Dwight Jaffee
Princeton University

Andrei Shleifer
University of Chicago

Costs of Financial Distress, Delayed Calls of Convertible Bonds, and the Role of Investment Banks*

I. Introduction

Convertible bonds are distinguished from straight debt securities by a *conversion option* that allows bondholders to convert the bonds into a fixed number of common shares, and by a call option that allows firms to call the bonds for cash redemption at the call price. Rational bondholders will voluntarily convert bonds to stock only when the bond's yield advantage (the interest coupon on the bond less the dividend on the converted shares) is negative. But even if the bond's yield advantage is positive, a firm can still exercise its call option and force conversion by bondholders if the bonds are in the money, that is, the bond's conversion value (the market value of converted stock) exceeds its call price. In a forced conversion, the firm calls the bonds for cash redemption, and the bondholders are given a notice period, usually 30 days, to decide whether to convert the bonds to stock or to tender them for cash. Rational bondholders would convert to stock if the bond is in the money at the end of the notice period. Forced conversion thus eliminates the yield advantage and expropriates the conversion option from bondholders. As shown by Brennan and Schwartz (1977) and by Ingersoll (1977a), shareholder interest requires a firm to force conversion as soon as the bond comes in the money.

Firms appear to systematically delay bond calls that force conversion, often for months and sometimes for years, beyond the time at which the bond first comes in the money. Ingersoll (1977b) reports that the median company waited until the conversion value of bonds was 44% in excess of the call price. Similar findings are analyzed by Constantinides and Grundy (1986) in their painstaking study of forced conversions. Explanations of this puzzling delay of forced conversion of in-the-money bonds with a positive yield advantage include the signaling of the value of the conversion option (Harris and Raviv 1985) or of future dividend increases (Constantinides and Grundy 1986) through delay, interest deductibility of debt (Mikkelson 1981, 1983), and the irrationality of "sleepy" bondholders who fail to convert bonds that even have a negative yield advantage (Ingersoll, 1977b).

This article offers an alternative explanation of delay based on the risk that forced conversion fails and thereby creates costs of financial distress for the firm. A forced conversion fails if the stock price falls during the notice period so that the bond is out of the money at the end of that period.[1] Bondholders then tender for cash, and the firm must proceed to raise the cash to pay them. Costs of financial distress are associated with raising this cash if, for example, it is expensive for the firm to borrow in imperfect capital markets, or if the firm is regulated and cash disbursements conflict with its capital requirements. Costs of financial distress—bankruptcy costs, costs of violating bond covenants, or, more generally, costs of having to raise funds on short notice—are often used to explain other aspects of corporate financial decisions such as the limited use of debt financing tax shield (see Miller [1988] for a survey). In this spirit, we consider costs of financial distress as an explanation of the forced conversion puzzle.

There is some reluctance among economists to rely on the costs of financial distress in explaining corporate behavior since these costs are not perceived to be high enough.[2] We suggest that these costs might be reasonably high for firms calling convertible bonds. But one should also recognize that the cost of delayed conversion—to which the cost of financial distress must be compared—is, in most cases, quite small.

---

1. There are two examples of a failed forced conversion unrelated to control activity that we have been able to identify, based on the samples of Ingersoll (1977b), Constantinides and Grundy (1986), and reading of the *Wall Street Journal*. In 1973 a forced conversion by Echelin failed subsequent to the market decline following the OPEC oil price increase. Based on our calculations, Kidder Peabody, the investment bankers underwriting the conversion, lost over $5 million on the deal. In 1987 a call by IBM of its Eurobond, the conversion value of which was tied to the price of Intel stock, failed after the October 19 market crash. According to *Barron's* (December 14, 1987), IBM lost over $12 million as a result of having to pay bondholders in cash rather than in Intel stock that IBM was holding at the time.

2. Warner (1977) finds that bankruptcy costs can be a very small fraction of assets. Alternatively, Cutler and Summers (1987) suggest that financial distress has been very costly to Texaco shareholders in its legal dispute with Pennzoil.

To see this, consider a hypothetical firm with a convertible bond issue representative of the samples in available empirical studies. The convertible issue of this firm is about 15% of the value of equity (Dann and Mikkelson 1984). While the available data do not allow us to gauge the median length of the delay, in the Constantinides and Grundy sample it is probably under 2 years, as long as the bond is continuously in the money. Suppose, therefore, that the hypothetical firm delays the forced conversion by 2 years. Finally, suppose that the difference between the yield on the convertible and on the corresponding stock is 6%, which is an unusually high positive yield advantage. After tax, then, the firm is paying convertible bondholders 3% more on their securities than it would have to pay if it forced them to convert. Since the bond issue is 15% of equity, over 2 years this hypothetical firm is giving up .15*.03*2 = .009 or .9% of the market value of its equity as a result of delaying the forced conversion. Although for some firms this can be a large amount of money in absolute value (Constantinides and Grundy 1986), the delay is clearly not a costly problem as a fraction of the value of equity. This observation is important to keep in mind in evaluating the plausibility of the costs of a failed conversion as an explanation of the puzzle.

In our model, when financial distress is costly, the fundamental value of the firm falls when conversion fails. Analogous to Diamond and Dybvig's (1983) bank runs, two equilibria can then exist: forced conversion succeeds if bondholders expect it to succeed and fails if bondholders expect it to fail. To see this, suppose that a firm, following Ingersoll's (1977a) advice, forces conversion when its bond is just at the money (i.e., just when choosing stock rather than cash first becomes in the interest of bondholders), and suppose also that the notice period is zero. If bondholders expect conversion to succeed, they convert to stock, the firm retains its fundamental value, and conversion succeeds. If, in contrast, bondholders expect conversion to fail, they expect the fundamental value of the firm to fall reflecting the costs of financial distress. The decline in fundamental value depresses the stock price so that the bond, which is initially at the money, falls out of the money. Bondholders then rationally tender their bonds for cash, and the conversion indeed fails, justifying the depressed price of the stock.

The prospect of failed conversion reduces the expected benefits to the firm of forcing conversion. In addition, the firm's managers may be extremely averse to this prospect. An obvious response is to delay conversion until the firm's value and stock price rise enough to ensure that the bond will remain in the money even after subtracting the costs of distress. Rational bondholders could then only expect the forced conversion to succeed, and it would unambiguously succeed. Since, as we suggested earlier, the cost of continuing to pay more bond interest than the implied dividends on converted stock is not very high, the

costs of financial distress need not be implausibly large to explain why firms delay forced conversions.

As an alternative to delay, an investment bank can provide a standby facility that eliminates the distress cost associated with a failed conversion. In a standard underwriting agreement, the investment bank essentially sells to the firm a put option with a strike price equal to the stock price at which the firm wants to force conversion. This arrangement transfers to the bank the cost of a failed conversion. Should the bond fall out of the money during the notice period, the investment bank buys the bonds tendered for cash, converts them to stock, and sells the stock in the open market. In this event, the firm is fully sheltered from the risk and cost of a failed conversion, while the investment bank suffers a loss when it pays more for the bonds than it receives from selling the stock.

This use of an underwriter eliminates the distress cost of a failed conversion as a reason for delay. The investment bank protects the firm from a self-fulfilling "bad" equilibrium—where bondholders expect the forced conversion to fail and therefore it does fail—in the same way that deposit insurance provides protection against bank runs (Diamond and Dybvig 1983). With an investment bank, the firm's fundamental value is unaffected by a failed conversion. In the case without the notice period, bondholders correctly anticipate that conversion must succeed, and it does succeed in equilibrium. Moreover, since conversion always succeeds in this case, there is no risk for the investment bank, and its fee (option premium) is therefore zero, reflecting the zero time premium of an at-the-money put option when the notice period (time until expiration) is zero. This logic explains why some firms use investment banks to underwrite a forced conversion. But it also implies, at least in the simple case of no-notice period, that firms using investment banks should not delay conversion.

The role of the investment bank becomes more complicated when the 30-day notice period is taken into account. A positive option premium is then required, for if the stock price falls during the notice period for fundamental reasons independent of the forced conversion, the investment bank suffers a loss if the bond falls out of the money. Still, if the investment bank is either risk neutral or can replicate the option it writes with other securities, it will charge the firm the arbitrage (Black-Scholes) price of the option. In this case, the firm will, as before, call the bond as soon as it comes at the money, as in Ingersoll (1977*a*). Such a perfect investment bank eliminates the need to delay a forced conversion, with or without the notice period. Unfortunately, in this case, the observed delays of forced conversions remain puzzling.

Unlike the perfect underwriters who charge the arbitrage price of the option, real-world investment bankers apparently refuse even to offer option contracts when the bond is at the money; equivalently, their

fees for at-the-money conversion far exceed the normal time premium cost of providing the option. Instead, they will participate only if forced conversions are delayed until the bond is deep in the money. While this practice explains why even underwritten forced conversions are delayed, it opens the question of why investment banks insist on the delay.

Our answer is that underwriting at-the-money forced conversions is risky, and that investment bankers are averse to the particular kind of risk this entails, namely, a small probability of a very large loss.[3] In underwriting a forced conversion, unlike many other similar transactions, the bank has relatively large amounts at stake, is exposed to risk for a considerable period (the notice period), and faces legal limits on its ability to engage in hedging and market stabilization. For these reasons, the bank insists on a delay and requires an underwriting fee much higher than the arbitrage price of the option.

Our explanation of delayed conversion then has two parts. A firm forcing conversion on its own will delay the conversion to avoid the risk that a failure would bring on costly financial distress. A firm using an investment bank, in contrast, is protected from this risk, and so it should force conversion without delay if it could buy fairly priced insurance against the decline of its fundamental value during the notice period. The actual price of this insurance will, however, be considerably higher if the underwriter is risk averse or cannot hedge the option it writes with other securities. With a notice period, then, a risk-averse investment bank will still insist on the firm's delaying its forced conversion. With plausible magnitudes of the costs of delay, of financial distress, and of underwriting, delay of a forced conversion seems to be the cheapest way to proceed.

Section II continues the analysis with a simple model of the usual case of a perfect capital market. Section III considers the case of the firm going it alone and illustrates the two equilibria arising in the presence of costly financial distress. Section IV shows how an underwriter of the conversion can eliminate the bad equilibrium. Section V then examines why the investment bank would nonetheless insist on delayed conversion. Section VI presents some implications of the argument, and Section VII concludes.

II. A Simple Model

The results in this study are easiest to demonstrate using a discrete-time two-period model, rather than the more elegant continuous-time

---

3. Underwriting forced conversions is only one of many examples of risk-averse behavior by investment bankers. Other examples include spot to future stock-index arbitrage and the underwriting of initial public offerings.

model of Ingersoll (1977*a*). Moreover, much of our analysis can be done without reference to the uncertainty of stock returns or to the notice period. While this ignores the put option that shareholders expropriate from bondholders when they force conversion, it allows us to focus on the yield advantage effects (interest higher than dividends), the paramount importance of which has been documented by Constantinides and Grundy (1986). We return to the valuation of the put option in Section V.

We consider a firm with stock that is not paying dividends, and bonds that are paying interest R, so that the yield advantage of bonds is clearly positive. We abstract from taxes, so that the shareholders' discount rate is also R. Let V be the value of the firm's assets at the initial date 1. To contrast our theory with the asymmetric information explanations, we assume that V is publicly known. Under certainty, it is natural to assume that the value of the firm grows at the rate R between dates 1 and 2, although this assumption is made only for convenience. Suppose that the firm's outstanding securities include b convertible bonds and s shares of stock. Without loss of generality, we can assume that the bond's call price is equal to its face value, K, and that the conversion ratio is 1. The value of the firm per fully diluted share then is $V/(b + s)$, which is also the stock conversion value of a bond.

At date 1, the firm decides whether to force conversion. If it proceeds, bondholders either convert to 1 share of stock or they take the face value of their bond, K, in cash. When all bondholders take cash, we say that conversion fails; when all take stock we say that it succeeds (we shall comment on intermediate cases). If the firm decides not to force conversion, then bondholders wait until date 2, when they collect KR in interest per bond and also decide whether voluntarily to convert their bonds into shares or to take cash. Because of the positive yield advantage of bonds assumed in our model, bondholders never convert voluntarily at date 1.

To begin, we prove a simple version of the standard result, under the assumption of zero notice period:

PROPOSITION 1.   The firm wants to force conversion if $V > K(b + s)$.

Proof.   If the firm forces conversion, each bondholder will take a share worth $V/(b + s)$ rather than cash worth K. Each shareholder then also gets $V/(b + s)$. If the firm does not force conversion, then at date 2 bondholders collect KR per bond and then choose between K and $(V(1 + R) - bKR)/(b + s)$. Under our assumption, it is easy to verify that they will take stock. In this case, the date 1 wealth of stockholders if the firm does not force conversion is given by $V/(b + s) - bKR/\{(b + s)(1 + R)\}$. In other words, if the firm does not force conversion, the value of each shareholder's claim is diluted by the present value of interest payments per fully diluted share. Hence the firm clearly wants to force conversion.

REMARK. In this discrete time framework, the firm sometimes wants to force conversion even if $V < K(b + s)$. In this case, bondholders take K in cash, conversion fails, but shareholders save all the interest. This result is purely a consequence of the assumption that between dates 1 and 2, the amount of interest payments is large and discrete. If time is continuous and the bond is out of the money (i.e., $V < K(b + s)$), it always pays to delay conversion until $V = K(b + s)$, just as proved by Brennan and Schwartz (1977) and Ingersoll (1977*b*). In this article, we only consider the puzzle of in-the-money convertibles; hence proposition 1 is all we need.

The logic of proposition 1 in our model is very simple, as has been explained in the more general context by previous researchers. With a positive yield advantage for bonds, which certainly obtains when the stock is not paying dividends, stockholders use forced conversions to deprive bondholders of the present value of their excess interest payments. In this world of the Modigliani and Miller theorem, the total size of the pie to be divided between bondholders and shareholders is fixed. Forced conversion is a redistribution of that pie toward shareholders relative to the no-forced-conversion division.

III. The Case of Costly Failed Conversion

Suppose we now amend the model to allow for the possibility of costly failed conversion. That is, when each bondholder chooses to take K in cash, and the firm must dispense bK in cash to satisfy them, we assume the firm as a whole incurs a cost C of failed conversion. This cost C may be significant for the firm for a variety of reasons.

First, capital regulations and other debt covenants may prohibit the cash redemption of convertible bonds. Banks, for example, are frequent issuers of convertible bonds because convertible debt is included in the capital computations made for regulatory purposes. A failed conversion removes the debt from the capitalization, without replacing it with stock, which may cause the bank to violate its capital requirements. For the same reason, failed conversions can cause firms to violate bond and loan covenants associated with their other debt issues.

Second, it may be expensive and even impossible for firms with failed conversions to raise cash immediately for the redemption payment. It is important to recognize in this regard that the median convertible bond issue is around 15% of the value of the firm's equity and that convertibles are often issued by firms with modest credit ratings precisely because these firms had difficulty issuing straight debt in the first place.

The upshot is that the cost C of failed conversion need not be small relative to the firm's value V. Conversion failure costs are analogous to bankruptcy costs in that both arise from the firm's financial structure in

the world of imperfect capital markets. Just as the Modigliani and Miller theorem fails in the case of bankruptcy costs, so does proposition 1 fail in the case of failed conversion costs. This is formalized in proposition 2.

PROPOSITION 2.   Suppose that $K(b + s) < V < K(b + s) + C$ and that the notice period is zero. Then the forced conversion succeeds or fails as bondholders expect it to succeed or to fail.

Proof.   Suppose that bondholders expect the conversion to succeed. Then the value of the share, $V/(b + s)$ exceeds K, and they take shares. As a result, conversion succeeds. Suppose, instead, that bondholders expect the conversion to fail. Then each share they get is worth $(V - C)/(b + s)$, which we assumed is less than K. In this case, each bondholder takes cash and conversion fails.

REMARK.   There is also an equilibrium in which each bondholder expects conversion to succeed with probability f, such that he is indifferent between taking shares or cash (assuming risk neutrality). In this equilibrium, each bondholder plays a mixed strategy of taking a share with probability f. This equilibrium, however, is unstable since if one extra bondholder takes cash, then everybody would strictly prefer taking cash and conversion fails.

Proposition 2 implies that, even in the absence of the notice period, if a firm forces conversion before its value net of fully diluted costs of failure exceeds the call value of the bond, then conversion might fail. To the extent that expectations are autonomous, either equilibrium can obtain in this range. Alternatively, still assuming the notice period to be zero, if the forced conversion is delayed until $V = K(b + s) + C$, then the firm has enough assets for conversion to succeed, even if the bondholders expect it to fail. The bad equilibrium then no longer exists.

A firm's managers can try to force conversion of the firm's bonds when the stock price P is in the range $K < P < K + C/(b + s)$, in which case the conversion might fail, or they can wait until the price P exceeds $K + C/(b + s)$, in which case the conversion will succeed. The managers' decision depends on the size of the yield advantage, on their estimates of the probability that the bad equilibrium occurs, and on any additional costs that they themselves face when conversion fails. The more risk averse the managers are, the more they will dread the possibility of a failed conversion, and the longer they will delay. Plausibly, managers, more than shareholders, are the source of such risk-averse preference for delay since managers are the ones who have to deal with regulatory authorities, other debt holders, or the capital market if conversion fails.

An assured success of forced conversion thus requires that the bond's conversion value exceed its call price by some margin at the announcement date. With a zero notice period, this margin must at

least equal the cost of financial distress $C/(b + s)$ to eliminate the bad equilibrium. With a discrete notice period, the fundamental value of the firm could also fall for reasons unrelated to the conversion, so an even larger margin may be necessary.

The question, then, is whether the costs of failure, including the effects of unrelated stock movements during the notice period, adequately account for the observed delays and 44% conversion premia. We think the answer is yes, both because the costs of delayed conversion are relatively small and because the costs of financial distress can be nontrivial. Regarding the costs of delay, recall from the introduction that for a typical firm they are likely to be below 1% of the market value of equity. It does not take a high expected cost of a failed conversion to justify delay in these circumstances. But it is also the case that the expected costs of a failed conversion are not negligible, especially in the presence of the notice period.

First, even if the bond is called at a premium exceeding $C/(b + s)$, the stock price can fall during the notice period. In this case, even if the "bad" equilibrium does not exist at the stock price at which the bond is called, it might still obtain if the stock price falls. If the managers are extremely averse to the possibility of a failed conversion, they will wait until the stock price is well above $K + C/(b + s)$. In this case, the cost of financial distress is only a lower bound on the conversion premium.

Perhaps what is more important, the stock price is likely to fall during the notice period if there is adverse news about the firm or about the market as a whole. But these are precisely the times when credit markets are in disarray, and the costs of financial distress are the highest. That is, the cost C might unexpectedly rise precisely when the share price falls, making the conversion more likely to fail. The desire to avoid dealing with credit markets precisely at the time when credit rationing might be most severe is, of course, yet another reason to extend the delay.

The importance of costs of financial distress in explaining other patterns of corporate choice is a useful point of comparison. These costs, for example, are commonly used to explain why firms adopt low debt-equity ratios despite the significant tax advantages of leverage. Firms maintain excess debt capacity because they fear that adverse shocks will reduce their ability to meet interest payments, even if current cash flows are compatible with a much larger level of debt (Donaldson 1969). Moreover, firms realize that the costs of a failure to meet interest payments are the highest precisely at the times when this failure is most likely. Just as firms carry only the debt they can service in almost all events, they delay the forced conversion until they are certain that it will succeed in virtually every contingency. Moreover, unlike the case of debt, where the cost of avoiding leverage can be substantial, the cost of delaying a forced conversion is not very large.

IV.   The Use of Investment Bankers When the Notice Period Is Zero

We next consider an alternative mechanism that allows firms to force conversion efficiently and promptly. The basic difficulty with forcing conversion when the bond is just at the money is the dependence of the firm's fundamental value on the outcome of the forced conversion. Similar to bankruptcy costs, the costs of a failed conversion create a dependence of value on capital structure that is inconsistent with the Modigliani and Miller theorem. To solve this problem, the firm must separate its fundamental value from the outcome of the forced conversion.

This can be accomplished by an investment bank. Under the standard "standby" underwriting agreement, the investment bank stands ready to buy bonds from bondholders at a price that just exceeds the call price of the bond. Bondholders who wish to obtain cash then tender to the investment bank rather than to the firm. The standard agreement further requires the investment bank to convert all the bonds it buys into stock and to sell the stock in the open market. The investment bank will suffer a loss on bonds tendered to it because rational bondholders tender for cash only when the cash price of a bond exceeds its stock conversion value. The investment bank is compensated for this risk by an up-front fee paid by the firm. This arrangement essentially represents a put option written by the investment bank and sold to the firm.

With such an agreement, the firm never incurs the cost of a failed conversion. Even when the investment bank bears the costs, the value of the firm is V regardless of the outcome of the forced conversion. Consequently, if V is at least equal to K, bondholders take shares even if they expect conversion to fail, and the failed conversion equilibrium disappears. The investment bank gives the firm access to a perfect capital market and so eliminates the bad equilibrium. The model thus explains why firms use investment banks to intermediate forced conversion and to eliminate inefficiencies that arise from capital market imperfections.

If we also assume that the investment bank writing the put option does so at the arbitrage (i.e., Black-Scholes) price of that option, we get the further result that firms using underwriters should not delay a forced conversion. Since the costs of a failed conversion are no longer relevant, we are back to Ingersoll's (1977a) result that the bond should be called at the money if the notice period is zero or even earlier with a positive notice period. If the investment bank is risk neutral, or if it can mimic the option it sells to the firm by using other securities and thereby hedge the risk, it will charge the competitive arbitrage price for this underwriting contract. The firm will buy the contract at that price and call the convertible bond as if the costs of financial distress were

zero, that is, slightly before it is at the money. Without the notice period, the forced conversion always succeeds; hence the competitive arbitrage price of the put option and underwriting contract is zero.

The analysis thus far explains why firms forcing conversion would choose to use underwriters. However, it also predicts that as long as investment banks price these underwriting contracts at their arbitrage value, firms should not delay conversion, with or without the notice period. The puzzle of delayed conversion therefore still remains to be solved.

V. The Notice Period and Risk-averse Investment Bankers[4]

Empirically, the delays observed on bond calls underwritten by investment banks are as long as the delays observed when firms operate on their own. Investment banks are apparently unwilling to provide standby agreements unless the stock sells at a substantial premium; equivalently, the banks would demand very high underwriting fees when the bond is at the money. Faced with a price of the put option that is much above its competitive arbitrage value, a firm using an investment bank delays the forced conversion. This, of couse, only shifts the issue to why the investment banks insist on delay or charge very high fees. We now discuss why this behavior of investment banks can be interpreted as a risk-averse response to various events that might occur during the 30-day notice period.

With the 30-day notice period, the price of the underwriting contract will reflect the chance that the firm's fundamental value (and stock price) per share falls below K, conversion fails, and the investment bank suffers a loss from buying the bonds, converting them to stock, and selling the stock at a relatively low price. The price of the stock can fall significantly during the 30-day notice period if (a) the market falls sharply, (b) the market revalues the stock for idiosyncratic reasons not related to bad news from the company, (c) bad news comes from the company, or (d) the price is manipulated. Investment banks do not seem to be concerned with item c—the company releasing bad news during the notice period—because they claim that the due diligence process, used when underwriting a forced conversion, is sufficiently thorough to preclude such developments while the bank has a position in the stock.

In contrast, investment banks worry that the stock price will fall over the notice period because the general market falls, the stock's industry group falls, or the stock price is manipulated. In principle, the

---

4. The discussion in this section is more tentative than in the previous sections and is based to some extent on interviews of investment bankers in charge of underwriting calls of convertible stock at Goldman, Sachs, and Salomon Brothers.

risk of general market, and even industry, movements can be largely hedged with option and futures contracts. One should remember, however, that both the Echelin and the IBM cases of a failed conversion occurred subsequent to a market crash. We do not know if either Kidder Peabody or IBM was hedging the market risk, although *Barron's* (December 14, 1987) account of IBM's losses implies that IBM was not. In practice, hedging of market risk in underwriting contracts seems much less common than one might have thought. The failure of major investment banks to hedge the new issue of British Petroleum stock that they held during October 1987 and their resulting losses in hundreds of millions of dollars is only the most dramatic example of this anomalous behavior.

Like the general market risk, stock manipulations could, in principle, also be hedged if the bank could buy traded put options on the stock. Underwriters could also hedge some of the risk by syndicating the forced conversion with other bankers, but the transaction costs of doing so (including the cost of sharing a customer relationship) are apparently high relative to the cost of delayed conversion.[5] While stock price movements during the notice period create serious risks for investment banks, a further explanation is necessary to understand why these risks are not hedged.

Imperfect market liquidity is a primary factor in understanding the behavior of investment banks. If conversion fails, they have to sell an often substantial fraction of the firm's shares on the open market. If they do so quickly, the sale exerts substantial pressure on the price of the stock, as documented in a variety of economic studies (e.g., Harris and Gurel 1986; Shleifer 1986). Imperfect liquidity also explains why investment banks cannot hedge their risk in traded put options on the stock since the liquidity of these markets is inadequate for a demand of the magnitude necessary to hedge a forced conversion. Investment banks are also concerned that the prospect of failed conversion can attract short sellers to the stock who drive its price down to ensure a failed conversion while planning to cover their position in the depressed market that results when the underwriter liquidates its long position.[6]

The magnitude of the price and liquidity risk for investment banks during forced conversions is much greater than that faced even in such risky activities as block trading, underwriting new issues, and dis-

---

5. Syndication is practiced in new stock and bond issues, but the amounts collected by investment banks in these transactions are much larger than the amounts collected from underwriting forced conversion. It might be much cheaper for a firm to delay a forced conversion than to pay for the costs of syndication. Significantly, delay as a way to reduce the risk of failure is not possible in the case of stock and bond issues.

6. Models of such price manipulation have not yet been developed, although Kyle (1985) proves that manipulation is impossible for a simpler model.

tributing new Treasury bond issues. The dollar amounts at risk in most forced conversions equal or exceed the amounts in all but the largest of these other transactions. And the duration of the risk of a forced conversion (30 days) vastly exceeds that of these other activities. In underwriting a new issue, for example, investment banks line up investors ahead of time, set the exact price on the deal after the market closes on the desired day, and then try hard to sell out the issue before the market opens the following day. Investment banks are also allowed to carry out market-stabilization activities following a new issue, whereas these operations are prohibited during the notice period of a forced conversion.

These risks suggests why investment banks are unlikely to accept the price and liquidity risks of a forced conversion as if they were risk neutral. First, investment banks have limited capital, so they are reluctant to put a good part of it at risk in situations with no opportunities for hedging. Second, investment banks might be unwilling to enter contracts offering a small gain with high probability at the cost of a large loss with low probability. Third, clients observing the big loss will be unsure whether the loss reflects bad luck, poor skill, or even fraud.

Also, if the low-probability disaster does, in fact, happen, the bank will have to incur a large cost of internal investigation into what went wrong. As will the outside observers, the management of the bank will want to determine whether the problem was luck, skill, or fraud. Thus the costs of dealing with such contracts might make them not worth the trouble. Finally, what is a cost of internal investigation to the bank might be a cost of a ruined career to its employee who supervised the underwriting. His integrity and skill are now in doubt. This suggests that even if the bank itself were prepared to underwrite conversion at the money, its employees who have to take responsibility for the deal might be reluctant to do so.

These informational problems explain the risk-averse behavior of investment banks. As a result, the underwriting contracts will be priced well above the arbitrage price of the put option. And firms facing these high underwriting fees will then rationally delay forcing conversion until the bond is well in the money.

This description of the behavior of investment banks completes our argument for the delay of forced conversions. Without an investment bank, firms must delay forced conversions or bear the risk of a self-fulfilling bad equilibrium in which conversion fails. With an investment bank, firms must still provide a safety margin of in-the-money bond value because of the banker's reluctance to bear the risk of price declines over the notice period. In either case, forced conversions are delayed. While empirical confirmation is, of course, still required to show that our explanation can account for the observed delays, it is important to recall that, in most cases, the delay is not very costly. It is

easy to believe, therefore, that delaying the call is cheaper than forcing conversion at the money and bearing the expected costs of a failure or of the underwriting fees.

VI.   Implications

Any reasonable theory of delayed conversion must be consistent with the Constantinides and Grundy (1986) hypothesis that the incentives for forcing conversion are positively related to the yield advantage. In our model, actions to force conversion are considered only under the assumption of a positive yield advantage, so our results are intrinsically consistent with the yield-advantage hypothesis.

Our theory has the important advantage that it explains the use of investment banks to underwrite some forced conversions. It also implies that the higher the distress costs of failed conversion, the more likely the firm is to hire an investment bank. In particular, regulated firms are more likely to use underwriters than unregulated firms, as are firms with a variety of restrictive covenants on the disposition of their cash flows. These implications are not available with other theories.

One of the important aspects of forced conversions is Mikkelson's (1981, 1983) finding that share prices decline approximately 2% when convertible bonds are called to force conversion. Various interpretations have been provided for this result. Mikkelson explains the decline in firm value by the tax shield that is lost when the bond is called. He recognizes, however, that firms could readily replace the convertible bond with straight debt if they wished to regain the tax shield.

Harris and Raviv (1985) interpret the share-price decline as negative information about future dividends. The idea is that firms force conversion only if they do not expect future dividends to exceed interest payments, which, other things being equal, is bad news for the stock. Both Mikkelson and Constantinides and Grundy provide some evidence concerning this information theory. Mikkelson shows that share prices decline much less (and insignificantly) when convertible preferred shares, in contrast to convertible bonds, are called to force conversion. This favors his tax shield explanation and appears contrary to the information theory. Mikkelson's results also show some recovery in the stock price during the 30 days that follow the announcement. Constantinides and Grundy report several findings that bear on the information theory, some positive and some negative. They find no evidence that longer delays cause larger price declines, contrary to an implication of the information theory. They do find evidence, however, that firms increase dividends by a greater extent when they delay forced conversion, consistent with the information theory.

Since the positive yield advantage of bonds is an integral part of our explanation, we are comfortable with the idea that the forced conver-

sion conveys bad news about future dividend increases. However, it seems much less plausible that delays are actively used as a signaling device, if for no other reason than the difficulty of rationalizing the concern of managers with the current share price. In a similar vein, it is much easier to accept the view that dividend increases convey information about future earnings than to believe that the reason dividends are paid is to signal.

Share price declines are also consistent with price pressure on the stock that reflects the increase in supply from conversion. Evidence for downward-sloping demand curves for individual stocks has been provided by Shleifer (1986), Harris and Gurel (1986), and several other studies. Consistent with this explanation, Constantinides and Grundy (1986) find that the share price reaction is greater when the increase in the number of shares from conversion is larger. Since they also find that the forced conversion is largely unanticipated, the price pressure hypothesis is consistent with price declines on the announcements of forced conversions.

Share price declines might also be based on our financial distress theory, although we have not extended our model to address this issue. Suppose that, when a bond is called, some shareholders believe that conversion will succeed and some believe that it will fail. Suppose, also—although this is hard to justify with completely rational agents—that shareholders ignore the equilibrium market price right after the bond is called and do not update their priors about the success or failure of conversion. Equilibrium price will then be a blend of valuations of those who expect conversion to succeed and those who expect it to fail. Hence the stock price might fall on the announcement of the call to reflect the decline in value if conversion fails. This theory, unlike other explanations of the price decline, makes the prediction that the share price should recover when it becomes clear during the notice period that the conversion will succeed. Mikkelson's data are suggestive that this is the case.

The decline of share prices on the announcement of the call is also consistent with Jensen's (1986) free cash flow theory. Insofar as conversion substitutes equity for debt, it enhances the freedom of managers to dispose of corporate cash flows. If managers waste some of the resources that they have not committed to pay out, then the value of the firm will decline when managers get more leeway. The advantage of Jensen's theory is that it explains a wide variety of other price reactions to changes in the capital structure in terms of the same basic idea.

The risk-of-failure explanation of delayed forced conversions has several additional implications that remain to be tested. It predicts that firms with ample cash or with easy access to the capital markets will force conversion promptly because their cost of failed conversion is small. In contrast, firms with poor bond ratings or with other capital

markets or regulatory costs of cash disbursements, are likely to delay conversion much longer. The strongest prediction of the theory here is this positive association between the distress cost of failed conversion and the conversion premium. The theory also predicts that companies with more volatile stocks and with higher market betas will delay conversion further. Other things being equal, the probability of failure is higher for these firms.

VII. Conclusions

In this article, we have presented an explanation of delayed forced conversion of convertible bonds that relies on the risk of failure. Without underwriters, firms delay forced conversions to avoid a self-fulfilling equilibrium in which conversion fails and they suffer the costs of financial distress. Underwriters can eliminate the costs of financial distress, but they, in turn, insist on a delay because they are averse to the risk of a substantial share price decline that can result from either rapidly changing market conditions or price manipulation.

Our explanation of delayed forced conversion is properly placed within the large set of models that explain puzzles in corporate finance on the basis of bankruptcy costs or, more generally, costs of financial distress. Corporate decisions on the debt-equity ratio are the premier case, but many examples exist. In all such cases, deadweight costs, in one form or another, account for the observed deviations of behavior from that expected under conditions of perfect capital markets.

References

Brennan, M. J., and Schwartz, E. S. 1977. Convertible bonds, valuation and optimal strategies of call and conversion. *Journal of Finance* 32:1699–1715.
Constantinides, G. M., and Grundy, B. D. 1986. Call and conversion of convertible corporate bonds: Theory and evidence. Mimeographed. Chicago: University of Chicago, Graduate School of Business.
Cutler, D., and Summers, L. H. 1987. The costs of conflict resolution and financial distress: Evidence from the Texaco-Pennzoil litigation. Working paper. Cambridge, Mass.: Harvard University.
Dann, L. Y., and Mikkelson, W. H. 1984. Convertible debt issuance, capital structure changes and financing-related information: Some new evidence. *Journal of Financial Economics* 13:157–86.
Diamond, Douglas W., and Dybvig, Philip. 1983. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy* 91:401–19.
Donaldson, Gordon. 1969. *Strategy for Financial Mobility*. Boston: Harvard University, Division of Research.
Harris, Lawrence, and Gurel, Eitan. 1986. Price and volume effects associated with changes in the S&P 500: New evidence for the existence of price pressure. *Journal of Finance* 41:815–30.
Harris, M., and Raviv, A. 1985. A sequential signaling model of convertible debt call policy. *Journal of Finance* 40:1263–81.
Ingersoll, J. E. 1977a. A contingent-claims valuation of convertible securities. *Journal of Financial Economics* 4:289–322.

Ingersoll, J. E., 1977*b*. An examination of corporate call policies on convertible securities. *Journal of Finance* 32:463–78.

Jensen, Michael C. 1986. The agency cost of free cash flow, corporate finance, and takeovers. *American Economic Review, Papers and Proceedings* 76 (May): 323–29.

Kyle, Albert S. 1985. Continuous auctions and insider trading. *Econometrica* 47 (November): 1315–36.

Mikkelson, W. H. 1981. Convertible calls and security returns. *Journal of Financial Economics* 9:237–64.

Mikkelson, W. H. 1983. Capital structure change and decreases in stockholders' wealth: A cross-sectional study of convertible security calls. Working Paper no. 1137. Cambridge, Mass.: National Bureau of Economic Research.

Miller, Merton H. 1988. The Modigliani-Miller propositions. *Journal of Economic Perspectives* 2, no. 4:99–120.

Shleifer, Andrei. 1986. Do demand curves for stocks slope down? *Journal of Finance* 41:579–90.

Warner, Jerold B. 1977. Bankruptcy costs: Some evidence. *Journal of Finance* 32:337–47.