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An Equilibrium Analysis of Debt Financing under Costly Tax Arbitrage and Agency Problems

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I. Introduction

IN HIS RECENT PAPER, Merton Miller [12] extends the notion of tax-induced differential returns on securities into a general equilibrium framework in which firms make adjustments in the supply of corporate debt. In an environment of progressive personal taxation, the interest rates on taxable corporate bonds are greater than rates on tax exempt securities so as to compensate investors for the associated tax burden. On the supply side, value-maximizing firms have an incentive to issue additional debt so long as the personal tax-induced compensation is less than the tax savings from interest-payment deductions at the corporate level. Miller argues that in the final equilibrium, the interest rate differential between taxable and tax-exempt bonds exactly reflects the tax advantage of debt financing at the corporate level. Thus, the tax subsidy disappears in its entirety, and we are back to an environment in which corporate leverage is inconsequential to the value of any particular firm. What emerges in equilibrium is merely an optimal debt-equity ratio for the corporate sector as a whole.¹

Miller derives this invariance proposition under the following assumptions: (1) progressive personal tax rates reach a maximum at a level beyond the corporate tax rate; (2) no tax arbitrage by individuals and firms is allowed; (3) there is a personal tax rate differential in favor of income from stocks; and (4) the opportunity for riskless borrowing and lending exists.² Indeed, Miller's equilibrium analysis is based on a zero effective personal tax rate on income from stocks, but

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¹ In the presence of dead-weight costs of debt, such as bankruptcy costs, debt financing is a losing proposition. However, Miller undermines these costs on empirical grounds.

² Recently, Taggart [19] has extended the Miller analysis into an incomplete market. He shows that the capital structure irrelevance proposition holds under the Miller tax environment with an additional restriction that investors sort themselves into extreme leverage clienteles.

his conclusions follow so long as income from stocks is taxed at a substantially lower rate than income from bonds.³

Unfortunately, neither the Miller invariance theorem nor the M[odigliani]–M[iller] tax-adjusted valuation model appears to explain observable phenomena in the real world. While the former suggests irrelevance of capital structure decisions, the latter implies a corner solution in favor of debt financing. Neither is in accord with commonly observed cross-sectional variations in debt ratios, debt maturity structure, and the existence of complex financial instruments (e.g., callables, convertibles, etc.).⁴ The empirical results of McCulloch [11] demonstrate that the yield differentials between taxable corporate bonds and municipal bonds imply a personal tax rate for the marginal investor which is significantly below the corporate tax rate (46 percent + state income tax rate) predicted by Miller to explain the interest rate differential.⁵ Another empirical study by Skelton [18] indicates that the implied tax rate is closer to, but still below, Miller's prediction in recent years, especially for short-term bonds. The apparent gap increases in significance if the marginal tax rates on income from equity investment are positive, suggesting that the yield differential in the Miller equilibrium is even higher than that determined by the corporate tax rate alone.

In addition, the absence of tax arbitrage in the Miller equilibrium leads to an apparent contradiction between Miller [12] and Miller and Scholes [14] who offer tax arbitrage strategies to “launder out” the tax imposed on investment income. If such tax planning devices are costlessly available and may be applied to bond as well as stock income, the demand curve in the Miller [12] analysis is no longer upward sloping.⁶

It is our purpose in this paper to generalize the Miller analysis in two important aspects which materially affect the nature of the demand and supply curves for corporate debt. First, we modify the demand curve by introducing costs associated with tax avoidance, thereby allowing for costly tax arbitrage by investors in an environment in which the tax on income may differ substantially across assets. Secondly, we introduce into the analysis agency costs associated with corporate debt financing.

Agency costs affect the supply of corporate bonds because a reduction in the

³ If the tax rate on equity income is high enough to imply that the equilibrium marginal tax rate on bond income is greater than the top tax bracket, then debt financing dominates.

⁴ There are some who argue, however, that the phenomena which we observe are merely artifacts of market equilibrium and hence consistent with the irrelevance of corporate financial policies.

⁵ The *marginal* corporate tax rate is uniform across all taxable corporations for which the taxable income exceeds \$100,000. Currently the tax rate is 46 percent + the applicable state tax rate. The horizontal supply curve in the Miller analysis implies uniform corporate taxation at the margin. The existence of tax shelters on the corporate level affects the average tax rate but not the marginal tax rate, as the amount of tax is reduced by 46 cents for each dollar of interest payment caused by leveraging.

⁶ Miller and Scholes [14, p. 346–7] attempt to reconcile their dividend irrelevance proposition with the conclusion of Miller [12] that tax-induced yield differentials characterize equilibrium in the bond market. It appears that the two models are consistent only under an extremely stringent set of assumptions. In particular, it must be assumed that at least some investors are able to “launder out” all personal taxes on dividends while simultaneously they are subject to full taxation on interest income. The reconciliation thus hinges on an arbitrary distinction between the tax status of dividend and interest incomes.

interest rate on corporate debt is required to entice additional debt financing by firms facing rising agency costs functions for debt capital. It is important to note that the agency costs which are considered in this paper are residual in the sense that they are not eliminated completely by either market forces (see Fama [5, 6] and Haugen and Senbet [8]) or by the issuance of complex financial instruments (see Bodie and Taggart [3] and Barnea, Haugen, and Senbet [1]). The magnitude of the costs associated with the residual, unresolved, agency problems must be determined by empirical investigation. We note, however, that there is no satisfactory market solution to agency costs associated with the issue of informational asymmetry and that the solutions to other agency problems involve transaction costs which in turn determine the magnitude of residual agency problems still faced by the firm.

Incorporating costly tax avoidance and unresolved agency problems in the demand and supply curves for corporate debt leads to an equilibrium in which:

- (1) the capital structure of any firm is consequential to its market value;
- (2) agency costs of debt as imposed on the marginal firm are shifted to bondholders in the form of lower interest rates. This shifting is a unique property of equilibrium, and therefore it is not recognized in the agency literature which is based on a microanalysis;⁷
- (3) our analysis is consistent with the empirical estimates of the tax rate which are implied by the yield differential between corporate and tax exempt bonds. It is also consistent with empirical evidence such as in [10] which does not support the existence of leverage clienteles as implied by the Miller equilibrium.

Section I of this paper considers the implications of the Miller analysis for observed market prices and portfolio construction. In Section II, we introduce a tax avoidance function and an agency cost function to derive a modified equilibrium relationship for corporate debt. Section III considers the impact of equilibrium on corporate financial policies and on the issue of the shifting of agency costs to bondholders. Section IV concludes the paper.

I. The Implications of the Miller Equilibrium

Miller [12] *initially* looks at an environment in which personal taxation is uniform across all investors but differential between investment incomes associated with stocks and bonds. Let τ_{ps} and τ_{pb} denote personal tax rates on income from stocks and income from bonds respectively. The traditional tax-adjusted valuation model can be modified to reflect the interaction between the corporate tax rate, τ_c , and the personal tax rates. Under the usual M-M assumptions and personal taxes, the after-tax returns to the securityholders of an arbitrarily levered firm are given by

$$\tilde{X}_L^T = \tilde{X}(1 - \tau_c)(1 - \tau_{ps}) + rD[1 - \tau_{pb} - (1 - \tau_c)(1 - \tau_{ps})] \quad (1)$$

⁷ Miller [12] and DeAngelo and Masulis [4] suggest the possibility of shifting debt-related costs, at least partially, to debtholders; however, neither pursues the implications of this issue.

where

- $\bar{X}$ = the random earnings before interest and taxes (assuming a given overall investment strategy);
- r = the interest rate on taxable but riskless corporate bonds sold at par, D .
For consistency, these are consol bonds, because the analysis is carried out in a perpetual framework.

A simple way to derive the valuation equation is to invoke a value additivity principle to discount the earnings in (1). The first term on the right hand side is an aftertax income stream that accrues to securityholders of the unlevered (but otherwise identical) firm, while the last term reflects the tax savings (dissavings) from debt financing. Discounting the expectation of former term by ρ_U , the cost of capital applicable to the unlevered firm, and the expectation of latter term by $r(1 - \tau_{pb})$ we obtain the modified tax-adjusted valuation model

$$V_L = V_U + D \left[1 - \frac{(1 - \tau_c)(1 - \tau_{ps})}{1 - \tau_{pb}} \right] \quad (2)$$

where

V_U = the value of the unlevered (but otherwise identical) firm.

Miller calls the second term the “gain from leverage” ([12], p. 267). The traditional $\tau_c D$ term survives if $\tau_{ps} = \tau_{pb}$; if $\tau_{pb} < \tau_{ps}$, the gain from leverage falls below $\tau_c D$, and it could conceivably be negative depending on the parameters employed. It disappears altogether when $(1 - \tau_c)(1 - \tau_{ps}) = 1 - \tau_{pb}$, and, if τ_{ps} is assumed zero, this condition requires that $\tau_c = \tau_{pb}$.

Miller then moves to a world of *progressive* taxation which is assumed to be *exogenous* to his framework. He demonstrates that the gain from corporate leverage disappears in its entirety in equilibrium. The equilibrium condition, of course, converges to the preceding condition which must obtain for the disappearance of the firm’s gain from leverage. That is, $\tau_c = \tau_{pb}$ at the margin where τ_{pb} is the marginal investor’s marginal tax rate on income from bonds, and τ_{ps} is assumed zero.

Miller disallows tax arbitrage by individuals so that they cannot eliminate their tax liabilities by borrowing to hold tax-exempt securities or by large-scale short-selling of corporate securities. Thus, the progressive nature of personal taxation is maintained and hence an upward sloping demand curve ($r^* r_d(D)$) such as in Figure 1 obtains. The intercept of the demand curve is the tax-exempt equivalent of the pure rate of interest in the Fisherian sense. All tax-exempt securities, including equity which is assumed tax-exempt in the Miller framework, yield certainty-equivalent returns equal r^* . The horizontal stretch of the demand curve reflects the demand for corporate bonds by tax-exempt individuals and organizations. A taxable individual with marginal tax rate τ'_{pb} will be indifferent between tax-exempt securities and corporate bonds only if $r = r^* / (1 - \tau'_{pb})$. Thus, to entice more investors in progressively higher tax brackets to buy bonds, corporations must pay higher interest rates. The upward sloping demand curve depicts this phenomenon.

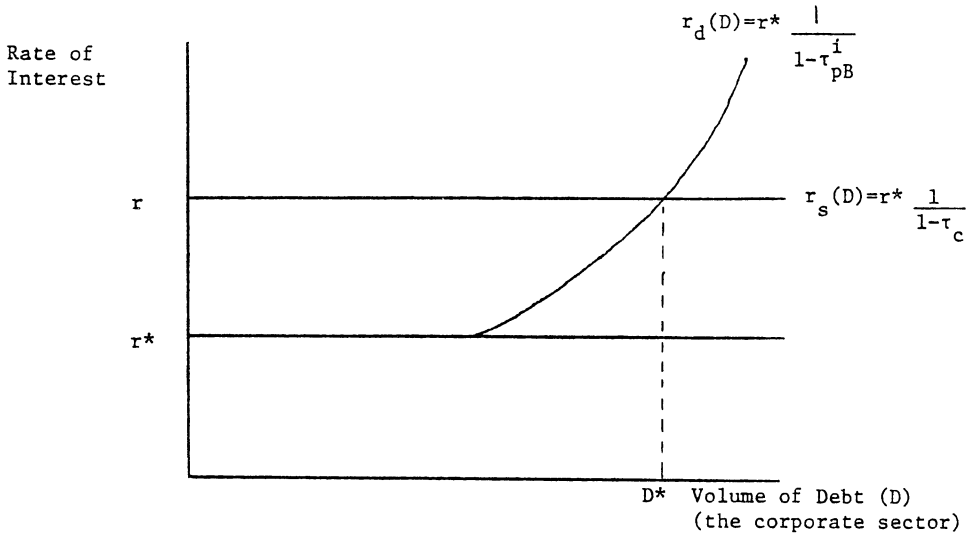


Figure 1. The Miller Bond Market Equilibrium

On the supply side, firms respond by issuing additional debt so long as the marginal tax saving, measured by $r\tau_c$, is less than $r - r^*$, the difference between the rate of interest on taxable and tax exempt debt securities. Equilibrium occurs when $r\tau_c$ is completely offset by the differential reflecting the marginal personal tax disadvantage. The intersection of the demand curve with the horizontal line through $r^*/(1 - \tau_c)$ determines the equilibrium. In equilibrium, leverage is a matter of indifference to individual corporations, although an aggregate level of equilibrium borrowing in the amount of D^* emerges. The last term in (2) disappears altogether, and we are back to an environment in which $V_L = V_U$, even in the presence of taxes.

Apart from the leverage clientele hypothesis suggested by Miller, an immediate empirical implication of the equilibrium is the emergence of a tax-induced yield differential on corporate bonds which is based on the corporate tax rate (or higher if stock income is taxed). A related implication is that the yield differentials change with changes in corporate tax rates. Thus, the Miller equilibrium leads to two testable implications about interest rate differentials. However, as we mentioned earlier, the results of the empirical studies of McCulloch [11] are inconsistent with the implications of the Miller analysis, as are the results of Skelton [18], although the latter are closer to Miller's predictions.

Furthermore, the Miller equilibrium is in apparent contradiction to the basic dividend irrelevance proposition of Miller and Scholes [14]. The irrelevance proposition follows from the ability of investors to costlessly eliminate the tax on dividend income. However, the same strategies used to "launder out" the tax on dividend income can be used to launder out the tax on all forms of taxable investment income, including interest income from bonds. One tax-avoidance mechanism employed by Miller and Scholes is to borrow on personal account against a tax-free debt-like instrument (e.g., an insurance policy), and in so doing

transform taxable investment income into tax-free income. If the investor employs this mechanism, the initial risk position is unaltered and the scheme is costless if borrowing and lending rates are identical. If investors are able to “launder out” the tax imposed on investment income, the progressive personal tax schedule considered by Miller [12] is no longer exogenous to his analysis. Indeed, with costless tax avoidance, the demand curve in Figure 1 is flat through r^* . No interior equilibrium is feasible, and once again debt becomes the dominant instrument of financing.

II. Bond Market Equilibrium Under Costly Tax Arbitrage and Agency Problems of Debt

In this section, we wish to generalize the Miller equilibrium analysis to an environment in which investors attempt to engage in tax arbitrage, and firms face agency problems associated with debt financing. The existence of agency problems presupposes that debt instruments are risk bearing. However, there is no apparent difficulty in incorporating risk bearing debt into the Miller analysis. The only required modification is the recasting of bond yields in certainty-equivalent terms—that is, bonds of different risk classes are perfect substitutes to one another if their yields are adjusted using the (unique) market price of risk. As discussed in Section I, the existence of *costless* tax arbitrage enables investors to eliminate the tax consequences of investment income so that their demand for taxable bonds is not affected by their tax status. This implies a perfectly elastic demand curve for corporate debt at the rate r^* as illustrated in Figure 1. If there are no agency problems associated with debt financing, debt becomes a dominant financial instrument. With identical certainty equivalent yields, debt and equity securities are equally desirable to investors, but debt financing provides a tax advantage at the corporate level.

In this sense, the analyses of Miller [12] and Miller and Scholes [14] are diametrically opposed. No interior debt equilibrium occurs in the environment assumed by Miller and Scholes; however, as we shall see below, when agency costs are introduced into the analysis, the nature of the equilibrium is materially affected. An interior (partial) equilibrium obtains in which the burden of agency costs is not borne by stockholders, but is shifted back to bondholders.

In the following sections, we modify Miller’s analysis by introducing first agency costs of debt and then costs of tax avoidance.

A. Agency Costs of Debt

The agency costs of debt arise in several forms. In the Jensen-Meckling [9] framework, these costs are associated with managerial (stockholder) risk incentives and bankruptcy. The risk-incentive problems can be seen in the context of the Black-Scholes [2] framework, which considers stockholders of a levered firm as holding a European call option to buy back the entire firm at an exercise price equal to the face value of the debt. The value of this call option is an increasing function of the variance of the cash flows of the underlying asset (firms), and hence stockholders have the incentive to engage in high risk activities at the

expense of debtholders. This in turn may lead to an adoption of suboptimal risky projects as long as the wealth transfer more than offsets the decline in project value.

Myers [16] identifies another related agency problem arising from debt financing by a growth firm in the M-M [13] sense. Again, suboptimal investment decisions occur if the debt maturity falls beyond the date of expiration of the options for future investments. In the Myers world, debt is issued against, and entirely supported by, a growth opportunity.⁸

Another agency problem occurs when the exact nature of firms issuing bonds cannot be revealed costlessly to debt financiers. This is a problem of informational asymmetry considered by Ross [17], although we subsume it within the general class of agency problems.

The agency costs of debt, if they cannot be resolved either through market forces or through complex securities, are commonly considered to be an increasing function of the amount of debt employed in the capital structure.⁹ Figure 2 plots the marginal and average agency costs functions associated with the amount of debt in the capital structure, assuming that the agency costs of equity are negligible.¹⁰ To simplify the graphical representation of the supply curve, but without loss of generality, we assume that the relationship is linear. The investment *opportunity set* is assumed to be given so that any increase in the amount of debt will increase the agency costs arising from the agency problems discussed above.

The supply curve for corporate bonds is depicted in Figure 3. In the *absence* of agency problems, corporations are indifferent between equity financing and debt financing as long as corporate debt yields the certainty-equivalent rate of interest $r^*/(1 - \tau_c)$. The horizontal supply curve in Figure 3 depicts this. If firms face agency costs, they are no longer indifferent between equity and debt financing when corporate debt yields $r^*/(1 - \tau_c)$. Nonetheless, they can be enticed into debt financing if the sum of the rate of interest on corporate bonds and the differential agency cost as a percent of marginal debt financed, $\theta_k(D)$, is at most equal to $r^*/(1 - \tau_c)$. Otherwise debt financing is a losing proposition. Thus, in the presence of agency problems, the supply curve is downward sloping as depicted by the schedule XYZ.

To see this, suppose that the certainty equivalent rate on corporate debt is $r' = r^*/(1 - \tau_c) - \theta'$. It pays the individual firm to issue debt until the differential

⁸ Suboptimal future investments can also occur when the firm has outstanding debt issued to finance the existing assets. Investment incentives are curtailed despite the possibility that they generate a positive net present value, if the benefits accrue partially to debtholders for which stockholders are uncompensated. Such agency problems are identified by Bodie and Taggart [3].

⁹ The marginal agency costs are presumed to increase as a function of the amount of debt in the capital structure. In the case of the risk incentive problem, marginal agency costs depend on the reduction in project values which is associated with the acceptance of investment projects with higher degree of risk. The expected costs associated with bankruptcy depend on the probability of bankruptcy which in turn depends on the amount of debt. In the Myers framework, the loss in firm value associated with each marginal unit of debt depends on state prices and the value of the firm in each state. In any case, a rising marginal cost curve is not a necessary condition for a downward sloping *aggregate* supply curve so long as the agency cost functions are heterogenous across firms.

¹⁰ For a discussion of the agency costs of equity for a firm under diffuse ownership see Fama [6].

agency costs of debt financing $\Theta_k(D)$ are equal to θ' for the marginal unit of debt. Thus, r' will be associated with a finite aggregate supply of debt across all firms in the economy. At a lower rate, it pays each firm to issue more debt so that aggregate supply is increased. Every point on the curve represents the quantity of bonds supplied as firms optimize their capital structures. In other words, the locus of points on the curve reflects corporate bond supply, given that firms have achieved their (optimal) capital structure positions. As the interest rate on corporate debt falls, there is a general increase across all firms in the optimal amount of debt in capital structures. Since the demand curve is flat, the bond market equilibrium obtains when all securities, namely taxable bonds, tax-exempt bonds, and equity securities, yield the same certainty equivalent rate of return, r^* . This equilibrium is represented in Figure 2 by the point X at which the supply and demand for bonds is equal to D^{**} and the interest rate is $r_c(D^{**}) = r^*$. In this equilibrium, for each firm k , $r^*/(1 - \tau_c) - r_c(D^{**}) = r^*\tau_c(1 - \tau_c) = \theta_k(D_k) = \theta(D^{**})$ and $\sum_k D_k = D^{**}$.

A significant property of this equilibrium is that interior (optimal) capital structures obtain at the level of individual firms as well as at the aggregate level of the corporate sector. It is also noteworthy that the differential agency costs of debt financing are shifted to the bondholders: firms characterized with few agency problems extract rent, and conceivably employ higher leverage.

A disturbing property of the preceding equilibrium is that there are no tax-induced differential returns on taxable and tax-exempt securities of equivalent risk classes. This conclusion is no more in accord with existing empirical results than is Miller [12]. This suggests that our reconciliation of Miller [12] and Miller and Scholes [14] is incomplete. There remains a missing link—the notion that tax arbitrage involves a cost.

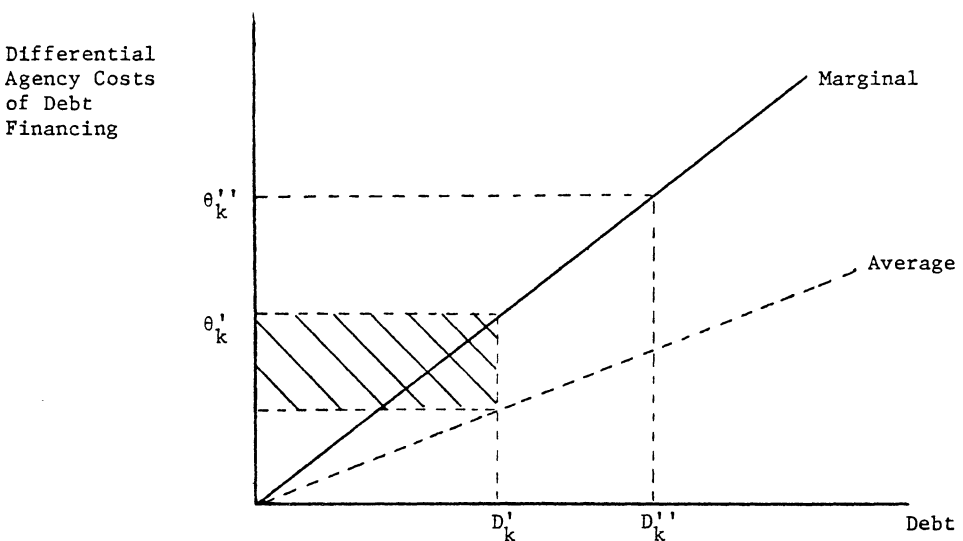


Figure 2. Agency Costs and Debt

B. The Costs of Tax Avoidance

In this subsection, we consider the effects of an explicit cost-of-tax-avoidance function on the demand for corporate bonds.¹¹ The ability of investors to engage in tax arbitrage is recognized in the literature. In some studies (e.g., Miller and Scholes [14]), investors are allowed to engage costlessly in tax arbitrage up to the level of their investment income; however, no “spillover” of investment expense is allowed against other income.¹² Obviously, tax arbitrage is prohibited in all studies which assume exogenous marginal tax rates for individual investors. Such an assumption seems to be inconsistent with the wide variety of possibilities to reduce tax liabilities—and to reduce marginal tax rates—by choosing particular mixtures of assets and liabilities which allow for front-end deduction of interest with tax deferral of income. Real estate investment financed by borrowing is one example of those possibilities.¹³ We assume that investment strategies which save taxes exist but are costly to the investor. The costs of tax avoidance are both explicit (e.g., costs associated with financial intermediation or costs associated with shortselling) and implicit (e.g., costs associated with suboptimal consumption and portfolio decisions), and include the agency costs of *personal* debt financing required for tax avoidance. These costs, together with legal restrictions on some combinations of assets and liabilities, are taken into account in the process of investor portfolio optimization.

We assume that the costs involved in tax avoidance are an increasing function of the amount of tax sheltered income utilized by the investor. Two arguments justify this assumption. First, utilization of tax shelters force investors to deviate from a utility maximizing optimal consumption and portfolio decisions which they would have chosen in the absence of taxes. The difference between the individuals’ utility level in a taxless world and their pretax utility level under tax avoidance is an implicit cost of engaging in tax arbitrage. It is obvious that individuals will make use of the “least painful” tax shelters first, thus making the

¹¹ Obviously, tax arbitrage may also take place on the part of firms as well as investors. However, in order to simplify the analysis, we have ignored the effects of tax avoidance at the corporate level. For an analysis of the effects of corporate tax avoidance on the supply curve see DeAngelo and Masulis [4]. They take a view that the supply curve is downward sloping because debt financing prevents full utilization of other corporate tax shelters. Their analysis assumes away tax carry-backs and carry-forwards.

¹² Miller and Scholes recognize the ability of investors to engage in tax arbitrage against their noninvestment income, but they seem to dismiss the practicality of such behavior by invoking agency costs on personal borrowing (see their fn. 19). The approach taken in this paper differs in that we allow for explicit agency cost functions for individuals and firms so that the advantages of tax arbitrage are weighted against the costs of borrowing. For some investors—perhaps those with low agency costs and high marginal taxes—leveraging to achieve tax arbitrage may be a preferred position.

¹³ See Miller and Scholes [14] for a detailed description of the tax provisions on the deductibility of interest and the tax treatment of income derived from selected tax shelters. To the tax shelters mentioned, we add the possibility of selling short high dividend paying stocks and purchasing equal-risk low dividend paying stocks. This will serve as a tax shelter since dividends are recognized as a front-end expense. As a general comment we add that tax provisions which allow for tax arbitrage are not strictly necessary to support models which predict the implications of tax arbitrage on the prices of securities. Even if, by interpretation, tax provisions prohibit some combinations of assets and liabilities, it is effective enforcement of those laws and the perceived penalties which determine the utilization of those combinations by investors and their effect on observed market prices.

marginal cost of tax avoidance an increasing function of the amount of income sheltered. Second, even in the absence of consumption and portfolio considerations, the tax code may prohibit excessive use of any given tax shelter, thus forcing the investor to utilize alternative tax shelters which, at the margin, are progressively less desirable.

Increasing costs of tax avoidance at the margin are sufficient to generate the upward sloping demand curve UYV in Figure 3. Note that because of the opportunity to avoid taxes (albeit at a cost) the demand curve exhibits greater elasticity than does Miller's. Moreover, unlike Miller's model, the upward sloping nature of the curve no longer reflects investors in progressively higher tax brackets. It merely reflects increasing aggregate demand by all investors in different tax brackets enticed by the increasing differential in yields on corporate bonds and tax-exempt securities. The interest rate determines the optimal quantity of bonds held by each investor. This is determined by a solution of a portfolio selection problem which considers the costs involved in tax avoidance. The demand curve in Figure 3 results from these optimizing decisions and, unlike Miller's corresponding schedule, does not bear any *direct* relationship to a progression of marginal tax rates.

The bond market equilibrium occurs at Y , the point of intersection between the downward sloping supply curve and the upward sloping demand curve. The major effect of introducing costly tax avoidance is to introduce equilibrium differential returns on securities of differential tax status. This is obviously consistent with empirical observation. The implied differential is consistent with a tax rate ranging from zero to the corporate tax rate, τ_c , (assuming that equity returns are not taxed). This implicit rate can no longer be interpreted as the marginal tax rate in any meaningful sense, because, as discussed above, the manner in which the demand curve is generated differs from that of Miller [12].

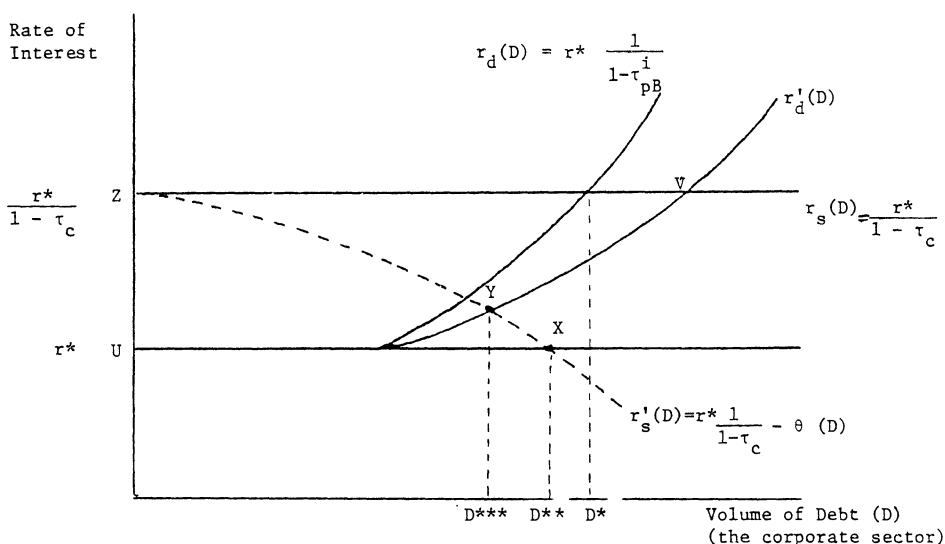


Figure 3. Bond Market Equilibrium with Costs of Agency Problems and Tax Avoidance

Thus, our model does not lead to leverage clienteles, contrary to the implication of the Miller equilibrium.

Again, we have an equilibrium quantity of bonds outstanding in the corporate sector, D^{***} . Again, the agency costs of debt are shifted to the bondholders, and again, there is an optimal capital structure such that individual firms supply debt until $r^*/1 - \tau_c - r_c(D^{***}) = \theta_k(D_k) = \theta(D^{***})$. These implications are identical to the case of costless tax avoidance, but there are now tax-induced differential returns on securities.

III. Implications of the Bond Market Equilibrium

An important element in agency theory is the issue of cost incidence: which of the claimholders in the firm bears the cost consequences of unresolved agency problems? Jensen and Meckling [9] suggest that rational bondholders will foresee the emergence of agency problems associated with debt financing, and will demand compensatory payments in the cost of corporate debt. However, in our equilibrium framework we find that, once the benefit of tax subsidy flows to debtholders in the form of “grossed up” interest rates via Miller [12], corporations are enticed to increase their supply of debt only if they are compensated for the associated agency cost disadvantage. Thus, in the same way as the tax subsidy “grossed up” interest rates, agency costs “gross them down.” In this *macro* sense, agency costs are borne by bondholders, contrary to the traditional view. We should notice that this same tradition prior to Miller [12] viewed the tax subsidy as fully accruing to stockholders.

In equilibrium, the marginal agency cost of debt, $\theta_k(D^{***}) = \theta^* = \theta_k^*$, is the same for all firms which supply debt, but the total agency costs, $\bar{\theta}_k^* D_k$, is differential across firms resulting in a differential “financier’s surplus.” Thus,

$$\left[\frac{r^*}{1 - \tau_c} - r(D^{***}) - \bar{\theta}_k^* \right] D_k = (\theta^* - \bar{\theta}_k^*) D_k.$$

For any firm, a reduction in the average agency cost function, $\bar{\theta}_k^*$, for a given yield differential θ^* , is beneficial as its own “financier’s surplus” is increased. However, notice that an economy-wide adoption of the resolution instrument will reduce θ^* . The *aggregate* change in the “financier’s surplus” depends on the elasticity of the demand and supply curves for corporate debt. Less elastic demand or more elastic supply imply smaller (and possibly negative) change in the “financier’s surplus.” On a *micro* basis, the individual firm can increase the magnitude of the “financier’s surplus” by reducing the magnitude of the agency costs associated with each unit of debt financing.¹⁴ But on a *macro* basis, reduction of agency costs by all firms will result in higher interest rates and *may* result in a reduction in “financier’s surplus” obtained by all equityholders. It would then follow that the individual firm incentive to reduce agency costs is related to the speed at which other firms can imitate the financial innovation and replace conventional debt with the modified debt in their capital structures. There are no

¹⁴ Agency costs may be reduced by engaging in lending or monitoring activities or by issuing complex financial contracts such as convertible bonds.

patents or copyrights in financial contracts. Unlike markets for physical goods or services, financial markets respond quickly and fully to any financial innovation. Thus, there *may* exist no incentive for a particular firm to promote innovative contracts or monitoring devices which effectively reduce agency costs. Note that this is especially true for reductions in agency costs which are associated with modifications of Generally Accepted Accounting Principles, since the acceptance of these modifications is, by definition, widespread.

A further implication of the equilibrium analysis concerns the cost incidence of tax avoidance. The costs of tax avoidance increase as tax loopholes are closed, as auditing procedures become more efficient, or as the costs of intermediation and short-selling rise. Suppose that Congress acts to increase effective rate of taxation on corporate bond investments. Upon first examination, the costs seem to be imposed on individual bond investors, but, as our analysis shows, a new equilibrium will be reached in which interest rates paid on corporate debt will rise. We observe this change through shifts in the location of the demand curve for corporate bonds. The costs of tax avoidance are the parameters of this curve. If the costs rise, the demand curve moves upward and equilibrium interest rates rise to entice investors, faced with the reality of costly tax avoidance, to purchase corporate bonds. A similar equilibrium phenomenon characterizes the agency costs of debt. Agency costs of debt affect the location of the supply curve. Higher agency costs (for any given level of debt financing) cause a downward shift of the supply curve and, consequently, lower the interest rate paid on corporate debt.

While we are able to determine the direction of changes in the relative costs of debt and equity due to changes in either the costs of tax avoidance or the agency costs of debt, definitive conclusions on cost incidence must await a more general equilibrium analysis in which returns on taxable and tax-free securities are simultaneously determined. Our analysis is partial, because we do not consider the effect of changes in the agency cost and tax avoidance functions on r^* : like Miller, we assume, to a first approximation, that r^* is exogenous. Only under this assumption are we able to suggest the possibility that stockholders may be worse off as agency costs of debt are reduced. If the cost of equity r^* is allowed to change, the exact location of the intersection point of the demand and supply curves, and the accompanying changes in cost incidence, cannot be determined on an a priori basis.¹⁵ This partial equilibrium analysis is, however, common to the rest of the studies in this area, and our analysis casts some doubt on the validity of the conclusions drawn from such studies.

IV. Summary

This paper has generalized the analysis of bond market equilibrium by specifying an explicit cost function for tax avoidance and an explicit agency cost function for corporate debt financing. These functions materially affect the demand and supply curves for corporate debt and lead to an equilibrium in which (1) corporate

¹⁵ The final incidence of agency costs in a general equilibrium framework will be determined by the elasticities and cross-elasticities of the demand and supply curves of corporate debt, tax-exempt debt and corporate equity. We note, however, that the equilibrium rate on corporate bonds will always be between r^* and $r^*/(1 - \tau_c)$ as depicted in Figure 3.

capital structure affects market value; (2) agency costs of debt shared by all firms are shifted to bondholders in the form of lower interest rates; and (3) the observable spread between yields on taxable and nontaxable bonds is explained. The introduction of the tax avoidance function integrates the seemingly contradictory models of Miller [12] and Miller and Scholes [14].

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