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Taxing Convertible Debt

Jeff Strnad

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TAXING CONVERTIBLE DEBT

Jeff Strnad*

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CONVERTIBLE debt plays a significant funding role in U.S. capital markets. Several hundred companies have convertible debt issues outstanding in quantities large enough to be traded by retail investors and followed by commercial investor information services.¹ A study of convertible debt covering the years 1963 to 1984 found that for a selection of companies, convertible debt plays an especially important

* Professor of Law and Helen L. Crocker Faculty Scholar, Stanford University. I would like to thank Christopher Hanna, Clarissa Potter, Roberta Romano, Reed Shuldiner, and Eric Talley as well as workshop participants at the Harvard Law School Seminar on Current Issues in Taxation, Stanford Law School, and the University of Southern California Law School for useful comments. All errors are my own responsibility.

1. The Value Line Convertibles Survey, at <http://www.valueline.com/news/conv011004.html>, for example, comes out weekly and covers about 600 issues.

role.² In particular, during that time period more than 10% of all publicly traded companies had one-third or more of their outstanding debt in convertible form.³ In addition, convertible issuers tend to have special characteristics including a high ratio of R&D to sales, a low ratio of tangible assets to total assets, a high ratio of market to book value, a high ratio of long-term debt to equity, and more volatile operating cash flows.⁴

During the past decade, there have been public policy proposals concerning certain aspects of the tax treatment of convertible debt. One of these proposals came from the government itself. As part of a set of December 1995 tax proposals and in each of the tax proposal sections of the budgets for fiscal years 1997 through 2000, the Clinton Administration included a provision deferring the original issue discount ("OID") deduction on convertible debt.⁵ Under this provision, the issuer would not be able to deduct accrued OID until this OID was actually paid. In the case of a zero coupon bond, this rule would defer the deduction until the issuer pays off the bond at maturity. If the holder exercises the option to convert the bond into equity in the meantime, the OID deduction would be lost entirely. Furthermore, the provision does not exempt the holder from paying taxes on accruing, but unpaid, OID. The holder who converts would have a higher basis as a result, but at the cost of paying taxes on the increase at ordinary income rates.

There is tax reasoning that supports this approach. A convertible bond is an instrument that has traits in common with both debt and equity. On one hand, convertible bonds have an underlying "straight debt" contract that is similar to a traditional bond. This contract may involve periodic interest payments or may be in zero coupon form where there is an obligation to pay a certain amount at some fixed time in the future. On the other hand, convertible bonds also give the holder an option to exchange

2. See Stuart Essig, *Convertible Securities and Capital Structure Determinants* (1991) (unpublished Ph.D. dissertation, Graduate School of Business, University of Chicago) (on file with author).

3. The actual sample was all COMPUSTAT companies, a collection that includes all companies traded on major U.S. exchanges.

4. See Jeremy C. Stein, *Convertible Bonds as Backdoor Equity Financing*, 32 J. FIN. ECON. 3, 13-14 (1992) (summarizing results, primarily from Essig, *supra* note 2).

5. See RIA, *President Presents Latest Tax Proposals*, FED. TAXES WKLY. ALERT NEWSL. (Dec. 14, 1995), available at <http://www.riahome.com>; Office of Management and Budget, Budget of the United States Government, Fiscal Year 1997, Analytical Perspectives, at 38-39 [hereinafter President's Fiscal 1997 Budget]; Office of Management and Budget, Budget of the United States Government, Fiscal Year 1998, Analytical Perspectives, at 48 [hereinafter President's Fiscal 1998 Budget]; Office of Management and Budget, Budget of the United States Government, Fiscal Year 1999, Analytical Perspectives, at 65 [hereinafter President's Fiscal 1999 Budget]; Office of Management and Budget, Budget of the United States Government, Fiscal Year 2000, Analytical Perspectives, at 81 [hereinafter President's Fiscal 2000 Budget]; James S. Eustice, *'Debt-Like' Equity & 'Equity-Like' Debt: Treasury's Anti-Hybrid Proposals*, 71 TAX NOTES 1657, 1658, 1660-61 (1996) (describing the December 1995 Treasury proposals). The original version of this article, containing much the same analysis as appears in this published version, was written and circulated among legal academics in the summer of 1997, a few months after the promulgation of the Fiscal Year 1998 Budget.

each bond for a given number of common shares of the issuer.⁶ If the company does well or shows increased future potential so that the common shares appreciate significantly, the shares underlying the bonds will be more valuable than the principal paid at maturity and the holder will want to convert the bonds before they mature. Thus, the conversion right is similar to a call option on the company's returns, and this type of option is an integral part of equity ownership.⁷ Furthermore, after conversion, the debt contract part of the convertible bond is extinguished, and the holder is a pure equity owner.

Since tax law treats debt and equity quite differently, instruments that have characteristics of both debt and equity are particularly troublesome for the tax system.⁸ Most convertible bonds do end up being converted

6. Some bonds are convertible into shares of companies other than the issuer or convertible into some security other than common stock. But this type of conversion feature is unusual.

7. Equity owners hold the residual claim to corporate earnings after subtracting amounts owed to various creditors. As a result, equity owners have the right to returns above a certain amount, a right that is effectively a call option on the returns.

There is one important trait of equity ownership not shared by convertible bonds prior to conversion. Equity owners effectively have sold a put to the debtholders of the corporation because these debtholders have the right to receive a fixed amount at the time the debt matures. Holders of convertible debt have this put option but give it up upon conversion. Holding a convertible bond is therefore similar to holding the stock of a company plus a (European) put exercisable at maturity for the principal amount due at that time. The convertible bondholder can convert right before maturity if the put option is worthless because the value of the underlying shares exceeds the amount due at maturity or can "exercise" the put option by not converting the bond and thus demanding repayment of the stated principal amount.

For readers familiar with the put-call parity equation, it is possible to visualize this relationship more precisely. Suppose S is the value of the stock, P is the value of a put at an exercise price, E , and C is the value of a call with the same exercise price and exercise date. The put-call parity equation is:

$$S + P = C + PV(E)$$

where $PV(E)$ is the present value of the exercise price, the value of holding a zero coupon bond that pays E at the time of exercise. A convertible bond is analogous to either side of the equation above. Such a bond is like holding a pure zero coupon bond that will pay E at a fixed date in the future with value given by $PV(E)$ plus a call option with value C that will pay off if the stock increases above E . A convertible bond is also like holding the underlying stock, but with the right to put the stock for the amount E when the bond matures.

As discussed later, this relationship is a precise equivalence if, and only if, the holder has no incentive to convert the bond prior to maturity. See *infra* text accompanying note 17. Otherwise, it is only an analogy or approximation.

8. See 3 BORIS I. BITTKER & LAWRENCE LOKKEN, *FEDERAL TAXATION OF INCOME, ESTATES AND GIFTS* ¶¶ 91.10.1-10.4 (2d ed. 1991). The problems arise for two reasons. First, "debt" and "equity" are not precise categories, making distinguishing them difficult. Second, at the debt/equity borderline there is a sharp discontinuity in the tax rules: The tax treatment of debt and equity are very different. See Jeff Strnad, *Taxing New Financial Products: A Conceptual Framework*, 46 *STAN. L. REV.* 569, 591, 598-600 (1994). Administrative and legislative attention has focused on the danger that issuers will attempt to disguise equity as debt in order to achieve desirable tax outcomes such as the ability to deduct interest payments versus not being able to deduct dividend payments. In contrast, it is not hard to incorporate debt into an equity type of instrument. Many corporations have some minimal level of returns that is highly predictable. These returns can support the issuance of highly rated bonds. But the corporation can fund itself entirely through equity and thus achieve an equity-like tax treatment for all of its returns even though a substantial portion

rather than extinguished by a repayment of principal when the bond matures.⁹ In fact, one view of convertible bonds is that they are a “back-door” source of equity financing¹⁰ or a method of issuing equity with a delay.¹¹ An immediate issuance of equity may be more costly than issuing debt, but the company ultimately may not want to add debt to its capital structure. If the company anticipates that its stock price will increase, a convertible bond issuance will end up being converted into stock and the company effectively will have issued equity on a delayed basis. If the company issues convertible bonds at a discount as a form of delayed equity and deducts the OID, the company is securing the advantages of debt-like treatment for an instrument that ultimately is intended to function as equity. Furthermore, assuming that the company’s expectation of future stock price increases is correct, the holders of the bonds will convert the bonds to stock with certainty and the company *never* will make any payments that correspond to the OID deductions. The Clinton Administration’s proposal would have ended this pleasant state of affairs by denying any OID deductions until they are actually paid.

One can attack this reasoning on its own terms¹² and the Clinton Administration’s proposal may have had other, more salient motivations.¹³ Furthermore, because convertible debt shares traits of both debt and eq-

of those returns may be debt-like. See Jeff Strnad, *Taxing New Financial Products in a Second-Best World: Bifurcation and Integration*, 50 TAX L. REV. 545, 568-69 (1995).

9. See Alexander J. Triantis & George G. Triantis, *Conversion Rights and the Design of Financial Contracts*, 72 WASH. U. L.Q. 1231, 1237 n.12 (1994).

10. See, e.g., Stein, *supra* note 4, at 3-4.

11. In surveys of firms, around 70% of respondents mention the desire to issue delayed equity as the main reason for using convertible bonds to raise funds. See Triantis & Triantis, *supra* note 9, at 1237 n.12.

12. Although conversion of the bonds allows the company to receive OID deductions without ever making any payments, the holders of the bonds have paid taxes on the OID without ever receiving any payments. If the holders and issuers are subject to the same marginal tax rate, this arrangement would not lose any revenue, so that there is no harm to the Treasury. In addition, given that rate situation, one would expect the issuance price of convertible bonds to reflect the future expected transfer of tax liability from the corporation to the buyers of the bonds so that there is no effect on funding incentives.

Even if some holders are subject to lower marginal rates than the corporation, the price effect may fully offset any corporate benefit if the *marginal* investor is subject to the same marginal rate as the corporation. Since security prices must make the marginal investor indifferent between alternative investments, the price of convertible bonds would have to fall enough to compensate for the tax disadvantages to the marginal investor. If that investor faces corporate marginal rates, this price offset will exactly cancel the tax advantages secured by the corporation.

13. The description of the proposal in two of the budget documents stresses the disparity in treatment between accrued, but unpaid, interest for bonds issued at par with the treatment of OID bonds. See President’s Fiscal 1997 Budget, *supra* note 5, at 38-39; President’s Fiscal 1998 Budget, *supra* note 5, at 48. Many corporate bonds pay interest every six months, and so-called “Eurobonds,” which are quite common, pay interest annually. When a holder converts a bond, the holder typically gives up any right to accrued, but unpaid, interest. Convertible bonds typically are callable by the issuer after some fixed period of time. Companies often call bonds to force conversion when the conversion value of the bonds, the value of the stock into which the bond is convertible, exceeds the call price. A common strategy, particularly among Eurobond issuers, is to call the bonds before an interest payment is due to avoid paying the interest. In this case, the issuer does not receive a deduction for the accrued interest because it was never paid. In contrast,

uity, the question of how to tax convertible debt is bound to be difficult and many of the best answers are likely to be unsatisfying.¹⁴ Nonetheless, convertible debt appears to be a significant financing vehicle. This debt may serve important nontax, efficiency-enhancing purposes. A very important question is how proposals such as the Clinton Administration's proposal would interact with the ability of convertible bonds to achieve such purposes. This article examines that question.

Part I considers the question of why companies use convertible bonds as a funding vehicle. There is considerable theoretical and empirical literature concerning convertible debt. Any theory as to purposes must explain both the peculiarities of convertible bond contracts and a wide variety of established empirical regularities. The theory that has the most explanatory power is that issuing convertible bonds instead of straight debt or equity signals the issuer's prospects. Part II discusses the tax treatment of convertible bonds. Part III details how various tax treatments affect the signaling functions of convertible debt. Part IV states conclusions and discusses policy implications.

I. THE FUNCTION OF CONVERTIBLE DEBT

A. A PUZZLE

Convertible bonds contain a number of peculiar, yet standard terms, and there is also substantial empirical evidence concerning the impact that issuing convertible bonds has on the value of the common stock of the issuer. For a theory to explain the existence and use of convertible debt, it must account for the standard terms as well as the observed empirical regularities. Prior to examining such theories, it is worthwhile considering a very elementary puzzle that both legal and finance scholars have posed:¹⁵ Since convertible bonds are simply a "package" of other familiar securities, why would investors or the issuer see any advantage in buying the package rather than the components? This question rests on the fact that convertible bonds are, at least approximately, a "straight" bond with no conversion privilege, plus a warrant.¹⁶

It is worth fleshing out this approximate equivalence. The standard convertible bond contract allows the holder to exchange the bond for a particular number of shares at any time prior to the time when the bond matures. Certain features or circumstances may motivate the holder to convert prior to maturity. Consider, first, the case where there is no reason for early conversion. In that case, a convertible bond is *exactly*

under current law, issuers of OID bonds may deduct the accrued OID even if it is never paid.

14. See *supra* note 8.

15. See, e.g., William A. Klein, *The Convertible Bond: A Peculiar Package*, 123 U. PA. L. REV. 547, 555-61 (1975); Michael J. Brennan & Eduardo S. Schwartz, *The Case for Convertibles*, 1 CHASE FIN. Q. 27, 28-32 (1982).

16. A warrant is a call option on a company's stock that is issued directly by the company to the public.

equivalent to a straight bond with the same principal payment and coupon terms plus a warrant exercisable at the time of maturity with a strike price equal to the amount of principal due on the bond at that time.¹⁷ This equivalence is easy to understand. If conversion prior to maturity is not optimal, the convertible bondholder will hold the bond until maturity and then decide whether to forgo the final principal payment in exchange for receiving the common stock due upon conversion of the bond. Prior to maturity, the holder enjoys all of the straight bond features inherent in the convertible bond. At maturity, the warrant feature comes into play.

The equivalence becomes approximate when there is a possibility that holders will exercise the bond or the warrant prior to maturity. In this case, the bond plus warrant package and the convertible bond differ because the holder of the package will retain the bond upon early exercise of the warrant, while exercising the convertible bond means surrendering the straight bond returns inherent in the convertible bond. The holder might exercise early for several reasons, three of which are of interest here.

Two of the reasons involve voluntary conversion by the holder of the convertible bond or voluntary exercise by the holder of the warrant. First, the underlying common stock may pay dividends. As is well known, when a stock does not pay dividends, it is not optimal to exercise a call option prior to expiration of the option.¹⁸ The same principle applies to a call option in the form of a warrant and the call option embedded in a convertible bond. Holders of warrants and convertible bonds do not receive the dividends due on the underlying common stock. If the stock does pay dividends, holders of warrants or convertible bonds may want to exercise or convert prior to expiration of the warrant or conversion right in order to receive the dividends.¹⁹ A second motivation for voluntary conversion of a convertible bond or voluntary exercise of a warrant occurs if the conversion ratio or exercise price changes over time. In particular, if the number of shares underlying the warrant or convertible bond falls over time, while the total exercise price remains constant, it may be optimal to convert early since doing so results in receiving a bigger equity position.

17. See Jonathan E. Ingersoll, *A Contingent-Claims Valuation of Convertible Securities*, 4 J. FIN. ECON. 289, 310 (1977) (Theorem 5). In addition to stating and proving the exact equivalence result, Professor Ingersoll also discusses in a rigorous way other aspects of the approximate equivalence between convertible bonds and a straight bond plus a warrant.

18. See JONATHAN S. INGERSOLL, *THEORY OF FINANCIAL DECISIONMAKING* 305 (1987) (Proposition 16); Robert C. Merton, *Theory of Rational Option Pricing*, 4 BELL J. ECON. & MGMT. 141 (1973).

19. It is easy to see why early conversion may be optimal by considering the case where the company declares that it will liquidate and pay out its entire value (net of amounts required to retire all outstanding debt) as a dividend to shareholders. In the case of the convertible bond, the dividend payment to be received upon conversion may exceed the amount that would be received to retire the bond. In the case of the warrant, the only hope for receiving any payoff is to convert immediately if the dividend payment on the underlying shares exceeds the conversion price.

The third reason for early conversion applies only to convertible bonds and involves a very important feature: Convertible bonds almost always are callable at the option of the issuer. The call price is specified in the contract and there usually is a period of call protection following issuance during which the issuer cannot call the bond.²⁰ Under most bond contracts, the issuer must announce a call thirty days in advance. The holder of a convertible bond may convert it into common stock at any time and a call announcement does not suspend the right to convert. As a result, after the announcement of a call, the holder must decide whether to tender the bond in exchange for the call price or to convert the bond into common stock. The decision hinges on whether the conversion value of the bond exceeds the call price. The conversion value of a bond at any given moment is the value of the underlying stock at that moment. Ignoring transaction costs, the holder would realize the conversion value by converting the bond and selling the shares received.²¹ The call price is the price that the issuer must offer to pay for the bond after calling it. This price usually is specified in the bond contract. If the conversion value exceeds the call price, the holder is better off converting the bond rather than tendering it to receive the call price. Thus, early conversion may be "involuntary" in the sense that the holder converts in order to retain the excess of conversion value over the call price. The fact that the issuer can force conversion of a callable convertible issue when stock prices are sufficiently high plays a particularly important role in the theories explaining the issuance of convertible bonds. The next Part discusses this feature extensively.

It is now easy to see why scholars initially found the widespread use of convertible bonds puzzling. Convertible bonds combine a low risk instrument (a bond) with a very high risk instrument (a call option). It would seem more attractive to potential investors with a variety of risk tolerances to purchase these instruments separately.²² Investors with low risk tolerance could stick with bonds, leaving the warrants for more speculative types. Furthermore, combining the instruments creates ongoing complexity as the issuer must determine a call policy and the investor

20. In a sample of 199 convertible bonds issued from 1980 to 1982, the mean call protection period was 295 trading days, and the median was 252 trading days, exactly one calendar year of trading days. 79% of the bonds in the sample had some call protection. Paul Asquith, *Convertible Bonds Are Not Called Late*, 50 J. FIN. 1275, 1279-80 (1995).

21. The holder does not have to wait for completion of the mechanics of the conversion process to lock in realization of the conversion value. The holder can send in an order to convert the bond and simultaneously sell short the underlying stock. When the issuer delivers the shares from conversion of the bond, the holder can close the short position using those shares. Of course, the holder will have to pay a commission on the short sale and will have to pay margin interest on the shares borrowed for the short sale.

22. Professor Klein illustrates this point by an apples-oranges analogy. If a company issues convertible bonds instead of warrants and bonds separately, it is like a grocery store insisting on selling oranges and apples only in a fixed ratio, independent of the buyer's preferences. Assuming that shoppers could not remarket their apples or oranges to undo this tie-in, there will be a welfare loss, reflected in lower consumer satisfaction, lower sales, lower store profits, or some combination of these effects. See Klein, *supra* note 15, at 555-56.

must respond to calls both by deciding whether to tender the bond or convert, and by portfolio rebalancing after the bond is tendered or converted. Finally, it is unlikely that issuance costs explain the packaging of convertible bonds. Instead of issuing convertible bonds, a company could issue a package of warrants and bonds where the warrants and bonds are separate, but are issued together in a fixed ratio. The warrants and bonds would trade separately so that an investor who wanted just bonds or just warrants could sell the other instrument right after issuance. Issuing the bond/warrant package in a single transaction means that issuance fees will be roughly similar. In fact, companies do issue such packages, but much less frequently than convertible bonds.²³

The puzzle of convertible bond issuance led to a series of popular explanations that are not consistent with issuer and/or investor rationality. For example, there is the observation that the option feature "sweetens" a convertible bond by giving the investor a little upside to complement a straight bond investment. This "sweetener" would make convertible bonds especially attractive if it were free. But a rational issuer will charge the market price for the sweetener, and, in fact, convertible bonds pay significantly lower yields than straight bonds with the same terms.²⁴ If convertible bonds were a new instrument, a period of misvaluation (e.g., issuers undervaluing or investors overvaluing the "sweetener") might be understandable. But convertible bonds have been a heavily used financing device for many years, and persistent, massive misvaluation is unlikely. Many of the purchasers are sophisticated institutions²⁵ and many of the issuers are represented by sophisticated investment banks.²⁶ In addition, beginning many years ago, both legal and finance scholars have emphasized the defects in popular explanations that implicitly rely on misvaluation by one or both parties.²⁷

There are some very powerful explanations for the heavy use and peculiar features of convertible bonds. Before detailing those explanations, it is important to review certain "stylized facts" about convertible bonds, that is, to review certain regularities in contract terms and market impact that any explanation for the use of convertible bonds must address.

23. See John D. Finnerty, *The Case for Issuing Synthetic Convertible Bonds*, 4 MIDLAND CORP. FIN. J. 73 (1986).

24. See Klein, *supra* note 15, at 558-59; Brennan & Schwartz, *supra* note 15, at 28.

25. An extreme example is Rule 144A issues. These issues may be sold *only* to certain institutional purchasers. In the first three quarters of 1996, 38.1% of new convertible issues coming to market were Rule 144A issues, and, as of November 1996, Rule 144A issues accounted for 14.2% of the total convertible market. See *Complications in the 144A Convertible Market—Is This Issue Registered or Not?*, 27 VALUE LINE CONVERTIBLES SURVEY 41 (1996).

26. The weekly "Chronicle of New Issues" in the Value Line Convertibles Survey lists nationally prominent lead underwriters for new convertible issues. See, e.g., *id.* at 48 (listing Alex Brown, Smith Barney, Lehman Brothers, Bear Stearns, DLJ, NatWest, Salomon Brothers, and National Securities as the lead underwriters for the eight upcoming issues).

27. See e.g., Klein, *supra* note 15; Brennan & Schwartz, *supra* note 15.

B. STYLIZED FACTS ABOUT CONVERTIBLE BONDS

Stylized facts about convertible bonds fall into two categories. First, certain contract terms are ubiquitous, but it is not obvious why they are consistently present. Second, empirical research has revealed that issuing and calling convertible bonds has systematic effects on the price of the underlying common stock.

1. *The Call Feature and Call Policy*

Almost all convertible bonds allow the issuer to call the bonds, usually only after some period of call protection. Some nonconvertible corporate bonds also have a call feature.²⁸ The issuer typically exercises the call provision for a regular bond when interest rates fall enough so that, net of issuance costs, it is better for the issuer to replace the bonds with a new issue requiring lower interest payments. For convertible bonds, however, the motive for calling an issue usually is to force conversion of the bonds rather than to secure a lower interest rate.²⁹ It is this aspect that distinguishes a convertible bond from a bond/warrant package. Even if the bond in the bond/warrant package is callable, the issuer cannot force the bondholder to relinquish the bond in exchange for stock. “Forced conversion” is a peculiar feature of convertible debt.

Given that almost all convertible bonds have a call feature, it is necessary for issuers to set a “call policy” that determines when the issuer will exercise its option to call. The “issuer” consists of managers acting on behalf of shareholders, or perhaps on their own behalf to the detriment of shareholders. It is useful to begin with the simple case where there is no agency conflict (i.e., managers act on behalf of the shareholders) and where the only securities outstanding other than equity are the convertible bonds. In this case, the optimal call policy is quite clear: The issuer should call the bonds as soon as the value of the bonds exceeds the call price. A premium over the call price that attaches to convertible bonds comes at the expense of shareholders since whatever the convertible bondholders gain, the shareholders give up.³⁰

It is quite striking, however, that issuers often delay calling convertible bonds until the conversion value (and market price) is significantly above the call price. It is worth explaining the dynamics of convertible bond pricing to make this result more clear. There are two theoretical lower bounds on the value of a convertible bond: the “investment value” of the bond, and the “conversion value” of the bond. The investment value of the bond is what the bond would be worth if it had no conversion right. This value is a lower bound on market price because the conversion right

28. See RICHARD A. BREALEY & STEWART C. MYERS, *PRINCIPLES OF CORPORATE FINANCE* 718-19 (6th ed. 2000).

29. See, e.g., Asquith, *supra* note 20, at 1280-81 (115 out of 123 calls in sample were to force conversion; the other eight appear linked to securing lower rates).

30. See Ingersoll, *supra* note 17, at 299. The same policy would be optimal for bonds that are not convertible. See R. BREALEY & STEWART MYERS, *supra* note 28, at 718-19.

is a valuable option. As we have already discussed, conversion value is the amount that the investor would realize by converting the bond and selling the shares received at the current market price. Since the investor always has the option of converting, a convertible bond should never sell below its conversion value.³¹ In fact, the convertible bond should trade for more than its conversion value. The common stock may fall and remain below the point where it is worthwhile to convert the bond. If there is no possibility of default, holding a convertible bond gives the holder a put option: The holder can "sell" the bond back to the issuer at maturity for the stated principal amount that is due at that time.³² This put option has value, but calling a convertible bond with a conversion value substantially above the call price, in effect, makes the option worthless. The fact that the conversion value substantially exceeds the call price means that the holders of called bonds almost certainly will convert their bonds in short order. The market value of the bonds should fall to the conversion value in response to a call, reflecting the fact that the put is now worthless.³³

The striking fact is that firms often delay calling to force conversion. For example, a seminal study by Jonathan Ingersoll found that the median firm delayed calling convertible bonds until the conversion value of the bonds exceeded the call price by 43.9%.³⁴ A call in the face of such a huge premium will trigger conversion, and the common stock owner will suffer dilution. The convertible bondholders will share in the upside outcome that drove up the conversion value but will have been at least partially protected (by the put feature inherent in an unconverted bond) in the event that the outcome had been less sanguine. Management could have called the bonds just when the conversion value of the bonds reached the call price. At that point, the bondholders would have to convert or tender. Converting would force them to share more fully in downside outcomes by giving up their put protection while tendering

31. Some circumstances where convertible bonds do trade below their conversion value, and reasonably so, are discussed below. See *infra* note 33.

32. If there is no reason to convert prior to maturity, then a convertible bond is exactly equivalent to owning the underlying stock plus a put option (to exchange the stock at the time of maturity for the principal amount due at that time) plus a right to whatever coupons are due on the bond prior to maturity. See Ingersoll, *supra* note 17 and accompanying text.

33. In practice, called convertible bonds often trade slightly *below* their conversion value. See *Call Protection and Likely Call Candidates*, 28 VALUE LINE CONVERTIBLES SURVEY 313 (1997). There is an obvious reason for this phenomenon. When bonds are called, the issuer typically is not obligated to pay the accrued interest on the bond to the holder. However, bond trading rules require the buyer to pay any accrued interest to the seller at the culmination of any trade. Thus, arbitrage can only support a price for the convertible bond equal to the conversion value *minus* accrued interest. Buying and converting the bonds requires paying the seller the accrued interest, so that an arbitrage profit is only available if the arbitrageur can buy the convertible bond for less than the conversion value minus the accrued interest, and then convert and sell the stock for the conversion value. Of course, the transaction costs of arbitrage may require an even lower convertible bond price (than conversion value less accrued interest) to make arbitrage profitable.

34. Jonathan Ingersoll, *An Examination of Corporate Call Policies on Convertible Securities*, 32 J. FIN. 463, 469 (1977).

would mean that the common stock owners would not have to share upside outcomes with the bondholders. When a conversion-forcing call is delayed until the conversion value of the bonds is above the call price, the failure to call allows the bondholders to hold the full upside share that would be available as shareholders after conversion while retaining their put option in the event that things go badly for the firm. The premium value of the bond above the call price represents value transferred to the bondholders at the expense of the common stock owners. A premium in the range of 43.9% seems quite large.

Professor Ingersoll considers and rejects several possible explanations for the premium and apparent delay in forcing conversion. Two of these explanations flow from the fact that there typically is a thirty-day "notice period" between the announcement of a call and the final date on which the bondholder may convert to avoid the call. Assuming that early conversion is not optimal, this delay means that the conversion value of the bond versus the call price at the end of the notice period and not at the announcement date is key. This fact suggests one possible explanation for a premium: The issuer wishes to avoid the situation where the conversion value is below the call price at the end of the notice period because in that situation, the bondholders would receive a bonus at the expense of the shareholders. Calling only after there is a premium makes that event less likely. However, Ingersoll finds that the opposite is true: Taking the typical thirty-day notice period into account dictates calling whenever conversion value exceeds a level a few percentage points *below* the call price.³⁵ It is easy to see why: Failure to call when the conversion value increases above the call price means value is being transferred from shareholders to bondholders. Calling the bond when this situation materializes cuts off this possibility. The danger that the conversion value will be below the call price at the end of the notice period is more than offset by the danger that the conversion value will move substantially above the call price in the absence of a call.

A second possible explanation related to the notice period arises from possible financing costs. If the call announcement is made when conversion value equals the call price and the stock price falls during the notice period, bondholders will tender for the call price instead of converting. If the firm has to pay the call price to each bondholder, it may have to raise funds through a new debt or equity issuance. In contrast, conversion requires no commitment of funds by the company. It could be that firms wait until the stock price is sufficiently high so that conversion is highly likely even after thirty days of stock market action. That approach minimizes the possibility of having to incur additional financing costs. Ingersoll's results indicate that even for very risky firms where more "cushion" is needed since a large drop in stock price over thirty days is more likely, underwriting costs of the order of 5-20% do not come close to dictating premia as large as 43.9%. The largest mandated premium that Ingersoll

35. *Id.* at 469-70.

finds is 12.65%—that premium is for the case of a stock with an annual standard deviation of 35%, underwriting costs that are 20% of the capital raised, and a bond issue that converts into 20% of the equity of the firm.³⁶

Finally, Ingersoll considers a tax explanation. A call that forces conversion reduces debt in favor of equity and thus eliminates interest (or OID) deductions at the corporate level. Ingersoll points out, however, that this problem can be fixed by recapitalizing after the call. As just discussed, the need to pay recapitalization costs does not justify the size of the observed premia.

2. *The Stock Price Impact of Issuance and Calls*

Finance scholars have studied the stock price impact of numerous corporate events, including the issuance of various kinds of securities, calls on convertible bonds, and increases or decreases in dividend payments. Hypotheses that rest on an information asymmetry between corporate insiders and outside investors motivate many of these studies. Consider the case of a firm that wishes to invest in a new project and issues new securities to do so. If information is symmetric, this issuance should have no price impact. The outsiders know about the new investment and know that the firm's prospects dictate that the firm must raise outside money to pursue it. In fact, the issuance of most types of securities results in nega-

36. *Id.* at 471. A recent study by Paul Asquith raises some questions about the extent of delay and the size of the premium. *See* Asquith, *supra* note 20. Professor Asquith examines a sample of convertible bonds issued from 1980 to 1982. He removes two sets of bonds from his sample: bonds for which conversion value exceeds the call price when call protection expires and bonds for which the firm has an incentive to delay calling the bonds because the after-tax cost of paying (deductible) interest on the bonds is lower than the cost of paying (nondeductible) dividends on the stock. Adjusting the sample in this way reduces the *average* call premium from around 50.2% to 25.8%. However, based on Ingersoll's analysis, even a median premium of 15-20% is much higher than would be justified simply by the desire to avoid underwriting costs, and the existence of a notice period calls for a *negative* "premium" if underwriting costs are ignored. If managers are waiting for a large premium as a "cushion" to insure that conversion is highly likely, their motivation must be something much more frightening than the danger of incurring additional underwriting costs. The discussion in the next Part considers just such a motivation.

Professor Asquith also suggests that bonds seem to be called rather soon after the premium of conversion value over the call price passes 20%. He finds that the median number of trading days for which the conversion value exceeded 120% of the call price was only 20. *Id.* at 1281. However, the average was 95.7, suggesting that some calls were delayed substantially.

Professor Asquith's results have to be read with caution because of the period he chose to study. Convertible bonds issued in 1980-82 would be subject to accelerating interest rates and the accompanying big drop in the stock market during those years. As discussed in a later Part, a leading theory suggests that early convertible bond calls signal bad information, and there was a lot of bad information during the period immediately following issuance of the bonds. In addition, the sharp drop in interest rates following 1982 may have motivated many of the calls. This drop would mean that firms would be eager to refinance their outstanding debt including convertibles. They would call the convertibles as soon as possible. Professor Asquith notes, with surprise, that several bonds in his sample were called when the call price was greater than the conversion price and explains some of these calls as being motivated by the desire to refinance at lower rates. *Id.* at 1280-81.

tive abnormal returns to the company's stock.³⁷ A common explanation for this phenomenon is information asymmetry: Insiders know more about the firm's earnings prospects than outsider investors, and these investors are aware of that fact. Raising funds by issuing securities is costly, and insiders would not do so unless they expect there is a significant chance that internally generated funds will not pay for the investments. Thus, issuing securities to raise funds signals negative information about the future earnings prospects of existing firm operations.³⁸

There have been a large number of studies concerning the impact of issuing or calling convertible bonds on stock prices. In the rest of this Part, I summarize these studies by stating two "stylized facts," empirical results of potential importance that seem well established, and one "potential stylized fact." Any hypothesis or theory explaining the purpose of convertible bonds needs to address these facts.

Stylized Fact #1: (The Issuance Hierarchy) Issuing straight debt, convertible debt, and equity have significantly different impacts on a company's stock price. The most negative abnormal returns come from issuing equity, followed by convertible debt, and then straight debt. Issuing straight debt may not have any negative impact at all.

Empirical studies consistently find that issuing equity results in significantly more negative abnormal returns than issuing convertible debt. Two recent summaries of the literature find a gap of 1-2%.³⁹ Taking the abnormal returns from issuing equity to be about -3.25% and the abnormal returns from issuing convertible debt to be -1.75% seems reasonable based on the existing studies.⁴⁰ In contrast, issuing straight (i.e., nonconvertible) debt seems to have little or no impact on the issuer's stock price.⁴¹

37. Abnormal returns are measured by comparing actual stock performance to how a stock is expected to perform compared to similar stocks. To measure such returns, one needs a baseline model such as the capital asset pricing model that generates expected returns for the stock conditional on the actual returns of all other stocks. For example, under the capital asset pricing model, a stock with a beta of 1.5 is expected to move in the same direction as, and 1.5 times as much as, "the market." Examining performance for a period before and after a given event such as calling the company's convertible bonds is called an "event study." The approach is to compare performance each day to predicted performance (based on some model). If the sum of the daily prediction "errors" for a period of time surrounding a particular event significantly deviates from zero for a large sample of firms subject to that event, then there is support for the hypothesis that "abnormal" returns accompany the event. If prediction errors are negative, the stocks subject to the event did more poorly than predicted, and there are "negative abnormal returns."

38. The seminal paper along these lines is Merton H. Miller & Kevin Rock, *Dividend Policy Under Asymmetric Information*, 40 J. FIN. 1031 (1985).

39. A 1986 study summarizing the empirical evidence found the average abnormal return for issuing equity of -3.14% versus -2.07% for convertible debt. See Clifford W. Smith, *Investment Banking and the Capital Acquisition Process*, 15 J. FIN. ECON. 3, 4 (1986). Another more recent summary of the evidence published in 1992 suggests an even greater disparity, with average abnormal returns from issuing equity of -3.57% versus -1.65% for issuing convertible bonds. See Stein, *supra* note 4, at 15-17.

40. See *supra* note 39.

41. See B. Epsen Eckbo, *Valuation Effects of Corporate Debt Offerings*, 15 J. FIN. ECON. 119, 121, 134 (1986) (reporting a -1.7% abnormal return for convertible debt versus

Stylized Fact #2: (The Call Effect) A conversion-forcing call causes negative abnormal returns for the issuer's stock.

Researchers consistently have observed the negative impact of a conversion-forcing call and the impact appears to be around -2%.⁴² In contrast, calls on nonconvertible debt seem to have no significant effect on returns.⁴³ It also appears that the abnormal negative returns from a call are large enough so that issuing convertible debt and then calling it results in a more negative total abnormal return than issuing equity.⁴⁴ However, because this result is not established enough to be characterized as a stylized fact,⁴⁵ we will record it as a potential stylized fact:

Potential Stylized Fact: Issuing and calling convertible bonds results in a more negative total abnormal return for the issuer's stock than issuing equity.

C. THE NYBORG-HARRIS-RAVIV SIGNALING THEORY

The most successful comprehensive explanation for the issuance, price effects and contract terms for convertible bonds is signaling in the face of asymmetric information. The basic idea is that firm insiders issue convertible bonds and call them in response to their inside information concerning future performance. The market interprets issuance and calls to convey information, giving rise to the negative abnormal returns that surround both issuance and conversion-forcing calls.

The signaling aspects of convertible bonds divide into two "games:" a "conversion game" and an "issuance game." In the conversion game, insiders decide whether to call a convertible bond. The classic model of this game is set out in a 1985 article by Milton Harris and Artur Raviv.⁴⁶ The model does not rationalize the issuance of convertible bonds, but only studies conversion policy. In a 1992 paper, Jeremy Stein showed that a signaling game can explain the issuance decision and the issuance effects for convertible bonds.⁴⁷ In a 1995 paper Kjell Nyborg combined the Harris-Raviv conversion game with an issuance game that captures many of

an abnormal return not significantly different from zero for straight debt); Aigbe Akhigbe et al., *Valuation Effects from Issuing Zero-Coupon Debt*, 22 J. BUS. FIN. & ACCT. 751, 758-59 (1995) (finding no significant abnormal returns on issuer's stock for U.S. domestic coupon debt or zero-coupon debt issuance and finding no significant difference between the two types of debt in terms of abnormal returns).

42. See, e.g., Wayne H. Mikkelson, *Convertible Calls and Security Returns*, 9 J. FIN. ECON. 237 (1981); Asquith, *supra* note 20, at 1287.

43. See Joseph D. Vu, *An Empirical Investigation of Calls of Nonconvertible Bonds*, 16 J. FIN. ECON. 235 (1986).

44. See Kjell G. Nyborg, *Convertible Debt as Delayed Equity: Forced Versus Voluntary Conversion and the Information Role of Call Policy*, 4 J. FIN. INTERMEDIATION 358, 359 (1995).

45. As Nyborg points out, there has been no formal test of this in the literature. See *id.*

46. Milton Harris & Artur Raviv, *A Sequential Signalling Model of Convertible Debt Call Policy*, 40 J. FIN. 1263 (1985).

47. See Stein, *supra* note 4.

the features of Stein's model.⁴⁸ I use a variant of Nyborg's model to test for the impact of various tax approaches on the utility of convertible bonds as a financing device. Because the Nyborg model incorporates the Harris-Raviv model, I sometimes refer to the model as the "NHR model" where the initials stand for Nyborg-Harris-Raviv.⁴⁹

In this subsection, I develop basic aspects of the model and show how the model succeeds in explaining the features of convertible bonds and the impact of issuance and calls.⁵⁰ In the next subsection, I consider alternative explanations for the existence, nature and function of convertible bonds.

In Nyborg's model, a company must fund an investment that costs I dollars by raising funds through an issuance of securities. There are three possible funding vehicles: zero-coupon debt ("straight debt"), zero coupon convertible debt, and equity. There are four time periods: 0, 1, 2, and 3. The investment must be made at time 0 and will pay either H (a high outcome) or L (a low outcome) at time 3. Nyborg assumes that both H and L are greater than I and ignores discounting. As a result, the project is a sure winner. At worst, the company will receive L , which is a profitable outcome since it exceeds the amount of required investment, I . Manager-insiders receive private information at times 0, 1 and 2. At time 0, their information is either good (G_0), bad (B_0), or awful (A_0). This information tells the managers what the probability of the high outcome is at time 3: highest for G_0 , in the middle for B_0 , and lowest for A_0 . At times 1 and 2, the managers receive either good (G_1 at time 1, or G_2 at time 2) or bad (B_1 at time 1, or B_2 at time 2) information concerning the probability of the high outcome. Probabilities that are based on knowing particular information are called "conditional probabilities." The information at times 1 and 2 is more precise than that available at time 0. For example, the probability of the high outcome conditional on the managers receiving good information at time 1 is at least as high as the probability if the managers receive good information at time 0. Nyborg assumes that the call price for the convertible bonds is zero and that the managers can call them either at time 1 or time 2. There are no dividends on the equity nor coupon payments on the bonds, and the conversion terms of the bonds remain fixed. As a result, holders of convertible bonds will not voluntarily convert the bonds until after observing what the outcome (H or L) is at time 3.

Investors know H , L , and I as well as how private information would affect the probability of H occurring. However, investors do not know directly what private information the managers have received. Investors

48. Nyborg, *supra* note 44.

49. Nyborg does not simply incorporate Harris & Raviv's model off the shelf. Instead, he uses some game theoretic concepts to develop conditions under which the outcome of the Harris-Raviv game is unique, both as a separate game and when combined with the issuance game. *See id.* at 362 n.4.

50. The goal here is a heuristic explanation of the model and its results. For a more detailed and very good explanation, the reader should refer to Nyborg's article.

can only infer this information by observing manager behavior such as which type of security is issued at time 0 or whether the managers call an outstanding convertible bond issue at time 1 or 2. The most desirable outcome would be that the issuance and call decisions of the managers reveal, at each time, what their information is. In this case, security prices will capture all of the information and the market will be “informationally efficient” in the sense that prices capture all available information. This quality is desirable because prices will be better at guiding investment resources to their highest and best use conditional on all the information that is available to anyone.

Informational efficiency in a setting such as the Nyborg model requires that there be a “separating equilibrium.” This concept is one of several equilibrium concepts that is appropriate in asymmetric information models. In such models, generally there are actors of several different types, and the observer does not know which actor is of which type. Equilibrium occurs if each actor settles on some behavior that is optimal given that actor’s preferences and given what that actor knows about the beliefs and preferences of others. An equilibrium where each actor’s behavior reveals that actor’s type is a separating equilibrium. In contrast, a “pooling equilibrium” occurs when individuals of two or more different types behave in the same manner so that the observer (who does not know their types to begin with) cannot distinguish their types on the basis of their behavior.

In the Nyborg model, the different types are managers with different private information. For example, at time 0 there are three types: managers with good, bad, and awful information respectively. A separating equilibrium requires that these managers reveal their types through their actions. At time 0, there are three possible financing actions: issuing each the three types of securities.⁵¹ For a separating equilibrium to exist, it must be the case that each manager type issues a distinct security. If managers who received the bad and awful signals both issued equity, there would be a pooling equilibrium since an observer would not be able to distinguish between the two types based on their actions. Similarly, for companies that have issued convertible bonds and have not yet called the bonds, a separating equilibrium at times 1 or 2 means that managers receiving good and bad signals will exhibit different call behavior—one type will call and the other will not.

The key result in Nyborg’s paper is that there are parameters (the level of H , L , and I ; the value of the various probabilities conditional on different private information) for which a separating equilibrium (both in the issuance and conversion game) exists and that under certain conditions,

51. A fourth action would be to issue no securities and not to do the investment project. However, this approach would not be rational in any of the (tax or nontax) environments examined in this article. The project is a sure winner since even the low outcome guarantees return of the investment plus a profit. No tax scheme will be considered that burdens the funding methods so severely that it destroys this property.

this equilibrium is unique. This article uses the Nyborg framework to examine tax policy by considering the impact of various tax rules on the scope of projects covered by a separating equilibrium. For these projects, investors will be able to ascertain the private information held by managers at the time of issuance or at the time that the managers decide whether or not to call, and security prices at those times will accurately impound all available information. A tax policy that reduces the set of projects for which a separating equilibrium may occur reduces the scope for informational efficiency in the economy. Given that signaling is the primary rationale for the use of convertible bonds, evaluating tax policy through this kind of informational efficiency analysis makes sense.

The driving feature of the NHR model is the managers' preferences with respect to stock prices. The managers care about stock prices at each time (0, 1, 2, and 3) and are risk averse, but in a way that diminishes at higher stock price levels.⁵² The managers prefer higher stock prices at every particular time, but are willing to sacrifice the price at one time if this results in a large enough increase at some other time. Decreasing risk aversion means that the managers will be much more sensitive to variation that involves low outcomes. Thus, the managers will see the risk inherent in a fifty-fifty chance of \$70 per share versus \$60 per share as being much more innocuous than a fifty-fifty chance of \$11 per share or \$1 per share even though the monetary variation is the same in each case. Put another way, the managers will not like projects or methods of financing that involve the possibility of very low outcomes.

These manager "preferences" are consistent with many plausible real world features. Low stock prices are associated with financial distress, a situation that is likely to be harmful to a manager's immediate and long-run career.⁵³ Managerial compensation for each period may depend directly on the firm's stock price during that period with particularly low compensation in the case of low outcomes.⁵⁴ Low stock prices may also trigger a takeover that is damaging to the managers' human capital.

Armed with this knowledge about manager preferences, it is possible to understand how the separating equilibrium in Nyborg's model comes about.⁵⁵ First, I describe the equilibrium itself. It is important to keep in

52. In technical language, the manager is risk averse and has decreasing absolute risk aversion. In Nyborg's model, the manager maximizes $w(S_0) + w(S_1) + w(S_2) + w(S_3)$, where S_i is the stock price at time i , and w is a concave function ($w'' < 0$) whose second derivative increases (becomes less negative) as the stock price increases.

53. Stein's model, in fact, keys on financial distress. In his model, prior to issuance of new securities to fund the investment project, the firm has only equity outstanding, and a single individual owner-manager holds all of it. Default is possible, and if it occurs, the owner-manager suffers some fixed cost. Even if the owner-manager is risk neutral, this feature makes the owner-manager act as a "risk averse" party since low outcomes include an additional penalty. See Nyborg, *supra* note 44, at 361.

54. For example, if the package includes various stock options, these options will be worthless if the stock price falls enough.

55. The explanation here is in "story" form. It is not a proof. Readers interested in a more rigorous presentation should refer to Nyborg's article. The goal here is to lay some groundwork to interpret the tax results discussed later.

mind that a separating equilibrium will exist only for some values of the parameters (H , L , I , and the conditional probabilities of H or L based on the managers' private information). Nyborg shows that where a separating equilibrium exists, it is characterized by the following manager actions, conditional on their private information:

Nyborg's Equilibrium Manager Actions Conditional on Information Received		
Time	Manager Information	Manager Action
0	good	issue straight debt
0	bad	issue convertible debt
0	awful	issue equity
1	good	do nothing
1	bad	call convertible debt
2	good	do nothing
2	bad	call convertible debt

This equilibrium is game theoretic in nature. Each player's action is optimal taking into account the other players' actions and the information those actions reveal, if any. Nyborg shows that, subject to certain game theoretic concepts, this separating equilibrium is unique.⁵⁶ No other behavior pattern is stable when players take into account the actions of others.

Manager preferences shape the equilibrium above because the type of security issued and the call policy for convertible bonds heavily influences the stock price during the three time periods. Suppose that the low outcome, L , is above but not far from I , the amount needed to fund the investment. If the firm funds the project using straight debt, the low outcome will result in a very low stock price at time 3. The company will pay back the debt holders the amount I out of the return L , leaving $L - I$, a very small amount, for the shareholders. If the managers instead issued equity, the total amount L would be split between old and new shareholders without subtracting out I , resulting in a higher third period stock price. Note that L may be very large. Since managers very much dislike the possibility of a very low stock price, they will issue straight debt only when the probability of the low outcome is very low or zero.

Now consider convertible debt. If the low outcome occurs at time 3 and the debt was not converted, a low stock price result similar to the result in the straight debt case will occur. However, there is an important difference. If the managers receive negative information at time 1 or time 2, the managers can call the convertible debt and therefore avoid the low stock price outcome at time 3. But there is a cost to calling the convertible debt: Doing so signals that the managers have "bad" private information at time 1 or 2. As a result, the stock price will drop at time 1 or 2 after a call. Also, under the assumption that "bad" information at time

56. See Nyborg, *supra* note 44, at 370.

1 or 2 is “more precise” than bad information at time 0 (in the sense of signifying a higher probability of the low outcome occurring at time 3), the price will end up lower at the time of call than it would have if the managers had issued equity at time 0.

Now it is easy to rationalize the time 0 aspects of the equilibrium. Managers will issue straight debt only if the probability of the low outcome is very low. In the equilibrium, this corresponds to the case where the managers receive “good” private information at time 0. If the managers receive information at time 0 that the low outcome is very likely (the “awful” information case in the equilibrium), the managers will issue equity at time 0. Issuing debt would make it very likely that there would be a very low stock price at time 3. Issuing convertible debt would make it possible to call the debt at time 1 or 2 to avoid the low price at time 3. However, this option means a much lower price at time 1 and/or 2 than in the case of an equity issuance. If the information at time 0 is “awful,” the scenario of a call is likely, and the managers will prefer issuing equity.

In the intermediate case of information at time 0 that is merely “bad” rather than “good” or “awful,” convertible bond issuance makes sense. The probability of never facing the low outcome is much higher than in the case of “awful” information, so that it is much less likely that the managers will need to call the bonds at time 1 or 2 and face a big price drop then. At the same time, the probability of the low outcome is sufficiently higher than in the “good” information case that the managers will want to have the ability to call the bonds and force conversion “just in case.”

At time 1 and 2, the managers receive much more accurate information about the possibility of a low outcome. If this information is “bad,” the managers will want to call the bonds in the face of the high likelihood of a very low time 3 stock price in the absence of a call. The managers will want to do so even though the call causes a significant drop in the time 1 or time 2 stock price. The low price at time 3 is such a bad outcome, that the managers will go to great length to avoid it.

This equilibrium clearly supports the stylized facts discussed in the previous Part. If the managers issue straight debt at time 0, investors will infer that the managers received the good signal and will bid up the stock price. If managers issue convertible bonds or debt, then investors will infer the bad or awful signal respectively. Thus, equity issuance should result in the lowest stock price at time 0, followed by convertible bond issuance and straight debt issuance in that order. This order is exactly the “issuance hierarchy” observed in empirical tests and in Stylized Fact #1, stated above.

Another feature of the equilibrium is that managers call convertible bonds at time 1 (or time 2) if and only if they receive bad information at that time. Investors will infer the bad information from the call and will bid down the stock price. This call effect is observed in empirical tests and is Stylized Fact #2, stated above. If information becomes more pre-

cise over time (so that bad information at times 1 or 2 indicates a higher probability of the low outcome than bad or awful information at time 0), then the sum of the stock price drop from issuing convertible bonds (versus straight debt) and from calling those bonds should exceed the drop that would follow from issuing equity (versus straight debt). This possibility matches the Potential Stylized Fact stated above: It appears that issuing convertible bonds and then calling them creates a more negative total abnormal return than merely issuing equity.

Having reviewed the price effects that follow from the separating equilibrium, it is possible to fully specify the incentives of managers. If there were symmetric information, i.e., if investors knew managers' private information, then managers would always want to issue equity. Equity insures against the low outcome and ensuing low stock price at time 3. Convertible bonds provide the second best level of insurance, since the managers can call the bonds if the low time 3 outcome appears likely at time 1 or time 2. When information is asymmetric, these "insurance" features are costly. Issuing equity provides the best insurance but also signals the poorest prospects. As a result, the stock prices at times 0, 1 and 2 will be depressed. Convertible bonds also provide insurance but signal only average prospects for the firm at time 0. This will depress stock prices at all times compared to the case of straight debt issuance. In addition, if the call feature is used, even lower time 1 or time 2 stock prices will ensue. In economic terminology, the asymmetric information aspect creates an adverse selection problem that makes insurance more costly. The best insurance vehicles signal greater need for insurance and make the insurance more costly.

The equilibrium also provides an explanation for the observation that at least some firms tend to delay calls beyond the point at which they should make them on behalf of the shareholders. The equilibrium requires that the managers *not* call the bonds when they receive "good" information at time 1 or time 2. The managers' motivation for this strategy is that not calling the bonds ensures a higher stock price at time 1 and 2. Investors perceive the failure to call as indicating that the managers' information is "good" and bid up the stock price. It is precisely when the stock price gets high enough to push conversion value over the call price that classic theory suggests management should call the bonds. But in the conversion game, the opposite may be true. Good news privately received by managers is communicated to investors by not calling the bonds, and the resulting price increase may create or intensify a premium of the conversion value over the call price.

D. OTHER EXPLANATORY THEORIES

There are cogent explanations of the prevalence and purpose of convertible debt other than the Nyborg-Harris-Raviv theory. This subsection briefly discusses some of these other theories. This brevity is not meant to reflect on the quality or empirical validity of the theories. Several of

them may describe phenomena that do occur. However, none of them comprehensively explain the terms and empirical impact of convertible bonds in the way that the NHR theory does.

1. *Avoiding Risk Shifting*

When debt and equity are present in a firm's capital structure and the managers are agents of the shareholders, the managers have an incentive to engage in inefficiently risky projects.⁵⁷ Consider a firm that must choose between two mutually exclusive projects, each requiring \$100 million in investment. One project ("the low risk project") will return \$105 million with certainty, and the other ("the high risk project") will return \$1 billion with 10% probability and nothing with 90% probability. Assuming that the projects are instantaneous so that we can ignore discounting and assuming risk neutrality, the first project has a net present value of \$5 million while the second has a net present value of zero. Based on the net present value criterion, the low risk project is clearly superior.

Now suppose that the firm has \$100 million in cash but has bonds outstanding, and the bonds specify that \$100 million in principal and interest is due at a time that coincides with the payoff time for the two projects. If the firm does the low risk project, the bondholders will receive the \$100 million due for sure, and the shareholders will split \$5 million. If the firm does the high risk project, there is a ninety-percent chance that the bondholders will not be paid and a ten-percent chance that they will be paid in full. The net present value of their bonds prior to the project has fallen from \$100 million (if the firm did nothing or the low risk project) to \$10 million (if the firm does the high risk project). Under the high risk project, shareholders have a ten-percent chance of making \$900 million which has a net present value of \$90 million. Assuming risk neutrality, shareholders will strongly prefer the risky project even though it has lower net present value.

Increasing project risk typically increases downside risk and potential upside gains. However, all of the added upside gains go to the shareholders while they bear only part of the added downside risk. As a result, debt funding creates incentives for managers acting on behalf of the shareholders to engage in inefficient risk taking. Recognition of this fact ex ante means that there is an incentive for debt to include costly contractual provisions to prevent risk shifting. To the extent these provisions are ineffective, debt will be more costly since debtholders will demand ex ante compensation in exchange for exposing themselves to risk shifting.

Several finance scholars have pointed out that issuing convertible debt or a package of debt and warrants addresses the risk shifting problem.⁵⁸

57. Finance scholars have recognized this problem for quite some time, and it is currently a standard item in elementary finance texts. See, e.g., BREALEY & MYERS, *supra* note 28, at 516-18.

58. The leading rigorous exposition is Richard C. Green, *Investment Incentives, Debt, and Warrants*, 13 J. FIN. ECON. 115 (1984). Green points out several scholars who stated the idea earlier. *Id.* at 116, 125.

The conversion feature of the convertible bonds and the warrant part of the warrant package gives the holder a big slice of any high end gains. This reduces the incentives of management acting on behalf of shareholders to engage in inefficient risk shifting because the upside of risky projects must now be shared with the debtholders. Richard Green shows that in the case where the firm faces the choice of exactly two projects, the terms of the convertible bond or bond/warrant package can be set to restore the net present value maximizing incentives that would exist if there were no debt.⁵⁹

The risk shifting rationale for convertible bond or bond/warrant issuance is persuasive. However, by itself, it does not explain or predict the empirical regularities surrounding the choice of security at issuance. Avoiding risk shifting might prompt the issuance of convertible bonds for companies that have substantial choice about risk, but this issuance should have no impact on stock prices.⁶⁰ Even more striking, risk shifting may be alleviated by issuing a bond/warrant package as well as by issuing convertible bonds. The call feature does not play a role in alleviating risk shifting. Somewhat to the surprise of commentators, despite potential tax and other advantages, the bond/warrant package is much less common than convertible debt.⁶¹ This fact suggests that there is some additional or other role played by convertible bonds.

An important tax policy point also follows from considering the bond/warrant package alternative to convertible bonds. If risk shifting is the reason for convertible bond issuance, a tax policy that heavily burdens these bonds will not cause much harm. As long as the debt/warrant package is free from such burdens, issuers can address the agency problems inherent in risk shifting by using such a package.

2. *Addressing Uncertainty about Risk*

For some firms or enterprises, it may be difficult for investors to assess risk, putting aside any attempt by managers to shift the riskiness of their enterprises. The value of a straight bond tends to decline with increased risk since increased risk often involves a higher probability that the firm will default on bond coupon or principal payments. If investors are uncertain about the riskiness of a firm, they will demand a risk premium (in the form of higher coupons or yield) to purchase the firm's debt. This problem will be especially frustrating if management believes that firm riskiness is lower than investors fear. Michael Brennan and Eduardo Schwartz have pointed out that a simple way to address this problem is to issue warrants along with the debt or to issue convertible debt instead of

59. *Id.*

60. If management issued straight debt instead, the company would have to compensate the bondholders for any potential gains from risk shifting that would accrue to shareholders. As a result, there is no incentive to issue straight debt. The market will expect an issuance of convertible debt or a bond/warrant package, and there will be no price effect when this expectation is realized.

61. *See supra* text accompanying note 23.

straight debt.⁶² Warrants and the conversion option are more valuable if the firm is riskier.⁶³ Combining bonds and warrants in suitable proportions results in an instrument whose value is relatively insensitive to risk. An increase in riskiness lowers the value of the bond portion, but this drop is offset by an increase in the value of the warrant portion. Brennan and Schwartz note that there is evidence that convertible debt is used more heavily by firms whose risk is subject to a higher degree of uncertainty.⁶⁴

The phenomenon just described does not depend on asymmetric information. Managers and investors might be equally uncertain about firm risk. In this case of "symmetric uncertainty," settling on a bond/warrant package or convertible debt would serve to eliminate the need to pay investors a big premium to cover the uncertainty, just as it would in the case of asymmetric information.

Michael Brennan and Alan Kraus have considered the case of uncertainty about risk in an asymmetric information setting.⁶⁵ In this case, managers know how risky a proposed investment is, but investors do not. Brennan and Kraus demonstrate that if certain assumptions are made about the universe of possible projects, then managers can signal the riskiness of the firm by choosing the terms of the convertible bond contract.⁶⁶ In particular, riskier firms will choose a higher face value and lower conversion ratio for their convertible bond issues. That is, riskier firms will choose to issue convertible bonds with a more prominent debt component and less prominent option component. Later work by Brennan and Her⁶⁷ finds some empirical support for this result: The abnormal returns for firms issuing bonds with higher face value or lower conversion ratios are higher (less negative).⁶⁸

Although the Brennan/Schwartz and the Brennan/Kraus theories have some empirical support, they have some of the same weaknesses as the risk shifting theory. In particular, neither of them explains the call feature that pervades convertible bond contracts. In both cases, conversion is a voluntary event. As a result, both theories are as, or more applicable

62. Brennan & Schwartz, *supra* note 15.

63. A warrant is a call option and the conversion option is a call option with the peculiar feature that the exercise price depends on the value of the debt component of the convertible bond. Holding expected return constant, a call option is more valuable if there is more risk. More risk means a higher probability for outcomes above the strike price of the option and therefore a higher expected value for the option. See BREALEY & MYERS, *supra* note 28, at 599-600.

64. *Id.* at 36-37.

65. See Michael J. Brennan & Alan Kraus, *Efficient Financing Under Asymmetric Information*, 42 J. FIN. 1225 (1987).

66. See *id.* at 1238-40.

67. See Michael J. Brennan & Constance Her, *Convertible Bonds: Test of a Financial Signaling Model* (IFA, Working Paper No. 187, 1993).

68. The higher face value and lower conversion ratio suggests the firm is riskier, holding mean returns constant. Equity value is a convex function of firm returns: Stockholders receive nothing until returns cover the amount payable to senior securities and then increase dollar for dollar above that point. This pattern is similar to the returns of a call option, and the value is higher if risk is greater given a fixed expected rate of return.

to a debt/warrant package than to convertible bonds. Neither theory explains the more intensive use of convertible bonds as compared to debt/warrant packages. In addition, neither theory explains why convertible bonds fall in the middle of the hierarchy of announcement effects, causing more negative abnormal returns than a straight debt issuance but less negative abnormal returns than an equity issuance.

On the other hand, it is intriguing that the Brennan/Kraus theory provides a possible explanation for the terms of convertible bonds that are issued. These terms may be influenced by tax policy,⁶⁹ so that it is important to ascertain whether various tax treatments might interfere with or enhance the ability to signal firm riskiness by choosing issuance terms. The Nyborg-Harris-Raviv theory does not explain the choice of contract terms explicitly and therefore misses this aspect.

As mentioned above, it is important to keep the availability of the debt/warrant option in mind when considering the impact of tax policy on financial efficiency. If the focus is only on signaling concerning risk or on being able to issue a package with a value that is insensitive to risk, tax burdens on convertible debt may not be a concern. As long as these burdens do not extend to debt/warrant packages, firms can signal riskiness or immunize value from risk by issuing such a package. In summary, it would be desirable to include the phenomena modeled by Brennan and Kraus in assessing the impact of tax policy, but these phenomena are not central to the peculiar role played by convertible debt, as opposed to other financing vehicles such as debt/warrant packages.⁷⁰

II. THE TAX TREATMENT OF CONVERTIBLE DEBT

This Part begins with a description of some basic tax rules that apply to convertible debt instruments and some of the "reform" proposals. With that discussion in hand, the rest of this Part describes various tax alternatives studied in Part III. These alternatives are simplified and do not exactly coincide with current treatments or specific proposals. There are

69. See *infra* text accompanying note 102.

70. There is one caveat. It may be most efficient to achieve multiple signaling goals or to signal and simultaneously immunize value from risk by using callable convertible bonds. Issuing a callable convertible bond signals firm prospects as detailed in the Nyborg-Harris-Raviv model. In these models, there is some latitude to vary the face value and conversion ratio terms of the bonds: Choosing a lower face value means choosing a larger conversion ratio. One could signal firm risk or immunize the issue against risk by choosing these terms. This ability would be particularly useful if achieving these goals did not by themselves justify the extra expense (compared to a straight debt issuance, the cheapest variety) of a specialized kind of issue (bonds/warrants or convertibles). Then, heavy tax burdens on convertible debt might not only destroy its signaling function as described in the NHR model, but might also destroy the ability to signal firm riskiness or to immunize issuance value against risk. Note, however, that this case arises precisely where the value of signaling firm riskiness or immunizing an issue against risk is low—too low to justify a special issuance on their own.

It is also unclear how signaling firm riskiness (or immunizing an issuance against risk) would interact with the signaling already present in the NHR model. Assessing this interaction requires a model that comprises the NHR signaling and the other phenomena simultaneously. No such model exists at present.

two reasons for this approach. First, the main goal is to gain an appreciation of how taxes interact with signaling. Using simplified alternatives emphasizes the features that are more general and, at the same time, sheds considerable light on current and proposed rules. Second, signaling models are complex. Even if one does the work to add a high level of detail, it is often not clear why particular results ensue or whether the results depend on peculiarities in the model.

A. CURRENT LAW AND REFORM PROPOSALS

1. *Current Law*

Convertible bonds create difficult tax law questions because of their dual nature. Part of the convertible bond's value resides in a straight bond and part resides in the value of the conversion right. One obvious approach would be bifurcation, splitting the bond into two pieces and taxing each piece according to the appropriate rules—the bond rules for the straight bond portion and the option rules for the conversion right. Current law partially applies this approach to bonds issued at a premium, but otherwise does not attempt to separate the conversion right and bond portions.

Consider first, a convertible bond issued at par. Suppose that the bond will pay \$1000 in five years, that the issuance price is \$1000, and that the conversion right is worth \$200 at the time of issuance. Suppose that the bond pays coupons of \$80 per year. Bifurcation into a straight bond and an option would call for treating this as a discount bond issued with \$200 of OID plus an option sold for \$200. OID would accrue at a 4.56% annual rate and would result in taxable income for the holder and an equal deduction for the issuer. If the bond were converted at any time, the \$200 cost of the option portion would be added to the basis of the stock received. The exchange of the bond for stock would be a realization event, resulting in capital gain or loss for the holder. The issuer could be treated as having discharge of indebtedness income or an ordinary loss from retiring the debt at a premium.

The actual treatment is quite different. The bond is not treated as an OID bond.⁷¹ As a result, the issuer has no OID deductions and the

71. I.R.C. §1272 and the accompanying regulations specify the computation of OID for contingent debt that includes an embedded option. *See* Treas. Reg. § 1.1272-1(c)(1), (c)(5) (2002). Under the current OID rules, the OID accruing each period is the yield to maturity applied to the adjusted issue price at the beginning of that period. So the crucial element in determining the OID accrual schedule is the yield to maturity. When the debt contract gives the holder an option, the yield to maturity is computed both with and without exercise of the option. The larger yield to maturity applies. In the case of an option held by the issuer, the minimum yield to maturity applies. Treas. Reg. § 1.1272-1(c)(5) (rule), -1(j) (Examples (5), (6)).

However, "an option is ignored [in computing yield to maturity] if it is an option to convert a debt instrument into the stock of the issuer . . ." Treas. Reg. § 1.1272(e) (2002). Furthermore, "[t]he issue price of a debt instrument includes any amount paid for an option to convert the instrument into stock (or another debt instrument) of either the issuer or a related party . . . or into cash or other property in an amount equal to the approximate value of such stock (or debt instrument)." Treas. Reg. § 1.1273-2(j) (2002). Since the value

holder has no OID income. Conversion has no tax consequences for the issuer, except that the issuer no longer makes coupon payments and receives the corresponding deductions. Conversion gives the holder a cost basis of \$1000 in the stock received.

Now consider a convertible bond issued at a discount. Suppose it will pay \$1000 in five years, that it is issued for \$800, that it pays coupons of \$18 per year, and that the conversion right is worth \$200 at the time of issuance. Bifurcation would separate out a straight bond portion, taking the issuance price as \$600 for that portion. The \$400 of original issue discount would accrue at a 10.76% annual rate. Instead, current law treats the amount of OID as \$200, accruing at a 4.56% annual rate.⁷² In addition, conversion is not a taxable event either for the issuer or the holder.

Finally, suppose the convertible bond is issued at a premium and that the straight bond portion of the convertible also includes an issuance premium.⁷³ In particular, assume that the convertible bond will pay \$1000 in five years, that it is issued for \$1250, that it pays coupons of \$125 per year, and that the conversion right is worth \$200 at the time of issuance. Bifurcation into a straight bond plus an option would treat the bond portion as a premium bond issued for \$1050, allowing the taxpayer to amortize a premium of \$50 over the life of the bond. In this case, current law accomplishes this precise result by requiring that the amount of any bond premium be reduced by the value of the conversion right.⁷⁴ Again, conversion is not a taxable event either for the issuer or the holder.

Thus, if bifurcation into a straight bond and an option is the desideratum, current law computes deductions from premiums and income from

of the conversion right is included in the issue price in computing OID, a convertible bond issued at par will not have any OID.

72. See *supra* note 71 (quoting applicable Treasury regulations). For a discussion and an example, see BITTKER & LOKKEN, *supra* note 8, at 56.4.3 (example; 1997 Cumulative Supplement No. 1) and 56.3.3 (until conversion, the issue price of a convertible bond is allocated entirely to the debt aspect of the instrument; the conversion privilege is ignored).

73. The same rules that apply to convertible bonds issued at par also apply to convertible bonds issued at a premium with straight bond components that are discount or par bonds. See *infra* note 74.

74. Treas. Reg. § 1.171-2(c)(1) states that "for the purpose of determining the amount of amortizable bond premium on a convertible bond for the taxable year, the amount of bond premium shall not include any amount attributable to the conversion features of the bond." The standard used to compute the amount attributable to the conversion features is a market value standard that separates out the straight bond component. Treas. Reg. § 1.171-2(c)(2) states that "[t]he value of the conversion feature of a particular bond shall be ascertained as of the time of acquisition by reference to the assumed price at which such bond would be purchased in the open market if without the conversion features, and by subtracting such assumed price from the cost of the bond."

If subtraction of the value of the conversion right eliminates any premium or shows that the straight bond portion is in fact a discount bond, these Regulations eliminate the ability to deduct any premium. Under the rules for computing OID, there is no OID either. See *supra* note 71. As a result, the rules treat these convertible bonds in the same way as they treat convertible bonds issued at par: There is no accrual of OID or amortization of bond premium even though the straight bond portion would demand such accrual or amortization if treated separately.

OID correctly only for convertible bonds issued at a premium whose straight bond portion also includes an issuance premium. For convertible bonds that are issued at discount, that are issued at par, or that are issued at a premium with a straight bond portion that is an OID bond, some OID is "hidden" behind the value of the conversion premium. The issuer may choose to make this conversion premium large and thus hide more OID. The implications of this ability to hide OID depend on the tax rates that apply to the issuer, to the holder, and to the marginal investor. If the same marginal rate applies to both the issuer and the holder, changing the bond terms to increase or decrease OID does not matter if the bond is held until maturity. Each tax increase for the holder from accruing more OID is exactly offset by an equal tax reduction at the same time for the issuer. The issuer and holder can offset this transfer by changing the yield of the bond. However, there is an asymmetric effect if conversion occurs. If the bond is converted, the holder will have a higher basis equal to the amount of OID accrued and taxed, thereby reducing future capital gains (or increasing capital losses). This higher basis will not matter if the taxpayer has a low effective capital gains rate.⁷⁵ There are no tax consequences for the issuer upon conversion.⁷⁶

75. A low effective capital gains rate may apply because the investor will hold the stock until death or because the investor has large capital loss carryovers.

76. If the bond is paid off at maturity, neither the holder nor the issuer will face any additional tax consequences. Any potential gain or loss will have been absorbed by accrued OID or amortization of the issuance premium.

If the issuer calls the bond and the holder tenders for the call price, the holder will have a capital gain or loss after reducing the amount received by the adjusted issue price of the bond. (The adjusted issue price generally is equal to the issue price plus accrued OID minus the amount of issuance premium amortized to date.) The treatment of the issuer is more complex. The issuer cannot simply deduct the full repurchase premium paid over the adjusted issuance price but may only deduct the "normal call premium." I.R.C. § 249(a) (2002). The "normal call premium" is generally defined as "an amount equal to a normal call premium on a nonconvertible obligation which is comparable to the convertible obligation." Treas. Reg. § 1.249-1(d)(1) (2002). The call price for callable but nonconvertible bonds generally includes a premium over the face value of the bond. Payment of this premium is a deductible expense for the issuer, and the § 249 regulations attempt to carry over that deductibility to convertible bonds. It is not always clear what a normal call premium would be. The Regulations provide a one-year's interest safe harbor, Treas. Reg. § 1.249-1(d)(2), and also permit the issuer to argue that an amount in excess of the normal call premium "is attributable to the cost of borrowing and is not attributable to the conversion feature." Treas. Reg. § 1.249-1(e) (2002).

In this article, I do not attempt to study tax effects due to the rules that apply when the issuer calls a convertible bond and the holders tender for the call price. A call with this result generally will be a call that is not intended to force conversion. The signaling theories that seem to explain the existence of convertible bonds and call policy envision that calls will be made to force conversion. In fact, calls made to force tender at the call price are rare. To induce tender at the call price, the call must be made when conversion value is less than the call price. For example, in Professor Asquith's study of 199 convertible bonds issued between 1980 and 1982, issuers called 123 of the bonds by December 31, 1993, but only 8 of these calls were made when conversion value was less than the call price. See Asquith, *supra* note 20, at 1280. Only 14 bonds were outstanding as of December 31, 1993, and the remaining 64 (not called or outstanding) were bonds of firms subject to a merger or reorganization during the study period.

Even aside from signaling theory, it is not surprising that few bonds are called to force tender at the call price. Unless interest rates have fallen so that the firm can refinance at a

A different situation arises if the issuer and holder are subject to different tax rates. Suppose the issuer faces a higher marginal rate. Then increasing the amount of OID by reducing the conversion premium creates a joint gain. The issuer receives deductions and the holder has matching income, but the deductions are subject to the issuer's higher marginal rate. Maximum exploitation of this joint gain requires elimination of the conversion premium so that the bond becomes an ordinary, i.e., nonconvertible, bond. The opposite will be the case if the holder faces higher marginal rates than the issuer. Then, minimizing joint taxes calls for maximizing the conversion premium, i.e., moving in the direction of straight stock.⁷⁷

An important question is whether tax rate disparities between issuers and holders could distort the issuance terms of convertible bonds or distort the choice between convertible bonds and either of the alternatives, straight bonds and equity. The crucial fact needed to answer the question is the tax rate of the *marginal* investor.⁷⁸ If the marginal investor faces the same marginal rates as the firm, the size of the conversion premium will not affect the issuance price. In that case, adjusting the conversion premium cannot lead to a joint tax saving between the marginal investor and the firm, and the OID rules will not implicitly favor straight debt or equity over convertible debt.

lower rate, there is a real economic loss for the shareholders for such calls since the firm is paying the bondholders a premium for the bonds.

77. Given limited liability, straight stock is a call option with a strike price of zero. As the conversion premium portion of the bond becomes more and more prominent, the relative value of the bond portion becomes small. As the relative value of the bond portion approaches zero, conversion becomes certain, and the convertible bond is effectively stock. This exact phenomenon in fact occurs for "deep-in-the-money" convertible bonds. These bonds have a conversion value way above the payment due on maturity as a bond. Conversion is virtually certain and the bond trades very much as if it were actually the underlying shares. The only difference is that the bond coupon may exceed the dividend payments on the stock giving the convertible bond superior cash flows. If the coupon payment is below the dividend rate and eventual conversion is virtually certain, the holder will want to convert immediately. The general principal that the holder of a call option should not exercise until the expiration of the option, here at maturity of the bond, does not apply when the underlying security pays dividends. *See supra* text accompanying note 18.

78. The marginal investor is a hypothetical individual who is indifferent between investments with different tax attributes. For example, if tax-exempt (municipal) bonds yield 7% while taxable bonds with the same risk characteristics yield 10%, the marginal investor must be in the 30% bracket. With a 30% tax rate, the after-tax yield on the taxable bonds is 7%, and the investor is indifferent between the tax-exempt and taxable bonds. Investors in other tax brackets are "inframarginal."

The tax bracket of the marginal investor is determined by the supply of investment funds at various tax rate levels and the demand of issuers for investment funds. For example, high demand from municipal governments means a bigger supply of tax-exempt bonds at any given interest rate. The municipal governments may have to sell these bonds to individuals in lower brackets to clear the market. As a result, the interest rate on the tax-exempt bonds would increase, and the marginal investor would have a lower tax rate.

In the text, I speak as if the marginal investor is fixed exogenously. The implicit assumption is that shifting the terms of convertible issues or increasing or decreasing the issuance of convertibles relative to straight bonds and equity has no effect on the tax rate that characterizes the marginal investor.

2. Reform Proposals

The Clinton Administration's proposal would defer any issuer OID deductions on convertible debt until the OID is actually paid.⁷⁹ Absent a bond call followed by tender at the call price, an issuer typically does not pay OID until maturity. If the bonds are converted at any point, the issuer would never pay the OID to the holder, and would lose the deduction forever. Finally, the provision does not exempt the holder from paying taxes on accruing, but unpaid OID. The holder who converts will have a higher basis as a result, but at the cost of paying taxes on the increase at ordinary income rates.

Unless the marginal investor is subject to a zero marginal rate, this provision will tend to have an impact on both the "issuance game" and the "conversion game." With respect to the conversion game, the provision effectively taxes the issuer at the time of the conversion event by eliminating OID deductions forever. As a result, the issuer will be less eager to call convertible debt in order to force conversion, and the entire "insurance" value of being able to issue conversion-forcing calls is lower. With respect to the issuance game, the provision makes both equity and straight debt relatively more attractive sources of funding compared to convertible debt.

Most convertible bonds end up being converted.⁸⁰ This fact is not surprising given the dynamics of the signaling explanation for convertible debt. If the underlying stock does well, investors will convert voluntarily. Otherwise, if the call price is low enough, the issuer can call to force conversion if poor performance threatens to leave little to shareholders after paying off creditors. Given that issuers anticipate conversion with high probability, a simple reform proposal would be just to bar any OID deductions regardless of whether or not conversion actually occurs. This approach would have the advantage of not imposing any tax penalty on the issuer for forcing conversion.

After discussing how I will model taxes in the next Part, the Part following considers the impact of both of these proposals, among others, on the conversion and issuance games that are central to the signaling rationale for convertible debt. The results do not necessarily match up with conventional tax policy intuition. For example, policies that are not "neutral" with respect to various financial instruments may result in greater efficiency gains from signaling.

B. MODELING TAXES

The results in the next Part stem from a modified version of the Nyborg model. As discussed above, the driving force in the model is risk aversion on the part of managers. They prefer high stock values at each of the four times 0, 1, 2, and 3. The only payoffs in the model occur at time 3

79. See *supra* text accompanying note 5.

80. See *supra* text accompanying note 9.

when the firm realizes the high outcome, H , or the low outcome, L . The model assumes investors are risk neutral and ignores discounting. As a result, the stock price at any one of the times 0, 1, or 2 is simply the per share expected value of the returns to equity at time 3 conditional on the time 0, 1, or 2 information about the likelihood of the high and low outcomes at time 3. This fact makes it convenient to add taxes by changing the time 3 outcomes to reflect the cumulative tax consequences on each possible outcome. These changes will reflect back through the expected value computation to yield correct values at each of the earlier times. Suppose, for example, that the firm calls the bonds at time 1. Under the separating equilibrium, this lowers the probability of the high outcome at time 3, eliminates the potential squeeze on time 3 stock prices that would result under the low outcome in the face of unconverted bonds, and ensures under the Clinton Administration's proposal that the firm will never be able to use its OID deductions. The stock price value is the expected time 3 per share outcome conditional on conversion, on loss of the deductions, and on the fact of a time 1 call. One can add the tax penalty of loss of the deductions to both the low and high outcome at time 3. The time 1 stock value right after the call will then incorporate this penalty with 100% probability.

The main focus in the next Part will be on how various provisions change the signaling equilibrium from some baseline state. Rather than start with a no tax world, it is convenient to give H and L appropriate after-tax interpretations for each thought experiment. Otherwise, complex modeling of many detailed features is necessary. There are around ten basic inequalities in the signaling equilibrium. Avoiding detail reduces the number of inequalities and also makes interpretation of major tendencies much easier.

The firm must finance an investment of I at time 0 using equity, convertible bonds, or straight bonds. At time 0, there are N shares of common stock and no other securities outstanding. Consider first, the per share value of stock at time 3 assuming equity financing. Redefine H , the amount realized under the high outcome, to be the amount available to shareholders (under pure equity financing) *after* both personal and corporate taxes. Thus, features such as corporate deductions for the portion of I that is depreciable, capital gains taxes at the personal level, and corporate income taxes are all included. Redefine L , the amount realized under the low outcome similarly. Now, the per share time 3 after-tax return for the high outcome is:

$$h_e = \frac{H}{N + Q}.$$

Q is the number of shares issued at time 0 to raise the amount I . Q depends on H and L since the value of shares at time 0 is the expected value per share at time 3 conditional on the time 0 information.⁸¹ Similarly, the

81. If the firm is issuing equity at time 0, then under the separating equilibrium it received "awful" information at that time. Defining $P(H|A_0)$ and $P(L|A_0)$ as the

per share time 3 after-tax return for the low outcome is:

$$l_e = \frac{L}{N + Q}.$$

There are no explicit tax terms in either of these equations since we are setting equity as the baseline case where all the tax effects are incorporated into H and L .

Now consider an issuance of straight debt in an amount I . Since no conversion takes place and since the firm does not issue any new common shares, N shares will be outstanding at time 3. However, the firm must pay the debt holders I before paying the shareholders anything. In addition, the use of debt instead of equity may change the combined personal and corporate level tax in the high and low outcome cases. For example, with debt the firm can deduct coupon payments and OID, but the personal tax on these items may differ from the combined corporate and personal tax on the same amounts under all equity financing. Generally, the tax deviations due to debt will be proportional to I .⁸² As a result, we subtract $(I+d)I$ instead of I where the d factor reflects the additional tax burden due to financing the amount I through debt instead of equity.⁸³

probabilities that the firm realizes H or L respectively at time 3, given awful information at time 0, the total expected value of all shares combined at time 3 will be

$$E(S_3 | A_0) = P(H | A_0) \cdot H + P(L | A_0) \cdot L.$$

Then Q must be set such that

$$Q = \frac{I}{E(S_3 | A_0) / (N + Q)},$$

where the denominator is the expected per share value at time 3 taking into account that there will be $N + Q$ shares outstanding at that time. Rearranging this equation results in a simple expression for Q as a function of H and L :

$$Q = \frac{N \cdot I}{P(H | A_0) \cdot H + P(L | A_0) \cdot L - I}.$$

82. For example, suppose that rates on coupon income exceed the combined personal and corporate tax on the same amount of income in the all equity case. The coupon income involved will be proportional to the face amount of debt, I . Suppose that this proportion is s and that rates on coupon debt are higher by the amount t . Then, the tax adjustment will be

$$s \cdot t \cdot I.$$

83. One feature that may appear strange is that the model does not explicitly allow for coupon income or OID. The model assumes that interest rates are 0, and no one discounts future values for the time value of money. This feature is harmless for modeling the tax policies of interest here. The critical feature of these policies is not that they change the timing of income or deductions, but that they make tax treatment dependent on the choice of instrument or on whether or not a convertible bond is called. Some of the choice of instrument differences may flow from timing differences, but these may be summarized via factors such as the d factor for debt. In examining a signaling equilibrium, the crucial tax features are those that make signals more or less costly. The signals in the model here are the type of security issued at time 0 and the call policy for convertible bonds. Thus, differential treatment of instruments matters, but it does not matter how the differences come about.

There are models that consider debt maturity (long-term versus short-term) as a signal. See Mark J. Flannery, *Asymmetric Information and Risky Debt Maturity Choice*, 61 J. FIN. 19 (1986). Adding taxes to such a model would make tax timing more important. The potential impact of considering signaling by choice of maturity and its interaction with the signaling discussed in the text is very complex. I discuss these issues in the Appendix. See *infra* text accompanying notes 113-22.

Now the per share time 3 after-tax returns for the high and low outcomes in the case of straight debt issuance at time 0 are:

$$h_s = \frac{H - (1 + d)I}{N}.$$

$$l_s = \frac{L - (1 + d)I}{N}.$$

Finally, consider the case of convertible bonds. In this case, we must specify the terms of the convertible bond contract. Assume that the bonds promise to pay a total of M at maturity and that the conversion rate is r . For convenience, suppose that each bond has a face value of \$1, so that there are M bonds issued, and these bonds convert into rM shares of stock. The parameters r and M are not independent. In order to raise I at the time of issuance, a lower M requires a higher r . In other words, reducing the straight debt feature of the bond requires increasing the value of the conversion feature. We will adjust for taxes through the quantity cM where c is the adjustment parameter. The idea is that adjustments in factors such as the deductibility of OID will create an increase or decrease in tax due that is proportional to M . We will model the "conversion tax penalty" inherent in the Clinton Administration's proposal by making this adjustment if and only if the bond is converted.⁸⁴ We will also consider a "general tax penalty" on convertible bonds that would deny OID deductions whether or not the bonds are converted.

Given a choice for M , the conversion ratio r will depend on H , L , M , c , and the probabilities for H and L conditional on receiving "bad" information at time 0.⁸⁵ Replacing r using the appropriate formula yields the following time 3 share values for the case where the bonds are converted:

84. A key feature of the Clinton Administration's proposal is that the firm loses its OID deductions if the bonds are converted. One could add a general term, similar to the $(I + d)$ term applied to straight debt, to model tax discrepancies that arise from using convertible debt instead of equity under current law. However, I include no such general term because none of the simulations in the next Part turn on such discrepancies.

85. Recall that the separating equilibrium requires the firm to issue convertible bonds at time 0 if the information received is "bad" as opposed to "good" or "awful." Consider the case where conversion takes place so that there will be a tax penalty of cM . Defining $P(H|B_0)$ and $P(L|B_0)$ as the probabilities of receiving H and L , respectively, at time 3, conditional on receiving "bad" information at time 0, the expected total return for the company at time 3 is:

$$E(R_3 | B_0) = P(H | B_0) \cdot H + P(L | B_0) \cdot L - c \cdot M.$$

Then r must be set such that

$$rM = \frac{I}{E(R_3 | B_0) / (Mr + N)}.$$

where the denominator is the expected per share value at time 3 taking into account that the investors will have converted the bonds so that there will be $N + Mr$ shares outstanding at that time. Rearranging this equation results in a simple expression for r as a function of H , L , M and c :

$$rM = \frac{N \cdot I}{P(H | B_0) \cdot H + P(L | B_0) \cdot L - c \cdot M - I}.$$

$$h = \frac{(H-c \cdot M) \cdot [P(H | B_0) \cdot H + P(L | B_0) \cdot L - c \cdot M - I]}{N \cdot [P(H | B_0) \cdot H + P(L | B_0) \cdot L - c \cdot M]}$$

$$l = \frac{(L-c \cdot M) \cdot [P(H | B_0) \cdot H + P(L | B_0) \cdot L - c \cdot M - I]}{N \cdot [P(H | B_0) \cdot H + P(L | B_0) \cdot L - c \cdot M]}$$

In the separating equilibrium, the bonds always are converted if the outcome is high. If the outcome is low, and the bonds are not converted, the per share value at time 3 is:

$$l_N = \frac{L-M}{N}.$$

One important aspect that is not present in the model is the choice between discount debt and par or premium debt. This choice is relevant to reform ideas such as the Clinton Administration's proposal because that proposal aims only at OID deductions and not at the deduction of coupon income. An issuer can avoid this type of provision by issuing par or premium convertible debt. The difference between these debt types is a difference in debt maturity. Discount bonds involve delayed payment compared to coupon bonds. In effect, discount bonds have a later maturity date than coupon bonds.

The choice of debt maturity may itself be a signal, and there is extensive literature on whether maturity can be an effective signal and on whether maturity choice has an impact that is observable in abnormal stock returns at issuance.⁸⁶ These issues are complex, and I discuss them at length in the Appendix.

The resolution of the issues affects the interpretation of the results in the next Part. If maturity choice has no signaling or abnormal stock return effects, then the Clinton Administration's proposal may not matter much because issuers can switch to par or premium convertibles. In that case, the results in the next Part are best interpreted as applying to hypothetical provisions that deny OID *and* coupon deductions for convertible debt: the conversion tax penalty variation denying the deductions only if there is conversion and the general tax penalty denying the deductions regardless of whether or not conversion occurs.

III. RESULTS: THE IMPACT OF TAXES ON THE SIGNALING EQUILIBRIUM

The key question in a signaling model is whether there is a separating equilibrium. The existence and uniqueness of such an equilibrium promotes informational efficiency: By observing manager actions, investors can infer private information held by managers. As a result, market

86. See *supra* note 83 and the Appendix, *infra* text accompanying notes 113-22.

prices will capture this private information as well as all other available information.

Generally, a separating equilibrium will exist only for some values of the parameters in the model. The key parameters in the Nyborg-Harris-Raviv model are:

- (1) H , the high outcome;
- (2) L , the low outcome;
- (3) I , the amount of investment;
- (4) the probabilities of receiving H or L conditional on various private information that managers might receive;
- (5) manager preferences.

A separating equilibrium requires that a number of inequalities be true. Each inequality reflects a managerial decision (e.g., call the convertible bond at time 1), and the inequality guarantees that the decision will send the signal required by the separating equilibrium.

This Part will proceed through simulations based on several extended examples. Particular assumptions about conditional probabilities and manager preferences will make the governing inequalities easy to understand. However, the interpretation of these inequalities will be the same as if they were in a more abstract, less comprehensible form.

Since the principal nontax purpose of convertible debt appears to be signaling, a key policy issue is how various tax proposals affect the scope of any separating equilibrium. Particular provisions may result in a reduced or an increased set of projects for which a separating equilibrium is possible. Since the separating equilibrium comes about in part from the issuance choice (between convertible debt, equity, or straight debt), the tax treatment of other instruments matters also.

Unfortunately, we do not know either the list of all potential projects or the list of projects for which convertible debt signaling is important. The approach here is to fix manager preferences, conditional probabilities, and the amount of investment I , and then examine how tax policy affects the size and shape of the region in H - L space where a separating equilibrium exists. In other words, the goal will be to find the set of pairs (H, L) , such that a firm can signal its type, and then see how this set is affected by taxes.

Managers choose which security to issue and when to call convertible bonds. As a result, manager incentives are crucial. Conditional on their information, managers must prefer the actions that are consistent with a separating equilibrium, as described in the table above.⁸⁷ In the model, manager preferences depend on stock prices in the sense that managers maximize:

$$E[w(S_0)+w(S_1)+w(S_2)+w(S_3)]$$

87. See *supra* text accompanying notes 52-53.

where S_i is the stock price at time i , $w(\cdot)$ is a risk averse utility function, and $E[\cdot]$ is the expectation operator. In other words, managers maximize the sum of the expected utilities of the stock price at the each of the four times.

In the simulations below, $w(x) = \ln(x)$ is each manager's utility function. As required by the model, this utility function implies risk aversion at all price levels and greater risk aversion at low price levels. The qualitative features of the results are not sensitive to the exact form of the manager's utility function, and using a logarithmic function makes the inequalities that characterize equilibrium easy to understand.

The simulations use particular conditional probabilities. First, the signals at time 2 will be unambiguous: A "good" signal at time 2 implies that the high outcome will occur for certain, and a "bad" signal at time 2 implies that the low outcome will occur for certain. In addition, a "good" signal at any of the earlier times, time 0 or time 1, implies that there will be a good signal at all future times.⁸⁸ The signaling equilibrium in the Nyborg-Harris-Raviv model splits into two parts: the conversion game and the issuance game. There are two sets of simulations below. One set, the "conversion game simulations," focuses on the conversion game alone. The other set, the "full game simulations," focuses on the combined issuance and conversion games.⁸⁹ The probability of receiving a good signal in the period following a bad signal is .5 in the full game simulations and .8 in the conversion game simulations. The probability of a good signal conditional on receiving awful information at time 0 is .4 in the full game simulations. Given these conditional probabilities, it is possible to compute all the others.

Changing the conditional probability assumptions would affect the exact quantitative results, but the article draws qualitative conclusions that would not change if the results reflected different conditional probability assumptions. The assumptions about time 2 conditional probabilities simplify the model significantly. These assumptions imply that after receiving the time 2 signal, the managers will know with certainty what the outcome will be at time 3. In equilibrium, a "bad" signal at time 2 means the managers will call the bonds and thereby force conversion.⁹⁰ If managers receive the "good" signal at time 2, the high outcome will occur at time 3 and bondholders will convert voluntarily. Thus, in equilibrium, conversion is certain to occur. This fact makes analyzing the issuance game much easier. It also is true that most convertible bond issues do end up being converted.⁹¹

The next subsection analyzes the conversion game and the final subsection of this Part analyzes the full game. Although this Part also includes a

88. Thus, a good signal at any time implies that the high outcome is certain to occur.

89. The issuance game includes the conversion game as a subcomponent. It is impossible to analyze the issuance game in isolation.

90. The call forces conversion because the call price is zero.

91. See *supra* text accompanying note 9.

great deal of interpretation of the results, some of the interpretation is left to the next Part.

A. THE CONVERSION GAME

1. *The Results*

The separating equilibrium demands that managers will call the bond issue at time 1 or time 2 if they receive a "bad" signal at that time, and will not call if they receive a "good" signal. For this to coincide with manager preferences, four groups of inequalities must hold:

Group (1): At time 2, a call reduces the time 2 stock price thereby lowering managers' expected utility. However, a call increases the time 3 price and the associated expected utility of that price. If the managers receive a "good" signal at time 2, the expected utility gain from the higher price at time 2 due to not calling must exceed the expected utility gain at time 3 that would result from calling. This requirement gives rise to two sets of inequalities, one conditional on having received a "bad" signal at time 1 and the other conditional on having received a "good" signal at time 1.⁹²

Group (2): If the managers receive a "bad" signal at time 2, the expected loss in utility from the drop in the time 2 stock price from calling must be less than the expected gain in utility from the increase in the time 3 stock price. This requirement gives rise to two sets of inequalities, one conditional on having received a "bad" signal at time 1 and the other conditional on having received a "good" signal at time 1.⁹³

Group (3): If the managers receive "good" news at time 1, then the sum of the expected utility of time 1, 2, and 3 stock prices must be higher if the managers do not call the bonds at time 1.⁹⁴

Group (4): If the managers receive "bad" news at time 1, then the sum of the expected utility of time 1, 2, and 3 stock prices must be higher if the managers call the bonds at time 1.⁹⁵

These four groups, totaling six inequalities, boil down to just three basic inequalities given the assumptions set out above concerning conditional probabilities and manager preferences. Before stating these inequalities, the following list sets out some notation:

H = high outcome

92. See Harris & Raviv, *supra* note 46, at 1277 (equations (A1) and (A2)).

93. See *id.* at 1278 (equations (A3) and (A4)).

94. See *id.* (equation (A5)).

95. See *id.* (equation (A6)).

If the managers call the bonds at time 1, there will be no signaling possibility (using a call) at time 2. As a result, investors will not be able to infer at time 2 the information ("good" or "bad") that managers learned at that time, and the scheme will not fully reveal the managers' private information to the market. We nonetheless refer to this outcome as part of "the separating equilibrium," with the justification that the scheme utilizes the full capacity of the convertible instrument to signal private information. That capacity includes the ability to signal that managers received "bad" information at time 1 or at time 2 but not at both times.

L = low outcome

M = total face value of convertible debt = number of bonds, given \$1 face value each

r = conversion ratio

N = number of shares outstanding prior to conversion

c = tax penalty factor at time 3 if bonds are converted

$P(G|B)$ = the probability of getting good news conditional on bad news in the previous period

$P(B|B)$ = the probability of getting bad news conditional on bad news in the previous period

$$l_N = (L - M)/N$$

$$h_c = (H - cM)/(N + Mr)$$

$$l_c = (L - cM)/(N + Mr)$$

$$\beta = (H - cM)/(L - cM)$$

I state each inequality first in a form that corresponds closely with the expected utility terms from the managers' preferences and then in a form that shows the dependence on basic parameters such as M , N , L , H , and c . All of the inequalities in Groups (1) and (3) boil down to the first basic inequality:

$$\ln(h_c) - \ln(l_c) \geq 0 \quad (CG1)$$

$$H \geq L$$

This constraint is met trivially since H is the high outcome and L is the low outcome.

The two inequalities in Group (2) end up being the same and yield the second basic inequality:

$$\ln(h_c) - \ln(l_c) \leq \ln(l_c) - \ln(l_N) \quad (CG2)$$

$$\left[\frac{L - cM}{L} \right]^2 NL^2 \geq \left[\frac{H - cM}{H} \right] H(N + Mr)(L - M)$$

Since $H > L$, it is obvious that increasing c , the tax penalty factor, will make it harder to meet the inequality.⁹⁶

The inequality in Group (4) is the third basic inequality:

$$2 \cdot [\ln(P(G|B)h_c + P(B|B)l_c)] + P(G|B)\ln(h_c) + P(B|B)\ln(l_c) \geq$$

$$2 \cdot [P(G|B)\ln(h_c) + P(B|B)\ln(l_c)] + \ln(h_c) \quad (CG3)$$

$$\beta^{1+P(G|B)} \leq [P(G|B)\beta + 1 - P(G|B)]^2$$

It turns out that increasing c makes it easier to meet this inequality. This result follows from the assumption that the managers are less risk averse at higher stock price levels. It also is easy to understand intuitively since the Group (4) inequality is driven by risk averse managers wanting to

96. Increases in c cause the term in square brackets on the left hand side in the second version of (CG2) to fall more than the term in square brackets on the right hand side.

avoid a very low stock price outcome at time 3. Adding in a tax penalty makes this outcome even lower and the managers' risk aversion increases at lower stock price ranges.

Algebraic examination of the inequalities reveals that the tax penalty tightens the second basic inequality and loosens the third. The tax penalty has no effect on the first basic inequality, and, in any event, this inequality is not binding.⁹⁷ The overall effect is therefore ambiguous. Added insight is possible through looking at a graph of the region in which the separating equilibrium exists. Before doing so, I discuss the algebraic results for the more general form of the tax penalty, that is, denial of OID deductions on convertible bonds whether or not the holder converts the bonds.

The only algebraic difference that considering the more general form of the penalty makes is to alter the return in the case where the bonds are not converted. In equilibrium, conversion occurs if the outcome is high. As a result, the only change is in the formula for l_N , the time 3 value of the stock if there was no conversion and the low outcome occurs. The more general form of the tax penalty means that we must subtract the tax penalty from this outcome. The new formula for l_N is $(L - (I + c)M)/N$, instead of $(L - M)/N$. l_N enters into the second of the three basic inequalities. Adding in the tax penalty lowers l_N , and it is clear from the first equation in (CG2) above that the impact of lowering l_N is to make the constraint easier to satisfy.

There is one subtlety of the model that requires explanation with respect to the general form of the tax penalty. The model assumes no default, so in the absence of the penalty, M must be less than L . There is more likely to be a signaling equilibrium, however, if M is close to L since that means the stock price will be very low if the low outcome occurs and the bonds remain unconverted. The possibility of this very low stock price will make risk averse managers more eager to call the bonds when they receive bad information at times 1 or 2. Subtracting the penalty from the low outcome when the bonds remain unconverted, means that, to avoid default, L must be greater than M , the face value of the bonds, by at least cM , the amount of the penalty. If a project has a lower value of L , the issuer must reduce M . A lower M means that the issuer must increase either the bond coupons or the conversion ratio, r , in order to raise the required investment amount, I .

Either of these changes leads to what I will call "the disappearing OID effect." Previous discussion indicated that conversion value "hides" OID.⁹⁸ Increasing the coupon rate combined with reducing the amount due at maturity would replace OID income with coupon income. In the model there are no coupons, and the adjustment to a lower face value is an increase in the conversion ratio. Under the Clinton Administration's

97. When $H > L$, the third basic inequality is not met until H exceeds some level. As a result, if the third basic inequality is satisfied, so is the first.

98. See *supra* text accompanying notes 74-75.

proposal, the tax penalty of denying a deduction for OID falls only on OID. So reducing the face value reduces the amount of the penalty. This fact will be important in explaining some of the results.

The following figure indicates for each value of L which values of H admit the separating equilibrium.⁹⁹ The lines are the borderlines for the second and third basic inequalities, labeled CG2 and CG3, for both tax cases and a base case where neither tax penalty applies. The second basic inequality is met below the solid lines, labeled CG2 in the legend. The third basic inequality is met above the dotted lines, labeled CG3 in the legend. The first basic inequality is met throughout the plotted area since this inequality only requires that H be larger than L .

In the base case the two critical lines are denoted by solid circles. The region where a separating equilibrium exists is the triangle above the dotted line and below the solid line. Adding the tax penalty at conversion shifts the dotted line down, reflecting the relaxation of the third basic inequality, and shifts the solid line down, reflecting the tightening of the second best constraint. The overall change indicates the net effect of adding the tax penalty: Some projects with lower values for the high outcome now admit the separating equilibrium, but others with larger values for the high outcome are excluded. The general penalty results in the same relaxation of the lower dotted constraint as the conversion tax, but also results in what appears to be a considerably relaxed upper solid constraint.

This later result is largely an illusion. In the general tax penalty case, all outcomes are shifted down by the penalty. If we shift the general tax penalty inequality lines to the left by cM , the amount of the penalty, these lines would nearly coincide with the lines in the base case.¹⁰⁰

A potentially important point is that the expansion of the projects at the bottom of the region caused by the conversion tax penalty may be much more significant than the loss of projects at the top. The reason for this possibility is that the issuer can choose M , the total face value of the bonds, and then adjust the conversion ratio to ensure that the issue raises

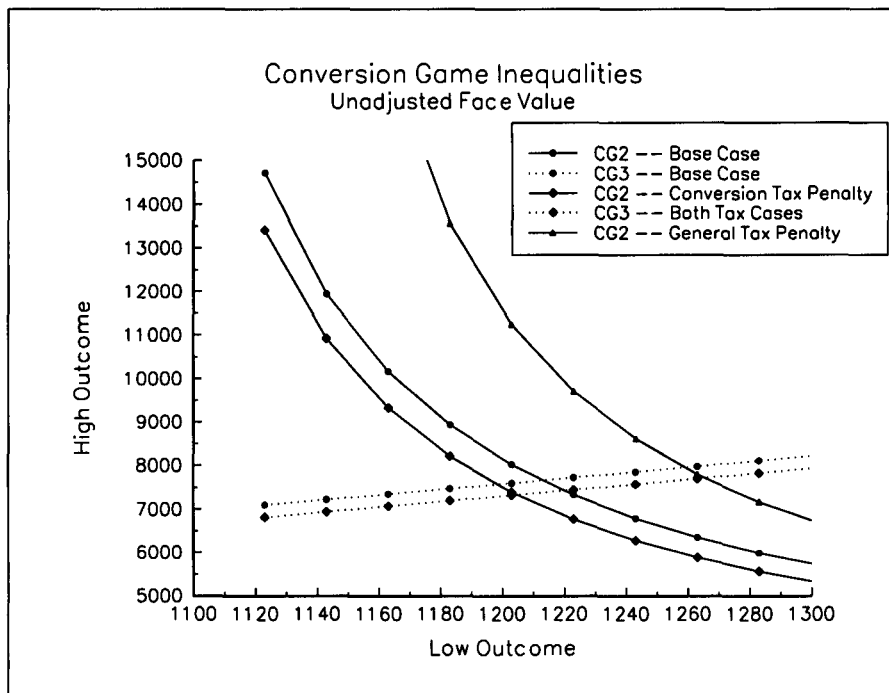
99. The simulation is based on the following assumed values for various parameters:

convertible debt face value	$M = 1050$
conversion ratio	$r = .5$
pre-conversion shares outstanding	$N = 2750$
tax penalty factor	$c = .05$
conditional probability	$P(G B) = .8$

The tax penalty factor is quite modest, being only 5% of face value.

Fixing M and r , but allowing the tax penalty to vary, means that the amount raised at issuance will vary among the tax penalty cases. A larger tax penalty lowers the expected returns upon conversion (or across all outcomes in the case of the general penalty) and thus reduces the initial value of convertible bonds issued with a fixed M and r . Requiring that the amount of investment, I , be fixed, e.g., by fixing M and allowing r to adjust so that the issue may be sold for I , makes very little difference. The ensuing diagram and accompanying explanations would be nearly identical.

100. The only difference would be that both lines for the general tax penalty case would be above the corresponding lines for the base case by the amount of the tax penalty. Thus, the general tax penalty is more restrictive at the bottom (third basic inequality constraint) of the region and somewhat less restrictive at the top (second basic inequality constraint).



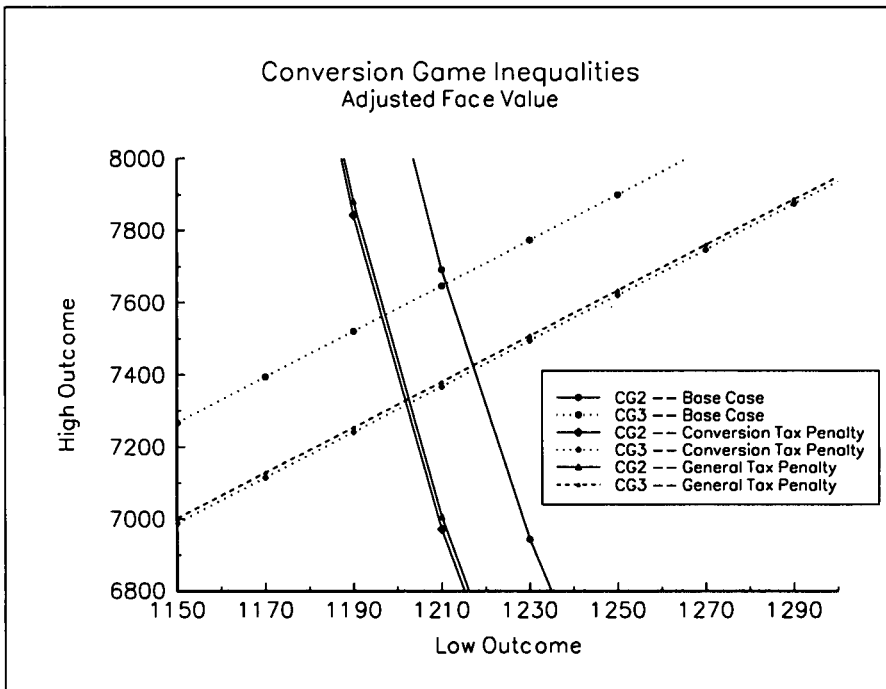
the required amount. As the low outcome approaches M from above, the solid lines (reflecting the second basic inequality) run off to infinity. This behavior means the proper choice of M for a given L ensures that H , the high outcome, can be as high as desired without losing the separating equilibrium.¹⁰¹ Thus, if there is any conclusion that can be stated here, it is that the conversion tax penalty tends to increase the scope of the separating equilibrium in the conversion game. However, this conclusion rests, at least partially, on the ability to shift the terms of the convertible debt contract (e.g., by lowering the face value, M , and increasing the conversion ratio, r). If, as claimed by Brennan and Kraus, choice of these

101. This flexibility may be exaggerated in the model here as compared to "real life." The very high values of H are admissible in the equilibrium because when L gets close to M , the third period stock value will be extremely low if there is no conversion. The company will be close to defaulting on the bonds. Actual default or being at the point of default would mean the theoretical value of the stock is zero. For managers with logarithmic utility, as the stock price approaches zero, utility goes to minus infinity. The second basic inequality arises out of the Group (2) inequalities that ensure that the manager will call the bonds upon receipt of bad information. Setting M to move arbitrarily close to default when the low outcome occurs without prior conversion, one can make manager distaste for a "near death experience," where the stock plunges to near zero, as intense as one needs to induce the manager to call when information is bad. In the "real world," there are many stochastic influences on the outcomes, and it is doubtful one can step so close to the edge of default without having a significant chance of actual default. The fear of that outcome may be so intense that no manager would be willing to move M that close to the anticipated value of L .

terms also has a signaling function, the conclusion may be incorrect.¹⁰² More generally, there is a “Brennan/Kraus caveat” whenever an argument rests on being able to shift the terms of the convertible debt.

Altering the terms of the convertible debt contract also can make the two tax cases very similar. The following figure indicates the result when face value, M , is reduced to $M/(1 + c)$ in response to a general tax penalty on convertible debt. In each case, the initial investment, I , is held constant. Thus, the reduction in face value from M to $M/(1 + c)$ requires an increase in the conversion ratio, r , to ensure that the firm can issue the bonds for I in the first place. This adjustment in face value makes the accessible values of L (subject to a no bankruptcy constraint) the same for both tax cases so that the figure presents a truer comparison of the two taxes than the figure for the unadjusted face value.

From the figure, it is clear that the inequality borderlines for the two taxes are nearly identical. The borderlines for the general tax penalty are slightly closer to the base case borderlines. The reason for this phenomenon is the “disappearing OID effect.” Increasing the conversion ratio and reducing M reduces the amount of OID per bond and therefore reduces the penalty. Not surprisingly, this shifts the result in the direction of the base case.



102. See *supra* text accompanying note 65. The model here does not incorporate the Brennan/Kraus type of signaling.

2. *Interpreting the Results*

If one ignores any restrictions on the choice of terms in the convertible bond contract, then the model suggests that the conversion tax penalty expands the set of projects consistent with the separating equilibrium in the conversion game. The general tax penalty, after taking into account an adjustment in face value of the bonds, falls in between the base case and the conversion tax penalty because of the "disappearing OID effect."

It is clear that these results are subject to the Brennan/Kraus caveat: The choice of the convertible bond terms may themselves play a signaling role. In effect, there are additional constraints that do not appear in the pictures above. This caveat leads to a much more general point. There are many ways for managers to convey information, some involving signaling and some not. First, there is the public release of information. Some of this information release has enhanced credibility because of the penalties present in governing securities law. Second, there are many potential signaling devices. These include dividend policy,¹⁰³ managerial ownership of shares,¹⁰⁴ and the choice of maturity for debt,¹⁰⁵ among others. None of these items are present in the model here.

Convertible debt may provide some signaling capability that either is not available otherwise or is less costly than alternative methods. But it is not easy to figure out what the signaling domain for convertible debt is or how much the cost saving might be. For example, it may be the case that there is a cheaper signaling device available for the projects that seem to be added to the separating equilibrium by the conversion tax penalty. In that case, the apparent conclusion that the tax adds projects to that equilibrium may not have any policy implications. We do not really know which parts, *if any*, of the triangular regions where a separating equilibrium is possible in the figures above, are important because they are not covered by alternative signaling or nonsignaling methods.

Completing the conversion game by adding on the issuance game in the next subsection illustrates these very points. The issuance game adds six new inequality constraints. In some of the examples, one of the conversion game constraints is extraneous: It does not define the region where the separating equilibrium is attainable. Given that a constraint may be extraneous, the fact that tax policy affects the constraint may not matter absent a big enough effect that the constraint supplants other constraints that currently define the critical region.

B. THE FULL GAME

Overlaying the issuance game on the conversion game adds six new inequality constraints that limit the set of projects for which a separating

103. See, e.g., B. Douglas Bernheim, *Tax Policy and the Dividend Puzzle*, 22 RAND J. ECON. 455 (1991); Miller & Rock, *supra* note 38.

104. See Hayne E. Leland & David H. Pyle, *Information Asymmetries, Financial Structure, and Financial Intermediation*, 32 J. FIN. 371 (1977).

105. See Flannery, *supra* note 83.

equilibrium exists. The separating equilibrium requires that the firm issue straight debt, convertible debt, or equity if it receives good, bad, or awful information respectively at time 0. For each of the three types of information there are two constraints. For example, if the information is awful, then one inequality will assure that managers will issue equity instead of straight debt and the other will assure that they issue equity rather than convertible debt. In each case, the inequalities center on the sum of the managers' expected utilities over the stock price in each of the four periods. These expected utilities are conditional on the information received at time 0 since that information influences the probabilities of various stock price outcomes.

1. The Results

Before stating the inequalities, the following list sets out the relevant notation for convenience.

l = the time 3 stock price if the low outcome occurs, the firm issued convertible bonds, and investors converted the bonds

l_N = the time 3 stock price if the low outcome occurs, the firm issued convertible bonds, and investors did not convert the bonds

h = the time 3 stock price if the high outcome occurs, and the firm issued convertible bonds

l_e = the time 3 stock price if the low outcome occurs, and the firm issued equity

h_e = the time 3 stock price if the high outcome occurs, and the firm issued equity

l_s = the time 3 stock price if the low outcome occurs, and the firm issued straight debt

h_s = the time 3 stock price if the high outcome occurs, and the firm issued straight debt

A_0 = the firm receives awful information at time 0

B_0 = the firm receives bad information at time 0

G_0 = the firm receives good information at time 0

$x = P(G|B)$ = the probability of receiving good information this period conditional on receiving bad information the prior period

$z = P(G_1|A_0)$ = the probability of receiving good information at time 1 conditional on receiving awful information at time 0

"SD" stands for straight debt

"E" stands for equity

"CD" stands for convertible debt

I will denote the six inequalities by an expression indicating the issuance choice required by the separating equilibrium and indicating the time 0 information received. For example, $SD > E, G_0$ will indicate the inequality arising from the requirement that managers issue straight debt instead of equity if they receive good information at time 0.

The first two inequalities guarantee that managers will issue convertible debt if they receive the "bad" signal at time 0:

$$\begin{aligned} & \ln[(1-x)^2l+(x+x(1-x))h] \\ & +(1-x)[2\ln(xh+(1-x)l)+x\ln h+(1-x)\ln l]+3x\ln h \\ & > 3\ln h_s+[x+x(1-x)] \ln h_s+(1-x)^2\ln l_s \end{aligned} \quad (CD > SD, B_0)$$

$$\begin{aligned} & \ln[(1-x)^2l+(x+x(1-x))h] \\ & +(1-x)[2\ln(xh+(1-x)l)+x\ln h+(1-x)\ln l]+3x\ln h \\ & > 3\ln[(z+x(1-z))h_e+(1-z)(1-x)l_e] \\ & \quad + (x+x(1-x))\ln h_e+(1-x)^2\ln l_e \end{aligned} \quad (CD > E, B_0)$$

The left hand side of each equation is the sum of the expected utilities of the stock prices at each time conditional on receiving “bad” information if convertible debt is issued. The right hand sides are the corresponding sums of expected utilities if the managers issue straight debt or equity, respectively.

The next two inequalities guarantee that managers who receive “awful” information at time 0 will issue equity rather than convertible debt or straight debt, respectively:

$$\begin{aligned} & 3\ln[(z+x(1-z))h_e+(1-z)(1-x)l_e] \\ & \quad + (z+x(1-z))\ln h_e+(1-x)(1-z)\ln l_e \\ & > \ln[(1-x)^2l+(x+x(1-x))h] \\ & \quad + (1-z)[2\ln(xh+(1-x)l)+x\ln h+(1-x)\ln l]+3z\ln h \end{aligned} \quad (E > CD, A_0)$$

$$\begin{aligned} & 3\ln[(z+x(1-z))h_e+(1-z)(1-x)l_e] \\ & \quad + (z+x(1-z))\ln h_e+(1-x)(1-z)\ln l_e \\ & > 3\ln h_s+(z+x(1-z))\ln h_s+(1-x)(1-z)\ln l_s \end{aligned} \quad (E > SD, A_0)$$

The left hand side of each equation is the sum of expected utilities of the stock prices at each time conditional on receiving “awful” information if equity is issued. The right hand sides are the corresponding sums of expected utilities if the managers issue convertible debt or straight debt, respectively.

The final two inequalities guarantee that managers who receive “good” information at time 0 will issue straight debt rather than convertible debt or equity, respectively:

$$4\ln h_s > \ln[(1-x)^2l+(x+x(1-x))h]+3\ln h \quad (SD > CD, G_0)$$

$$4\ln h_s > 3\ln[(z+x(1-z))h_e+(1-x)(1-z)l_e]+\ln h_e \quad (SD > E, G_0)$$

The left hand side of each equation is the sum of expected utilities of the stock prices at each time conditional on receiving “good” information if straight debt is issued. The right hand sides are the corresponding sums of expected utilities if the managers issue convertible debt or equity, respectively.

None of these equations have any l_N term, the term expressing the stock price if the outcome is low and there was no conversion. In the full game, conversion occurs for certain, and the l_N outcome is irrelevant to computing expected utility as of time 0. Expected utility conditional on time 0 information and conditional on the various issuance alternatives determines which alternative managers will pick. The only difference between the conversion tax penalty and the general tax penalty is that the latter results in a lower value of l_N .¹⁰⁶ Therefore, the issuance inequalities are the same for the two taxes.

The tax terms under either tax only affect the stock price if managers issue convertible bonds. In each case, a higher tax results in lower values of the time 3 stock prices, h and l , corresponding to the high and low outcomes respectively, in the case, where the managers issue convertible bonds.¹⁰⁷ The stock prices at each time are expected values based on the time 3 stock prices. Thus, each of the two taxes lowers stock prices at all four times in the case where managers issue convertible bonds. The two taxes have no effect on the stock prices if the managers issue other securities instead. As a result, the two taxes affect only four of the six inequalities, in particular, the four that involve convertible bonds. The direction of the effects is clear: Since the taxes place a relatively heavier burden on convertible bonds, the first two inequalities are less likely to be satisfied and the third and fifth inequalities are more likely to be satisfied. The first two inequalities ensure that the managers will issue convertible bonds upon receiving “bad” information at time 0. Taxes that lower stock prices in all periods following convertible bond issuance make it harder to satisfy these inequalities. The third and fifth inequalities guarantee that managers will issue equity and straight debt, respectively, instead of convertible debt when their time 0 information is “awful” or “good,” respectively. By reducing the stock prices that will occur conditional on convertible bond issuance, the two taxes make it easier to satisfy these inequalities.

As is the case for the conversion game, the overall impact of the two taxes is not clear. The taxes tighten some inequalities and loosen others. However, the following table shows that the taxes can cause a drastic shrinking of the set of projects for which there is a separating equilibrium.¹⁰⁸

In the base case, the region where there exists a separating equilibrium is the interval of high outcomes between 1144.60 and 4865.27. The conversion game constraints determine this region. None of the six issuance inequalities restricts the region. Adding the conversion tax penalty

106. See *supra* text accompanying notes 97-98.

107. This fact is obvious from observing the impact of a higher tax penalty parameter, c , in the equations for h and l . See *supra* text accompanying note 85.

108. The final column covers both the general tax penalty case and the conversion tax penalty case except for the conversion game constraints CG2 and CG3. The general tax penalty is large enough to cause default if it is applied when the low outcome occurs and investors have not converted the bonds. In that case, the CG2 constraint is undefined.

Restrictions on High Outcome (H) Required for Separating Equilibrium (L = 100, I = 99, M = 98, N = 300) (P(G B) = .5, P(G ₁ A ₀) = .4)		
Inequality	Base Case	Penalty Tax Cases (c = .2; b = 0)
CD > SD, B ₀	> 234.76	> 1173.51
CD > E, B ₀	> L = 100	> 1878.58
E > CD, A ₀	> L = 100	> L = 100
E > SD, A ₀	> 240.09	> 240.09
SD > CD, G ₀	> L = 100	> L = 100
SD > E, G ₀	> L = 100	> L = 100
CG2	< 4865.27	< 3115.04
CG3	> 1144.60	> 939.86

makes the first two issuance inequalities much more restrictive, and the second of these two replaces the CG3 conversion game inequality in setting a lower bound of 1878.58 for the region. The upper bound of 3115.04 is tighter than in the base case, but is determined by the same conversion inequality, CG2, that determines the upper bound in that case.

The figures for the issuance constraints in the base case indicate that the only potential restriction arising from these constraints is due to the first and fourth constraints. Both of these constraints require managers to issue some security other than straight debt. It would seem that a tax that put an extra, non-neutral burden on straight debt would loosen these constraints. That supposition is correct as the following table indicates.

Restrictions on High Outcome (H) Required for Separating Equilibrium The Impact of a Nonneutral Tax Disfavoring Straight Debt (L = 100, I = 99, M = 98, N = 300) (P(G B) = .5, P(G ₁ A ₀) = .4)		
Inequality	Base Case Normal Tax on SD (b = 0)	Base Case Extra Burden on SD (b = .01)
CD > SD, B ₀	> 234.76	> L = 100
CD > E, B ₀	> L = 100	> L = 100
E > CD, A ₀	> L = 100	> L = 100
E > SD, A ₀	> 240.09	> L = 100
SD > CD, G ₀	> L = 100	> 104.08
SD > E, G ₀	> L = 100	> 103.33

The nonneutral treatment of straight debt makes the first and fourth constraints irrelevant. The extra burden causes a very small tightening of the fifth and sixth constraints, but the overall effect is to move the constraint from a lower bound of 240.09 on the high outcome to a lower bound of 104.08, just above the “natural” lower bound of 100, the value of the low outcome. The lesson from this example is that tax changes that are non-neutral in that they favor one type of financing over another may

improve a signaling equilibrium by loosening constraints on the set of projects for which the equilibrium exists. "Good" tax policy that enforces principles such as neutrality may impede informational efficiency.

2. *Interpreting the Results*

The simulations in this Part illustrate the complexity that signaling models raise for tax policy. These models center on the costs of various signals. For example, issuing straight debt raises the danger of low stock prices in the future, an outcome that would be very unfortunate for risk averse managers. This cost makes straight debt issuance a credible signal that managers have positive private information about the firm's prospects. Tax policies impose different costs on different instruments. Some of these costs may appear to be bad tax policy, such as imposing an extra "non-neutral" tax burden on debt, but may enhance a signaling equilibrium.

Another aspect of complexity for tax policy is that multiple instruments and financial policies contribute to signaling equilibria. As mentioned previously,¹⁰⁹ the model here does not take into account many signaling devices such as dividend policy, managerial share ownership, and debt maturity. Nonetheless, even after simplifying this limited model further by examining special cases, it was necessary to consider nine different inequalities, three for the conversion game and six for the issuance game. For a fixed low outcome, finding a range for the high outcome involves only two of the nine constraints. It is easy to see that the fact that tax policy has a major impact on a particular inequality may be irrelevant since that inequality may be extraneous.

Finally, there is another important caveat. So far, the assumption behind the discussion has been that a separating equilibrium is unambiguously good. It is well known, however, that it is sometimes optimal to prevent signaling even though one then has to settle for a pooling equilibrium.¹¹⁰ The reason is straightforward: Signaling is costly and these costs may outweigh the benefits that inhere in a separating equilibrium.

IV. CONCLUSIONS

In its budget documents for each of the four fiscal years 1997 through 2000, the Clinton Administration's proposal to delay OID deductions on convertible debt until the OID is paid was in a section labeled: "Eliminate Unwarranted Benefits and Adopt Other Revenue Measures."¹¹¹ At first glance, it might appear that in each budget this proposal was simply

109. See *supra* text accompanying notes 103-05.

110. A seminal paper making this point in the law and economics literature is Philippe Aghion & Benjamin Hermalin, *Legal Restrictions on Private Contracts Can Enhance Efficiency*, 6 J.L., ECON. & ORG. 381 (1990).

111. See President's Fiscal 1997 Budget, *supra* note 5, at 38-39; President's Fiscal 1998 Budget, *supra* note 5, at 48; President's Fiscal 1999 Budget, *supra* note 5, at 65; President's Fiscal 2000 Budget, *supra* note 5, at 71, 81.

one of several fairly minor corporate tax changes that each raise a modest amount of revenue. Perhaps the hope also was that these changes would not be politically troubling.¹¹²

This article shows that the Clinton Administration's proposal may be much less innocuous than it may seem. The most powerful explanation for the existence and prevalence of convertible bonds is that they are useful in signaling firm prospects. The model that has been most successful at explaining the role of these bonds in signaling, divides the signaling process into a "conversion game" and an "issuance game." In the conversion game, managers signal private information to investors through their decision to call or not to call convertible issues. In the issuance game, managers signal by their choice of security to fund new investment by their firms.

The Clinton Administration's proposal may have a major impact on both of these games. Under that proposal, the firm receives OID deductions if and only if investors never convert the bonds. This fact changes the efficacy of calls that force conversion. Since most bonds are converted, the Clinton Administration's proposal also burdens convertible debt as an issuance device. This burden may have a major impact on the ability to signal at the issuance stage.

Unfortunately, it is hard to tell what the direction or magnitude of the effect of rules like the Clinton Administration's proposal would be. Signaling equilibria are very complex. There are multiple ways to signal firm prospects. Each signaling device gives rise to a number of inequalities that determine the set of projects for which signaling is possible. Some of the inequalities may be extraneous in the sense that they establish borderlines that lie far away from the region carved out by the other inequalities. Tax policy may have a big impact on certain inequalities, but these inequalities may be irrelevant. It is very difficult to say which domain of projects and which inequalities are key with respect to convertible bonds. In addition, the tax treatment of other instruments may have a major impact on the signaling equilibria established through the use of convertible bonds. Finally, signaling equilibria in financial markets depend on the cost patterns that surround corporate decisions. As a result, tax approaches that are defective under conventional criteria, such as the desire to make the tax system neutral between different financing methods, may enable or enhance a signaling equilibrium because these approaches impose costs in appropriate ways.

Despite these difficulties, the heavy use of convertible bonds and the prevalence of peculiar features of convertible bond contracts that are

112. If so, that hope was not fulfilled. A May 23, 1997 letter from eight Democratic House Ways and Means Committee members to Chair Bill Archer opposed the provision in the fiscal year 1998 budget delaying OID deductions along with several of the other corporate tax revenue raisers relating to the taxation of debt. The letter states that these provisions "go way beyond 'loophole closing,' and may, in fact have a negative effect on capital formation and investment." *Ways and Means Democrats Oppose Administration Bond Proposals*, 97 TAX NOTES TODAY 105-14 (1997).

hard to explain outside of a signaling context suggest caution. Policymakers should avoid tax provisions that have substantial effects on convertible debt or that turn on the conversion feature, unless there are very important reasons for these provisions. Convertible bonds appear to play a major role. Provisions such as the Clinton Administration's proposal may enhance that role or destroy it. Not knowing which is the case, perhaps the best course is to do nothing and at least preserve the role that exists now.

Some of the results in the signaling models examined here suggest more general concerns. Although convertible debt may be particularly tied in with signaling, it is clear that many other instruments, including equity and straight debt, may play an important role in signaling equilibria. As a result, the signaling "side effects" of tax policy may be significant. Unfortunately, the complexity of signaling phenomena may mean that we do not know what the side effects are even though we suspect that they may be important. For those who study the taxation of financial instruments, considering signaling effects may prove to be analogous to opening Pandora's box.

V. APPENDIX: DEBT MATURITY SIGNALS AND TAXES

Mark Flannery has shown that debt maturity can play a signaling role.¹¹³ His argument is as follows. Consider a two-period model where there are three times: 0, 1, and 2. A firm finances a project by borrowing at time 0. The payoffs are at time 2. During each time period, the firm will draw by chance either an up or a down signal. These signals indicate what the time 2 payoff will be. If the firm draws two down signals, the time 2 payoff will be so low that the firm will default on its debt. There are two types of firms. The "good" type has a much higher probability of getting an up signal in each of the two time periods than the "bad" type. Investors know the two firm types but do not know which firm is of which type. Insider-managers of each firm do know their firm type.

Firms can borrow with either two-period (long-term) debt or can borrow for one period and then refinance for the second period. Investors know at the end of the first period whether the firm received an up or a down signal in that period. If a firm picks the short-term debt strategy and the bad outcome occurs, refinancing will be very expensive because default is more likely. On the other hand, a good signal during the first period makes default at time 2 impossible, so the firm can refinance at the risk-free rate.

Good firms have a much higher probability of being able to refinance at the riskless rate under a short-term debt strategy since they are more likely to receive an up signal during the first period. As a result, a good firm might attempt to signal its type, and thereby reduce its borrowing costs, by opting for short-term borrowing. However, if short-term and long-term borrowing are equally costly, then good firms borrowing short-term and bad firms borrowing long-term is not an equilibrium. The bad firms will copy the good firm's signal by borrowing short-term. There will be a pooling equilibrium in which all firms borrow short-term. This type of result is typical: If a signal is costless, bad types will mimic good types, and there will be a pooling equilibrium.¹¹⁴

However, Flannery shows that if short-term borrowing is more expensive, e.g., because the firm that borrows short-term has to borrow twice and pay two sets of fees, then a separating equilibrium is possible. This result suggests an immediate tax policy application. In a Flannery type of world, tax policies that burden short-term debt more than long-term debt might induce a separating equilibrium or extend the scope over which a separating equilibrium is possible. The extra tax burden on short-term borrowing would play the same role as higher issuance fees in Flannery's article.

This article focuses on convertability rather than maturity as a signaling device. Including maturity differences in the signaling equilibrium would

113. Flannery, *supra* note 83.

114. In the Nyborg-Harris-Raviv model, the cost aspect that drives the signaling is the aversion of managers to low stock prices. Financing by debt sends a good signal, but the cost is a much higher probability of having catastrophically low stock prices at time 3.

be difficult. I do not attempt to do so. Nonetheless, maturity signals may interact with the signals discussed here in the face of alternative tax approaches. This interaction is especially prominent in the choice between discount bonds and par bonds.

Suppose that a firm wishes to borrow \$1,000,000 through a ten-year loan and that ten-year rates are 10%. If the firm borrows through zero coupon debt it, will receive \$1,000,000 today and will pay \$2,593,742 in ten years. If the firm issues par bonds instead, it will receive \$1,000,000 now and will pay \$100,000 in interest each year and \$1,000,000 at the end of ten years. The zero coupon debt is longer-term borrowing than the par bond. A classic way to look at the difference is to break the par bond down into a series of zero coupon bonds. That breakdown is as follows:

Breakdown of \$1,000,000 ten year bond with 10% annual coupons into ten zero coupon bonds.				
bond	maturity (years)	amount due	present value	contribution to duration
one year	1	\$100,000	\$90,909.09	.0909
two year	2	\$100,000	\$82,644.63	.1653
three year	3	\$100,000	\$75,131.48	.2254
four year	4	\$100,000	\$68,301.35	.2732
five year	5	\$100,000	\$62,092.13	.3105
six year	6	\$100,000	\$56,447.39	.3387
seven year	7	\$100,000	\$51,315.81	.3592
eight year	8	\$100,000	\$46,650.74	.3732
nine year	9	\$100,000	\$42,409.76	.3817
ten year	10	\$1,100,000	\$424,097.62	4.2410
total			\$1,000,000	6.7590

A bond's duration is the present value weighted average maturity of the components of the bond. The computed duration for the par bond in the table, 6.759 years, is considerably shorter than the ten-year duration for the zero coupon bond.

In Flannery's model, the key difference between the bonds is that for the par bond, the firm would have to finance the \$100,000 annual coupon payments. If bad information arrives, this financing would be more expensive. Thus, issuing the par bond instead of the zero is a potential way to signal high quality.

Taxes have an interesting impact on this situation. Suppose the corporate rate is 20% and that the marginal investor is also subject to a 20% rate. Then, for the par bond, the after-tax coupon payment drops by \$20,000 to \$80,000 while the investor pays \$20,000 in tax. The firm and the investor can restore the original cash flows by raising the coupon to \$125,000. Then, the after-tax coupon for both parties will be \$100,000 as before. The same type of analysis applies to the zero coupon bonds. OID will accrue each year creating a tax for the investor and a tax reduc-

tion equal in amount for the corporation. In effect, adding taxes forces the investor to lend to the corporation each year. This effect also could be eliminated by adding coupons to the bond. These coupons would have to increase over time since OID computed on a yield-to-maturity basis increases over time, but the amount of OID and the OID accrual schedule would be the same as before.¹¹⁵ Thus, when the firm and the marginal investor face the same marginal tax rate, taxes will not have any effect on signaling. The firm can adjust the coupon so that, from the perspective of the market (i.e., the marginal investor), the after-tax cash flows will be identical to those observed before imposing taxes.¹¹⁶

In this happy case where the marginal investor and firms face the same rate and maturity signaling is unaffected, there also should be little or no effect on signaling in the convertible arena. If the parties can restore any after-tax debt contract (in cash flow terms) to the pre-tax situation by changing the coupon, there should be no impact on any signaling result.¹¹⁷

If firms and the marginal investor face different marginal rates, then the situation is more complicated. If the marginal investor faces a lower rate, then taxation creates a joint gain for the parties since the coupon or OID deductions for the firm reduce taxes more than taxes increase for the marginal investor due to the coupon or OID income. If the firm captures part of this joint gain, debt financing in general will be less expensive and there may be an impact on signaling equilibria. On the other hand, the sharing of joint gain should be similar for zero coupon and par debt,¹¹⁸ so that there should be no bias there. The analysis of the situation where the firm faces lower rates than the marginal investor is exactly parallel. Instead of a joint gain, there is a joint loss.

The empirical evidence on the signaling impact of debt maturity is not very clear. Several studies have found signaling effects, but the statistical evidence is weak.¹¹⁹ Of great interest for this article is whether the

115. Computing the coupon amount is straightforward. Adding the 20% tax increases the pre-tax market interest rate to 12.5%. One can compute annual OID assuming that the firm borrows \$1,000,000 and that OID accrues at a 12.5% rate but then replace 1/5 of the OID accrual with a coupon. The result will be that OID accrues at a 10% rate, just as before. The only difference is that the investor receives a coupon sufficient to pay the taxes on the accruing OID.

116. If there are inframarginal investors, they will receive a bonus. But that bonus will accrue independent of the type of debt. Interest rates in general will have increased by more than enough to compensate them for taxes regardless of the form the debt takes. After-tax firm cash flows are equal to the cash flows before taxes were imposed. Thus, the signaling properties of various kinds of debt remain the same.

117. This no impact reasoning should apply even to signaling of the Brennan/Kraus variety where the signal is through the contract terms of the convertible. Although the pre-tax contract terms shift in response to taxes, the after-tax terms are what matter. Those terms are unchanged.

118. Otherwise, firms, assuming they act as agents for the shareholders, would use only the kind of debt that maximized their share of the gain.

119. See, e.g., Michael J. Barclay & Clifford W. Smith, *The Maturity Structure of Corporate Debt*, 50 J. FIN. 609, 629 (1995); Karlyn Mitchell, *The Debt Maturity Choice: An Empirical Investigation*, 16 J. FIN. RES. 309 (1993).

choice between zero coupon debt and coupon debt matters. One study matched zero coupon debt issues with similar issues that pay a significant coupon.¹²⁰ For straight debt, the abnormal returns at issuance were statistically indistinguishable. For convertible debt, issuance of zero coupon debt had a positive statistically significant announcement effect that also was significantly greater than the effect for coupon debt. However, most convertible zero coupon bonds are "LYONs." LYONs have special features, in particular, a right for holders to put the bond for cash a few years after issuance. These features may be driving the results. The put feature makes the effective maturity of these bonds quite short. The empirical results may reflect a Flannery type of phenomenon where short-term debt is associated with higher quality issuers. A second study finds high coupon levels (versus a corporate bond benchmark) in convertible bonds associated with more negative abnormal returns at issuance in a statistically significant way,¹²¹ but the authors of this study do not mention excluding LYONs.

Firms may signal quality by choice of maturity for debt issues. This article does not model maturity explicitly, but implicitly considers OID bonds. These bonds have a longer maturity than coupon bonds with the same nominal maturity. As a result, the choice of OID bonds may involve a maturity signal. General changes in tax rates should not affect the signaling properties of discount bonds versus par bonds. However, the text considers tax proposals that burden discount bonds but not par bonds. For example, the Clinton Administration's proposal eliminates the OID deduction for convertible bonds that end up being converted, as most do. At the same time, the holder must pay taxes on accruing OID. Corresponding convertible par bonds do not suffer from similar effects. If there is a signaling effect for these bonds (based on maturity), the tax rules affect the cost structure and should affect the signaling equilibrium. In particular, by making OID bonds more costly, the tax rules may make issuance of short-term or coupon bonds less effective as a signal of good future prospects. This impact is similar to the impact in the "full game" simulation example in the text where the Clinton Administration's proposal reduces the range for effective signaling.

Unfortunately, there are further complexities. Faced with a tax that imposes a particular burden on bonds with OID, the issuer can respond by increasing the conversion ratio of the bond until it is a par bond. In effect, the straight bond component will be just as much a discount bond as before, but the OID will be "hidden" by the value of the conversion right.¹²² The relative terms of the bond, however, may themselves play a signaling role. In the Brennan/Kraus model, for example, shifting the terms of a convertible bond away from the bond component signals lower risk.

120. See Akhigbe et al., *supra* note 41, at 758-60 (empirical results).

121. See Brennan & Her, *supra* note 67, at 16.

122. See *supra* text accompanying note 74.

In sum, there are many types of signaling, and more than one type may come into play when considering changes in tax rules. The text ignores the role of debt maturity in signaling and also ignores Brennan/Kraus type signaling. Doing so makes the analysis tractable and the results understandable. However, it is clear that the text model is quite incomplete.