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On the Matter of Parity among Financial Obligations

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ABSTRACT

The lessons of the leasing literature concerning the impact of leases on the debt capacity of a firm are reviewed and summarized to establish an approach to the analysis of the corporate bond refunding decision. A general proposition regarding financial obligation parity is established, and from that a clear bond refunding decision rule is developed. Previous debates in the literature about appropriate discount rates and about the appropriate cash flows to be discounted for refunding decisions are clarified.

THE DEBATE IN THE finance literature during the last decade about the proper approach to the corporate asset-leasing decision has given rise to a number of useful insights into issues relating to debt capacity and the valuation of income streams having different risk characteristics. Indeed, the debate turns out to have much in common with the U.S. space program of the preceding decade, in that the technological spin-offs resulting from the effort were often as significant as the attainment of the original objective itself.

Our purposes in the present paper are twofold, and they are addressed in sequence below. First, we shall offer what we believe to be some needed additional clarifying observations on the nature of the most-recently-proposed approaches to the evaluation of lease contracts. Second, we shall extend the lessons derived from the analysis to develop a further important technological spin-off. The latter has to do with corporate bond-refunding decisions. In particular, the notion of "parity" among alternative financial obligations which we shall see is central to a proper appraisal of asset-leasing arrangements also provides the key to a resolution of the longstanding refunding controversy.

I. Buying, Borrowing, and Leasing

Received doctrine with regard to leasing is contained in three papers published in the *Journal of Finance* in June 1976 [15][17][21]. Of the three, that by Myers, Dill, and Bautista [21] had the most direct managerial decision-making orientation and was the most precise in its consideration of the implications of lease contracts for the other investment and financing opportunities of the lessee firm. The authors (hereafter, MDB) pointed out that the acquisition of an asset via a pure financial lease agreement[1] permits the firm to avoid having to finance that

* Respectively, Purdue University and the University of Missouri. The authors acknowledge the helpful suggestions of Robert Taggart, and of the *Journal's* editor, Michael Brennan, in improving the analysis presented.

[1] That is, one under which none of the asset's operating expenses, maintenance costs, insurance requirements, or property tax assessments are assumed by the lessor.

asset in the "normal" way, but causes the firm instead to incur a burden comprised of three distinct elements: (1) the after-tax lease payments; (2) the corporate income tax savings lost by not being able to claim depreciation deductions on the asset; and (3) the stock-valuation consequences of the reduction in the firm's borrowing power which is occasioned by (1) and (2). It is the last of these three elements that has proven in the literature to be the most elusive, and it is the most important to the present analysis.

By invoking the value-additivity principle [24] and protraying the imbedded market valuation process in the usual discounted-expected-cash-flow mode, MDB showed the net (present value) advantage of leasing to be

$$V_0 = C_0 - \sum_{t=1}^{N} \bar{L}_t(1 - T)/(1 + r)^t - \sum_{t=1}^{N} T\bar{D}_t/(1 + r)^t - \sum_{t=1}^{N} rT\bar{B}_t/(1 + r)^t \tag{1}$$

where C_0 would be the cost of purchasing the asset, $\bar{L}_t$ denotes the pre-tax lease payment (expected) to be made in year t, $\bar{D}_t$ is the depreciation deduction on the asset which could be taken in t, $\bar{B}_t$ represents the amount of debt "displaced" in t by committing to the lease, T is the marginal tax rate on corporate income, r is the pre-tax interest rate on borrowings by the lessee firm that have the same claim-seniority standing and duration as the lease payments, and year N denotes the termination date of the lease agreement.[2]

MDB argued for r as the relevant discount rate in (1) on the basis that each of the flows therein would be regarded by the securities market as falling in the same category of risk as principal and interest payments on the firm's debt. Such a conclusion is inevitable. The cash flow elements $\bar{L}_t(1 - T)$ and $T\bar{D}_t$ represent, respectively, an obligation and a tax deduction that are contingent only upon the same event on which the payment of creditors depends: the survival of the lessee firm as a going concern for the term of the lease.[3] Accordingly, whatever might be the risk characteristics of the firm's *aggregate* cash flow stream, the prospective reduction of that stream by the amount $\bar{L}_t(1 - T) + T\bar{D}_t$ in any year, pursuant to signing a lease agreement, can only be perceived by investors as lowering the firm's present worth to the extent indicated by the first two summations in (1). This must be so because r is, by definition, the discount rate used in the market to value expected cash flows which—like those in the equation—are obligations scheduled to come "off the top" regardless of what the firm's total earnings may be.

In similar fashion, lenders will necessarily consider the firm's ability to service debt to be correspondingly diminished by the incremental amount $\bar{L}_t(1 - T) + T\bar{D}_t$ each year as a consequence of the commitment elsewhere of this very stable component of future cash flow. Since the protection of their position as creditors is altered exactly to that degree by the lease, so will be their perception of the firm's borrowing power. Indeed, this insight was the major contribution of the MDB paper.

[2] The comparison is to equation (1a) of MDB. The analysis here, however, is cast in terms of total rather than per-dollar asset cost, and the sign convention on the $\bar{B}_t$ is reversed from that of MDB. The end-of-lease salvage value of the asset is assumed to be zero.

[3] Conceivably, one could argue about the tax-deduction component if tax-loss carry-forward and carry-back provisions are not totally effective.

The authors correctly noted that the amount of debt which would be displaced by assuming a set of lease obligations (and simultaneously relinquishing a series of depreciation deductions) should not be prescribed exogenously nor arbitrarily set equal to the purchase price of the asset involved. Rather, it would be the borrowings that could have been supported specifically by the flows $\bar{L}_t(1 - T)$ and $T\bar{D}_t$ peculiar to the lease in question, because these are the flows that thereupon become unavailable to potential lenders. Thus, there will be a unique time profile of displaced debt associated with each lease; if the agreement calls for reasonably level annual payments to the lessor, such debt will have the general character of an installment loan amortizable over the term of the lease.[4]

The stock-valuation impact, *à la* Modigliani and Miller [18][19], of losing the tax benefit from this displaced debt is the final element in equation (1). The MDB analysis spelled out the distinctive sequence of loan balances eliminated by any given lease arrangement and, in the process, determined that equation (1) reduced to

$$V_0 = C_0 - \sum_{t=1}^{N} [\bar{L}_t(1 - T) + T\bar{D}_t]/[1 + r(1 - T)]^t. \quad (2)$$

That is, the present value of the after-tax lease payments, lost depreciation tax savings, and foregone interest tax benefits, discounted at the *pre-tax* interest rate on the lessee firm's debt, was found to be exactly equal to the present value of just the after-tax lease obligations and the depreciation tax flows discounted at the firm's *after-tax* interest rate. In effect, the use of an after-tax rate to capitalize flows which fall in the same risk category as a firm's debt-repayment commitments captures automatically the additional valuation "side effects" those flows have through their incremental impact on debt capacity.[5] A similar phenomenon had been noted, but apparently not sufficiently noticed, in an earlier paper by Bower [3].[6]

A further substantial contribution in this regard is contained in a commentary on the MDB paper by Franks and Hodges [8]. The latter recognized that the present value represented by the summation term in equation (2) has yet another interpretation: it is equivalent to the amount of debt which, if borrowed by the firm at time $t = 0$, could be amortized exactly by a series of annual debt-service payments of size $\bar{L}_t(1 - T) + T\bar{D}_t$ after taxes. Thus, in the notation of equation (1), $\bar{B}_t$ refers to the extra principal amount of debt that could be outstanding during year t, prior to the payment of end-of-year principal and interest, if the lease agreement did not displace such borrowings. For any loan, of course, the *initial* amount obtainable is equal to the present value of the principal plus interest payment promises made, given the yield lenders demand. Accordingly,

$$B_0 = \sum_{t=1}^{N} (\bar{B}_t - \bar{B}_{t+1} + r\bar{B}_t)/(1 + r)^t. \quad (3)$$

[4] And not, as was suggested in [15], a loan having a single balloon maturity.

[5] As MDB correctly stressed [21, p. 807], however, this conclusion holds only when valuing flows that are in the same risk class as debt obligations. See [20] as well.

[6] The Lewellen, Long, and McConnell paper [15], which emphasized the likely implications of market competition for lease pricing, was cast in the same valuation framework as the MDB discussion. The prescription therein of a pre-tax interest rate to discount the foregone interest tax savings [15, p. 795] is consistent with the MDB analysis, but a recognition of the endogenous nature of the displaced debt was lacking.

Consider, then, the particular sequence of $\bar{B}_t$ that would be diverted by the presence of a lease. With the same *after-tax* outlay as required under the lease, a firm could make a pre-tax principal plus interest payment to creditors in year t of size

$$\bar{P}_t = \bar{L}_t(1 - T) + T\bar{D}_t + rT\bar{B}_t \tag{4}$$

since the interest portion ($r\bar{B}_t$) of this payment would be tax-deductible. Now, in any given year, the outstanding loan balance would be reduced by the part of $\bar{P}_t$ available to service principal. Hence,

$$\bar{B}_t - \bar{B}_{t+1} = \bar{P}_t - r\bar{B}_t \tag{5}$$

$$\bar{B}_t - \bar{B}_{t+1} = \bar{L}_t(1 - T) + T\bar{D}_t + rT\bar{B}_t - r\bar{B}_t \tag{6}$$

and, substituting for $\bar{B}_t - \bar{B}_{t+1}$ in Equation (3), we obtain

$$B_0 = \textstyle\sum_{t=1}^{N} [\bar{L}_t(1 - T) + T\bar{D}_t + rT\bar{B}_t]/(1 + r)^t \tag{7}$$

the right-hand side of which matches the last three terms in equation (1), which in turn were shown by MDB to resolve to the last two in equation (2).

The message of the Franks/Hodges analysis, therefore, is that the essence of the financial burden associated with a lease is the debt-service capability it destroys, and that burden can be measured very directly simply by the amount of debt displaced—i.e., the size of the loan that could have been obtained and just repaid with the cash flows consumed by the lease. We find this perspective to be appealing because it provides an intuitively pleasing interpretation of Equation (2). Thus, substituting from (7), we have $V_0 = C_0 - B_0$, which says that leasing has a net advantage as the means to acquire an asset if the amount of debt the lease agreement displaces is less than the purchase price of the asset. Such a criterion makes eminent sense, since if the firm were instead to commit to lenders incremental cash flows exactly like those diverted by the lease, the firm would be unable thereby to raise enough money to buy the asset. Conversely, if B_0 is greater than C_0, the firm could decline the lease, borrow an amount which would exceed the purchase price of the asset, buy it, distribute the leftover loan proceeds to shareholders as a dividend, and end up with a future after-tax payment burden to service the debt precisely identical to that which would be incurred in assuming the lease.

This notion of determining the amount of debt displaced by a lease—and thereby the lease's valuation impact—by focusing on a match between debt-service and lease-service cash flows can be described as one of establishing "parity" between the respective future financial obligations. As Franks and Hodges noted, if two financing arrangements that impose identical cash outflow requirements on a firm in every future period ($t \geq 1$) are identified, the one that provides the larger initial inflow at $t = 0$ is obviously the preferred. It happens that the same concept can be used to address the matter of bond refunding and produce a clear decision rule that is free of the speculations which have characterized past discussions of that problem.

II. Bond Refunding

There have been a variety of normative treatments of the decision by a firm to "call" and retire an outstanding bond issue, and to replace it with the proceeds of a new issue. As Ofer and Taggart [22] detailed in their review of the literature, however, there has been continual disagreement about whether a pre-tax or a post-tax interest rate should be employed to discount the savings from refunding, what in fact comprises those savings, what the impact on the firm's debt capacity is, and how the cost of calling the old bonds at a premium should be thought of as being financed [1] [2] [4] [9] [14] [25] [27] [28] [29].

These difficulties, it would appear, have arisen in part because many of the analyses have not been properly anchored in an underlying security-valuation framework. Strangely enough, many authors have also confined their attention to the case of infinite-maturity bonds, causing some important aspects of the problem to be overlooked. Nonetheless, the major barrier to progress to date has been the tendency to approach the refunding decision in terms of the future corporate cash flows that might be changed in the process.[7] As the leasing literature discussed above has taught us, however, the key to a comparison of the merits of alternative fixed-promise financing strategies is to keep all future cash flow burdens the same under the various choices. Doing so completely neutralizes any stock valuation side-effects that may be of concern, and eliminates the need to debate possible debt-capacity implications.

Application of this principle to the case of bond refunding allows us to obtain a distortion-free measure of the essence of that decision: namely, the identification of the *exercise value* of the call option contained in the original bond indenture, given interest rate developments to date. Such an option, of course, has certain characteristics that distinguish it from the normal varieties of options on securities, the theoretical values of which can readily be computed using standard option-pricing technology [5] [10] [11]. In particular, there are attendant corporate tax consequences for the firm that exercises the option, these associated with the deductibility of the call premium and the required treatment of issue expenses on both the old and the new bonds. Moreover, since the option in question can be exercised only by the borrower firm involved, there are effectively no available market quotations for similar instruments that can be relied on for guidance. Accordingly, the value of the option at the point in time a firm is contemplating its exercise (and, thereby, extinction[8]) must necessarily be computed directly from the specific debt service cash flow circumstances that firm confronts.

In this regard, consider first the situation of a corporation having outstanding an existing bond issue which has a book (par) value B_E, carries a coupon interest rate r_E, and which can be retired immediately at a call price of B_C (where $B_C \geq B_E$). Assume the bonds to have a balloon maturity N years distant and to have been issued originally at par.[9] Assume further that prevailing market conditions

[7] The Yawitz and Anderson [29] and Livingston [16] papers are notable exceptions in this regard.

[8] That is, the debt issued to accomplish the refunding should not contain a new call provision if the original call option is truly to be exercised. We shall return to this point below.

[9] More specifically, assume that the firm realized the par value of the bonds as the net proceeds

would allow new non-callable debt to be issued at par if the coupon interest rate on the replacement debt were r_R. Finally, let the before-tax transactions costs that would be incurred to accomplish a refunding be the amounts: R_1, for out-of-pocket registration and legal expenses, plus any overlapping interest cost [7]; and R_2, for the bond underwriters' compensation. The former are generally tax-deductible in full in the year they are incurred (as is the call premium, $B_C - B_E$), while the latter must be amortized for tax purposes over the life of the new bonds.

As indicated, whatever the firm's total debt capacity, and whatever effect debt may have on the aggregate market value of the firm, a decision about replacing old debt with new clearly should not be intermingled with changes in the firm's degree of leverage if it is truly to be only a refunding decision. The one proper measure of "degree of leverage" for any firm, of course, is obvious: the full schedule of future debt service requirements faced by that firm. If, therefore, the decision about refunding is based on a comparison in which those requirements are held constant, we indeed have a pure refunding decision rule. Should the firm wish also simultaneously to alter its leverage position, it can (and should) treat that matter separately.

The refunding desirability test, then, is quite straightforward: if the firm issued new debt in an amount that would necessitate exactly the same future after-tax cash flows to service principal and interest as are associated with the existing debt, would enough new debt be obtained to cover the after-tax call price of the old plus immediate after-tax refunding costs? If so, the exercise value of the call option is positive because exercise of the call will generate an immediate free cash flow for the firm's stockholders without changing any of their *future* cash flow prospects. This trick is accomplished by extracting from the identical debt service burden imposed by the existing expensive debt an initial principal amount of new cheap debt which is more than enough to pay at $t = 0$ the cost of getting rid of the old bonds.

The debate about how call premia and refunding expenses should be "financed" therefore is empty. There is, in the literal sense of the term, no new financing in a pure refunding. Rather, a given vector of debt-repayment promises is merely transferred from one set of lenders to another (i.e., parity in future financial obligations is maintained) and, in the exchange, an instantaneous cash bonus is generated. A firm certainly can choose to forego that bonus, by transferring to new lenders just a portion of existing repayment promises so as to obtain new debt in an amount sufficient only to recall the old. By doing so, however, the firm will have reduced its leverage and effectively have engaged in some de-financing.

The "net advantage of refunding" decision rule counterpart of the net advantage of leasing therefore can be stated as

$$V_R = B_R - [B_C - T(B_C - B_E) + R_1(1 - T) + R_2] \tag{8}$$

where B_R denotes the principal amount of new (replacement) debt that can be raised and repaid with the same subsequent debt service outlays as imposed by

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from their issuance, and thereby that no tax amortizations of premiums, discounts, or underwriting expenses are overhanging on the "old" bonds. These elements will be introduced later, as will the treatment of sinking-fund obligations.

the existing debt. If V_R is positive, refunding is advantageous; the call option can be profitably exercised.[10]

The determination of B_R follows directly from the displaced-debt concept developed in the leasing literature. In fact, the appropriate computation can be both simplified and given added intuitive content if we recognize that B_R is really comprised of two distinct elements. One is a bond issue exactly equal to B_E, having the same balloon maturity date N, which can be sold immediately at par, and which can be serviced with the same maturity payment as scheduled for the existing debt—but which will require *less* in annual interest payments as long as the prevailing market interest rate r_R is below r_E. Thus, a specific portion of the firm's existing debt service obligations can be thought of as being earmarked to repay a new balloon-maturity bond issue having the same par value as the old bonds, but carrying the contemporary rather than the imbedded coupon interest rate.

The portion of present after-tax debt service cash flows which is left over after netting out enough to take care of such a new bond issue, then, is what is available to service additional new debt—and make it potentially possible for the firm to borrow sufficient extra money at $t = 0$ to retire the old bonds, even at a call premium. That leftover portion, of course, is a level annuity of N years' duration and it can be used to repay what amounts to the same sort of installment debt as represents financial-obligation parity in the case of lease arrangements.

To formalize the matter for decision purposes, let B_R' denote the principal amount of new installment debt that can be raised, and B_C' be the call premium on the existing bonds. Thus, $B_R = B_E + B_R'$, $B_C = B_E + B_C'$, and equation (8) reduces to

$$V_R = B_R' - [(B_C' + R_1)(1 - T) + R_2] \tag{9}$$

with B_C', R_1, and R_2 being known quantities, leaving B_R' the determinant of the decision to refund. The latter figure will be the sum which, if borrowed at $t = 0$, can be serviced at an expected after-tax cash cost equal to the $(r_E - r_R)\bar{B}_E(1 - T)$ per year for N years that is the "excess" component of the existing debt service burden.[11] Because underwriting fees are tax-amortizable over the maturity of the debt with which they are associated, refunding will give rise to an annual tax deduction of $\bar{R}_2/N$ in addition to the deduction for interest. Accordingly, if in year t the scheduled pre-tax payment to new creditors for the installment debt B_R' is $\bar{P}_t'$, the attendant after-tax outlay will be

$$\bar{P}_t' - T[r_R\bar{B}_t + (\bar{R}_2/N)]$$

and therefore, for debt-service parity before and after refunding,

$$\bar{P}_t' = (r_E - r_R)\bar{B}_E(1 - T) + r_R T\bar{B}_t' + T(\bar{R}_2/N) \tag{10}$$

[10] We are assuming, for the moment, no extraneous valuation consequences resulting from changes the new debt might imply in the priority position of other debt claims on the firm. If effective "me first" convenants are not in place for such other debt, additional valuation impacts like those spelled out in [12] might occur, as we shall see.

[11] We retain the expected cash flow format and notation, to allow for corporate debt-repayment prospects that may not be totally risk-free.

where $\bar{B}_t'$ denotes the principal that will be outstanding on the extra debt during the year, prior to the end-of-year principal-plus-interest payment.

From the standpoint of lenders who require a yield of r_R on any funds advanced, the condition that establishes the permissible initial amount of (additional) debt is, as always

$$B_R' = \sum_{t=1}^{N} (\bar{B}_t' - \bar{B}_{t+1}' + r_R\bar{B}_t')/(1 + r_R)^t. \tag{11}$$

Since the loan principal reduction $\bar{B}_t' - \bar{B}_{t+1}' = \bar{P}_t' - r_R\bar{B}_t'$, we have that

$$\bar{B}_t' - \bar{B}_{t+1}' = (r_E - r_R)\bar{B}_E(1 - T) + r_RT\bar{B}_t' - r_R\bar{B}_t' + T(\bar{R}_2/N) \tag{12}$$

which, substituting in equation (11), results in

$$B_R' = \sum_{t=1}^{N} [(r_E - r_R)\bar{B}_E(1 - T) + T(\bar{R}_2/N) + r_RT\bar{B}_t']/(1 + r_R)^t \tag{13}$$

as the expression for the quantity of extra installment debt that can be obtained at $t = 0$ upon refunding the old bonds.

This expression, of course, has a familiar look. The first term under the summation is the annual after-tax coupon interest saving realized by replacing old bonds with new, in the amount B_E; it corresponds to the annual after-tax lease payments identified in equation (7) above as one of the burdens which cause leases to affect debt capacity. The second term under the summation in (13), representing an annual tax deduction acquired in the process of refunding, is the mirror image of the item in equation (7) consisting of the annual depreciation deductions foregone by leasing. Finally, the third terms in (13) and (7) are also exact parallels: both capture the equity valuation consequences of changes in the firm's debt capacity through the tax-deductibility of interest expenses. Thus, the leasing and refunding analytical frameworks are equivalent.

We can make good use of that equivalence to save the effort of having to replicate here the MDB demonstration [21, pp. 804–805] that the summation on the right-hand side of equation (13), like that on the right-hand side of Equation (7), can be rewritten in the condensed form

$$B_R' = \sum_{t=1}^{N} [(r_E - r_R)\bar{B}_E(1 - T) + T(\bar{R}_2/N)]/[1 + r_R(1 - T)]^t \tag{14}$$

wherein the valuation impact of the $r_RT\bar{B}_t'$ terms in (13) is again captured by discounting the other debt-service cash flows involved at a post-tax rather than a pre-tax interest rate. The various issues which have been in contention in the refunding literature, then, can be resolved. Concerns about refunding-caused alterations in corporate leverage, for example, are fully neutralized in the present analysis by holding all the borrower firm's debt service burdens at their pre-refunding levels. As a corollary, the conclusion must be that the relevant horizon for measuring refunding benefits is the maturity of the old bonds—simply because this is the duration of the (maintained) existing debt service obligations. Moreover, there is no ambiguity about which cash flows to discount; none are changed in the execution of a "pure" refunding.

Finally, arguments about the discount rate to be used in computing the present-value advantage of refunding can be dispensed with. It is clear from equations

(13) and (14) that either the prevailing pre-tax market interest rate r_R or its defined after-corporate-tax counterpart $r_R(1 - T)$ may be employed in present value calculations to arrive at the figure for B_R' to be inserted into the refunding decision rule of Equation (9), as long as the correct specification of the corresponding freed-up debt service cash flows is also made. The after-tax version represented by Equation (14), certainly, is much the easier to use. Nonetheless, the choice is a matter of convenience rather than of concept.[12]

III. Commentary and Extensions

The indicated approach has the additional virtue of being able to accommodate quite readily, under the ambit of preserving financial-obligation parity, the full range of special circumstances that can arise in refunding. Thus, the old bonds in question may not have a balloon maturity but instead be scheduled to be retired piecemeal over time through a sinking fund. In such a situation, the proper "base" amount of new debt around which to organize the refunding analysis simply becomes the sum (still B_E) that can be borrowed by the firm at $t = 0$ and just serviced to its final maturity by the same sinking fund schedule that applies to the existing debt. Since the periodic interest payments which will have to accompany that schedule will, however, be less than those required on the existing debt, there will again be a vector of freed-up debt service cash flows in prospect that can be used to acquire extra debt (our $\bar{B}_R'$ at $t = 0$) in the process of refunding. The desirability test expressed in equation (9) therefore still applies, as does the computational format of equation (14). The only difference is that the $\bar{B}_E$ term in the latter will now also have a time dimension (becoming the series $\bar{B}_{E,t}$) to reflect the imbedded sinking-fund retirement scenario.[13]

A similar convenient extension emerges for the case wherein the original-issue proceeds, net of underwriting costs, realized by the borrower enterprise from the old bonds represented either a discount from, or a premium over, their par value—that difference being amortized to maturity for tax purposes. Because this existing annual tax cash flow will be extinguished by the replacement of the old bonds with new ones issued at par,[14] its disappearance will act either to offset or accentuate the tax consequences associated with amortizing the new-debt underwriting cost R_2. Thus, following our previous analysis, for a firm to maintain parity in its expected future after-tax debt service obligations, it can commit to its creditors the pre-tax payment $\bar{P}_t'$ in year t to satisfy principal and interest

[12] For that matter, the conceptual framework underlying equation (9) does not require that we even address the decision problem from the perspective of a formal present value calculation. One could as well view the determination of B_R', as taking place simply by the corporate treasurer negotiating with potential lenders and identifying directly how much they would in fact be willing to lend against the debt service cash flows released by refunding.

[13] Implying as well that the incremental installment debt B_R' will be serviced with payments that are not quite the level annuity indicated in equation (14). The valuation analog in equation (7) would be unequal lease payments.

[14] The stipulation that the new debt be issued at par is made to avoid the question of whether *ex ante* there are possible valuation side effects attendant upon bond sales made deliberately at discounts or premia [6] [23].

requirements on borrowings in excess of B_E, as determined by the condition that

$$\bar{P}_t' - T[r_R\bar{B}_t' + (\bar{R}_2/N) + (\bar{A}_E/N')] \tag{15}$$

be equal to the after-tax interest costs saved in year t by replacing expensive old bonds with the same (book) amount of new ones. In (15), $\bar{A}_E$ represents the original amortizable dollar premium or discount on the existing debt and N' denotes the original number of years to maturity of that debt ($N' > N$). For existing bonds that were sold at a net premium (discount), $\bar{A}_E$ has a positive (negative) sign.[15]

If we then trace, in the manner of equations (10) through (14) above, the implications of this parity condition through to its impact on the quantity of extra debt the borrower firm will be able to obtain, we find that

$$B_R' = \sum_{t=1}^{N} [(r_E - r_R)\bar{B}_{E,t}(1 - T) + T(\bar{R}_2/N) + T(\bar{A}_E/N')]/[1 + r_R(1 - T)]^t \tag{16}$$

where now the valuation expression allows both for sinking fund bonds and original-issue premia or discounts. The cash tax effect of having to recognize what remains unamortized of the latter as an item of income or loss in the year of refunding must, of course, also be included as an element in equation (9) as part of the $t = 0$ refunding comparison. The test for a profitable exercise of the call option would thereby become

$$V_R = B_R' - [(B_C' + R_1)(1 - T) + R_2 + T\bar{A}_E(N/N')] \tag{9a}$$

wherein the sign convention on the $\bar{A}_E$ is as indicated above.

Another factor this financial-obligation-parity framework can accommodate with ease is the common phenomenon of an interest rate term structure that is not totally flat. Thus, it could occur that the yields required by lenders on loans that are scheduled to be repaid on an installment basis—like the $\bar{B}_R'$ which is central to our discussion—may be different than are required of either balloon-maturity or sinking-fund bonds, merely because the debt service time profile is different. If so, the interest rate r_R on the new bonds that replace the old will not be the same as that applicable to the "extra debt" component.

Pursuant to the current analysis, however, once the series of principal payments (which will be identical to those scheduled for the existing bonds) and interest payments (each of which will be reduced by the percentage $r_E - r_R$) necessary to sell new bonds in the amount B_E at a yield r_R are identified, the after-tax cash flows freed up from the existing debt service burden are simultaneously identified as well. These become available to service additional new debt B_R, where the amount that can be borrowed will—as always—be dictated by the yield lenders demand when advancing funds against a given set of repayment promises. If, then, that yield is not r_R but instead some other rate r_R', the quantity B_R' is still determinate. In particular, it can be determined from either equation (14) or (16) simply by retaining r_R in the numerator of the summation terms as the measure of the annual debt-service cash flow *savings* produced by refunding, but inserting

[15] We are assuming, in (15), a straight-line amortization schedule for any such net discounts or premia. Other schedules would necessitate a time-subscripting of the $\bar{A}_E$ as well.

r_R' in the denominator as the *capitalization rate* which translates those savings, when committed to new creditors, into a dollar figure for extra $t = 0$ borrowing power. That distinction is conceptually quite clean.

Indeed, the bond-refunding decision framework is in general "cleaner" than the leasing analysis reviewed earlier. There is, for example, no need to be troubled in the refunding case by the valuation implications of cash flows like asset salvage values and asset operating costs borne by the lessor—both of which will typically be in a different category of risk than lease payments or debt service requirements. More importantly, since it bears directly on the heart of the matter here, the discrepancies which can exist between lease agreements and loan arrangements in the claim-seniority standing of lessors and lenders in the event of financial distress can be avoided very neatly when refunding debt. All that is necessary is for the borrower firm to insert exactly the same convenants and provisions into the new bond indenture as were included in the old one. Such full parity may not always be attainable when weighing the debt-capacity/leasing trade-off, however. There may be constraints on the feasible contract terms, and there are distinctive prevailing judicial interpretations of the recovery and priority rights of different categories of outside claimants that may not be able to be undone by agreements among the parties themselves.[16] Certainly, the task of attaining total equivalence is at least more difficult in the lease vs. loan context.

This question of equivalence in all dimensions merits particular emphasis, because it has often been either overlooked entirely or treated too casually in both the prior leasing and refunding literature. Not only must the borrower firm's schedule of cash debt service obligations be maintained intact when new debt replaces old, but so must all other aspects of the rights and responsibilities of the lending and borrowing entities, if the re-financing is truly to be a pure refunding. Any coincident change in loan-contract provisions will necessarily mean a change in the circumstances of the borrower firm's other creditors, which in turn will have valuation side-effects for stockholders.

It is, obviously, possible for the borrower to seek deliberately to alter the profile of claimant priorities or revise other elements of the loan agreement while refunding. But such modifications of the contract need to be evaluated for desirability in their own right as independent phenomena—just as should decisions about lengthening, enlarging, or rescheduling future principal and interest commitments. All would imply a change in what we should mean when we refer to the "degree of leverage" in a firm's capital structure, and what we do mean here when we speak of financial obligation parity. The latter necessarily encompasses the full range of elements in the firm's bargains with non-shareholder claimants.[17]

In this regard, however, the one feature which should not be carried over from the old to the new bond indenture—at least, not for purposes of measuring the benefit from refunding—is the call provision itself. When it issued the old bonds, the borrower enterprise obtained a call option having a maturity matching that

[16] For example, the limit on the lessor's claim for damages to one year's rent in liquidation, or three years' rent in reorganization, of the lessee firm.

[17] Livingston [16] makes mention of this point peripherally in a recent comment on the Ofer/Taggart [22] paper.

of those bonds, and the essence of the refunding decision is whether (with parity maintained in all other dimensions of the obligations) the option should now be exercised and extinguished, given interest rate developments to date. This is the same decision faced in connection with the exercise of any option. Indeed, attempts to define possible "optimal" strategies for such exercises are framed explicitly in terms of the proper moment to extinguish the remaining life of the option [5] [10] [11] [13] [26]. Accordingly, only if the new bonds sold to accomplish the refunding are non-callable will the borrower firm truly have exercised its call opportunity in full, and not simply re-issued part of it in a modified version. The relevant coupon interest rate r_R for use in equations (13), (14), and (16) above to establish the debt-service cash flows freed up by refunding, therefore, is quite specifically the rate that would allow new non-callable bonds to be sold at par.

A corporate management could, of course, choose to insert a call provision in the new bonds, as it could choose to alter other features of the existing contract while refunding. In an efficient market, the new bondholders will demand an appropriate (correctly-priced) *ex ante* compensation for acceding to changes of this sort, in the form of a higher coupon interest rate on the bonds. If the firm is to assess accurately the benefits from a "pure" refunding, however, it must keep those decisions separate, since a pure refunding involves the exercise (but a full exercise) of only one of the options in the original indenture—the call. The benchmark for proper call-benefit measurement, then, is the indicated non-callable new bond coupon rate even if management should elect to have the actual new bond issue contain a revised call feature. On that basis, our analysis will identify the refunding gain to be realized at any given point in time. We offer a numerical example of the relevant computations in the Appendix.

That analysis, though, is effectively an *ex post* one. It provides an ongoing measure of whether and to what extent the borrower has in fact won its original *ex ante* interest-rate game with lenders. It does not directly address the question of the best time to refund. The work of other writers on the latter topic [5] [11] [26] would suggest that, in a securities market characterized by fair-game properties, the right time to exercise such an option is the first time it can produce a profit. In the case at hand, this would imply a call as soon as our V_R becomes a positive quantity.[18] We have no particular new insights to offer in that regard.

Presumably, corporate financial officers attach call provisions to bonds in the first place because they perceive themselves as having better forecasts of the future course of interest rates than do lenders, and thereby as being confronted with call-option compensation demands at the time the bonds are sold which are below the options' values. If so, they may also not always tend to call those bonds at the earliest profitable opportunity but instead to wait for still larger gains which they might feel are obtainable from further favorable interest rate movements yet unanticipated by the rest of the market. The weight of available empirical evidence on market efficiency, on the other hand, would lead one to be

[18] In the case of publicly-traded bonds, incidentally, there will be a clear signal to the firm that it should examine the possibility that a refunding benefit may be available: an observed market price equal to the call price. This would denote a perception on the part of lenders that the intrinsic value of the debt service schedule associated with the bonds is likely to be high enough to yield a figure for B_R' that will make V_R positive.

skeptical of a call-timing strategy based on managerial prescience. Whatever one's views on this issue, we believe the decision rule developed here at least provides a correct specification of the benefit to be derived from refunding at the point when the borrower firm does opt to take that action.

Appendix

An Illustrative Bond-Refunding Analysis

Consider the case of a firm that has a $20 million balloon-maturity bond issue outstanding, which bonds carry a 10% coupon interest rate and are immediately callable at 105. Assume the bonds to have been sold 8 years previously with a 20-year original maturity, and that the net proceeds from their issuance were $19.5 million after underwriting costs. Thus, $500 thousand of such costs are presently in the process of being amortized as a tax-deductible expense, at a rate of $25 thousand per annum. Assume the firm to be in a 45% marginal corporate income tax bracket.

Current capital-market conditions are as follows: (a) 12-year balloon-maturity non-callable bonds having the same covenants and other indenture provisions as the existing bonds can be sold at par to the public if they carry a 9% coupon rate; (b) the underwriting costs for a $20 million issue of such bonds will be $180 thousand; (c) registration fees, legal expenses, and overlapping interest costs associated with issuing new bonds and calling the old ones will amount to $100 thousand; (d) 12-year installment debt can be obtained by the firm in question via a private placement with institutional lenders at an effective interest rate of 8%, and at negligible transactions costs.

In this set of circumstances, equation (9a) above defines the requirement for a refunding to be advantageous; the quantity V_R must be positive. Therein, B'_C is $1 million (i.e., a gross call price of $21 million compared with a par value of $20 million); R_1 is $100 thousand; R_2 is $180 thousand; $T = .45$; $N = 12$; $N' = 20$; and $\bar{A}_E$ is a *negative* $500 thousand, since the existing bonds were issued originally at a net discount from par and their retirement will allow the borrower firm to write off the remaining unamortized portion of the discount for tax purposes in the current year. Hence, the term in brackets in equation (9a) amounts to $650 thousand. This figure represents the immediate net after-tax cash cost of eliminating the old bonds and replacing them with the same par value of non-callable new ones.

If, then, the extra installment debt B'_R that can be obtained by the firm by committing to lenders the cash flows freed up in future years by retiring the old bonds exceeds $650 thousand, the firm will gain an immediate cash flow advantage by doing so—while maintaining its debt service burdens at their pre-funding levels. Pursuant to equation (16), this quantity of extra debt will be the amount that can be exactly repaid over the next 12 years with the annual interest payments saved by replacing $20 million of 10% coupon bonds with 9% ones, plus the annual tax-saving cash flow realizable by being able to amortize over 12 years the $180 thousand of initial underwriting costs of the new bonds, less the annual tax savings lost due to the extinguishment of the remaining amortizable underwriting costs of the old bonds. In (16), therefore: $r_E - r_R$ is equal to 0.01, all the $\bar{B}_{E,t}$ are \$20 million for balloon-maturity bonds (both old and new), and the other parameters are as indicated above. Accordingly, the numerator of the summation comes to \$105.5 thousand after taxes for each of the next 12 years.

Because (presumably, due to term structure effects) only an 8% pre-tax yield is demanded by the borrower firm's institutional installment (term) debt suppliers, payments to them in an amount that will cost the firm \$105.5 thousand per annum after taxes over a 12-year period will allow the firm to obtain and thereafter service an initial ($t = 0$) loan of

$$B_R' = (\$105.5)\left(\sum_{t=1}^{12} 1/[1 + (.08)(1 - .45)]^t\right) = \$967.5 \text{ thousand}$$

and, since this loan is larger than the immediate \$650 thousand after-tax cash cost of the refunding, the call option should in fact be exercised and the old bonds retired.

As a check on the analysis, note that the aggregate annual debt service requirement on the existing bonds is: \$1.1 million of after-tax coupon interest payments, minus (0.45) (\$25 thousand) = \$11.25 thousand of tax savings from underwriting cost amortizations, for a net of \$1088.75 thousand per annum. On the new bonds, the figures will be: \$990 thousand of annual after-tax interest costs, less (0.45) (\$15 thousand) = \$6.75 thousand in associated tax benefits from amortizations, the net being \$983.25 thousand. At maturity, of course, the same \$20 million principal payment is due the bondholders in either case. Consequently, the \$105.5 thousand refunding-generated annual after-tax savings for 12 years identified in Equation (16) is the amount which can be allocated to installment lenders while preserving full parity on the borrower firm's schedule of future debt service obligations. That amount will just repay \$967.5 thousand of term debt.

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