Tax benefits of leasing

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Abstract

Financial economists view the tax benefits of leasing as a complex function of the tax deductions and income associated with rentals, depreciation, and interest attributed to lessors and lessees facing different tax rates. We offer two ways to simplify that complexity using the concept of present value depreciation, which reflects the decline in an asset’s value (present value of remaining cash flows) over time. We rely on the insight in Samuelson (1964) that tax rates do not matter if depreciation allowed under tax rules equals present value depreciation. We show that tax benefits of leasing, between a high tax rate lessor and zero tax rate lessee, equal the present value of lessor tax shields on a) the difference between actual tax depreciation and tax-neutral depreciation implied by actual rentals, or b) interest expense associated with a “loan” from the lessor to the lessee created by deferring actual lease rents relative to tax-neutral rents implied by actual tax depreciation.

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Tax benefits of leasing

In the popular press, the tax benefits of leasing are straightforward: taxes can be saved by transferring valuable depreciation deductions from low tax rate users of equipment to high tax rate lessors. Financial economists (e.g., Miller and Upton, 1976, Smith and Wakeman, 1985) have recognized, however, that the tax effects of leasing are more complex: lease rental payments generate taxable income to the recipient and deductions to the payer, and any funds borrowed generate interest deductions. While the interaction of tax effects for depreciation, rents, and interest can be modeled for specific transactions, a conceptual way to characterize the net tax benefit is missing. And while prior work recognizes that deferral of lease rents increases tax benefits, the benchmark against which deferral should be compared has also not been identified. We offer two ways to fill these gaps.

To develop those two ways of characterizing tax benefits, we build a simple transaction derived from actual tax-motivated sale/leaseback transactions (e.g., Ahlstrom and Engelson, 1999). The owner/user of an asset, facing a zero tax rate, transfers tax ownership of the asset to a taxpaying entity facing the top tax rate of 35 percent and immediately leases back the asset for its useful life (see Figure 1, Panel A). Focusing on this lease, we refer to the taxpayer as the lessor and the zero-tax user as the lessee. The lessor borrows the purchase price from a lender and pays it to the lessee, and the lessee transfers that amount to a deposit earning interest. The contracted rents are set such that they are paid off exactly by principal plus interest accruing in the deposit, leaving the lessee indifferent. Because the interest rate earned on the deposit equals the rate charged by the lender, the rents received by the lessor equal the principal and interest owed to the lender.\(^2\) The entire transaction is self-financing, and requires no funding by the lessor or lessee.

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\(^2\) Although we do not distinguish between risky and risk-free interest rates, because we do not model uncertainty, the risk-free rate is the appropriate interest rate for both the deposit and the loan, as all cash flows (rents and loan payoffs) are fully funded in advance.
By capturing the essential tax features of actual tax-motivated transactions, we are assured that the after-tax value created in our simple transaction represents the conceptual tax benefits of leasing. Note that these conceptual benefits apply to all leasing transactions, including, for example, the case where lessors purchase the asset directly and lease it to users. By overlaying our transaction on an existing situation and not perturbing any underlying cash flows, we are able to abstract from various tax and non-tax effects that are in practice commingled with the tax benefits of leasing. For example, our analysis is not affected by variation in costs of capital across lessors and across lessees (e.g., some lessees might access funding at preferential tax-exempt rates) or variation across lessees in operating cash flows they can generate from the same assets. Finally, by suppressing all market imperfections and frictions we are in effect identifying the maximum tax benefits available from leasing.\(^3\)

Our analysis relies on the concept of “present value” depreciation, which equals the decline in an asset’s “pre-tax value”, where pre-tax value at any point in time equals the present value of remaining pre-tax cash flows, discounted at the pre-tax cost of capital. This definition of depreciation has also been labeled economic depreciation (e.g., Samuelson, 1964); we avoid that label, however, because it covers other types of depreciation too. In particular, it has been used to measure decline in actual asset values (e.g., Miller and Upton, 1976), which depend on after-tax cash flows and discount rates.

Assume that the asset in our transaction generates pre-tax cash flows of $11 and $12.10 at the end of years 1 and 2, respectively. Assuming a 10 percent pre-tax discount rate, its current pre-tax value is $20. A year later, the asset’s pre-tax value is $11—the present value of $12.10

\(^3\) Actual tax-motivated transactions are associated with imperfections/frictions along many dimensions. For example, tax authorities will disallow transactions such as ours that serve no non-tax purpose, will impose limits on rent deferral and depreciation deductions, and require that the lessor bear certain risks. Non-tax considerations, such as accounting rules and legal restrictions, as well as costs paid to third parties create additional imperfections/frictions.
discounted back by one year. Present value depreciation for the first (second) year is thus $9 ($11) reflecting the decline in pre-tax value from $20 to $11 ($11 to $0). The depreciation actually allowed by U.S. tax rules, which is determined by tax policy, is generally faster than present value depreciation. Assume that tax depreciation allowed in the example above for years 1 and 2 is $12 and $8.

To understand the tax benefits of leasing, we switch from pre-tax cash flows and discount rates to their after-tax counterparts. In general, after-tax cash flows equal pre-tax operating cash flows times \((1-\tau)\), where \(\tau\) is the user’s tax rate, plus the depreciation tax shield (equal to \(\tau\) times the tax depreciation allowed each year). And the after-tax cost of capital is the pre-tax rate multiplied by \((1-\tau)\), because interest is tax deductible (assuming the asset is fully debt-financed).

We rely on present value depreciation because Samuelson (1964) shows that it is tax rate neutral; i.e., for the special case where tax depreciation equals present value depreciation, the after-tax value of cash flows is not a function of the user’s tax rate. The intuition is that taxable income (=net cash inflow – interest expense – depreciation) is zero in each year if tax depreciation equals present value depreciation. Because taxable income is always zero, tax rates become irrelevant. (See Sims, 2012, and cites to related work, for extensions of this result.)

Returning to our sale/leaseback transaction, the high rate taxpayer (lessor) borrows $20 and buys the asset from the zero-tax user (lessee), and leases it back to the user in exchange for two contracted rent payments with a present value of $20, discounted at 10 percent. Satisfying this present value condition makes the lessee indifferent to the sale/leaseback, as both rents can be paid exactly from the $20 purchase price held by the lessee in the interest-bearing deposit.

There are many rental schedules that satisfy the $20 present value condition, and each schedule is associated with its own present value depreciation and tax benefits. To simplify the
calculations for our transaction, we select for our base case, also referred to as our actual case, rents equal to $11 and $12.10 in years 1 and 2, respectively. Because they are the same amounts as the operating cash flows to the user discussed earlier, we can rely on the same present value depreciation computations. We consider later a second, tax-neutral rent schedule, to identify the benchmark against which deferral of rents should be compared. Tax benefits of leasing are zero for that schedule, and they become increasingly positive (negative) as rents are deferred more (less) relative to it. Even though the tax benefits we compute for the actual case are positive, as rents in the actual case are deferred relative to the tax-neutral benchmark, tax benefits can be increased further by deferring rents relative to our actual case.

To show the tax benefits of leasing, we focus on the taxpaying lessor. Note that the lessor’s position is similar to that of an owner/user: the rents, which are included as taxable income to the lessor, correspond to operating cash inflows from the asset and depreciation allowed by tax rules as well as deductible interest on the loan outstanding would be available to an owner/user. Recall that the actual tax depreciation allowed for this asset is $12 and $8 in years 1 and 2, whereas the present value depreciation associated with actual rents (of $11 and $12.10) is $9 and $11 in years 1 and 2. We characterize the tax benefits of leasing in two ways by comparing our actual case with two tax-neutral cases (see Figure 1, Panel B).

The first way is to compare our actual case with a hypothetical tax-neutral case, labeled Case A, where the tax laws are changed such that tax depreciation allowed equals present value depreciation. Using more detailed calculations (available from the authors) we can show that Case A is tax-neutral in the sense that the tax benefits of leasing are zero because all parties are indifferent to the transaction. The tax-neutrality of Case A can also be seen by relying on Samuelson’s insight: the present value of after-tax cash inflows plus depreciation tax shields
discounted at the after-tax rate is the same for asset owners with different tax rates. For the particular case where the lessor’s tax rate is zero, the after-tax value equals the pre-tax value, or the present value of pre-tax cash flows discounted at the pre-tax rate. Given that the pre-tax value of the lease is $20, the after-tax value to the lessor in case A is also $20, regardless of the lessor’s tax rate. That after-tax value is exactly offset by the $20 loan the lessor uses to finance the lease. As a result, there are no tax benefits in Case A because the sale/leaseback creates no value for the lessor or lessee.

If so, the tax benefits of leasing for the actual case are explained by differences in lessor value between the actual case and case A. The only difference between the two cases is the tax depreciation allowed, which is the actual tax depreciation of $12 and $8 in the actual case versus the present value or tax-neutral depreciation of $9 and $11 in case A. Thus the difference in lessor value between the two cases is the present value of the difference between the two sets of depreciation tax shields, where depreciation tax shield equals the tax depreciation allowed times the lessor’s tax rate of 35 percent. That net tax benefit is the present value of 35 percent of $3 (equal to $12 - $9, difference between actual and tax-neutral depreciation in year 1) discounted for one year plus the present value of 35 percent of minus $3 (equal to $8 - $11, depreciation difference in year 2) discounted back two years. Using a discount rate of 6.5 percent, which is the lessor’s after-tax cost of capital, the tax benefit of leasing equals $0.060173.4

Even though the sum of the difference between tax and present value depreciation is zero, the present value of tax shields associated with those annual differences is positive if tax depreciation is accelerated, relative to present value depreciation. Contrary to popular perception, it is not always beneficial to transfer to high tax lessors the ability to depreciate assets for tax

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4 To be sure, this tax benefit is small: only 6 cents on a $20 asset. The tax benefits of leasing increase, however, with increases in rent deferral and asset lives, as the discounted value of differences between tax and present value depreciation becomes more meaningful.
purposes, even though tax depreciation is “wasted” in the hands of zero tax lessees. Net tax benefits will turn negative if the rental schedules are sufficiently front-loaded; i.e., if present value depreciation is more accelerated than tax depreciation.

The second way to describe the net tax benefits of leasing is to compare the actual case with another tax-neutral case, labeled Case B, where the rents are revised such that the present value depreciation on the revised rents equals the tax depreciation allowed of $12 and $8 in years 1 and 2. The revised tax-neutral set of rents can be inferred from tax depreciation as follows. As the tax depreciation for year 2 is $8, the depreciated asset value at the end of year 1 is also $8. If so, the second rent payment at the end of year 2 should be $8.80, so that its present value at the end of year 1 (discounted at 10 percent) is $8. Given that the present value at year 0 of both rent payments is $20, and the present value of the second rent payment is $7.27 (present value of $8.80 discounted back 2 years), the first rent payment must be $14 (to have a year 0 present value of $12.73). To review, case B rents of $14 and $8.80 in years 1 and 2, referred to as tax-neutral rents, are associated with present value depreciation that exactly equals the tax depreciation allowed.

As with case A, Samuelson’s insight indicates that case B is tax-neutral, which implies that the lessor’s value in case B is zero. If so, the tax benefits of leasing for the actual case, represented by the lessor’s value in the actual case minus that in case B, is determined by the difference between the two sets of rents: actual rents of $11 and $12.10 in years 1 and 2 versus tax-neutral rents of $14 and $8.80. While both sets of rents have the same present value of $20, when discounted at the pre-tax discount rate of 10 percent, the actual rents are deferred relative to tax neutral rents. In effect, the lessor “loans” to the lessee an additional $3 in year 1 (the
difference between $14 and $11) and recovers that loan with interest at 10 percent in year 2 (the $3.30 difference between $8.80 and $12.10).

Whereas the lessee views this $3 loan on a pre-tax basis, the loan balance from the lessor’s perspective equals the lessee loan balance times \((1−τ)\), where \(τ\) is the lessor’s tax rate. This is because for each $1 shortfall in taxable rents received by the lessor, caused by deferring rents, the lessor faces an after-tax cash reduction of only $(1−τ). In effect, the lessor needs to borrow just $(1−τ) for each $1 loaned to the lessee. In our example, the lessor need only borrow $1.95 to finance the incremental loan of $3 to the lessee in year 1. The interest paid in year 2 by the lessor on this incremental borrowing is $0.195, at a 10 percent rate.

Tax benefits arise because the lessor raises funds via debt-financing and effectively pays interest at the after-tax cost of capital (given the tax deductibility of interest) whereas the lessee earns interest at the pre-tax rate (because its tax rate is zero). Stated differently, the tax benefit equals the tax shield available to the lessor when it deducts the interest of $0.195 on the loan from the lessor to the lessee. The tax shield on this incremental interest is $0.06825 (=35 percent of $0.195), which has the same present value of $0.060173 (discounted at the lessor’s after-tax rate of 6.5 percent) mentioned in the first comparison based on depreciation tax shields.

This second way of characterizing the tax benefits of leasing illustrates the nature of “arbitrage” underlying those benefits. The effective loan described above is created by the lessor borrowing funds and handing it off to the lessee. Tax arbitrage arises because of the asymmetric treatment of interest expense and interest income associated with this loan: whereas the lessor reduces its taxes by deducting interest expense on the borrowed funds, interest income earned by the lessee on those same funds attracts no tax.
While practitioners recognize that tax benefits are created by deferring lease rents, this second way identifies the specific benchmark against which deferral should be viewed. Tax benefits are created only when actual lease rents are deferred relative to the tax-neutral rents implied by depreciation allowed by tax rules. As with the first way, tax benefits are not assured just because the ability to deduct depreciation for tax purposes is transferred from zero tax lessees to high tax lessors; in fact, tax benefits are negative if actual lease rents are accelerated relative to tax-neutral rents.5

In sum, we offer two conceptual ways to characterize the tax benefits of leasing. First, it equals the present value of the difference in tax shields for actual depreciation allowed by tax rules versus present value depreciation associated with contracted lease rents. Second, it equals the present value of interest tax shields associated with a loan corresponding to the difference between contracted lease rents and tax-neutral rents implied by actual tax depreciation. These conceptual ways also highlight the three ingredients necessary for leasing to create tax benefits: a) lessors and lessees should face different tax rates, b) contracted lease rents should be deferred relative to tax-neutral rents implied by tax depreciation rules, and c) lessors should use debt financing and interest expense should be tax-deductible.6

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5 That tax benefits from leasing can be negative has been noted before (e.g., Graham et al., 1998). However, that observation is a general one that describes the sign of tax benefits in terms of an algebraic expression of the different tax effects. Our contribution is to identify the conceptual pivot point, based on tax-neutral rents, at which the tax benefits change sign. In the first way of characterizing tax benefits of leasing, the pivot point is described in terms of tax-neutral depreciation.

6 In fact, the tax benefits of leasing can also be stated as the present value of the after-tax difference between actual lease rents and tax-neutral rents discounted at the lessor's after-tax cost of capital less the present value of that difference in rents discounted at the lessor’s pre-tax rate. The former (latter) case describes the lessor when interest expense is (is not) deductible for tax purposes.
References:


Panel A: Flow of funds for Sale/Leaseback transaction.
In year 0, a high tax-rate party (Lessor) borrows $20 at 10% interest from a Lender and purchases an asset from a zero tax-rate party (Lessee), who transfers the $20 to a deposit bearing 10% interest. This path is shown by the black, solid line. The Lessee immediately rents the asset back under a 2 year lease, agreeing to pay rent of $11 and $12.10 in years 1 and 2. The present value of those two rents is $20, discounted at 10%. In years 1 and 2, the Lessee withdraws $11 and $12.10, respectively, from the Deposit and pays those amounts as rent to the Lessor, who in turn pays those amounts as principal and interest to the Lender. This path is shown by the dashed, green line. The transaction is self-financing and requires no funds from the Lessor or Lessee.

Panel B: Comparison of Actual Case with two Tax-neutral Cases
The actual case, described in the middle column below, requires the Lessee to pay the Lessor rents of $11 and $12.10 in years 1 and 2 (see Panel A). Under tax depreciation rules, the Lessor is allowed to depreciate the $20 asset as follows: $12 in year 1 and $8 in year 2. Case A, described in the left column below, refers to a tax-neutral case where the rents equal those in the Actual Case, but the tax depreciation allowed is based on present value depreciation associated with actual rents. Present value depreciation of $9 and $11 in years 1 and 2 is the decline in “pre-tax” value for the lessor, where pre-tax value is the present value of remaining pre-tax rents, discounted at 10 percent. Pre-tax value at years 0, 1, and 2 is $20, $11, and $0, respectively. This case is tax-neutral because the after-tax position of the Lessor is not a function of tax rates, and no tax benefits are generated for this case. Tax-neutral Case B, described in the right column below, is based on actual depreciation, but the rents of $14 and $8.80 have been altered from the actual case to be tax-neutral; i.e., present value depreciation for those tax-neutral rents equals actual depreciation of $12 and $8 in years 1 and 2. The present value of tax neutral rents, discounted at 10 percent, is also $20, similar to the actual rents. The first (second) way to describe leasing tax benefits compares the depreciation (rents) in the actual case with those in the tax-neutral Case A (Case B).