a reasonably sophisticated market, however, investors will have already anticipated the conversion, recognizing that fully diluted EPS provides a better guide to the value of the company's stock. Consequently, we remain a bit skeptical of the idea that excessive concern with the effect of reduced EPS on stock prices accounts for the widespread tendency to put off conversion.

There is, however, another reason for managers' heeding reported earnings per share—one consistent with rational behavior: namely, their compensation may be tied to this figure. If such is the case, then tying the bonus to undiluted EPS is creating the wrong incentive for financial managers, rewarding actions which detract from instead of contribute to stockholder value.

It is interesting to note, however, that management's alleged concern with the stock price implications of forcing conversion seems to find justification in Mikkelson's puzzling discovery that announcements of convertible bond calls are accompanied, on average, by a 2 percent *drop* in stock prices. In the case of forced conversions on preferred issues, the average market response is a negative 1.3 percent. It

4. Jonathan Ingersoll, "A Contingent-Claims Valuation of Convertible Securities," *Journal of Financial Economics*, Volume 4, Number 3 (May, 1977).

5. Jonathan Ingersoll, "An Examination of Corporate Call Policies on Convertible Securities," *Journal of Finance*, Volume 32, pp. 463-478 (1977).

THE MARKET MAY HAVE BECOME CONDITIONED TO ASSOCIATE
CONVERTIBLE CALLS WITH UNFAVORABLE EVENTS HAVING NOTHING TO
DO WITH THE CONVERSION

is unlikely that these negative reactions are attributable to a systematic error by the market in interpreting the reported earnings figures.

Mikkelson tentatively attributes this market response to the tax effect discussed earlier; that is, the negative response reflects the market's recognition of the loss of the interest tax shield associated with the bonds. Some indirect support for this position is provided by a study demonstrating a positive stock price response to companies that issue debt to retire stock, which is essentially the reverse of converting outstanding bonds.⁶ The problem with this explanation is that it implies that managements systematically make financial decisions which are contrary to the interest of their shareholders; and we are reluctant to rest with such a conclusion.

A more palatable explanation, and the one that we favor, would attribute Mikkelson's findings to an "information effect." That is, the market may have become conditioned to associate convertible calls with unfavorable events having nothing to do with the conversion. For example, if managements, in anticipation of difficult times, have a tendency to clear the decks of fixed and semi-fixed obligations by forcing conversion, the market would then come to recognize forced conversions as unfavorable auguries, and mark down the stock prices accordingly.

In summary, corporate call policies and their effects remain obscure. Managers seem to delay too long in exercising their call privileges. Yet the stock price tends to decline when they do exercise it. We have suggested that the delay may be due to management's concern with the negative effect on reported EPS. The negative stock price reaction to the announcement of a call may be attributable to tax effects or to information effects. We favor the information hypothesis because, unlike the tax hypothesis, it does not imply that managers are acting against the shareholder interest. At this point, however, we do not have the evidence to make a confident choice among these alternatives.

PRICING A CONVERTIBLE ISSUE

At the outset, we stated that most of the existing models for valuing convertibles (and thus for pricing

new convertible issues) are inadequate. Such models have been based on simplistic analyses which assume the future is known with certainty. The price of the company's stock is assumed to grow at a given rate; and on the basis of this assumption, conversion is assumed to take place a pre-determined number of years after the security is issued.

The problem with such models is their failure to reflect the essential feature of the convertible: the conversion *option* gives the bondholder the right to wait until current uncertainties are at least partially resolved before deciding to be treated as a fixed claim holder or as an equity investor. By assuming that the future evolution of the bond is known with certainty, conventional valuation techniques assume away the *raison d'être* of the security. Recent advances in the theory of option pricing have enabled us to construct a richer model, one which takes account of future uncertainties.

Our own research, in combination with the work on options by Fischer Black and Myron Scholes, has led to the development of a more realistic means of valuing and analyzing convertible securities.⁷ Our model relies on a fundamental principle underlying the Black-Scholes Options Pricing Model: namely, that the expected rate of return on a convertible security should be equal to the expected rate of return on an equivalent risk portfolio consisting of bonds and the company's common stock. Unlike the older certainty models, which are essentially static in nature, our model is a dynamic, continually-adjusting formula which enables the user to determine the effect of changes in several key variables on the value of the convertible.

Our valuation model takes the form of a fairly complicated differential equation, which yields the value of convertible securities only with the aid of a computer. But though the equation itself would probably have little meaning for readers unfamiliar with quantitative methods, a simplified account of what the model says about how convertibles are valued by investors can be compressed into a sentence or two.

The major determinants of a convertible's value are: the coupon rate on the bond (or the preferred dividend); the current level of interest rates

⁶ Ronald Masulis, 1980, "The Effects of Capital Structure Change on Security Prices: A Study of Exchange Offers," *Journal of Financial Economics*, Vol. 8, pp. 149-178.

⁷ See Fischer Black and Myron Scholes, "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy*, Volume 81, Number 3 (May/June

1973); Robert Merton, "The Theory of Rational Option Pricing," *Bell Journal of Economics and Management Science*, Volume 4, Number 1 (Spring 1973); and Michael Brennan and Eduardo Schwartz, "Convertible Bonds: Valuation and Optimal Strategies of Call and Conversion," *Journal of Finance*, Column 32, Number 5 (December, 1977).

(including the company's current yields on straight debt and preferred); the conversion price; the level *and* the volatility of the company's stock price; the dividend yield on the stock; the call provisions; and the maturity of the issue. The general relationships between a convertible's value and the major variables are these: The lower the coupon rate relative to the company's borrowing rates on straight securities, the lower the price of the convertible. The higher the stock price relative to the conversion price, and the greater the volatility of the underlying stock price, the higher the value of the convertible. Also, the lower the call price, and the sooner the call can be exercised, the lower the value. And, finally, the higher the common dividend, the lower the value of the convertible (since higher dividends mean less price appreciation).

There is nothing exceptional about the identification of these determinants, and the direction in which they affect convertible prices. The virtue of our model lies rather in its improved ability to analyze and quantify the effects of changes in these crucial variables on the price of a given security.

For the sake of illustration, consider the example described in Table 2. Given the bond characteristics summarized in this table and the measure of the risk (and volatility) of the company's common stock—and further assuming that both the investor

TABLE 2
BASIC CHARACTERISTICS OF A CONVERTIBLE ISSUE

Financial Markets	
Treasury Bill Rate	15%
10 year Government Rate	14.46%
The Issuing Firm	
Capitalization	1 million shares of common stock No Senior Debt
Stock Price	\$44.02
Dividend/Share	\$ 2.08
The Convertible Issue	
Issue Size	\$6 million
Coupon Rate	8%
Conversion Price	\$54
Maturity	10 years
Callable after 5 years	
Recovery in Bankruptcy	2/3 of par value

TABLE 3
BOND VALUE SENSITIVITY ANALYSIS

	Bond Value	Effect of Change on Bond Value
Basic Characteristics	\$ 997	
Non-callable	1032	3.5%
Non-callable, non-convertible	787	- 21.1
Stock Price: 10% increase	1045	4.9
Firm Risk: 10% increase	1007	1.0
Coupon Rate: 10% increase	1028	3.2
Conversion Price: 10% decrease	1047	8.0
Call Period Deferred: 1 year increase	1005	0.8
Call Price: 10% increase	1005	0.8

and management follow the optimal conversion and call policies outlined earlier—our model estimates the values of the bond at \$997 per \$1000 of par value.

In Table 3, the results of a sensitivity analysis show the effect of changes in various parameters and bond characteristics on the value of the bond. For example, removal of the company's right to call the bond should increase its value by 3.5 percent, or \$35 per \$1000. On the other hand, also removing the conversion privilege, which would make the bond a straight non-callable bond, would reduce its value by 21.1 percent.

Note the relative insensitivity of the bond's value to the risk of the firm. In this case, a 10 percent increase in risk actually results in a 1 percent increase in the value of the convertible. This supports the rationale for convertibles we offered above: they are likely to be especially attractive to an issuing company which is perceived as more risky by the market than by management. Such a company would be burdened by a penalty coupon rate on a straight bond issue, whereas it may actually benefit from the higher risk perceived by the market if it issues a convertible.

Table 3 also contains the kind of information which would be most valuable to an issuer in designing a convertible, because it enables management to determine the relative costs and benefits of various

improvements and concessions in the basic terms of the issue. For example, a 6.4 percent reduction in the conversion price from \$54 to \$50.54 could be granted in return for a 10 percent reduction ($6.4\% \times 5.032$) in the coupon rate. As the variety of possible bond contracts continues to increase, effective analysis of the alternative possibilities demands a valuation model of this type.

CONCLUSION

1. We have shown the fallacy in the conventional argument that convertibles are a cheap source of funds. That convertibles allow companies to borrow at below market rates and to sell stock at premiums over the present price does not mean that they provide cost advantages to the issuer. The real opportunity cost of convertible debt, reflecting its hybrid character, should be thought of as a weighted average of the company's cost of straight debt and the considerably higher cost associated with the conversion or equity option.

2. The most plausible rationale for the continuing popularity of convertibles lies in their insensitivity to company risk. This allows them to be issued on terms that look fair to management, even when the market rates the risk of the issuer higher than does management of the issuing company.

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This rationale receives strong support from the available evidence. Companies issuing convertible bonds tend to be characterized by higher market and earnings variability, higher business and or financial risk, stronger growth-orientations, and shorter corporate histories than their straight debt counterparts. Such companies stand to benefit most from convertible financing.

3. Although our theory suggests that management should force conversion of convertibles soon after the value of the security rises above the call price, companies tend to delay calling their convertibles well beyond this point. We surmise that this may be due to management's misguided preoccupation with reported earnings-per-share.

4. When a convertible call is announced, the company's stock price tends to drop. Although a tax-based explanation of this market response has been offered, we favor the "information" hypothesis suggesting that convertible calls are interpreted by the market as management's effort to clean up the balance sheet in the face of impending difficulties.

5. We offer a brief introduction to the Brennan-Schwartz valuation model for pricing convertible securities. By incorporating some of the insights of the Black-Scholes Option Pricing Model, the model represents a significant advance over the older static models of convertible pricing.

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