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Debt, Taxes and Leasing—A Note

R. A. BREALEY and C. M. YOUNG

This paper discusses the implications of Miller's paper "Debt and Taxes" for the valuation of leases. It shows that if Miller's equilibrium holds, leasing is only likely to dominate debt *and* equity for companies in temporary non-tax-paying positions.

MILLER'S 1976 PRESIDENTIAL ADDRESS to the American Finance Association [2] analyzed the capital structure decision under certainty when investors are subject to different marginal rates of personal tax and equity income is taxed at a lower rate than bond income. In equilibrium the corporate sector will issue debt up to the point at which the marginal reduction in corporate tax is equal to the increase in personal tax incurred by the marginal debtholder.

In the simplest case, where all bond income is taxed at the investor's personal tax rate and all equity income is free of personal tax, companies can afford to "bribe" investors to hold more bonds as long as the corporate tax rate is less than the personal tax rate of the marginal debtholder. Thus in equilibrium the aggregate debt ratio is equal to the proportion of aggregate wealth held by investors with tax rates below the corporate tax rate. At this equilibrium the required return on corporate debt is equal to the required return on equity grossed up by the corporate tax rate and the investor whose personal tax rate is equal to the corporate rate faces the same after-tax income from both debt and equity.

In this note we analyze the implications of Miller's equilibrium for the cost of leasing. We show that in general in Miller's world leasing offers no advantages to companies that are either in a permanent tax-paying position or permanent non-tax-paying position. However, there may be benefits for firms that are in a temporary non-tax-paying position.

Leasing vs. Buy-and-Borrow

A company that wishes to make use of an asset may either lease it or finance the purchase by borrowing. If the company leases the asset, it saves the purchase price but it loses the depreciation tax shield and incurs the net of tax lease payments. Myers et al [4] show that the difference between the values of the two strategies is equal to these incremental cash flows discounted at the after-tax rate of interest. Thus, the present value of the difference between leasing and "buy-and-borrow" is given by

$$V_0 = A - \sum_{t=0}^H \frac{P_t(1 - T^*) + b_t T^*}{\{1 + r_D(1 - T^*)\}^t}$$

1245

where

A = purchase price of the asset

P_t = lease payment in year t

b_t = depreciation of leased asset's value in period t

T^* = company's marginal tax rate

r_D = required rate of return on debt

The same expression, with the signs on the cash flows changed, also gives the value of the lease to the lessor; that is, it represents the difference in value between the strategy of buying the asset and leasing it to the user and the alternative strategy of lending the user sufficient funds to purchase the asset.

In the Myers model the company's tax rate is assumed to be constant over time. Franks and Hodges [1] have generalized this model to cover the case of companies in a temporary non-tax-paying position. The difference between the alternative financing strategies is still equal to the incremental after-tax flows, discounted at the company's effective after-tax interest rate. However, when the tax rate is not constant, the effective after-tax interest rate changes over time.

The Myers and Franks-Hodges formulas give the correct expression for the difference between the value of the lease and "buy-and-borrow". In a Modigliani and Miller (MM) world with taxes [3], the formulas also provide the appropriate decision rule for when to lease. This is because borrowing in an MM world is never dominated by equity.

Thus, in an MM world there is no place for equity.¹ Debt dominates equity as long as the company's tax rate is positive and leasing dominates both debt and equity if the company's tax rate is permanently or temporarily less than the corporate tax rate. Individuals or tax-free companies should lend to taxable companies and taxable companies should lease to tax-free companies.

Leasing in Miller's World

We now consider the implications for the leasing decision of Miller's model of capital structure. We consider first the case of a company whose tax position does not change over time.

For leasing to have zero net present value to a lessor paying tax at the full rate of T_c ,² the following condition must be met

$$A = \sum_{t=0}^H \frac{P_t(1 - T_c) + b_t T_c}{1 + r_D(1 - T_c)^t} \quad (1)$$

Let D denote the discounted value of the depreciation allowance as a proportion

¹ This is an overstatement. MM recognized that there may be other non-tax reasons for issuing both debt and equity. Our point is that the marginal tax benefit to debt is always positive in the MM model.

² More strictly, we define T_c as the marginal tax rate of corporations that are indifferent between debt and equity in Miller's model. This rate is equal to the standard corporate tax rate if there are sufficient companies paying the standard rate to satisfy the demands for bonds by investors with personal tax rates less than the standard rate.

of the cost of the asset

$$D = \frac{1}{A} \sum_{t=0}^H \frac{b_t}{\{1 + r_D(1 - T_c)\}^t}$$

Then, substituting in (1) and re-arranging, we get

$$\sum_{t=0}^H \frac{P_t}{\{1 + r_D(1 - T_c)\}^t} = \frac{A(1 - T_c D)}{1 - T_c}$$

But under Miller's equilibrium the required return on equity (r_E) is equal to the after-tax rate of interest. Therefore,

$$\sum_{t=0}^H \frac{P_t}{\{1 + r_E\}^t} = \frac{A(1 - T_c D)}{1 - T_c} \quad (2)$$

(2) gives the level of lease payments at which the taxable lessor is indifferent between providing lease finance, debt finance and equity finance.

Now consider the case in which the operator of the assets pays tax at a constant rate of T^* . For this company to prefer leasing to equity finance, the net cost of the asset to the company must be greater than the present value of the after-tax lease payments

$$A(1 - T^* D) > (1 - T^*) \sum_{t=0}^H \frac{P_t}{\{1 + r_E\}^t} \quad (3)$$

Substituting from (2), gives the equivalent condition

$$A(1 - T^* D) > A(1 - T^*) \frac{(1 - T_c D)}{1 - T_c}$$

$$\text{ie } \frac{1 - T^* D}{1 - T^*} > \frac{1 - T_c D}{1 - T_c} \quad (4)$$

Provided that $T^* < T_c$, this condition can only be met when $D > 1$. For $D < 1$ equity dominates leasing.³

This further implies that the present value of lease finance as an alternative to equity finance is given by

$$PV \text{ Lease} = A \left\{ \frac{1 - T^* D}{1 - T^*} - \frac{1 - T_c D}{1 - T_c} \right\} \quad (5)$$

Thus the present value of a lease is a function of the effective tax rate of the

³ It will have been noticed that these results have been derived for a project with a present value of zero. It should be clear that this is not necessary for the results to hold. Provided the lessor is interested solely in the cost of the asset and not in the value of the asset in deciding the equilibrium level of lease payments, then the derived inequality holds.

lessee, the full corporate tax rate (which determines the lease terms) and the level and timing of the depreciation allowances on the asset.⁴

It is interesting to note that, as long as the present value of the lease to the lessor is unchanged, the timing of the lease payments has no effect on the value of the lease to the lessee. At first sight this is curious, since the timing of these payments does enter into Myers's model of the present value of leasing as an alternative to debt finance. If the lessor finances the longer lease schedule by borrowing, it requires a return of $r_E = (1 - T_c)r_D$ on the additional investment. But this is precisely the return that the lessee can earn by postponing the lease payments. In other words, a longer lease schedule increases the attraction of leasing relative to debt because it displaces a larger amount of debt. But the larger amount of debt that is displaced also makes the debt alternative less attractive relative to equity. The present value of the lease relative to equity is unaffected by the change.

Consider now the situation where the tax rate of the asset's user is an increasing function of time. Thus for year t the effective marginal tax rate is $T^*(t)$. For the company to lease in a Miller world the following must be true

$$A > \sum_{t=0}^H \frac{P_t(1 - T^*(t)) + b_t T^*(t)}{(1 + r_E)^t} \quad (6)$$

Now we have established that for the fully taxed lessor to be indifferent between leasing and lending

$$\begin{aligned} A &= \sum_{t=0}^H \frac{P_t(1 - T_c) + b_t T_c}{\{1 + r_D(1 - T_c)\}^t} \\ &= \sum_{t=0}^H \frac{P_t(1 - T_c) + b_t T_c}{\{1 + r_E\}^t} \end{aligned}$$

Substituting into (6), we have the following condition for leasing

$$\begin{aligned} \sum_{t=0}^H \frac{P_t(1 - T_c) + b_t T_c}{\{1 + r_E\}^t} &> \sum_{t=0}^H \frac{P_t(1 - T^*(t)) + b_t T^*(t)}{(1 + r_E)^t} \\ ie \sum_{t=0}^H \frac{(b_t - P_t)T_c}{(1 + r_E)^t} &> \sum_{t=0}^H \frac{(b_t - P_t)T^*(t)}{(1 + r_E)^t} \end{aligned} \quad (7)$$

For example, suppose that the company is in a temporary non-tax-paying position (ie $T^*(t)$ is an increasing function of time). For leasing to be preferred to equity finance $b_t - P_t$ needs to be positive in the early years and negative in the later years. With any form of accelerated depreciation and with a flat schedule of lease payments, this is likely to be the case.

The reason that leasing may be attractive when the lessee's tax rate is not

⁴ Notice that the net present value of the equity financed project is also generally not independent of the tax rate of the company undertaking it. If the discounted value of the depreciation shields is less than the initial investment, the tax free company has an incentive to undertake projects that are not attractive to the taxable company. It is perhaps fortunate that such a firm cannot enjoy an additional advantage by leasing its equipment.

constant stems from the fact that a relatively low weight may be placed on the foregone depreciation allowances and a relatively high weight placed on the rental tax relief. Because the lessor and the lessee can shift funds over time at different rates, the timing of the lease payments becomes important when tax rates are not constant.

Miller, Non-Tax-Paying Companies and Money Machines

Our discussion of alternative financing methods points to a difficulty in placing companies with different tax rates in a Miller world. If the required return on equity for non-tax-payers is r_E and they have an opportunity to earn $r_D = \frac{r_E}{1 - T_c}$, we would appear to have a money machine. Tax-free companies could issue equity and lend the proceeds. The gains from such an operation would be limited only by the amount of the firm's tax losses.

In the case of a charitable institution freedom from taxes is a function of its status rather than its income level. An ingenious charity might, therefore, be tempted to issue equity to invest in bonds, thereby doing good work among the rich as well as the needy. The only limitation to such philanthropy would be the threat of a ruling by the tax authorities that the company was trading on its charitable status. If an issue of equity is not a feasible option, leasing is likely to be the preferred method of financing for a tax-exempt charity.

Conclusion

Because leasing involves a series of fixed payments, it is natural to compare the case flows from leasing with those from a policy of "buy and borrow". Myers and Franks-Hodges have shown how to evaluate the choice between leasing and "buy and borrow".

In an MM world with taxes the Myers and Frank-Hodges formulas also provide the appropriate decision rule for when to lease. This is because borrowing in an MM world is never a more costly source of finance than equity.

The purpose of this paper was to provide a reminder that the use of any lease valuation model involves a general theory of capital structure. In particular, we showed that Miller's presidential address implies that equity is generally a more attractive source of finance than leasing for companies that are in a permanently non-tax-paying position. It is only if a company is temporarily not liable to tax that leasing is likely to be the preferred source of finance.

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