

# UNDERSTANDING THE DESIGN OF CONVERTIBLE DEBT

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**C**onvertible debt is a "hybrid" security—one that effectively combines straight debt with an option (or, more precisely, a warrant) on the company's common equity. Why do corporate managers issue convertible debt? Financial executives typically point to the lower interest rates relative to those on straight debt and to the opportunity to issue equity at a premium to the current share price as the main motivating factors. But, as financial economists have pointed out, this argument is flawed. It compares convertibles to straight debt in one set of circumstances (when the firm does poorly and straight debt would have been more burdensome) and to equity in another (when the firm does well and equity proves more dilutive). What the popular argument for convertibles fails to mention is that the firm would have been better off issuing straight debt if it does well (for then there is *no* dilution of equity) or common equity if the firm does poorly (when the burden of servicing straight debt would turn out to be greatest).<sup>2</sup>

Objecting to the "free lunch" implied by the popular argument, financial economists have offered other explanations that show how the *combination* of debt and equity built into convertibles can reduce information and agency costs faced by companies when raising capital from outside investors. At the risk of oversimplifying, we will suggest that there are now two dominant theories of convertible debt. Like the two strands of the popular argument for convertibles, one theory effectively views convertibles as an alternative to straight debt and the other views it as an alternative to ordinary equity.<sup>3</sup>

The "debt-like" school of thought focuses on how convertibles deal with investors' uncertainty about the issuing company's level of risk, and about management's incentive and ability to increase that risk. Because they include an option-like component whose value *increases* with risk, convertibles provide investors with a hedge if the firm turns out to be riskier than expected.<sup>4</sup> The option-like feature of convertibles also protects investors against the possibility that management increases the risk of the firm after the bonds are issued (known in the finance literature as the "risk-shifting" problem).<sup>5</sup>

The second major theory of convertibles views them not as an alternative to debt, but as "backdoor equity."<sup>6</sup> In this explanation, smaller companies on a rapid growth trajectory are unable to issue (long-term) debt on economic terms due to high financial distress costs and are unwilling to carve in outside investors at today's stock price. When viewed together with their inability to issue long-term debt, the unwillingness of such companies to issue straight equity sends a positive "signal" to the market about management's confidence in the future. Rather than issuing equity today, which would likely cause the stock price to fall even below current levels, management says to investors in effect, "We are confident in the firm's ability to service (lower-coupon) debt for a time (at least until expiration of the call protection period), at the end of which we expect the bonds to convert into stock at an x% premium over the current price." To the extent the market agrees with the message, such a signal allows the firm to conserve value by raising (deferred) equity on better terms.

1. This paper draws on two papers written by the authors. The first is "Agency Problems, Information Asymmetries, and Convertible Debt Security Design," forthcoming in the *Journal of Financial Intermediation* (1998). The second is an unpublished working paper entitled "Is Convertible Debt a Substitute for Straight Debt or Common Equity?" (1998).

2. See Brennan and Schwartz, "The Case for Convertibles," *Journal of Applied Corporate Finance* Vol. 1 No 2 (Summer 1988); and Jen, Choi, and Lee, "Some New Evidence on Why Companies Use Convertible Bonds," *Journal of Applied Corporate Finance* Vol. 10 No. 1 (Spring 1997).

3. A new argument by David Mayers suggests that convertible debt solves sequential financing problems. This motivation is analogous to the stage-financing concept used by venture capitalists. See *Journal of Financial Economics*, January (1998).

4. Brennan and Schwartz (1988).

5. Green, R., "Investment Incentives, Debt, and Warrants," *Journal of Financial Economics* 13 (March, 1984).

6. J. Stein, "Convertible Bonds as Backdoor Equity Financing," *Journal of Financial Economics* 32 (1992).

These two theories of convertibles—which might be dubbed the “risk-shifting” hypothesis and the “signalling” (or “backdoor-equity”) hypothesis—are not mutually exclusive. Both explanations are likely to apply to most if not all convertible issues (though with differing degrees of importance), and there is considerable supporting evidence for each. For example, studies have shown that, when compared to both straight debt and common equity issuers, convertible issuers tend to be smaller firms with higher growth rates and more volatile earnings and stock prices—findings that are consistent with both views of convertibles, as a substitute for debt and as an alternative to equity.<sup>7</sup> What’s more, the stock market appears to have reinforced this behavior by responding more positively (thus reducing capital-raising costs) to announcements of convertibles by firms with both strong growth prospects *and* limited debt capacity.<sup>8</sup>

But if the existing theory and evidence on convertibles now seems fairly persuasive, there is still an important limitation of most of the existing studies: they tend to ignore important differences in the design of individual convertible issues, thereby effectively treating all convertibles as a single homogeneous group. As corporate treasurers and investment bankers are well aware, there are a large number of variables to consider in designing the terms of a convertible issue. Besides the coupon rate, face value, issue size, and maturity, managers must also decide the conversion ratio (the number of shares promised per bond), and the amount of call protection afforded investors.

As we have demonstrated in our own recent research on convertibles, several of these features of convertible design have the effect of making a convertible more like a straight debt or a straight equity issue. For example, lowering the coupon rate and raising the conversion ratio of a given convertible issue would cause it to trade more like an equity than a debt issue. But, to offer a less obvious case, shortening the maturity and extending the period of call protection of a convertible would make the issue resemble debt rather than equity.

In this respect, managers need to know:

- when to issue convertible debt instead of common equity and straight debt; and, once the decision to issue convertible debt has been made,
- how the features of the security should be set in order to raise capital on the most advantageous terms possible.

For example, a manager who correctly decides to issue convertible debt but designs the features ineffectively is unnecessarily increasing the firm’s cost of capital. In our view, efficient financing decisions require the proper choice of security type *and* the selection of the best features for the chosen security.

Stated in brief, the aim of our work on convertibles has been to explain how specific design features help to manage financing problems faced by individual convertible issuers. By focusing on the design of convertibles, our research can be viewed as an attempt to unify (or at least to illustrate the relation between) the two main theories of convertibles. The hypothesis underlying our work is that issuers of convertibles that behave more like debt are attempting to address a somewhat different financing challenge than the issuers of convertibles that behave more like equity. Stated in brief, our research suggests that the primary aim of “debt-like” convertible issues is to reduce investors’ concerns about risk, whereas the main goal of “equity-like” convertibles is to minimize the information costs associated with raising new equity.

## TWO THEORIES OF CONVERTIBLES

Although the use of convertible debt instead of straight debt or equity may end up reducing a company’s cost of raising capital, signalling theory suggests that the market’s response to the announcement of new convertible offerings will be negative, on average. The signalling argument runs as follows:<sup>9</sup> A company’s managers are likely to know more about their firm’s prospects than outside investors. To the extent they aim to maximize the wealth of their existing (as opposed to potential) stockholders, such managers have an incentive to issue new equity when they believe the company is overvalued (or at least not undervalued). And, because part of a convertible issue’s value consists

7. A 1991 University of Chicago working paper by Stuart Essig reported that convertible bond financing tends to be used by risky firms, high-tech firms, and firms with a limited track record.

8. For a nice review of this evidence, see Jen et al (1997), cited above. Lewis, Rogalski, and Seward (1998) examine this issue in their paper entitled, “Industry

Conditions, Growth Opportunities, and Market Reactions to Convertible Debt Financing Decisions.”

9. Stewart Myers and Nicholas Majluf, “Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have,” *Journal of Financial Economics* 13 (1984).

By focusing on the design of the securities, our research can be viewed as an attempt to unify (or at least to illustrate the relation between) the two main theories of convertibles. Our underlying hypothesis is that issuers of "debt-like" convertibles are attempting to address a somewhat different financing challenge than the issuers of "equity-like" convertibles.

of an option on the company's stock, the same 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.

Because of this information "asymmetry" between managers and outside investors, corporate issuers of new securities face an "adverse selection" (or "lemons") problem whenever they issue new securities. Investors understand that some of the securities they are being offered are likely to be overvalued. And the riskier the security being offered, the greater the potential "lemons" problem, and the larger the discount the market assigns to the securities.

This hypothesis 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 a negative 1-2%.<sup>10</sup> By contrast, the market response to straight debt offerings is essentially zero.

This negative market reaction to new equity and convertible offerings causes the new securities to be issued at a lower price than otherwise and, hence, to dilute the value of the existing stockholders' claims. In this sense, the negative market reaction should be viewed as a cost of issuing the security; and throughout the rest of this article, we will refer to such costs as "information costs."

### How Convertibles Reduce Agency Costs (or the Risk-Shifting Hypothesis)

What are the benefits of convertibles that would make companies willing to incur such costs? One suggestion came from a 1984 paper by Rick Green entitled "Investment Incentives, Debt, and Warrants."<sup>11</sup> That paper demonstrated how the substitution of convertible debt for straight debt reduces potential conflicts of interest between a company's

bondholders and its stockholders (or managers acting on behalf of stockholders).

In highly leveraged companies, corporate managements are sometimes in a position to increase shareholder value *at the expense of* bondholders.<sup>12</sup> For example, management can reduce the value of outstanding bonds by increasing debt or adding debt senior to that in question. (Among finance practitioners this is known as "event risk"; among academic economists it is the "claims dilution" problem.) In leveraged companies that get into financial difficulty, management might also choose—as did many S&L executives—to invest in ever riskier projects after the debt is issued (the "asset substitution" problem). And a management squeezed between falling revenues and high interest payments might also choose to pass up value-adding (or value-preserving) projects such as R&D or, if things are bad enough, basic maintenance and safety procedures (the "underinvestment" problem).<sup>13</sup>

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.<sup>14</sup>

10. See Clifford Smith, "Investment Banking and the Capital Acquisition Process," *Journal of Financial Economics* 15 (1986); and E. Pilotte, "Growth Opportunities and Stock Price Response to New Financing," *Journal of Business* 65 (1992), among others.

11. Green (1984), cited earlier.

12. For the seminal discussion of the effect of conflicts between shareholders and debtholders (and between management and shareholders as well) on the behavior of the firm, see Michael C. Jensen and William H. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs, and Capital Structure," *Journal of Financial Economics* (1976), pp. 305-360.

13. For an account of the underinvestment problem, see Stewart Myers, "The Determinants of Corporate Borrowing," *Journal of Financial Economics* (1977). For a more detailed examination of these sources of shareholder/debtholder conflict, see Clifford W. Smith and Jerold B. Warner, "On Financial Contracting: An Analysis of Bond Covenants," *Journal of Financial Economics*, 7 (1979), pp. 117-161.

14. 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.

## How Convertibles Reduce Information Costs

As Michael Brennan and Eduardo Schwartz pointed out in a 1981 paper, convertibles are also potentially useful in resolving disagreements between managers and bondholders about just how risky the firm's activities are.<sup>15</sup> As suggested above, the value of an appropriately designed convertible is relatively insensitive to changes in company risk for the following reason: Although unexpected increases in company risk reduce the value of the bond portion of a convertible, they also increase the value of the embedded option on the company's stock (by increasing volatility). And, as Brennan and Schwartz go to argue, it is largely because of this risk-neutralizing effect of convertibles—combined with their role in reducing the “underinvestment problem” mentioned above—that convertible issuers tend to be smaller, riskier, growth firms characterized by higher earnings volatility than companies that issue straight debt.<sup>16</sup>

A new twist on the Brennan-Schwartz argument was provided by Jeremy Stein in a 1992 paper entitled “Convertibles Bonds as Backdoor Equity Financing.”<sup>17</sup> Building on the insight that many convertible bond issuers raise new 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 to build equity.

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 financing because they face high expected costs of financial distress. Lacking an investment-grade bond rating, such firms are likely to face high borrowing rates. 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 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 firms 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 conserve significant value by issuing convertibles and planning to use the call provision to force conversion when the stock price rises in the future.

## SOME NEW EVIDENCE ON THREE ASPECTS OF CONVERTIBLE DESIGN: POST-CONVERSION OWNERSHIP, MATURITY, AND CALL PROTECTION

As mentioned earlier, financial managers have considerable flexibility in choosing a security design and must make important decisions regarding issue size, maturity, coupon rate, call features, and the conversion ratio. The resulting security design influences the way both the stock market and potential new investors interpret the convertible debt issue as a financing instrument. To explore these effects, we recently conducted a study of three important design features in convertible bonds: the level of post-conversion ownership; time to maturity; and relative call protection.<sup>18</sup> The basic aim of the study was to examine how these three features varied among different issuers, and whether such variation could be linked to issuer characteristics.

Our hypothesis is that both motives for issuing convertible debt—reducing agency costs and information costs—are important in most if not all decisions to use convertibles, and that different security designs are chosen to control the type of cost

15. Brennan and Schwartz (1988), cited above. The article was first published in Vol. No. 3 of the *Chase Financial Quarterly* (Fall 1981).

16. As reported in footnote 7, a 1991 University of Chicago working paper by Stuart Essig reported that convertible bond financing tends to be used by risky firms, high-tech firms, and firms with a limited track record.

17. Stein (1992), cited earlier.

18. Craig Lewis, Richard Rogalski, and James Seward, “Agency Problems, Information Asymmetries, and Convertible Debt Security Design,” *Journal of Financial Intermediation* (forthcoming January 1998).

One of the main findings of our study is that bondholders' post-conversion ownership tends to be higher in companies with higher leverage ratios and smaller market capitalization.

**TABLE 1 ■ ISSUE- AND ISSUER-SPECIFIC SUMMARY STATISTICS FOR THE SAMPLE OF 712 CONVERTIBLE DEBT OFFERINGS BY NYSE/AMEX AND NASDAQ FIRMS OVER THE PERIOD 1978-1992**

| Descriptive Measure  | Mean   | Median | Standard Deviation | Maximum  | Minimum |
|--|--------|--------|--------------------|----------|---------|
| (1) Issue size (millions)  | 100.28 | 50.00  | 213.28             | 3,200.00 | 4.00    |
| (2) (Issue size) ÷ (Market value of common stock)(a)                           | 0.47   | 0.27   | 2.58               | 66.93    | 0.03    |
| (3) (# Shares issued upon conversion) ÷ (# Shares outstanding) (b)             | 0.17   | 0.14   | 0.11               | 1.00     | 0.02    |
| (4) (Conversion price) ÷ (Stock price) (c)                                     | 1.21   | 1.21   | 2.46               | 60.50    | 0.47    |
| (5) Call protection period (years)   | 2.10   | 2.00   | 1.06               | 5.20     | 0.00    |
| (6) Bond maturity (years)  | 21.20  | 25.00  | 4.90               | 30.00    | 9.50    |
| (7) Yield advantage (%) (d)  | 7.03   | 7.00   | 2.44               | 16.70    | 1.31    |
| (8) (Total assets after the offering) ÷ (Total assets before the offering) (e) | 1.47   | 1.34   | 0.57               | 5.72     | 0.75    |
| (9) Debt-asset ratio before the offering (f)                                   | 0.18   | 0.15   | 0.15               | 0.86     | 0.00    |
| (10) Debt-asset ratio after the offering (f)                                   | 0.25   | 0.23   | 0.14               | 0.78     | 0.01    |

(a) Market value of common equity is measured at the fiscal year end preceding the announcement date. It is measured as the closing stock price at the fiscal year end preceding the announcement date multiplied by the number of shares outstanding at the same date.

(b) Shares outstanding is the number reported at the fiscal year end preceding the announcement date plus the number of shares issued upon full conversion.

(c) The conversion premium is calculated as the conversion price divided by the market price per share on the day preceding the issue announcement.

(d) Yield advantage is the difference between the yield on the convertible bond issue and the dividend yield on the common stock at the issue date.

(e) Total assets are estimated by their book values reported at the fiscal year end.

(f) Debt ratio is calculated as the book value of long-term debt divided by the market value of the firm at the fiscal year end.

that is larger for a given issuer. In short, different firms offer convertible debt for different reasons. And the two theories not only suggest why firms issue convertible debt, but also offer clues as to how managers should design specific features of the security. Therefore, we investigate differences in the actual security features chosen by managers to examine whether these design characteristics are consistent with the agency and information cost motives for convertible debt.

We began by compiling a sample of convertible debt issues from a listing of all domestic public offerings of convertible debt in the *Investment Dealers' Digest Domestic and International New Issues* database for the years 1979 through 1992. After eliminating all issues by financial institutions or regulated public utilities, we ended up with a sample of 712 convertible bond issues by 575 different issuers. In 465 of the 712 issues, the common equity was listed on the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) at the time of the offer announcement. In the remaining 247 cases, the issuer's common equity traded on the Nasdaq.

As can be seen in Table 1, there is considerable variation among specific design features in our

sample of convertibles. For example, although the average issue size is about \$100 million, the median is only \$50 million, and it ranges from a high of \$3.2 billion to a low of \$4 million. Issue size as a percentage of total market capitalization shows a similar pattern. Although the average convertible debt issue represents approximately 47% of the market value of the issuer's common stock prior to announcement, the median case is only 27%, and there is a good deal of variation around this median.

### Post-conversion Ownership

Post-conversion ownership is defined as the proportion of common equity owned by the convertible bondholders assuming full conversion. Upon conversion, the average offering allocates 17% of the equity to convertible bondholders (the median value is 14%), but this percentage ranges from 100% to 2%. The average conversion premium is 21%.

One of the main findings of our study is that bondholders' post-conversion ownership tends to be higher in companies with higher leverage ratios and smaller market capitalization. We also find that post-conversion ownership tends to be higher in companies whose convertibles have lower conver-

sion premiums. These results would appear to lend support to both theories of convertibles. As the risk-shifting argument would suggest, companies with high debt levels must give larger fractions of equity ownership to convertible bondholders to allay investors' concerns about risk and potential asset substitution.<sup>19</sup> But these findings could also be interpreted as furnishing support for the "information" or "backdoor equity" argument. One would expect smaller firms to fall into the category of "equity-like" convertible issuers because there is typically less public information about these firms. They are often younger companies that have failed to attract much attention from Wall Street equity analysts.

In addition, we find that convertible issues with higher than expected levels of post-conversion ownership also have shorter maturities and less call protection. But it is not entirely clear what this tells us. On the one hand, shorter maturities and call protection periods make issues more "debt-like" by reducing the probability of conversion; and this may be interpreted as management's attempt to give "excessively equity-like" convertibles a more "normal" distribution of debt and equity components.<sup>20</sup> But, as we discuss immediately below, there may be another reason for otherwise equity-like convertibles to have shorter maturities.

### Time to Maturity

We also find that convertible debt has a relatively long maturity. The average time to maturity is 21.2 years (with a range of 9.5 to 30 years) and a standard deviation of 4.9 years.

Our principal finding with respect to maturity is that companies with valuable growth opportunities (as measured by high market-to-book ratios) issue convertible debt with shorter maturities. As mentioned above, because shorter maturities decrease the probability that an issue is converted into common equity, the main effect is to make such

issues "more debt-like" by reducing the odds that conversion will take place.

But if we would expect convertible issues by growth firms to be more "equity-like" on the whole, such issuers may also have good reasons to prefer shorter maturities. As Michael Barclay and Clifford Smith reported in a recent article in this journal, companies with high market-to-book ratios tend to have less significantly less (straight) debt to begin with; and what debt they have tends to carry short maturities.<sup>21</sup> As Barclay and Smith interpret their findings, growth companies make such choices both to protect lenders against the greater uncertainty associated with such businesses (including the risk-shifting problem mentioned earlier) and to preserve their own ability to make strategic investments (that is, to guard against the underinvestment problem).<sup>22</sup>

It is also interesting to note (as shown in Table 2) that the average time to maturity tends to increase over the period 1979 through 1988, and then decreases each year thereafter. This is similar to the pattern followed by the number of convertible debt issues, the inflation rate based on the Consumer Price Index, and the Leading Indicators Index. Taken together, these findings suggest that firms issue convertible bonds with longer maturities when credit is relatively easy to obtain and investors' expectations about the economy are high. It is also consistent with the notion that information and adverse selection costs vary with time and across the business cycle.

### Relative Call Protection

Our study also finds that call provisions are included in the majority of convertible debt issues. Overall, 673 of the 712 issues are callable. The median time to first call is 2.00 years. Of the 673 callable offerings, 84 are callable immediately after issue. For the remaining 589 callable issues, the median length of call period protection is 2.76 years.

19. The risk-shifting problem is mitigated to some extent in large firms, possibly because the larger asset base serves as better collateral for the debt. All else equal, the larger asset base would attenuate shareholder gains from asset substitution.

20. If a convertible bond has a relatively low amount of post-conversion ownership and a long time to maturity, there exists a convertible with an equivalent (debt-equity) design with a higher level of post-conversion ownership and a shorter maturity. With this idea in mind, one might argue that shortening the maturities of issues with high post-conversion ownership is an attempt by management to adjust issues that would otherwise appear "too equity-like" given the characteristics of the issuer by increasing the size of the debt component.

21. Michael Barclay and Clifford Smith, "On Financial Architecture: Leverage, Maturity, and Priority," *Journal of Applied Corporate Finance*, Vol. 8 No. 4 (Winter 1996)

22. In this sense, our distinction between motives for equity-like and debt-like convertibles begins to break down. That is, like the issuers of convertibles we have called debt-like, equity-like issuers face "agency costs" as well as "information costs," and equity-like issuers' reliance on short maturities can be seen as a means of addressing both problems at once.

Our principal finding with respect to maturity is that companies with valuable growth opportunities (as measured by high market-to-book ratios) issue convertible debt with shorter maturities.

**TABLE 2**  
ANNOUNCEMENT DATES BY YEAR FOR THE SAMPLE OF 712 CONVERTIBLE DEBT OFFERINGS BY NYSE/AMEX AND NASDAQ FIRMS OVER THE PERIOD 1978-1992 AND BUSINESS CYCLE VARIABLES\*

| Year | Number of Offerings | Cumulative Percentage of Sample | Composite Index of 11 Leading Indicators | Inflation Rate Based on CPI | Average Time to Maturity |
|------|---------------------|---------------------------------|--|-----------------------------|--------------------------|
| 1978 | 6+                  | 0.80%                           | 1.000                                    | 0.076                       | n.a.                     |
| 1979 | 16                  | 3.10                            | 0.982                                    | 0.112                       | 9.851                    |
| 1980 | 70                  | 12.90                           | 0.969+                                   | 0.122**                     | 20.036                   |
| 1981 | 41                  | 18.70                           | 0.971                                    | 0.101                       | 20.925                   |
| 1982 | 42                  | 24.60                           | 0.964                                    | 0.058                       | 22.341                   |
| 1983 | 67                  | 34.00                           | 1.025                                    | 0.025                       | 23.020                   |
| 1984 | 41                  | 39.70                           | 1.033                                    | 0.042                       | 24.436                   |
| 1985 | 92                  | 52.70                           | 1.049                                    | 0.033                       | 24.092                   |
| 1986 | 127**               | 70.50                           | 1.064                                    | 0.016+                      | 24.470                   |
| 1987 | 84                  | 82.30                           | 1.084**                                  | 0.042                       | 24.769                   |
| 1988 | 25                  | 85.80                           | 1.082                                    | 0.039                       | 25.298                   |
| 1989 | 39                  | 91.30                           | 1.073                                    | 0.046                       | 25.434                   |
| 1990 | 20                  | 94.10                           | 1.069                                    | 0.054                       | 26.385                   |
| 1991 | 30                  | 98.30                           | 1.073                                    | 0.037                       | 20.970                   |
| 1992 | 12                  | 100.00%                         | 1.078                                    | 0.031                       | 21.131                   |

\*The business cycle variables are the composite index of 11 leading indicators (1977 = 1.00), and the inflation rate is based on the Consumer Price Index (CPI) for all urban consumers, all items. The data source is the Business Cycle Indicators Economic Series data base.

\*\*Indicates the maximum value over the sample period.

+Indicates the minimum value over the sample period.

n.a. Due to missing COMPUSTAT data items we are unable to estimate the average time to maturity.

One effect of the short call protection is to decrease the effective maturity of the convertible debt. Unlike straight debt, where the call functions primarily to allow firms to refinance straight debt when interest rates fall,<sup>23</sup> the role of the call in convertibles is to force conversion and so provide "backdoor equity" to support future growth. For this reason, we would expect to see less call protection in issues by companies with greater confidence in their expected future performance.

To test this theory, we used a company's market-to-book ratio as a proxy for its degree of expected superior performance and price appreciation. As predicted, companies with higher market-to-book ratios, and thus presumably greater confidence in the future, tended to choose less call protection. At the same time, we found that those issues with greater-than-expected call protection have lower levels of post-conversion ownership and shorter maturities.

## IS CONVERTIBLE DEBT A SUBSTITUTE FOR DEBT OR EQUITY?

In an as yet unpublished working paper, we also compared a subset (203) of the convertible issuers from our published study to a sample of 259 straight debt and 182 common stock issues from 1977 through 1984.<sup>24</sup> The purpose of this study was twofold: first, to divide all convertibles into two groups ("debt-like" and "equity-like"); and, second, to determine whether there are differences between the issuers in these two groups, and between straight debt issuers and "debt-like" convertible issuers, and between issuers of "equity-like" convertibles and straight equity.

### Comparing "Debt-like" and "Equity-like" Convertible Debt Issuers

We began by classifying each of the 203 convertible debt issues as either "debt-like" or "equity-

23. This result highlights an important difference between convertibles and straight debt, because the use of call provisions in straight debt has diminished recently. In their paper entitled "Alternative Tests of Agency Theories of Callable Corporate Bonds," *Financial Management*, 23, 1994, 3-20, Crabbe and Helwege find that an increasing proportion of straight corporate debt issued since 1982 has

been non-callable. They find that straight corporate debt issues with call provisions are most likely to be speculative grade, or investment grade with 30 or more years to maturity.

24. K. Jung, Y. Kim, and R. Stulz provided the sample of straight debt and common stock issues.

like" based on a measure of the probability that the firm's stock price will increase so that the bond is converted into common equity. A convertible debt issue was classified as "debt-like" if, on the issue date, the probability of conversion appeared to be less than 50%.<sup>25</sup>

Perhaps the most important finding is that the equity-like convertible debt issuers have significantly lower dividend yields and higher market-to-book ratios. Although the lower dividend yield actually influences the classification by *increasing* the probability of conversion, the two measures taken together are a reliable indicator of larger growth opportunities and hence greater information costs associated with raising equity. We also find that debt-like convertible issuers are riskier than equity-like issuers, as indicated by the higher volatility of stock returns. Debt-like issuers also appear to face higher tax liabilities, presumably because they have larger, or at least more predictable, taxable income. Finally, as one might expect, the issuance decisions of equity-like convertible issuers are more sensitive to general economic conditions than the decisions of debt-like issuers in the sense that companies tend to issue equity-like issues when the outlook for the economy is good (as measured by the six-month leading indicators) and when they presumably have more good investment projects.

In sum, there appear to be important differences in the extent of investment opportunities, economic conditions, and tax considerations that explain much of the cross-sectional variation between "equity-like" and "debt-like" convertible debt issuers. Perhaps most striking, the pronounced differences in the proxies for growth potential between the two groups suggest the importance of information asymmetries and the associated costs in the design of convertibles.

### **Do "Debt-like" Convertibles Substitute for Straight Debt?**

The most notable difference between straight debt issuers and "debt-like" convertible issuers is that the convertible issuers have significantly greater

stock return volatility than the straight debt issuers. And this result is, of course, completely consistent with the explanation that views convertibles as an alternative to straight debt. Moreover, while total risk is an important discriminator between straight debt issuers and convertible debt issuers, there is no significant difference in levels of systematic risk.

Straight debt issuers also are significantly larger companies, make larger issue offerings, and operate with higher debt levels. Each of these factors together suggest that straight debt issuers have greater ability to service debt, larger collateral for lenders, and greater use for the larger tax shields provided by straight debt.

### **Do "Equity-like" Convertible Debt Issues Substitute for Common Equity?**

As expected, the market-to-book ratio proved to be far and away the best discriminator between common equity issuers and "equity-like" convertible debt issuers, with convertible debt issuers having greater market-to-book ratios than the common equity issuers. As mentioned earlier, the market-to-book ratio is a proxy for the extent of growth opportunities and, thus, for "information costs" in raising new equity.<sup>26</sup>

We also found that the size of issue proceeds as a percentage of the issuer's market equity capitalization was larger for convertibles than for straight equity issuers. To the extent that adverse selection costs are related to issue size, our results suggest that issuers may substitute convertible debt for common equity to reduce information costs. At the same time, however, the convertible debt *issuers* are also substantially *smaller* than the common equity issuers (where size is measured by the market value of the issuer's common stock), which again is consistent with "equity-like" convertible debt issuers facing potentially larger adverse selection costs.

### **CONCLUSION**

The design of convertible debt is an important issue—one that has been largely overlooked in existing studies—for companies considering a con-

25. This probability was estimated as the "risk-neutralized" probability that the issue is converted into common equity at maturity under the assumption that the continuously compounded return is lognormally distributed.

26. Our results have received independent confirmation by a Federal Reserve study that showed that capital expenditures as a percentage of total assets are

considerably larger for convertible issuers in general than for either straight debt or equity issuers. See Jean Helwege and Nellie Liang, "Financing Growth After the IPO," *Journal of Applied Corporate Finance*, Vol. 8 No. 4 (Winter 1996).



**Equity-like convertible debt issuers have significantly lower dividend yields and higher market-to-book ratios [than debt-like issuers]. These two measures taken together are a reliable indicator of larger growth opportunities and hence greater information costs associated with raising equity.**

vertible issue. Our research on the design of convertible provides a means of investigating the two most prominent theories of convertible debt financing. The first theory suggests that managers substitute convertible debt for straight debt to reduce investors' uncertainty about risk, and about agency costs stemming from "risk-shifting" and underinvestment problems. The second maintains that managers substitute convertible debt for common equity to minimize information costs (e.g., dilution of equity) that can make straight equity offerings especially expensive. Our results suggest that both motives are important in the convertible debt issuance decision.

Specifically, we find that some issuers seem to use convertible debt to control agency conflicts between bondholders and stockholders, while other issuers seem to use it as backdoor equity financing that ends up reducing information costs.

One of the objectives of the security design problem is to choose the optimal proportions of the debt and equity components by adjusting the contractual features of the convertible bond. The resulting security design may structure the convertible issue to be "debt-like" or "equity-like," depending on whether agency costs or adverse selection costs are a more serious problem for the issuer.

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