Convertible Bonds: Matching Financial and Real Options

by David Mayers,
University of California at Riverside
Why do companies issue convertible bonds instead of, say, straight bonds or common stock? The popular explanation is that convertibles provide the best of both worlds: they provide issuers with “cheap” debt in the sense that they carry lower rates than straight debt; and, if the firm performs well and the bonds convert into equity, they allow issuers to sell stock “at a premium” over the current share price. Take the case of MCI Communications Corp. In August of 1981, the company issued 20-year-convertible subordinated debentures with a 10 1/4% coupon rate (as compared to the 14 1/8% it was paying on 20-year sub bonds issued just four months earlier). The conversion price of $12.825 was set at an 18% premium over MCI’s then current price of $10.875. Eighteen months later, when the stock price had risen to $40, the issue was called, the convertible bondholders chose to become stockholders, and MCI received an infusion of equity in the midst of a major capital investment program.

But, as finance professors Michael Brennan and Eduardo Schwartz pointed out in an article published in the same year as MCI’s first convertible bond issue,¹ the argument that convertibles represent cheap debt and the sale of equity at a premium involves a logical sleight of hand. It compares convertibles to straight debt in one set of circumstances (when the company’s stock doesn’t rise and there is no conversion) and to common stock under another (when the stock price rises and the issue converts). What the argument fails to point out is that convertible issuers may well have been better off issuing stock in the first set of circumstances and straight debt in the second. That is, if the firm performs very well, straight debt may have preserved more value for the existing shareholders by not cutting new investors into future appreciation. And, if the...
firm’s stock performs poorly after the new issue, then common stock would have been better than convertibles—not only because there is no dilution of value, but because the firm may then have had the greatest need for equity.

As Brennan and Schwartz went on to say in their 1981 article, convertibles do not provide issuers with the financing equivalent of a “free lunch.” Investors are willing to accept a lower coupon rate on convertibles than on straight bonds only because the issuer is also granting them a valuable option on the company’s stock—an upside participation that can dilute the value of existing stockholders’ claims. And, provided the company’s stock is fairly valued at the time of issue, there are no obvious reasons why convertibles should be less expensive than straight debt or equity.

But there are some less obvious reasons why convertibles may be a value-conserving financing strategy—reasons that depend on market “imperfections” such as transaction and information costs, and managerial incentives that are not fully consistent with maximizing stockholder wealth. Beginning with the pioneering paper on agency cost theory by Jensen and Meckling in 1976,2 financial academics have proposed a number of ways that convertibles can reduce the costs arising from such imperfections. And, in a study published in 1998 in the Journal of Financial Economics (JFE), I presented yet another rationale for convertibles that shows how they reduce new issue costs and agency problems facing certain kinds of companies.3 Put as simply as possible, my explanation views convertibles as the most cost-effective way for companies with promising growth opportunities to finance a sequence of major corporate investments of uncertain value and timing. Financial economists, along with a steadily increasing number of corporate practitioners, refer to such future investment opportunities as “real options.” Such investments are options in the sense that, although they may not be worth undertaking today (i.e., they are currently “out-of-the-money”), they may become so in the future. And if and when such options move “into the money,” the company will need to have sufficient capital (or at least access to capital) to “exercise” its real options and carry out its strategic plan. Convertible bonds are likely to prove a cost-effective financing approach for companies with major growth options because of the ability they offer management to match capital inflows with expected investment outlays. In particular, as the company’s real options move into the money and its stock price rises to reflect that, the call provision in convertibles effectively gives management the option to call the bonds and so force conversion into equity. And, besides eliminating the cash flow drain from servicing the debt, the new infusion of equity can in turn be used to support additional debt (or convertible) financing.

In this article, after reviewing the theory and evidence on convertibles, I show how my own explanation and findings are both consistent with and extend the previous research. Like other theories—notably, Jeremy Stein’s “backdoor equity” hypothesis—my argument suggests that convertibles can be viewed as “deferred equity” offerings that add value for companies with promising future growth opportunities (that may not be fully reflected in current share prices). Unlike past theories, I show how convertibles are uniquely suited to the sequential financing problem faced by management in funding real investment options. Although there is considerable empirical support for my explanation in the past research, the most persuasive evidence comes from my recent study of the investment and financing activity of a large sample of U.S. companies around the time their convertible bonds are converted into common stock. In brief, my study of 289 conversion-forcing calls of convertible debt over the period 1971-1990 shows significant increases in corporate investment activity beginning in the year of the call and continuing for the following three years. This investment activity is matched with increased financing activity, principally new long-term debt, that is significant primarily in the year of the call. Thus, although equity is being brought in “through the back door” by the conversion process, new debt is being brought in along with it. To return to our earlier example, one month after MCI forced conversion of its first ($250 million) convertible bond issue, it floated its second convertible issue, this time raising almost $400 million. In short, my study suggests that convertibles are designed to facilitate the future financing of valuable real investment options.

THEORETICAL ARGUMENTS FOR CONVERTIBLES

Given that financial markets are reasonably efficient and that convertibles are a fair deal for investors and issuers alike, finance theory says that the issuance of convertibles should not increase the value of the issuing company. In fact, there is even reason to believe that the market's response to the announcement of new convertible offerings should be negative, on average.

Convertibles and the Market's “Information Asymmetry” Problem

In a 1984 paper entitled “Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have,” Stewart Myers and Nicholas Majluf offered an explanation for why the announcement of a convertibles issue is generally not good news for the company's stockholders. A company's managers have at least the potential to know more about their firm's prospects than outside investors and, as representatives of the interests of existing stockholders, the managers have a stronger incentive to issue new equity when they believe the company is overvalued. Because part of a convertible issue's value consists of an option on the company's stock, the same argument holds for convertibles, although to a lesser degree. Recognizing managers' incentives to issue overpriced securities, investors respond to announcements of both equity and convertible offerings by lowering their estimates of the issuers' value to compensate for their informational disadvantage.

This argument is supported by empirical studies that show that, in the two-day period surrounding the announcement of new equity issues, a company's stock price falls by about 3%, on average. In response to announcements of convertibles, the average market response is roughly a negative 2%. (By contrast, the market response to straight debt offerings is not reliably different from zero.) The negative market reactions to announcements of new equity and convertible offerings cause the new securities to be issued at a lower price than otherwise. And in those cases where management believes the firm is fairly valued (or even undervalued) prior to the announcement of the convertible offering, the negative market response effectively dilutes value of the existing stockholders' claims. In this sense, the negative market reaction represents a major cost of issuing the security (potentially much larger than the investment banker fees and other out-of-pocket costs). For example, if the stock price of a (fairly valued) firm with an equity market cap of $1 billion drops by 5% upon the announcement of a new $500 million common stock issue, the “information costs” associated with the new issue amount to 3.3% of the value of the firm (or 10% of the funds raised)—possibly a good reason not to issue common equity.

The Risk Insensitivity Hypothesis

Up to this point, we have mentioned the information costs associated with issuing convertibles. And such costs come on top of out-of-pocket flotation costs that are estimated to run around 3.8% (of funds raised) for the median convertible issue of $75 million. What are the benefits of convertibles that would make companies willing to incur such costs? And what kinds of companies are likely to find the cost/benefit ratio for convertibles to be most favorable?

The first theoretical justification for convertibles consistent with modern finance theory was provided by Michael Jensen and William Meckling in their much-cited 1976 paper on agency costs. Among the sources of agency problems described by Jensen and Meckling are potential conflicts of interest between

a company’s bondholders and its stockholders (or managers acting on behalf of stockholders). In normal circumstances—that is, when operations are profitable and the firm can comfortably meet its debt service payments and investment schedule—the interests of bondholders and shareholders are united. Both groups of investors benefit from managerial decisions that increase the total value of the firm. But, in certain cases, corporate managements find themselves in the position of being able to increase shareholder value at the expense of bondholders. For example, management can reduce the value of outstanding bonds by increasing debt or adding debt senior to that in question. (In professional circles, this is known as “event risk”; in academic terms it is the claims dilution problem.) Or, in highly leveraged companies, management could also choose—as did many S&L executives—to invest in ever riskier projects after the debt is issued (the risk-shifting or asset substitution problem). Finally, a management squeezed between falling revenues and high interest payments might choose to pass up value-adding projects such as R&D or, if things are bad enough, basic maintenance and safety procedures (the underinvestment problem).8

Debtholders, of course, are aware that such problems can arise in leveraged firms, and they protect themselves by lowering the price they are willing to pay for the debt. For corporate management, such lower prices translate into higher interest payments, which in turn further raise the probability of financial trouble. And for high-growth firms, in particular, financial trouble can mean a large loss in value from underinvestment.

Convertibles help to control such shareholder-bondholder conflicts in two ways: First, by providing bondholders with the right to convert their claims into equity, management gives bondholders the assurance that they will participate in any increase in shareholder value that results from increasing the risk of the company’s activities—whether by further leveraging, or by undertaking riskier investments. Second, by reducing current interest rates and so reducing the likelihood of financial trouble, convertibles also reduce the probability that financially strapped companies will be forced to pass up valuable investment opportunities.9

The Role of Convertibles in Reducing Information Costs

As Brennan and Schwartz argued in their 1981 paper, convertibles also are potentially useful in resolving any disagreements between managers and bondholders about how risky the firm’s activities are. As suggested above, the value of convertibles is relatively insensitive to changes in company risk. Unexpected increases in company risk reduce the value of the bond portion of a convertible, but at the same time they increase the value of the embedded option on the company’s stock (by increasing the “volatility” of the stock price). And, as Brennan and Schwartz went on to show, it is largely because of this risk-neutralizing effect of convertibles that convertible issuers tend to be smaller, riskier, growth firms characterized by high earnings volatility.10

The Backdoor Equity Financing Hypothesis

The next major development in the theory came in 1992, when Jeremy Stein published a paper in the *JFE* entitled “Convertibles Bonds as Backdoor Equity Financing.” Beginning with the recognition that many convertible bond issuers build equity through forced conversion of convertibles, Stein developed a model that uses information asymmetry between managers and investors, and the resulting information costs, to explain why growth firms in particular find it attractive to issue convertibles. As Stein suggests, companies with limited capital and abundant growth opportunities often find themselves in a financing bind. On the one hand, they are reluctant to use significant amounts of straight debt because they face high expected costs of financial distress. Often lacking an investment-grade bond rating, the kinds of companies that issue convertibles are likely

---

9. More technically, the underinvestment problem arises from the fact that, in financially troubled firms, an outsized portion of the returns from new investments must go to helping restore the value of the bondholders claims before the shareholders receive any payoff at all. This has also been dubbed the “debt overhang” problem.
10. In his 1991 Ph.D. dissertation at the University of Chicago, “Convertible Securities and Capital Structure Determinants,” St uart Essig reported that convertible bond financing tends to be used by risky firms, high-tech firms, and firms with a limited track record.
to face high coupon rates on straight debt. And, even if they are able to issue high-yield bonds or raise a significant amount through bank loans, a temporary shortfall in cash flow could force their managers to cut back on strategic investment—and tripping a covenant or failing to meet an interest payment could even mean relinquishing much of the value of the firm to creditors or other outsiders.

But if straight debt financing is very costly in these circumstances, conventional equity financing could also have significant costs. For one thing, the management of some growth firms—particularly, those in a fairly early stage of a growth trajectory—may not feel the current stock price fairly reflects the firm’s growth opportunities, and so the issuance of equity would be expected to cause excessive dilution of existing stockholders’ claims. And, even if the firm is fairly valued, the information asymmetry problem described earlier might cause investors to reduce the value of the company’s shares upon announcement of the offering, thereby diluting value.

In such circumstances, where both straight debt and equity appear to have significant costs, managers with a great deal of confidence in their firm’s growth prospects may choose to build equity by issuing convertibles and planning to use the call provision to force conversion when the stock price rises in the future. Moreover, the stock market may actually encourage the use of convertibles in the following sense: If investors are persuaded that convertible issuers have promising growth prospects but no other viable financing options (i.e., there is little additional debt capacity and a straight equity issue has been ruled out by management as too dilutive), the market is likely to respond less negatively (or, in some cases, even positively) to the announcement of a new convertible issue. That is, management’s choice of a convertible bond financing may function as a “signal” to investors that management is highly confident about the firm’s future, thus allowing the issuer to avoid much of the negative information costs that attend conventional equity announcements. And there is some interesting evidence to support this view. In a 1997 study published in this journal, Frank Jen, Dosoung Choi, and Seong-Hyo Lee showed that the stock market responds more favorably to announcements of convertible issues by companies with high post-issue capital expenditures and high market-to-book ratios (both plausible proxies for growth opportunities), but low credit ratings and high (post-offering) debt-equity ratios.12 And since high capital expenditures and market-to-book ratios are also reasonable proxies for the presence of the real options I discussed earlier, such findings also provide support for my own theory of convertibles.

A NEW RATIONALE

In my 1998 article in the *JFE*, I offered a rationale for convertibles that both is consistent with and extends Stein’s “backdoor equity” argument.13 Stein’s model addresses itself mainly to the financing problem that growth companies face at a given point in time. That is, given that the firm needs financing and cannot easily service a large amount of straight debt, how does management raise a form of equity financing that minimizes the dilution (“information costs”) suffered by the current stockholders at the time of issue?

The problem I address is somewhat different: Given that the firm needs financing today to fund current activities and may also require significantly more capital in the future (depending on how things turn out in the next few years), how does management minimize dilution and other costs over the expected sequence of current and future financings. To cite once more the case of MCI, how does management minimize not just the costs associated with its present convertible bond issue, but also that of the issue that is expected to follow its conversion…and, if the latter issue is likely to be a convertible, too, perhaps even the issue that is expected to follow it. Thus, a key consideration in my theory is the extent of both managers’ and investors’ uncertainty about both the value and the timing of the firm’s future investment opportunities. As I suggested earlier, the presence of such uncertainty means that today’s future investment opportunities are really “growth options” that may (or may not) be “exercised” at some point in the future—in most cases, by raising more outside capital.

---

13. My explanation is also similar to recent explanations for other special financing arrangements: unit initial public offerings, where warrants are issued with shares (Schultz (1993), and venture capital arrangements, where equity is provided sequentially (Sahlman (1990).
My explanation views convertibles as the most cost-effective way for companies with promising growth opportunities to finance a sequence of major corporate investments of uncertain value and timing. Financial economists refer to such future investment opportunities as “real options.”

The Analysis

To show how convertibles can minimize costs over a sequence of financings, my study used a “two-period model” that works essentially as follows. At time 0, the company has a (clearly) positive-NPV investment project that requires immediate funding, and it also has an investment “option” that may require funding at time 1, depending on what happens between time 0 and time 1. In addition to its positive-NPV project and investment option, the company also has an abundant supply of negative-NPV projects (think of them as diversifying acquisitions) that management might choose to take if it has excess capital and no positive-NPV projects. All investment projects are assumed to have a life of one period.

Given these conditions, the challenge for management is to devise a financing strategy at time 0 that minimizes the costs associated with funding both the initial project and the investment option. My model assumes that there are only two major categories of costs: (1) new issue costs and (2) overinvestment costs. By new issue costs I mean not only the transactions costs associated with floating a new issue, but also the “information costs” discussed above. Overinvestment costs can be described as the reduction in value that results from companies having too much capital—more than they can profitably reinvest in their core businesses. Excess capital is assumed to lead to corporate investment in negative-NPV projects because of the managerial tendency to pursue size at the expense of profitability. In my model, investors automatically assume that managers will invest excess capital in negative-NPV projects. Thus, if the firm announces its intent to raise more capital than investors think it can profitably use, investors effectively charge a higher cost for such capital by reducing the value of the firm’s shares in advance of the offering.

My model also assumes that the company can choose among three debt financing alternatives available at time 0 (an equity offering is ruled out from the start as “too expensive,” making some form of debt the preferred choice). It can issue two-period straight debt (that is, debt issued at time 0 and maturing at time 2); this way, the profits from the initial project can be used to help fund the second-period investment if the prospects materialize. Alternatively, the firm can finance both projects separately by sequentially issuing single-period straight debt (and forgoing the second issue if the investment option proves “out of the money”). The third possibility is that the firm can issue a convertible bond that matures at the end of the first period and must either be redeemed or converted into equity at that point.

First, let’s consider the two-period straight-debt issue. The advantage of this financing arrangement is that the proceeds from the first-period investment are left in the firm to help finance the second-period project if it turns out to be profitable (and this would also be true of an equity offering). For example, if the proceeds from the first project are sufficient, the two-period contract provides complete financing for both projects up front and saves the entire second-period issue cost. The problem with this financing alternative, however—and this would be even more true of equity—is that the second-period project will be financed, regardless of whether the investment option turns out to be valuable or not. And because the market anticipates this behavior, the firm’s securities are priced at a discount to reflect investors’ uncertainty about management’s use of the proceeds.

The second financing alternative—sequential issues of single-period straight debt—avoids this overinvestment problem of two-period debt (and equity) by forcing managers to return to the market to fund the second project. But this choice also has a problem: if the investment option proves profitable, the firm may be forced to bear heavy new issue costs, particularly if managers have a more optimistic view of the new investment than the market. And if it turns out that the firm really needs equity to fund the investment option, such new issue costs will be even higher.

The optimal solution to this sequential financing problem—the one that both economizes on second-period issue costs and helps control the overinvestment problem—is to issue a convertible bond at time 0 that matures at the end of the first period. The bond is designed such that its equity component is “out of the money” at issue.

14. The issue (or “information”) cost function is assumed to contain fixed and variable components, so that issue costs exhibit economies of scale, and the function is the same in each period.

15. Short-term debt typically has issue costs that are quite low, and the reader may wish to solve the cost-of-issue problem by sequentially issuing short-term debt. However, the periods are assumed long term, and long-term contracts are less costly.
and becomes “in the money” only if and when the NPV of the investment option is revealed (to investors as well as managers) to be positive. If the second-period project looks sufficiently profitable at time 1, the bondholders will convert their bonds into equity at the bond maturity date. This leaves the funds both inside the firm and transformed into equity that can then be used to finance the second-period project. But if the project turns out not to be profitable, the bondholders do not exercise the conversion option; instead they submit their bonds for redemption, thus controlling the overinvestment problem.

The Special Role of the Call Provision. Of course, like all models, this one is clearly unrealistic in many respects. To cite one of its most artificial assumptions, the model assumes that the maturity date of the investment option occurs at the end of the first period. But what if the investment opportunity materializes before then? If the stock price has appreciated sufficiently (in part to reflect the emergence of the new opportunity) to make the bond in the money, then management can use the call provision to force the bondholders to convert into equity.16

Forcing conversion has a number of benefits in this situation. First of all, the bonds no longer have to be redeemed at the end of time 1, thus eliminating the need to raise new capital (and the associated issue costs) to fund the new investment project. Second, since dividend yields are typically much lower than convertible coupon rates, forcing conversion halts the cash flow drain on the firm from required interest payments and allows the savings to be channeled into the new project. Third, the resulting addition to the firm’s equity base allows it to raise additional debt financing for the new project unencumbered by the outstanding debt issue. As mentioned earlier, one month after MCI forced conversion of its August 1981 10 1/4% convertible, the company issued a new 20-year convertible carrying a coupon of 7 3/4%. Thus, a convertible carrying a coupon of 7 3/4%. Thus, a convertible, the company issued a new 20-year convertible carrying a coupon of 7 3/4%. Thus, a convertible, the company issued a new 20-year convertible carrying a coupon of 7 3/4%.

Extension to Debt with Warrants and Convertible Preferreds. My model of convertible bonds—and to some extent those of Stein and Brennan and Schwarz as well—can also be applied to the cases of debt with warrants and convertible preferreds. Like convertible bonds, issues of debt with warrants and convertible preferreds also include options that provide additional financing (by allowing the firm to retain funds it would otherwise pay out) if the options are exercised; if not, the funds are returned to investors. (And it’s interesting to note that MCI issued both convertible preferreds and debt with warrants before issuing its first convertible bonds.) Indeed, the attachment of these financing options may make sense whenever a real investment option exists, regardless of whether debt, common, or preferred stock is the initial choice. Thus, for any initial security type (debt, equity, or preferred), it can be advantageous to add a financial option as a hedge against incurring additional issue costs.

THE EVIDENCE

What evidence do we have to back this theory? Consistent with the MCI story, my own recent study found striking evidence of increased investment and financing activity around the time convertible bonds are converted. But, before reporting the results of my own recent study, let me briefly review some of the relevant findings of other studies of convertibles.

The focus of past research on convertibles can be classified into the following four categories: (1) managers’ professed motives for issuing convertibles; (2) the frequency and timing of convertible calls and conversions; (3) the kinds of companies that choose to issue convertibles; and (4) the stock market’s reaction to announcements of new convertible issues.

The first academic research on convertibles took the form of surveys of corporate issuers. Each of the three best-known surveys, published in 1955, 1966, and 1977,17 reported that about two thirds of the responding managers believed that their stock prices would rise in the future and accordingly viewed their convertible offerings as ways of obtain-
The association of convertibles with volatility, intangible assets, and high R&D and market-to-book ratios is consistent with convertible issuers having significant growth opportunities, as well as considerable uncertainty about the value and timing of those opportunities.

...ing deferred equity financing. Management’s belief that the convertible feature will be exercised because the stock price will rise is, of course, consistent with my argument that convertible issuers have future investment “options” that will require funding if they turn out to be profitable.

And management’s expectations appear to be borne out by the subsequent experience of convertible issuers. For, as shown in a 1991 study by Paul Asquith, roughly two-thirds of all convertible bonds issued (and not subsequently redeemed in a merger) are eventually converted. Moreover, a 1991 study by Asquith and David Mullins showed that essentially all companies call their convertibles if the conversion value exceeds the call price and if there are cash savings from the conversion (that is, if the after-tax interest payments on the debt exceed the dividends on the new equity). The fact that such a large fraction of convertible bonds is ultimately converted is consistent with my view of convertibles as part of an anticipated financing sequence.

Among studies of the kinds of companies that issue convertibles, Stuart Essig’s 1991 Ph.D. dissertation showed that convertible issuers tend to have higher-than-average R&D-to-sales ratios, market-to-book ratios, and long-term debt-to-equity ratios (when the convertible issue is counted as debt). They also tend to have more volatile cash flows than issuers of straight debt. At the same time, convertible issuers have lower ratios of tangible assets (property, plant and equipment, and inventories) to total assets. The association of convertibles with volatility, intangible assets, and high R&D and market-to-book ratios is consistent with convertible issuers having significant future growth opportunities, as well as considerable uncertainty about the value and timing of those opportunities. The higher leverage ratios also are consistent with my argument since higher leverage means larger potential cash flow savings from calling the bonds and replacing them with equity when additional financing is required for new investment.

As noted earlier, the stock market reaction to announcements of convertible bonds is significantly negative, on average, though less negative than in the case of equity issues. Such a finding in and of itself neither supports nor contradicts my explanation. But, as also mentioned earlier, the 1997 study by Jen, Choi, and Lee found considerable variation in the market’s response to convertible offerings. The market reaction was significantly less negative to announcements of convertibles by companies with high market-to-book ratios and high (post-offering) capital expenditures. These are the kinds of companies that fit my thesis—firms with significant investment options that may pan out and require future funding, but may not.

New Evidence on After-Issue Investment and Financing Activity

In my 1998 study of convertibles, I tested my sequential financing hypothesis by comparing the post-issue investment and financing activity of convertible issuers with that of their industry competitors. I began by compiling a sample of all (436) calls of convertible bonds by NYSE or AMEX companies during the period 1968-1990. After combining multiple calls by the same companies within the same year (there were 35 such cases) and deleting cases without Cusip numbers (5) or call announcement dates (2), the sample fell to 394. Finally, I was forced to drop an additional 105 cases because some firms are not listed in Standard and Poor’s Industrial Compustat data files—my source of information about the company’s investment and financing. The final sample contains 289 events that occur during the period 1971 to 1990.

Table 1 lists the (two-digit) industrial classification codes of the companies making the 289 calls. As the table shows, convertible issuers are not confined to just a few industries, but nor are they randomly distributed among all sectors. For example, both the oil and gas extraction and computer equipment industries have large concentrations of companies calling their convertibles. The firms in such industries would seem to fit the profile of companies with large ongoing financing requirements combined with significant investment options.

Table 2 contains summary statistics comparing the sample firms with their industry medians at the close of the year prior to the call. Like the findings

---

reported in Essig’s 1991 study (cited earlier), my sample of convertible-calling companies had higher leverage ratios, higher market-to-book ratios, more

R&D to sales, and lower tangible to total assets than the median values in their industries. Moreover, for these sample firms, convertible bonds were an
The next issue my study addressed was the amount of time that elapses between the issuance and call of convertibles. Figure 1 presents a frequency distribution of the number of years between issue and call (time to call) for the 286 called convertible bonds that are identified in Moody’s Industrial Manual. Although the original maturities of the called convertible bonds ranged from 10 to 35 years, with a median of 25 years, the time period between issue and call was relatively short. The mean and median time to call were 6.8 and 5 years, and the mode was 3 years. (MCI’s 1981 convertible had a maturity of 20 years and was called in 18 months.)

I also examined the stated uses of funds reported in Moody’s (by 279 issuers) at the time of issue. Although the most common is to repay other indebtedness (cited by 162 of the 279 issuers), most issuers mention other uses. And, in the majority of cases where debt repayment is cited, there is another use that can be interpreted as providing funding for corporate investment. For example, 95 issuers mentioned a desire to fund increases in working capital (including accounts receivable), 38 cited funding for acquisitions, and 74 mentioned various forms of investment, a category that includes “exploration,” “expansion,” “capital expenditure,” and “new equipment.” Thus, considering the relatively short time-to-call together with the stated uses of funds, it seems highly plausible that most convertible issuers were considering the possible need to fund future investment options when raising capital for current activities.

Post-Call Investment Activity. Having looked at corporate statements of intent and the timing of convertible calls, the next step in my study was to examine both actual investment and further financing activity around the time of the convertible bond calls. For each of the 289 companies in my sample, I collected annual data from Standard & Poor’s Industrial Compustat files on capital expenditures (a category which represents the funds used for additions to the company’s property, plant, and equipment, but excludes amounts arising from acquired companies). My data collection began five years before the convertible call (year -5) and ended four years after the year of the call (year +4). For each of the 10 years (year 0 counts as the year of the call) and for all 289 companies, I calculated (1) the level of capital expenditures as a percentage of total assets and (2) (for nine of the ten years) the change in capital expenditures as a percentage of total assets from the prior year. Then I performed the same calculations for a control sample of companies in the same four-digit industrial classification.

As shown in Table 3 (see columns 2 and 3), companies that call their convertibles show somewhat higher levels of capital expenditures than their industry competitors in the years leading up to the call, but sharply higher levels in the years following the call. By far the largest changes in capital expenditures are reported in the year of the call and the year immediately following.
industry competitors in the years leading up to the call, but sharply higher levels in the years following the call. Moreover, as can be seen most clearly in column 6, by far the largest changes in capital expenditures are reported in the year of the call (3.4%) and the year immediately following (5.0%). (MCI’s increases in capital expenditures were 40.9% and 25.8% in the year of and the year following the call of its first convertible issue in 1983.) As shown in column 7, the industry-matched control firms also show their largest increases in years 0 and 1 (although the increases were only 1.5% and 1.6%). (And, to return to the MCI example, the capital spending of other telecommunications firms changed by –1.1% and 0.6% in 1983 and 1984.) Increased investment by competitors is not surprising since the profitability of investment options for firms within industries should be correlated. That is, when one oil company decides to undertake a major expansion, the same factors are likely to drive other oil companies to do the same. But even so, both the levels of capital expenditures, and their rates of growth, are significantly higher for the companies that force conversion of their convertibles.

Financing activity. Using the same Compustat source for the same sample of 289 firms, I next calculated the amount of funds received from (1) the sale of common and preferred stock, (2) the issuance of long-term debt, and (3) total sources—each as a percentage of total assets—over the same ten-year period. As shown in Table 4, both the means and distributions differ in years 0 and 1 between the conversion sample (column 6) and the industry matches (column 7). a. indicates significance at the 0.01 level. b. indicates significance at the 0.05 level. c. indicates significance at the 0.10 level.

### Table 3: Mean and Median Capital Expenditures and Changes in Capital Expenditures (Levels and Changes Scaled by Total Assets for Year –1) for Years Relative to the Call of Convertible Debt by 289 Firms During the Period 1971 Through 1990*

<table>
<thead>
<tr>
<th>Year</th>
<th>Conversion Sample Mean/Median</th>
<th>Industry Match Mean/Median</th>
<th>N(Sample)</th>
<th>N(Match)</th>
<th>t-test</th>
<th>Wilcoxon</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td>5.0/3.7</td>
<td>4.7/4.0</td>
<td>227</td>
<td>228</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-4</td>
<td>5.8/4.2</td>
<td>5.1/4.5</td>
<td>241</td>
<td>233</td>
<td>1.0/0.5a</td>
<td>0.4/0.4b</td>
</tr>
<tr>
<td>-3</td>
<td>6.8/5.8</td>
<td>5.7/4.8</td>
<td>245</td>
<td>241</td>
<td>0.8/0.4a</td>
<td>0.5/0.4a</td>
</tr>
<tr>
<td>-2</td>
<td>7.6/6.4</td>
<td>6.6/5.7</td>
<td>264</td>
<td>253</td>
<td>0.8/0.7a</td>
<td>0.8/0.6b</td>
</tr>
<tr>
<td>-1</td>
<td>9.2/7.1</td>
<td>7.8/6.2</td>
<td>276</td>
<td>268</td>
<td>1.3/0.6a</td>
<td>0.8/0.4a</td>
</tr>
<tr>
<td>0</td>
<td>13.4/8.8</td>
<td>9.5/7.2</td>
<td>273</td>
<td>268</td>
<td>3.4/1.3</td>
<td>1.5/0.5</td>
</tr>
<tr>
<td>1</td>
<td>18.3/11.6</td>
<td>11.5/8.1</td>
<td>261</td>
<td>268</td>
<td>5.0/1.8a</td>
<td>1.6/0.5</td>
</tr>
<tr>
<td>2</td>
<td>18.8/12.4</td>
<td>12.7/9.5</td>
<td>252</td>
<td>256</td>
<td>1.0/0.9</td>
<td>0.3/0.2</td>
</tr>
<tr>
<td>3</td>
<td>20.5/12.5</td>
<td>13.4/9.6</td>
<td>238</td>
<td>257</td>
<td>1.8/0.9</td>
<td>–0.1/0.2</td>
</tr>
<tr>
<td>4</td>
<td>25.2/12.2</td>
<td>14.6/9.7</td>
<td>224</td>
<td>249</td>
<td>1.3/0.5b</td>
<td>0.7/0.2</td>
</tr>
</tbody>
</table>

*Tests reported in columns 6 and 7 (and indicated by the letters a, b, and c as described below) are paired mean and median tests comparing year-zero changes with the changes in other years. Thus, for example, the 3.4 mean value reported in column 6, year 0 is significantly different from the other mean values of that column in all years. The tests reported in columns 8 and 9 are the indicated two-sample tests comparing the sample and matching mean changes and distributions of changes for each year. Thus, for example, both the means and distributions differ in years 0 and 1 between the conversion sample (column 6) and the industry matches (column 7).

- a. indicates significance at the 0.01 level.
- b. indicates significance at the 0.05 level.
- c. indicates significance at the 0.10 level.

---

22. I inferred this from the following procedure: Using the fractions of outstanding shares into which the bonds are convertible (about 14%), as reported in Singh, Cowan, and Nayar (1991), and the equity capitalization and total asset means from Table 3, I estimate that shares added through conversions on average represent 5.5% of assets. See A.K. Singh, A.R. Cowan, and N. Nayar, “Underwritten Calls of Convertible Bonds,” *Journal of Financial Economics* 29 (1991), 173-196.
Long-term debt, common and preferred stock, and total funding sources all experience significant increases during the year of the call. Debt is clearly the preferred instrument for financing after convertible bond calls.

### TABLE 4: MEAN AND MEDIAN ISSUANCES OF LONG-TERM DEBT, COMMON AND PREFERRED, AND TOTAL SOURCES OF FUNDS (LEVELS AND CHANGES SCALED BY TOTAL ASSETS FOR YEAR -1) FOR YEARS RELATIVE TO THE CALL OF CONVERTIBLE DEBT BY 289 FIRMS DURING THE PERIOD 1971 THROUGH 1990*

<table>
<thead>
<tr>
<th>Year (1)</th>
<th>Financing Activity Level/Total Assets (%)</th>
<th>Changes in Financing Activity/Total Assets (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conversion Mean/Median (2)</td>
<td>Industry Mean/Median (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-5</td>
<td>4.4/2.6</td>
<td>3.6/1.3</td>
</tr>
<tr>
<td>-4</td>
<td>5.0/2.8</td>
<td>3.9/1.6</td>
</tr>
<tr>
<td>-3</td>
<td>7.5/4.9</td>
<td>3.4/1.8</td>
</tr>
<tr>
<td>-2</td>
<td>7.9/5.6</td>
<td>3.2/1.9</td>
</tr>
<tr>
<td>-1</td>
<td>8.9/5.0</td>
<td>4.3/2.3</td>
</tr>
<tr>
<td>0</td>
<td>15.5/9.0</td>
<td>4.9/2.3</td>
</tr>
<tr>
<td>1</td>
<td>21.0/8.6</td>
<td>7.2/3.0</td>
</tr>
<tr>
<td>2</td>
<td>18.1/8.5</td>
<td>6.7/2.6</td>
</tr>
<tr>
<td>3</td>
<td>20.9/7.6</td>
<td>9.0/2.8</td>
</tr>
<tr>
<td>4</td>
<td>22.4/9.1</td>
<td>9.6/3.2</td>
</tr>
</tbody>
</table>

### PANEL A: ISSUANCES OF LONG-TERM DEBT

-5 4.4/2.6 3.6/1.3 195 224
-4 5.0/2.8 3.9/1.6 205 229 0.8/0.0a 0.7/0.0 0.8398 0.3640
-3 7.5/4.9 3.4/1.8 214 233 2.7b/0.5 -0.3/0.0 0.0003 0.0012c
-2 7.9/5.6 3.2/1.9 220 241 0.5/0.0a -0.2/0.0 0.4828 0.5194b
-1 8.9/5.0 4.3/2.3 230 253 1.3b/0.8a 0.4/0.0 0.3020 0.1939c
0 15.5/9.0 4.9/2.3 243 268 6.6/1.6 0.9/0.0 0.0011 0.0004
1 21.0/8.6 7.2/3.0 229 268 5.4/0.0 1.9/0.0 0.1410 0.2694
2 18.1/8.5 6.7/2.6 225 268 -2.3b/0.0 -1.5b/0.0 0.7622 0.6488c
3 20.9/7.6 9.0/2.8 219 257 2.3b/0.0 0.6/0.0 0.4578 0.9114
4 22.4/9.1 9.6/3.2 207 250 0.2b/0.0 1.1/0.0 0.7038 0.7552

### PANEL B: ISSUANCES OF COMMON AND PREFERRED

-5 0.9/0.1 0.3/0.0 200 224
-4 1.4/0.1 0.6/0.0 212 229 0.4b/0.0a 0.2/0.0 0.5353 0.3864
-3 1.7/0.2 0.6/0.0 219 233 0.3b/0.0a 0.0b/0.0a 0.4362 0.0072
-2 1.8/0.2 0.6/0.0 227 241 0.0b/0.0a 0.1/0.0 0.7142 0.2078
-1 2.4/0.5 0.7/0.0 238 253 0.7b/0.0a 0.0b/0.0a 0.2119 0.0071
0 9.4/5.4 0.9/0.1 250 268 6.7/3.5 0.2/0.0 0.0001 0.0001
1 5.4/0.5 0.6/0.1 239 268 -4.0b/-2.4a -0.3b/0.0a 0.0002 0.0001
2 3.5/0.2 0.6/0.1 232 268 -1.8b/0.0 -0.2a/0.0 0.1662 0.0037
3 4.1/0.3 0.9/0.0 220 257 0.7b/0.0a 0.1/0.0 0.5740 0.8634
4 3.8/0.2 0.7/0.0 206 250 -0.6b/0.0 0.0b/0.0b 0.6038 0.3575

### PANEL C: TOTAL SOURCES OF FUNDS

-5 13.1/11.2 14.1/11.6 210 224
-4 15.4/12.7 16.0/12.6 219 228 2.4b/1.3a 2.2b/1.7a 0.8455 0.5159
-3 19.4/15.4 16.3/14.4 219 231 4.2b/3.1a 1.8b/1.7a 0.0180 0.0127
-2 22.8/18.5 18.3/17.2 212 236 4.0b/3.3a 1.8b/2.2a 0.0748 0.0773
-1 27.4/21.9 21.9/19.9 208 240 4.7b/2.8b 2.3/2.8b 0.1112 0.7692
0 43.0/34.3 29.1/22.6 212 252 16.1/12.4 7.3/3.0 0.0043 0.0001
1 47.6/33.4 31.0/24.4 185 244 3.3b/-1.4a 4.3b/1.8b 0.7505 0.0012
2 48.1/36.7 32.9/26.1 169 221 1.8b/2.2a 0.4b/1.9b 0.6850 0.5429
3 52.9/36.9 38.7/29.4 150 200 5.0b/0.8a 3.8/2.9 0.7025 0.2585
4 60.2/38.9 40.5/32.8 129 186 7.4b/2.8b 4.0b/2.2 0.4198 0.7757

*Tests reported in columns 6 and 7 (and indicated by the letters a, b, and c as described below) are paired mean and median tests comparing year-zero changes with the changes in other years. Thus, for example, the 6.6 mean value reported in column 6, year 0 of Panel A is significantly different from the other mean values of that column and Panel in all years except year 1. The tests reported in columns 8 and 9 are the indicated two-sample tests comparing the sample and matching mean changes and distributions of changes for each year. Thus, for example, both the means and distributions differ in year 0 of Panel A between the conversion sample (column 6) and the industry matches (column 7). a. indicates significance at the 0.01 level 
b. indicates significance at the 0.05 level 
c. indicates significance at the 0.10 level
and the reason for this sudden drop will shortly become clear.

In the final part of my study, I also collected data from Investment Dealer’s Digest (which reports all issues of public securities by corporations) on the financing activity of a somewhat larger sample of 365 convertible-calling companies around the time of the call. Of the 365 firms, 110 obtained new financing during the year prior to the call, while 144 raised new capital the year after the call, a significant increase of 31%. Moreover, of the 144 firms with new post-call financings, 86 issued only debt, 28 only equity, and seven only preferred—while 23 issued some combination of debt and either preferred or equity. Thus, debt is clearly the preferred instrument for financing after convertible bond calls.23

Another way to capture the relative importance of debt in post-call financing is to examine leverage ratios (LTD/Equity), which reflect private as well as public debt. As a result of conversion, there are significant reductions in leverage ratios by the end of year 0, the mean and median leverage ratios are 0.63 and 0.36, as compared with 0.94 and 0.47 at the end of the preceding year. But at the end of year 1, the mean and median leverage ratios have risen significantly to 0.81 and 0.39. Moreover, by the end of year 2, mean and median leverage are 1.00 and 0.43, which are indistinguishable from their values at year end -1. (And the same result is obtained using total debt rather than long-term debt in measuring the leverage ratio.) This rapid increase in leverage ratios after the call explains the sharp drop in common and preferred in year 1.

In summary, Figure 2 illustrates the changes in both capital expenditures and funding sources of the 289 companies over the 10-year period surrounding their conversions. As shown in the figure, both the level of investment and total sources of outside funding experience notable increases in the year of the call and the year after. Nevertheless, equity funding, after rising sharply in the year of conversion, declines sharply in the next two years as companies follow with new debt (or convertible) issues.

CONCLUSION

In the “new economy,” a rapidly growing proportion of corporate value appears to derive not from the profits generated by companies’ current activities, but from their real investment options that may prove worth pursuing, but may not. For companies whose value consists in large part of real options (and Internet and biotech stocks are likely to fall into this category), convertible bonds may offer the ideal financing match (as long as the coupon rate can be kept low enough) because of the matching financial option that they provide.

23. Further, these estimates of the relative number of firms with new debt financings are likely biased down by the omission of private financings by the Digest.
In this paper, I propose that corporations use convertible debt as a key element in a financing strategy that aims not only to fund current activities, but to enable them to “exercise” their real options by giving them access to low-cost capital should the options turn out to be valuable. In this sense, convertibles can be seen as the most cost-effective solution to a sequential financing problem—that is, how to fund not only today’s activities, but also tomorrow’s opportunities. According to my analysis, the sequential financing approach is designed to control an overinvestment incentive that can arise if financing is provided before an investment option’s maturity (i.e., before an investment opportunity materializes). The key considerations in my analysis are new issue costs (which include the “information costs” associated with selling underpriced securities) and the degree of uncertainty about the profitability of the firm’s real investment options. The higher the new issue costs, and the greater the degree of uncertainty about the size and timing of the firm’s future capital requirements, the more effective are convertibles both in controlling the overinvestment problem and minimizing costs associated with raising capital in the future.

As my analysis also shows, the critical feature of convertibles is the call provision that, provided the stock price is “in the money,” effectively enables managers to force conversion of the bonds into equity. As option pricing theory suggests, the value of this call option increases directly with increases in uncertainty about both the eventual value and the maturity date of the real option. If and when the investment opportunity does materialize, exercise of the call feature gives the firm an infusion of new equity that enables it to carry out its new investment and financing plan unencumbered by the debt issue.

Because my analysis suggests the convertible feature is the key to solving a sequential-financing problem, my study examines the investment and financing activities of 289 companies around the time their convertible bonds are called and converted. Such companies made significant increases in capital expenditures (as compared to those by an industry-matched control group) starting in the year of the call and extending through three years after. These companies also showed increased financing activity following the call, mainly new long-term debt that is issued in the year of the call. These new issues of debt, which are often themselves convertible into equity, suggest that financing the exercise of real investment options is an important consideration in the design of convertible bonds.

For companies whose value consists in large part of real options (and Internet and biotech stocks are likely to fall into this category), convertible bonds may offer the ideal financing match because of the matching financial option they provide.

David Mayers holds the Philip L. Boyd Chair in Finance at the A. Gary Anderson Graduate School of Management at the University of California, Riverside.