

DEBT FINANCING

Leasing

► **Most of us** occasionally rent a car, bicycle, or boat. Usually such personal rentals are short-lived; we may rent a car for a day or week. But in corporate finance longer-term rentals are common. A rental agreement that extends for a year or more and involves a series of fixed payments is called a lease.

Firms lease as an alternative to buying capital equipment. In the U.S., about 30% of new capital equipment is leased. Trucks and farm machinery are often leased; so are railroad cars, aircraft, and ships. Just about every kind of asset can be leased. Many of the pandas in American zoos are leased, with the proceeds going to panda conservation.

Every lease involves two parties. The *user* of the asset is called the *lessee*. The lessee makes periodic payments to the *owner* of the asset, who is called the *lessor*. For example, if you sign an agreement to rent an apartment for a year, you are the lessee and the owner is the lessor.

You often see references to the *leasing industry*. This refers to lessors. (Almost all firms are lessees to at least a minor extent.) Who are the lessors?

Some of the largest lessors are equipment manufacturers. For example, IBM is a large lessor of

computers, and Deere is a large lessor of agricultural and construction equipment.

The other two major groups of lessors are banks and independent leasing companies. Leasing companies play an enormous role in the airline business. For example, in 2008 GE Capital Aviation Services, a subsidiary of GE Capital, owned and leased out nearly 1,500 commercial aircraft. The world's airlines rely largely on leasing to finance their fleets.

Leasing companies offer a variety of services. Some act as lease brokers (arranging lease deals) as well as being lessors. Others specialize in leasing automobiles, trucks, and standardized industrial equipment; they succeed because they can buy equipment in quantity, service it efficiently, and if necessary resell it at a good price.

We begin this chapter by cataloging the different kinds of leases and some of the reasons for their use. Then we show how short-term, or cancelable, lease payments can be interpreted as equivalent annual costs. The remainder of the chapter analyzes long-term leases used as alternatives to debt financing.

25-1 What Is a Lease?

Leases come in many forms, but in all cases the lessee (user) promises to make a series of payments to the lessor (owner). The lease contract specifies the monthly or semiannual payments, with the first payment usually due as soon as the contract is signed. The payments are usually level, but their time pattern can be tailored to the user's needs. For example, suppose that a manufacturer leases a machine to produce a complex new product. There will be a year's "shakedown" period before volume production starts. In this case, it might be possible to arrange for lower payments during the first year of the lease.

When a lease is terminated, the leased equipment reverts to the lessor. However, the lease agreement often gives the user the option to purchase the equipment or take out a new lease.

Some leases are short-term or cancelable during the contract period at the option of the lessee. These are generally known as *operating leases*. Others extend over most of the estimated economic life of the asset and cannot be canceled or can be canceled only if the lessor is reimbursed for any losses. These are called *capital, financial, or full-payout leases*.

Financial leases are a *source of financing*. Signing a financial lease contract is like borrowing money. There is an immediate cash inflow because the lessee is relieved of having to pay for the asset. But the lessee also assumes a binding obligation to make the payments specified in the lease contract. The user could have borrowed the full purchase price of the asset by accepting a binding obligation to make interest and principal payments to the lender. Thus the cash-flow consequences of leasing and borrowing are similar. In either case, the firm raises cash now and pays it back later. Later in this chapter we compare leasing and borrowing as financing alternatives.

Leases also differ in the services provided by the lessor. Under a *full-service, or rental, lease*, the lessor promises to maintain and insure the equipment and to pay any property taxes due on it. In a *net lease*, the lessee agrees to maintain the asset, insure it, and pay any property taxes. Financial leases are usually net leases.

Most financial leases are arranged for brand new assets. The lessee identifies the equipment, arranges for the leasing company to buy it from the manufacturer, and signs a contract with the leasing company. This is called a *direct lease*. In other cases, the firm sells an asset it already owns and leases it back from the buyer. These *sale and lease-back* arrangements are common in real estate. For example, firm X may wish to raise cash by selling an office or factory but still retain use of the building. It could do this by selling the building for cash to a leasing company and simultaneously signing a long-term lease contract. For example, in 2007 HSBC sold its head office building in London for £1.09 billion, or about \$2 billion. HSBC then leased the building back at an annual rent of £43.5 million. Thus legal ownership of the building passed to the new owner, but the right to use it remained with HSBC.

You may also encounter *leveraged* leases. These are financial leases in which the lessor borrows part of the purchase price of the leased asset, using the lease contract as security for the loan. This does not change the lessee's obligations, but it can complicate the lessor's analysis considerably.

25-2 Why Lease?

You hear many suggestions about why companies should lease equipment rather than buy it. Let us look at some sensible reasons and then at four more dubious ones.

Sensible Reasons for Leasing

Short-Term Leases Are Convenient Suppose you want the use of a car for a week. You could buy one and sell it seven days later, but that would be silly. Quite apart from the fact that registering ownership is a nuisance, you would spend some time selecting a car, negotiating purchase, and arranging insurance. Then at the end of the week you would negotiate resale and cancel the registration and insurance. When you need a car only for a short time, it clearly makes sense to rent it. You save the trouble of registering ownership, and you know the effective cost. In the same way, it pays a company to lease equipment that it needs for only a year or two. Of course, this kind of lease is always an operating lease.

Sometimes the cost of short-term rentals may seem prohibitively high, or you may find it difficult to rent at any price. This can happen for equipment that is easily damaged by

careless use. The owner knows that short-term users are unlikely to take the same care they would with their own equipment. When the danger of abuse becomes too high, short-term rental markets do not survive. Thus, it is easy enough to buy a Lamborghini Gallardo, provided your pockets are deep enough, but nearly impossible to rent one.

Cancellation Options Are Valuable Some leases that *appear* expensive really are fairly priced once the option to cancel is recognized. We return to this point in the next section.

Maintenance Is Provided Under a full-service lease, the user receives maintenance and other services. Many lessors are well equipped to provide efficient maintenance. However, bear in mind that these benefits will be reflected in higher lease payments.

Standardization Leads to Low Administrative and Transaction Costs Suppose that you operate a leasing company that specializes in financial leases for trucks. You are effectively lending money to a large number of firms (the lessees) that may differ considerably in size and risk. But, because the underlying asset is in each case the same salable item (a truck), you can safely “lend” the money (lease the truck) without conducting a detailed analysis of each firm’s business. You can also use a simple, standard lease contract. This standardization makes it possible to “lend” small sums of money without incurring large investigative, administrative, or legal costs.

For these reasons leasing is often a relatively cheap source of cash for the small company. It offers secure financing on a flexible, piecemeal basis, with lower transaction costs than in a bond or stock issue.

Tax Shields Can Be Used The lessor owns the leased asset and deducts its depreciation from taxable income. If the lessor can make better use of depreciation tax shields than an asset’s user can, it may make sense for the leasing company to own the equipment and pass on some of the tax benefits to the lessee in the form of low lease payments.

Leasing and Financial Distress Lessors in financial leases are in many ways similar to secured lenders, but lessors may fare better in bankruptcy. If a lessee defaults on a lease payment, you might think that the lessor could pick up the leased asset and take it home. But if the bankruptcy court decides that the asset is “essential” to the lessee’s business, it *affirms* the lease. Then the bankrupt firm can continue to use the asset. It must continue to make the lease payments, however. This can be good news for the lessor, who is paid while other creditors cool their heels. Even secured creditors are not paid until the bankruptcy process works itself out.

If the lease is not affirmed but *rejected*, the lessor can recover the leased asset. If it is worth less than the present value of the remaining lease payments, the lessor can try to recoup this loss. But in this case the lender must get in line with unsecured creditors.

Unfortunately for lessors, there is a third possibility. A lessee in financial distress may be able to renegotiate the lease, forcing the lessor to accept lower lease payments. For example, in 2001 American Airlines (AA) acquired most of the assets of Trans World Airlines (TWA). TWA was bankrupt, and AA’s purchase contract was structured so that AA could decide whether to affirm or reject TWA’s aircraft leases. AA contacted the lessors and threatened to reject. The lessors realized that rejection would put about 100 leased aircraft back in their laps to sell or re-lease, probably at fire-sale prices. (The market for used aircraft was not strong at the time.) The lessors ended up accepting renegotiated lease rates that were about half what TWA had been paying.¹

¹ If the leases had been rejected, the lessors would have had a claim only on TWA’s assets and cash flows, not AA’s. The renegotiation of the TWA leases is described in E. Benmelech and N. K. Bergman, “Liquidation Values and the Credibility of Financial Contract Renegotiation: Evidence from U.S. Airlines,” *Quarterly Journal of Economics* 123 (2008), pp. 1635–1677.

Avoiding the Alternative Minimum Tax Red-blooded financial managers want to earn lots of money for their shareholders but *report* low profits to the tax authorities. Tax law in the United States allows this. A firm may use straight-line depreciation in its annual report but choose accelerated depreciation (and the shortest possible asset life) for its tax books. By this and other perfectly legal and ethical devices, profitable companies have occasionally managed to escape tax entirely. Almost all companies pay less tax than their public income statements suggest.²

But there is a trap for U.S. companies that shield too much income: the alternative minimum tax (*AMT*). Corporations must pay the AMT whenever it is higher than their tax computed in the regular way.

Here is how the AMT works: It requires a second calculation of taxable income, in which part of the benefit of accelerated depreciation and other tax-reducing items³ is added back. The AMT is 20% of the result.

Suppose Yuppytech Services would have \$10 million in taxable income but for the AMT, which forces it to add back \$9 million of tax privileges:

	Regular Tax	Alternative Minimum Tax
Income	\$10	10 + 9 = 19
Tax rate	<u>.35</u>	<u>.20</u>
Tax	\$ 3.5	\$3.8

Yuppytech must pay \$3.8 million, not \$3.5.⁴

How can this painful payment be avoided? How about leasing? Lease payments are *not* on the list of items added back in calculating the AMT. If you lease rather than buy, tax depreciation is less and the AMT is less. There is a net gain if the *lessor* is not subject to the AMT and can pass back depreciation tax shields in the form of lower lease payments.

Some Dubious Reasons for Leasing

Leasing Avoids Capital Expenditure Controls In many companies lease proposals are scrutinized as carefully as capital expenditure proposals, but in others leasing may enable an operating manager to avoid the approval procedures needed to buy an asset. Although this is a dubious reason for leasing, it may be influential, particularly in the public sector. For example, city hospitals have sometimes found it politically more convenient to lease their medical equipment than to ask the city government to provide funds for purchase.

Leasing Preserves Capital Leasing companies provide “100% financing”; they advance the full cost of the leased asset. Consequently, they often claim that leasing preserves capital, allowing the firm to save its cash for other things.

But the firm can also “preserve capital” by borrowing money. If Greymare Bus Lines leases a \$100,000 bus rather than buying it, it does conserve \$100,000 cash. It could also (1) buy the bus for cash and (2) borrow \$100,000, using the bus as security. Its bank balance

² Year-by-year differences between reported tax expense and taxes actually paid are explained in footnotes to the financial statements. The cumulative difference is shown on the balance sheet as a deferred tax liability. (Note that accelerated depreciation *postpones* taxes; it does not eliminate taxes.)

³ Other items include some interest receipts from tax-exempt municipal securities and taxes deferred by use of completed contract accounting. (The completed contract method allows a manufacturer to postpone reporting taxable profits until a production contract is completed. Since contracts may span several years, this deferral can have a substantial positive NPV.)

⁴ But Yuppytech can carry forward the \$.3 million difference. If later years' AMTs are *lower* than regular taxes, the difference can be used as a tax credit. Suppose the AMT next year is \$4 million and the regular tax is \$5 million. Then Yuppytech pays only $5 - .3 = \$4.7$ million.

ends up the same whether it leases or buys and borrows. It has the bus in either case, and it incurs a \$100,000 liability in either case. What's so special about leasing?

Leases May Be Off-Balance-Sheet Financing In some countries financial leases are off-balance-sheet financing; that is, a firm can acquire an asset, finance it through a financial lease, and show neither the asset nor the lease contract on its balance sheet.

In the United States, the Financial Accounting Standards Board (FASB) requires that all *capital* (i.e., financial) leases be capitalized. This means that the present value of the lease payments must be calculated and shown alongside debt on the right-hand side of the balance sheet. The same amount must be shown as an asset on the left-hand side and written off over the life of the lease.

The FASB defines capital leases as leases that meet *any one* of the following requirements:

1. The lease agreement transfers ownership to the lessee before the lease expires.
2. The lessee can purchase the asset for a bargain price when the lease expires.
3. The lease lasts for at least 75% of the asset's estimated economic life.
4. The present value of the lease payments is at least 90% of the asset's value.

All other leases are operating leases as far as the accountants are concerned.⁵

Many financial managers have tried to take advantage of this arbitrary boundary between operating and financial leases. Suppose that you want to finance a computer-controlled machine tool costing \$1 million. The machine tool's life is expected to be 12 years. You could sign a lease contract for 8 years 11 months (just missing requirement 3), with lease payments having a present value of \$899,000 (just missing requirement 4). You could also make sure the lease contract avoids requirements 1 and 2. Result? You have off-balance-sheet financing. This lease would not have to be capitalized, although it is clearly a long-term, fixed obligation.

Now we come to the \$64,000 question: Why should anyone *care* whether financing is off balance sheet or on balance sheet? Shouldn't the financial manager worry about substance rather than appearance?

When a firm obtains off-balance-sheet financing, the conventional measures of financial leverage, such as the debt–equity ratio, understate the true degree of financial leverage. Some believe that financial analysts do not always notice off-balance-sheet lease obligations (which are still referred to in footnotes) or the greater volatility of earnings that results from the fixed lease payments. They may be right if off-balance-sheet lease obligations are moderate and “lost in the noise” of all the firm's other activities. But we would not expect investors, security analysts, and debt-rating agencies to miss large hidden obligations unless they were systematically misled by management.

Leasing Affects Book Income Leasing can make the firm's balance sheet and income statement *look* better by increasing book income or decreasing book asset value, or both.

A lease that qualifies as off-balance-sheet financing affects book income in only one way: The lease payments are an expense. If the firm buys the asset instead and borrows to finance it, both depreciation and interest expense are deducted. Leases are usually set up so that payments in the early years are less than depreciation plus interest under the buy-and-borrow alternative. Consequently, leasing increases book income in the early years of an asset's life. The book rate of return can increase even more dramatically, because the book

⁵ In March 2009 the FASB and the International Accounting Standards Board (IASB) published a discussion paper entitled *Leases: Preliminary Views*. This set out some possible changes to accounting rules that would lead to more leasing activity being shown on the balance sheet.

value of assets (the denominator in the book-rate-of-return calculation) is understated if the leased asset never appears on the firm's balance sheet.

Leasing's impact on book income should in itself have no effect on firm value. In efficient capital markets investors will look through the firm's accounting results to the true value of the asset and the liability incurred to finance it.

25-3 Operating Leases

Remember our discussion of *equivalent annual costs* in Chapter 6? We defined the equivalent annual cost of, say, a machine as the annual rental payment sufficient to cover the present value of all the costs of owning and operating it.

In Chapter 6's examples, the rental payments were hypothetical—just a way of converting a present value to an annual cost. But in the leasing business the payments are real. Suppose you decide to lease a machine tool for one year. What will the rental payment be in a competitive leasing industry? The lessor's equivalent annual cost, of course.

Example of an Operating Lease

The boyfriend of the daughter of the CEO of Establishment Industries takes her to the senior prom in a pearly white stretch limo. The CEO is impressed. He decides Establishment Industries ought to have one for VIP transportation. Establishment's CFO prudently suggests a one-year operating lease instead and approaches Acme Limolease for a quote.

Table 25.1 shows Acme's analysis. Suppose it buys a new limo for \$75,000 that it plans to lease out for seven years (years 0 through 6). The table gives Acme's forecasts of operating, maintenance, and administrative costs, the latter including the costs of negotiating the lease, keeping track of payments and paperwork, and finding a replacement lessee when Establishment's year is up. For simplicity we assume zero inflation and use a 7% real cost of capital. We also assume that the limo will have zero salvage value at the end of year 6.

	Year							
	0	1	2	3	4	5	6	
Initial cost	-75							
Maintenance costs etc	-12	-12	-12	-12	-12	-12	-12	
Tax shield on costs	+4.2	+4.2	+4.2	+4.2	+4.2	+4.2	+4.2	
Depreciation tax shield ^a		+5.25	+8.40	+5.04	+3.02	+3.02	+1.51	
Total	-82.80	-2.55	+6.0	-2.76	-4.78	-4.78	-6.29	
PV at 7% = -98.15 ^b								
Break-even rent (level)	-26.19	-26.19	-26.19	-26.19	-26.19	-26.19	-26.19	
Tax	+9.17	+9.17	+9.17	+9.17	+9.17	+9.17	+9.17	
Break-even rent after tax	-17.02	-17.02	-17.02	-17.02	-17.02	-17.02	-17.02	
PV at 7% = -98.15 ^b								

TABLE 25.1

Calculating the zero-NPV rental rate (or equivalent annual cost) for Establishment Industries's pearly white stretch limo (figures in \$ thousands). The break-even rent is set so that the PV of after-tax lease payments equals 98.15, the PV of the after-tax cost of buying and operating the limo.

Note: We assume no inflation and a 7% real cost of capital. The tax rate is 35%.

^a Depreciation tax shields are calculated using the five-year schedule from Table 6.4.

^b Note that the first payment of these annuities comes immediately. The standard annuity factor must be multiplied by $1 + r = 1.07$.

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The present value of all costs, partially offset by the value of depreciation tax shields,⁶ is \$98,150. Now, how much does Acme have to charge to break even?

Acme can afford to buy and lease out the limo only if the rental payments forecasted over six years have a present value of at least \$98,150. The problem, then, is to calculate a six-year annuity with a present value of \$98,150. We follow common leasing practice and assume rental payments in advance.⁷

As Table 25.1 shows, the required annuity is \$26,190, that is, about \$26,000.⁸ This annuity's present value (after taxes) exactly equals the present value of the after-tax costs of owning and operating the limo. The annuity provides Acme with a competitive expected rate of return (7%) on its investment. Acme could try to charge Establishment Industries more than \$26,000, but if the CFO is smart enough to ask for bids from Acme's competitors, the winning lessor will end up receiving this amount.

Remember that Establishment Industries is not obligated to continue using the limo for more than one year. Acme may have to find several new lessees over the limo's economic life. Even if Establishment continues, it can renegotiate a new lease at whatever rates prevail in the future. Thus Acme does not know what it can charge in year 1 or afterward. If pearly white falls out of favor with teenagers and CEOs, Acme is probably out of luck.

In real life Acme would have several further things to worry about. For example, how long will the limo stand idle when it is returned at year 1? If idle time is likely before a new lessee is found, then lease rates have to be higher to compensate.⁹

In an operating lease, the *lessor* absorbs these risks, not the lessee. The discount rate used by the lessor must include a premium sufficient to compensate its shareholders for the risks of buying and holding the leased asset. In other words, Acme's 7% real discount rate must cover the risks of investing in stretch limos. (As we see in the next section, risk bearing in *financial* leases is fundamentally different.)

Lease or Buy?

If you need a car or limo for only a day or a week you will surely rent it; if you need one for five years you will probably buy it. In between there is a gray region in which the choice of lease or buy is not obvious. The decision rule should be clear in concept, however: If you need an asset for your business, *buy it if the equivalent annual cost of ownership and operation is less than the best lease rate you can get from an outsider*. In other words, buy if you can "rent to yourself" cheaper than you can rent from others. (Again we stress that this rule applies to *operating* leases.)

If you plan to use the asset for an extended period, your equivalent annual cost of owning the asset will usually be less than the operating lease rate. The lessor has to mark up the lease rate to cover the costs of negotiating and administering the lease, the foregone revenues when the asset is off-lease and idle, and so on. These costs are avoided when the company buys and rents to itself.

There are two cases in which operating leases may make sense even when the company plans to use an asset for an extended period. First, the lessor may be able to buy and manage the asset at less expense than the lessee. For example, the major truck leasing companies buy

⁶ The depreciation tax shields are safe cash flows if the tax rate does not change and Acme is sure to pay taxes. If 7% is the right discount rate for the other flows in Table 25.1, the depreciation tax shields deserve a lower rate. A more refined analysis would discount safe depreciation tax shields at an after-tax borrowing or lending rate. See the Appendix to Chapter 19 or the next section of this chapter.

⁷ In Section 6-4 the hypothetical rentals were paid *in arrears*.

⁸ This is a level annuity because we are assuming that (1) there is no inflation and (2) the services of a six-year-old limo are no different from a brand-new limo's. If users of aging limos see them as obsolete or unfashionable, or if purchase costs of new limos are declining, then lease rates have to decline as limos age. This means that rents follow a *declining* annuity. Early users have to pay more to make up for declining rents later.

⁹ If, say, limos were off-lease and idle 20% of the time, lease rates would have to be 25% above those shown in Table 25.1.

thousands of new vehicles every year. That puts them in an excellent bargaining position with truck manufacturers. These companies also run very efficient service operations, and they know how to extract the most salvage value when trucks wear out and it is time to sell them. A small business, or a small division of a larger one, cannot achieve these economies and often finds it cheaper to lease trucks than to buy them.

Second, operating leases often contain useful options. Suppose Acme offers Establishment Industries the following two leases:

1. A one-year lease for \$26,000.
2. A six-year lease for \$28,000, *with the option to cancel the lease* at any time from year 1 on.¹⁰

The second lease has obvious attractions. Suppose Establishment's CEO becomes fond of the limo and wants to use it for a second year. If rates increase, lease 2 allows Establishment to continue at the old rate. If rates decrease, Establishment can cancel lease 2 and negotiate a lower rate with Acme or one of its competitors.

Of course, lease 2 is a more costly proposition for Acme: In effect it gives Establishment an insurance policy protecting it from increases in future lease rates. The difference between the costs of leases 1 and 2 is the annual insurance premium. But lessees may happily pay for insurance if they have no special knowledge of future asset values or lease rates. A leasing company acquires such knowledge in the course of its business and can generally sell such insurance at a profit.

Airlines face fluctuating demand for their services and the mix of planes that they need is constantly changing. Most airlines, therefore, lease a proportion of their fleet on a short-term, cancelable basis and are willing to pay a premium to lessors for bearing the cancellation risk. Specialist aircraft lessors are prepared to bear this risk, for they are well-placed to find new customers for any aircraft that are returned to them. Aircraft owned by specialist lessors spend less time parked and more time flying than aircraft owned by airlines.¹¹

Be sure to check out the options before you sign (or reject) an operating lease.¹²

25-4 Valuing Financial Leases

For operating leases the decision centers on "lease versus buy." For *financial* leases the decision amounts to "lease versus borrow." Financial leases extend over most of the economic life of the leased equipment. They are *not* cancelable. The lease payments are fixed obligations equivalent to debt service.

Financial leases make sense when the company is prepared to take on the business risks of owning and operating the leased asset. If Establishment Industries signs a *financial* lease for the stretch limo, it is stuck with that asset. The financial lease is just another way of borrowing money to pay for the limo.

Financial leases do offer special advantages to some firms in some circumstances. However, there is no point in further discussion of these advantages until you know how to value financial lease contracts.

¹⁰ Acme might also offer a one-year lease for \$28,000 but give the lessee an option to *extend* the lease on the same terms for up to five additional years. This is, of course, identical to lease 2. It doesn't matter whether the lessee has the (put) option to cancel or the (call) option to continue.

¹¹ A. Gavazza, "Leasing and Secondary Markets: Theory and Evidence from Commercial Aviation," Working paper, Yale School of Management, March 2007.

¹² McConnell and Schallheim calculate the value of options in operating leases under various assumptions about asset risk, depreciation rates, etc. See J. J. McConnell and J. S. Schallheim, "Valuation of Asset Leasing Contracts," *Journal of Financial Economics* 12 (August 1983), pp. 237–261.

Example of a Financial Lease

Imagine yourself in the position of Thomas Pierce III, president of Greymare Bus Lines. Your firm was established by your grandfather, who was quick to capitalize on the growing demand for transportation between Widdicombe and nearby townships. The company has owned all its vehicles from the time the company was formed; you are now reconsidering that policy. Your operating manager wants to buy a new bus costing \$100,000. The bus will last only eight years before going to the scrap yard. You are convinced that investment in the additional equipment is worthwhile. However, the representative of the bus manufacturer has pointed out that her firm would also be willing to lease the bus to you for eight annual payments of \$16,900 each. Greymare would remain responsible for all maintenance, insurance, and operating expenses.

Table 25.2 shows the direct cash-flow consequences of signing the lease contract. (An important indirect effect is considered later.) The consequences are:

1. Greymare does not have to pay for the bus. This is equivalent to a cash inflow of \$100,000.
2. Greymare no longer owns the bus, and so it cannot depreciate it. Therefore it gives up a valuable depreciation tax shield. In Table 25.2, we have assumed depreciation would be calculated using five-year tax depreciation schedules. (See Table 6.4.)
3. Greymare must pay \$16,900 per year for eight years to the lessor. The first payment is due immediately.
4. However, these lease payments are fully tax-deductible. At a 35% marginal tax rate, the lease payments generate tax shields of \$5,920 per year. You could say that the after-tax cost of the lease payment is $\$16,900 - \$5,920 = \$10,980$.

We must emphasize that Table 25.2 assumes that Greymare will pay taxes at the full 35% marginal rate. If the firm were sure to lose money, and therefore pay no taxes, lines 2 and 4 would be left blank. The depreciation tax shields are worth nothing to a firm that pays no taxes, for example.

Table 25.2 also assumes the bus will be worthless when it goes to the scrap yard at the end of year 7. Otherwise there would be an entry for salvage value lost.

Who Really Owns the Leased Asset?

To a lawyer or a tax accountant, that would be a silly question: The lessor is clearly the *legal* owner of the leased asset. That is why the lessor is allowed to deduct depreciation from taxable income.

From an *economic* point of view, you might say that the *user* is the real owner, because in a *financial* lease, the user faces the risks and receives the rewards of ownership. Greymare cannot cancel a financial lease. If the new bus turns out to be hopelessly costly and

	Year								
	0	1	2	3	4	5	6	7	
Cost of new bus	+100								
Lost depreciation tax shield		-7.00	-11.20	-6.72	-4.03	-4.03	-2.02	0	
Lease payment	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9
Tax shield of lease payment	+5.92	+5.92	+5.92	+5.92	+5.92	+5.92	+5.92	+5.92	+5.92
Cash flow of lease	+89.02	-17.99	-22.19	-17.71	-15.02	-15.02	-13.00	-10.99	

TABLE 25.2

Cash-flow consequences of the lease contract offered to Greymare Bus Lines (figures in \$ thousands; some columns do not add due to rounding).

unsuited for Greymare's routes, that is Greymare's problem, not the lessor's. If it turns out to be a great success, the profit goes to Greymare, not the lessor. The success or failure of the firm's business operations does not depend on whether the buses are financed by leasing or some other financial instrument.

In many respects, a financial lease is equivalent to a secured loan. The lessee must make a series of fixed payments; if the lessee fails to do so, the lessor can repossess the asset. Thus we can think of a balance sheet like this:

Bus	100	100	Loan secured by bus
All other assets	1,000	450	Other loans
		<u>550</u>	Equity
Total assets	1,100	1,100	Total liabilities

as being economically equivalent to a balance sheet like this:

Bus	100	100	Financial lease
All other assets	1,000	450	Other loans
		<u>550</u>	Equity
Total assets	1,100	1,100	Total liabilities

Having said this, we must immediately qualify. Legal ownership can make a big difference when a financial lease expires because the lessor gets the asset. Once a secured loan is paid off, the user owns the asset free and clear.

Leasing and the Internal Revenue Service

We have already noted that the lessee loses the tax depreciation of the leased asset but can deduct the lease payment in full. The *lessor*, as legal owner, uses the depreciation tax shield but must report the lease payments as taxable rental income.

However, the Internal Revenue Service is suspicious by nature and will not allow the lessee to deduct the entire lease payment unless it is satisfied that the arrangement is a genuine lease and not a disguised installment purchase or secured loan agreement.¹³

Some leases are designed *not* to qualify as a true lease for tax purposes. Suppose a manufacturer finds it convenient to lease a new computer but wants to keep the depreciation tax shields. This is easily accomplished by giving the manufacturer the option to purchase the computer for \$1 at the end of the lease. Then the Internal Revenue Service treats the lease as an installment sale, and the manufacturer can deduct depreciation and the interest component of the lease payment for tax purposes. But the lease is still a lease for all other purposes.

A First Pass at Valuing a Lease Contract

When we left Thomas Pierce III, president of Greymare Bus Lines, he had just set down in Table 25.2 the cash flows of the financial lease proposed by the bus manufacturer.

These cash flows are typically assumed to be about as safe as the interest and principal payments on a secured loan issued by the lessee. This assumption is reasonable for the lease payments because the lessor is effectively lending money to the lessee. But the various tax shields might carry enough risk to deserve a higher discount rate. For example, Greymare

¹³ For example, the IRS will disallow the lease if the lessee has an option to acquire the asset for a nominal sum. The lessee will almost certainly exercise such a bargain-purchase option, leaving the lessor with no chance of future ownership. Special-purpose assets that can only be used by the lessee will also be disqualified, because the lessee will end up owning them.

might be confident that it could make the lease payments but not confident that it could earn enough taxable income to use these tax shields. In that case the cash flows generated by the tax shields would probably deserve a higher discount rate than the borrowing rate used for the lease payments.

A lessee might, in principle, end up using a separate discount rate for each line of Table 25.2, each rate chosen to fit the risk of that line's cash flow. But established, profitable firms usually find it reasonable to simplify by discounting the types of flows shown in Table 25.2 at a single rate based on the rate of interest the firm would pay if it borrowed rather than leased. We assume Greymare's borrowing rate is 10%.

At this point we must go back to our discussion in the Appendix to Chapter 19 of debt-equivalent flows. When a company lends money, it pays tax on the interest it receives. Its net return is the after-tax interest rate. When a company borrows money, it can deduct interest payments from its taxable income. The net cost of borrowing is the after-tax interest rate. Thus the after-tax interest rate is the effective rate at which a company can transfer debt-equivalent flows from one time period to another. Therefore, to value the incremental cash flows stemming from the lease, we need to discount them at the after-tax interest rate.

Since Greymare can borrow at 10%, we should discount the lease cash flows at $r_D(1 - T_D)$ = $.10(1 - .35)$ = $.065$, or 6.5%. This gives:

$$\begin{aligned} \text{NPV lease} &= +89.02 - \frac{17.99}{1.065} - \frac{22.19}{(1.065)^2} - \frac{17.71}{(1.065)^3} - \frac{15.02}{(1.065)^4} \\ &\quad - \frac{15.02}{(1.065)^5} - \frac{13.00}{(1.065)^6} - \frac{10.99}{(1.065)^7} \\ &= -.70, \text{ or } -\$700 \end{aligned}$$

Since the lease has a negative NPV, Greymare is better off buying the bus.

A positive or negative NPV is not an abstract concept; in this case Greymare's shareholders really are \$700 poorer if the company leases. Let us now check how this situation comes about.

Look once more at Table 25.2. The lease cash flows are:

	Year							
	0	1	2	3	4	5	6	7
Lease cash flows, thousands	+89.02	-17.99	-22.19	-17.71	-15.02	-15.02	-13.00	-10.99

The lease payments are contractual obligations like the principal and interest payments on secured debt. Thus you can think of the incremental lease cash flows in years 1 through 7 as the "debt service" of the lease. Table 25.3 shows a loan with *exactly* the same debt service

	Year								
	0	1	2	3	4	5	6	7	
Amount borrowed at year-end	89.72	77.56	60.42	46.64	34.66	21.89	10.31	0	
Interest paid at 10%		-8.97	-7.76	-6.04	-4.66	-3.47	-2.19	-1.03	
Interest tax shield at 35%		+3.14	+2.71	+2.11	+1.63	+1.21	+0.77	+0.36	
Interest paid after tax		-5.83	-5.04	-3.93	-3.03	-2.25	-1.42	-0.67	
Principal repaid		-12.15	-17.14	-13.78	-11.99	-12.76	-11.58	-10.31	
Net cash flow of equivalent loan	89.72	-17.99	-22.19	-17.71	-15.02	-15.02	-13.00	-10.99	

TABLE 25.3

Details of the equivalent loan to the lease offered to Greymare Bus Lines (figures in \$ thousands; cash outflows shown with negative sign).

as the lease. The initial amount of the loan is 89.72 thousand dollars. If Greymare borrowed this sum, it would need to pay interest in the first year of $.10 \times 89.72 = 8.97$ and would receive a tax shield on this interest of $.35 \times 8.97 = 3.14$. Greymare could then repay 12.15 of the loan, leaving a net cash outflow of 17.99 (exactly the same as for the lease) in year 1 and an outstanding debt at the start of year 2 of 77.56.

As you walk through the calculations in Table 25.3, you see that it costs exactly the same to service a loan that brings an immediate inflow of 89.72 as it does to service the lease, which brings in only 89.02. That is why we say that the lease has a net present value of $89.02 - 89.72 = -.7$, or $-\$700$. If Greymare leases the bus rather than raising an *equivalent loan*,¹⁴ there will be \$700 less in Greymare's bank account.

Our example illustrates two general points about leases and equivalent loans. First, if you can devise a borrowing plan that gives the same cash flow as the lease in every future period but a higher immediate cash flow, then you should not lease. If, however, the equivalent loan provides the same future cash outflows as the lease but a lower immediate inflow, then leasing is the better choice.

Second, our example suggests two ways to value a lease:

1. *Hard way.* Construct a table like Table 25.3 showing the equivalent loan.
2. *Easy way.* Discount the lease cash flows at the *after-tax* interest rate that the firm would pay on an equivalent loan. Both methods give the same answer—in our case an NPV of $-\$700$.

The Story So Far

We concluded that the lease contract offered to Greymare Bus Lines was *not* attractive because the lease provided \$700 less financing than the equivalent loan. The underlying principle is as follows: A financial lease is superior to buying and borrowing if the financing provided by the lease exceeds the financing generated by the equivalent loan.

The principle implies this formula:

$$\text{Net value of lease} = \text{initial financing provided} - \sum_{t=1}^N \frac{\text{lease cash flow}}{[1 + r_D(1 - T_c)]^t}$$

where N is the length of the lease. Initial financing provided equals the cost of the leased asset minus any immediate lease payment or other cash outflow attributable to the lease.¹⁵

Notice that the value of the lease is its incremental value relative to borrowing via an equivalent loan. A positive lease value means that *if* you acquire the asset, lease financing is advantageous. It does not prove you should acquire the asset.

However, sometimes favorable lease terms rescue a capital investment project. Suppose that Greymare had decided *against* buying a new bus because the NPV of the \$100,000 investment was $-\$5,000$ assuming normal financing. The bus manufacturer could rescue the deal by offering a lease with a value of, say, $+\$8,000$. By offering such a lease, the manufacturer would in effect cut the price of the bus to \$92,000, giving the bus-lease package a positive value to Greymare. We could express this more formally by treating the lease's NPV as a favorable financing side effect that adds to project adjusted present value (APV):¹⁶

¹⁴ When we compare the lease to its equivalent loan, we do not mean to imply that the bus alone could support all of that loan. Some part of the loan would be supported by Greymare's other assets. Some part of the lease obligation would likewise be supported by the other assets.

¹⁵ The principles behind lease valuation were originally set out in S. C. Myers, D. A. Dill, and A. J. Bautista, "Valuation of Financial Lease Contracts," *Journal of Finance* 31 (June 1976), pp. 799–819; and J. R. Franks and S. D. Hodges, "Valuation of Financial Lease Contracts: A Note," *Journal of Finance* 33 (May 1978), pp. 647–669.

¹⁶ See Chapter 19 for the general definition and description of APV.

$$\begin{aligned} \text{APV} &= \text{NPV of project} + \text{NPV of lease} \\ &= -5,000 + 8,000 = +\$3,000 \end{aligned}$$

Notice also that our formula applies to net financial leases. Any insurance, maintenance, and other operating costs picked up by the lessor have to be evaluated separately and added to the value of the lease. If the asset has salvage value at the end of the lease, that value should be taken into account also.

Suppose, for example, that the bus manufacturer offers to provide routine maintenance that would otherwise cost \$2,000 per year after tax. However, Mr. Pierce reconsiders and decides that the bus will probably be worth \$10,000 after eight years. (Previously he assumed the bus would be worthless at the end of the lease.) Then the value of the lease increases by the present value of the maintenance savings and decreases by the present value of the lost salvage value.

Maintenance and salvage value are harder to predict than the cash flows shown in Table 25.2, and normally deserve a higher discount rate. Suppose that Mr. Pierce uses 12%. Then the maintenance savings are worth:

$$\sum_{t=0}^7 \frac{2000}{(1.12)^t} = \$11,100$$

The lost salvage value is worth $\$10,000/(1.12)^8 = \$4,000$.¹⁷ Remember that we previously calculated the value of the lease as $-\$700$. The revised value is therefore $-700 + 11,100 - 4,000 = \$6,400$. Now the lease looks like a good deal.

25-5 When Do Financial Leases Pay?

We have examined the value of a lease from the viewpoint of the lessee. However, the lessor's criterion is simply the reverse. As long as lessor and lessee are in the same tax bracket, every cash outflow to the lessee is an inflow to the lessor, and vice versa. In our numerical example, the bus manufacturer would project cash flows in a table like Table 25.2, but with the signs reversed. The value of the lease to the bus manufacturer would be:

$$\begin{aligned} \text{Value of lease to lessor} &= -89.02 + \frac{17.99}{1.065} + \frac{22.19}{(1.065)^2} + \frac{17.71}{(1.065)^3} + \frac{15.02}{(1.065)^4} \\ &\quad + \frac{15.02}{(1.065)^5} + \frac{13.00}{(1.065)^6} + \frac{10.98}{(1.065)^7} \\ &= +.70, \text{ or } \$700 \end{aligned}$$

In this case, the values to lessee and lessor exactly offset ($-\$700 + \$700 = 0$). The lessor can win only at the lessee's expense.

But both lessee and lessor can win if their tax rates differ. Suppose that Greymare paid no tax ($T_c = 0$). Then the only cash flows of the bus lease would be:

	Year							
	0	1	2	3	4	5	6	7
Cost of new bus	+100							
Lease payment	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9

¹⁷ For simplicity, we have assumed that maintenance expenses are paid at the start of the year and that salvage value is measured at the end of year 8.

These flows would be discounted at 10%, because $r_D(1 - T_c) = r_D$ when $T_c = 0$. The value of the lease is:

$$\begin{aligned}\text{Value of lease} &= +100 - \sum_{t=0}^7 \frac{16.9}{(1.10)^t} \\ &= +100 - 99.18 = +.82, \text{ or } \$820\end{aligned}$$

In this case there is a net gain of \$700 to the lessor (who has the 35% tax rate) *and* a net gain of \$820 to the lessee (who pays zero tax). This mutual gain is at the expense of the government. On the one hand, the government gains from the lease contract because it can tax the lease payments. On the other hand, the contract allows the lessor to take advantage of depreciation and interest tax shields that are of no use to the lessee. However, because the depreciation is accelerated and the interest rate is positive, the government suffers a net loss in the present value of its tax receipts as a result of the lease.

Now you should begin to understand the circumstances in which the government incurs a loss on the lease and the other two parties gain. Other things being equal, the combined gains to lessor and lessee are highest when

- The lessor's tax rate is substantially higher than the lessee's.
- The depreciation tax shield is received early in the lease period.
- The lease period is long and the lease payments are concentrated toward the end of the period.
- The interest rate r_D is high—if it were zero, there would be no advantage in present value terms to postponing tax.

Leasing around the World

In most developed economies, leasing is widely used to finance investment in plant and equipment.¹⁸ But there are important differences in the treatment of long-term financial leases for tax and accounting purposes. For example, France, Italy, and the U.K. allow the lessor to use depreciation tax shields, just as in the U.S. In Germany, the Netherlands, and Sweden it is the other way around; the lessee claims depreciation deductions. Accounting usually follows suit. Thus in France the leased equipment shows up on the books of the lessor, while in Germany it moves to the books of the lessee.

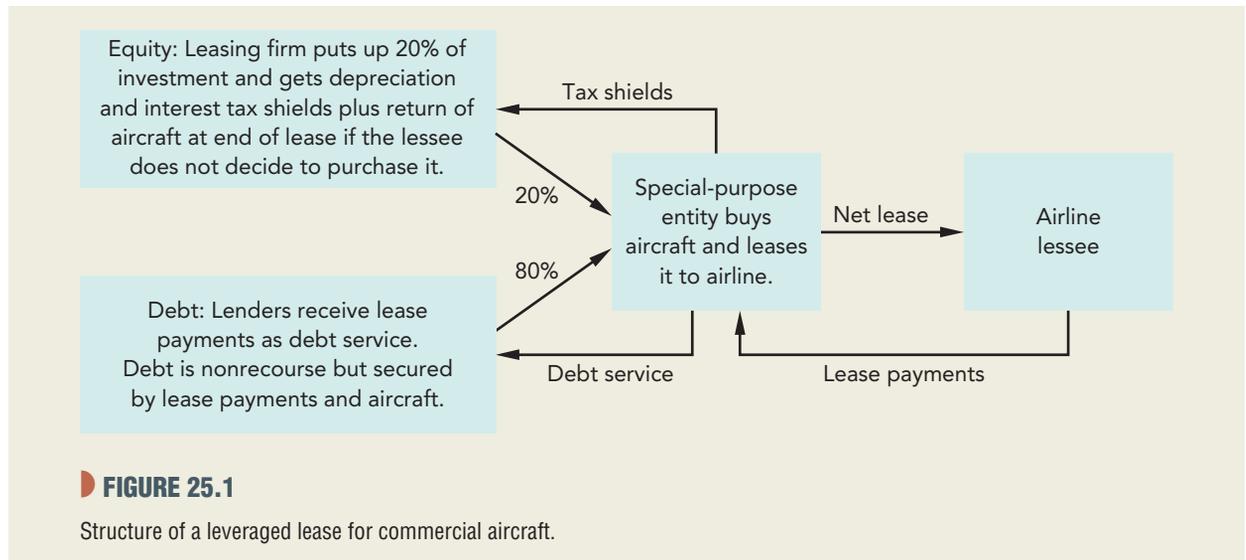
A number of *big-ticket* leases are cross-border deals. Cross-border leasing can be attractive when the lessor is located in a country that offers generous depreciation allowances. The ultimate cross-border transaction occurs when *both* the lessor *and* the lessee can claim depreciation deductions. Ingenious leasing companies look for such opportunities to *double-dip*. Tax authorities look for ways to stop them.¹⁹

25-6 Leveraged Leases

Big-ticket leases are usually *leveraged leases*. The structure of a leveraged lease is summarized in Figure 25.1. In this example, the leasing company (or a syndicate of several leasing companies) sets up a special-purpose entity (SPE) to buy and lease a commercial aircraft. The SPE raises up to 80% of the cost of the aircraft by borrowing, usually from insurance

¹⁸ For example, in 2008 leasing accounted for 22.8% of all European investments in industrial equipment (www.leaseurope.org).

¹⁹ Currently in the U.S. the tax authorities seem to be winning. The American Jobs Creation Act (JOBS) of 2004 eliminated much of the profit from cross-border leases.



companies or other financial institutions. The leasing company puts up the remaining 20% as the equity investment in the lease.

Once the lease is up and running, lease payments begin and depreciation and interest tax shields are generated. All (or almost all) of the lease payments go to debt service. The leasing company gets no cash inflows until the debt is paid off, but does get all depreciation and interest deductions, which generate tax losses that can be used to shield other income.

By the end of the lease, the debt is paid off and the tax shields exhausted. At this point the lessee has the option to purchase the aircraft. The leasing company gets the purchase price if the lessee's purchase option is exercised, and takes back the aircraft otherwise. (In some cases the lessee also has an early buyout option partway through the term of the lease.)

The debt in a leveraged lease is *nonrecourse*. The lenders have first claim on the lease payments and on the aircraft if the lessee can't make scheduled payments, but no claim on the leasing company. Thus the lenders must depend solely on the airline lessee's credit and on the airplane as collateral.

So the leasing company puts up only 20% of the money, gets 100% of the tax shields, but is not on the hook if the lease transaction falls apart. Does this sound like a great deal? Don't jump to that conclusion, because the lenders will demand a higher interest rate in exchange for giving up recourse. In efficient debt markets, paying extra interest to avoid recourse should be a zero-NPV transaction—otherwise one side of the deal would get a free ride at the expense of the other. Nevertheless, nonrecourse debt, as part of the overall structure shown in Figure 25.1, is a customary and convenient financing method.²⁰

²⁰ Leveraged leases have special tax and accounting requirements, which we won't go into here. Also, the equity investment in leveraged leases can be tricky to value, because the stream of after-tax cash flows changes sign more than once, and there can be two or more internal rates of return (IRRs). This requires use of modified internal rates of return, if you insist on using IRRs. We discussed multiple IRRs and modified IRRs in Section 5-3. Also take a look at Problem 23 at the end of this chapter.


SUMMARY

A lease is just an extended rental agreement. The owner of the equipment (the *lessor*) allows the user (the *lessee*) to operate the equipment in exchange for regular lease payments.

There is a wide variety of possible arrangements. Short-term, cancelable leases are known as *operating leases*. In these leases the lessor bears the risks of ownership. Long-term, noncancelable leases are called *full-payout*, *financial*, or *capital* leases. In these leases the lessee bears the risks. Financial leases are *sources of financing* for assets the firm wishes to acquire and use for an extended period.

The key to understanding operating leases is equivalent annual cost. In a competitive leasing market, the annual operating lease payment will be forced down to the lessor's equivalent annual cost. Operating leases are attractive to equipment users if the lease payment is less than the *user's* equivalent annual cost of buying the equipment. Operating leases make sense when the user needs the equipment only for a short time, when the lessor is better able to bear the risks of obsolescence, or when the lessor can offer a good deal on maintenance. Remember too that operating leases often have valuable options attached.

A financial lease extends over most of the economic life of the leased asset and cannot be canceled by the lessee. Signing a financial lease is like signing a secured loan to finance purchase of the leased asset. With financial leases, the choice is not “lease versus buy” but “lease versus borrow.”

Many companies have sound reasons for financing via leases. For example, companies that are not paying taxes can usually strike a favorable deal with a tax-paying lessor. Also, it may be less costly and time-consuming to sign a standardized lease contract than to negotiate a long-term secured loan.

When a firm borrows money, it pays the after-tax rate of interest on its debt. Therefore, the opportunity cost of lease financing is the after-tax rate of interest on the firm's bonds. To value a financial lease, we need to discount the incremental cash flows from leasing by the after-tax interest rate.

An equivalent loan is one that commits the firm to exactly the same future cash flows as a financial lease. When we calculate the net present value of the lease, we are measuring the difference between the amount of financing provided by the lease and the financing provided by the equivalent loan:

$$\text{Value of lease} = \text{financing provided by lease} - \text{value of equivalent loan}$$

We can also analyze leases from the lessor's side of the transaction, using the same approaches we developed for the lessee. If lessee and lessor are in the same tax bracket, they will receive exactly the same cash flows but with signs reversed. Thus, the lessee can gain only at the lessor's expense, and vice versa. However, if the lessee's tax rate is lower than the lessor's, then both can gain at the federal government's expense. This is a tax timing advantage, because the lessor gets interest and depreciation tax shields early in the lease.

Leveraged leases are three-way transactions that include lenders as well as the lessor and lessee. Lenders advance up to 80% of the cost of the leased equipment and lessors put in the rest as an equity investment. The lenders get first claim on the lease payments and on the asset but have no recourse to the equity lessors if the lessee can't pay. The lessor's return comes mostly from interest and depreciation tax shields early in the lease and the value of the leased asset at the end of the lease. Leveraged leases are common in big-ticket, cross-border lease-financing transactions.


FURTHER READING

Two useful general references on leasing are:

J. S. Schallheim, *Lease or Buy? Principles for Sound Decision Making* (Boston: Harvard Business School Press, 1994).

P. K. Nevitt and F. J. Fabozzi, *Equipment Leasing*, 4th ed. (New Hope, PA: Frank Fabozzi Associates, 2000).

Smith and Wakeman discuss the economic motives for leasing:

C. W. Smith, Jr., and L. M. Wakeman, "Determinants of Corporate Leasing Policy," *Journal of Finance* 40 (July 1985), pp. 895–908.

The options embedded in many operating leases are discussed in:

J. J. McConnell and J. S. Schallheim, "Valuation of Asset Leasing Contracts," *Journal of Financial Economics* 12 (August 1983), pp. 237–261.

S. R. Grenadier, "Valuing Lease Contracts: A Real Options Approach," *Journal of Financial Economics* 38 (July 1995), pp. 297–331.



Select problems are available in McGraw-Hill Connect.
Please see the preface for more information.

BASIC

1. The following terms are often used to describe leases:
 - a. Direct
 - b. Full-service
 - c. Operating
 - d. Financial
 - e. Rental
 - f. Net
 - g. Leveraged
 - h. Sale and lease-back
 - i. Full-payout

Match one or more of these terms with each of the following statements:

- A. The initial lease period is shorter than the economic life of the asset.
 - B. The initial lease period is long enough for the lessor to recover the cost of the asset.
 - C. The lessor provides maintenance and insurance.
 - D. The lessee provides maintenance and insurance.
 - E. The lessor buys the equipment from the manufacturer.
 - F. The lessor buys the equipment from the prospective lessee.
 - G. The lessor finances the lease contract by issuing debt and equity claims against it.
2. Some of the following reasons for leasing are rational. Others are irrational or assume imperfect or inefficient capital markets. Which of the following reasons are the rational ones?
 - a. The lessee's need for the leased asset is only temporary.
 - b. Specialized lessors are better able to bear the risk of obsolescence.
 - c. Leasing provides 100% financing and thus preserves capital.
 - d. Leasing allows firms with low marginal tax rates to "sell" depreciation tax shields.
 - e. Leasing increases earnings per share.
 - f. Leasing reduces the transaction cost of obtaining external financing.
 - g. Leasing avoids restrictions on capital expenditures.
 - h. Leasing can reduce the alternative minimum tax.
 3. Explain why the following statements are *true*:
 - a. In a competitive leasing market, the annual operating lease payment equals the lessor's equivalent annual cost.

PROBLEM SETS



- b. Operating leases are attractive to equipment users if the lease payment is less than the *user's* equivalent annual cost.
4. True or false?
- Lease payments are usually made at the start of each period. Thus the first payment is usually made as soon as the lease contract is signed.
 - Some financial leases can provide off-balance-sheet financing.
 - The cost of capital for a financial lease is the interest rate the company would pay on a bank loan.
 - An equivalent loan's principal plus after-tax interest payments exactly match the after-tax cash flows of the lease.
 - A financial lease should not be undertaken unless it provides more financing than the equivalent loan.
 - It makes sense for firms that pay no taxes to lease from firms that do.
 - Other things equal, the net tax advantage of leasing increases as nominal interest rates increase.
5. What happens if a bankrupt lessee affirms the lease? What happens if the lease is rejected?
6. How does a leveraged lease differ from an ordinary, long-term financial lease? List the key differences.
7. Lenders to leveraged leases hold nonrecourse debt. What does "nonrecourse" mean? What are the benefits and costs of nonrecourse debt to the equity investors in the lease?

INTERMEDIATE

8. Acme has branched out to rentals of office furniture to start-up companies. Consider a \$3,000 desk. Desks last for six years and can be depreciated on a five-year MACRS schedule (see Table 6.4). What is the break-even operating lease rate for a new desk? Assume that lease rates for old and new desks are the same and that Acme's pretax administrative costs are \$400 per desk per year. The cost of capital is 9% and the tax rate is 35%. Lease payments are made in advance, that is, at the start of each year. The inflation rate is zero.
9. Refer again to Problem 8. Suppose a blue-chip company requests a six-year *financial* lease for a \$3,000 desk. The company has just issued five-year notes at an interest rate of 6% per year. What is the break-even rate in this case? Assume administrative costs drop to \$200 per year. Explain why your answers to Problem 8 and this question differ.
10. In Problem 8 we assumed identical lease rates for old and new desks.
- How does the initial break-even lease rate change if the expected inflation rate is 5% per year? Assume that the *real* cost of capital does not change. (*Hint:* Look at the discussion of equivalent annual costs in Chapter 6.)
 - How does your answer to part (a) change if wear and tear force Acme to cut lease rates by 10% in real terms for every year of a desk's age?
11. Look at Table 25.1. How would the initial break-even operating lease rate change if rapid technological change in limo manufacturing reduces the costs of new limos by 5% per year? (*Hint:* We discussed technological change and equivalent annual costs in Chapter 6.)
12. Suppose that National Waferonics has before it a proposal for a four-year financial lease. The firm constructs a table like Table 25.2. The bottom line of its table shows the lease cash flows:

	Year 0	Year 1	Year 2	Year 3
Lease cash flow	+62,000	-26,800	-22,200	-17,600

These flows reflect the cost of the machine, depreciation tax shields, and the after-tax lease payments. Ignore salvage value. Assume the firm could borrow at 10% and faces a 35% marginal tax rate.

- What is the value of the equivalent loan?
- What is the value of the lease?
- Suppose the machine's NPV under normal financing is $-\$5,000$. Should National Waferonics invest? Should it sign the lease?

The following questions all apply to financial leases. To answer Problems 13 to 17 you may find it helpful to use the "live" Excel spreadsheets at www.mhhe.com/bma.

- Look again at the bus lease described in Table 25.2.
 - What is the value of the lease if Greymare's marginal tax rate is $T_c = .20$?
 - What would the lease value be if Greymare had to use five-year straight-line depreciation for tax purposes?
- In Section 25-4 we showed that the lease offered to Greymare Bus Lines had a positive NPV of \$820 if Greymare paid no tax and a +\$700 NPV to a lessor paying 35% tax. What is the minimum lease payment the lessor could accept under these assumptions? What is the maximum amount that Greymare could pay?
- In Section 25-5 we listed four circumstances in which there are potential gains from leasing. Check them out by conducting a sensitivity analysis on the Greymare Bus Lines lease, assuming that Greymare does not pay tax. Try, in turn, (a) a lessor tax rate of 50% (rather than 35%), (b) immediate 100% depreciation in year 0 (rather than five-year MACRS), (c) a three-year lease with four annual rentals (rather than an eight-year lease), and (d) an interest rate of 20% (rather than 10%). In each case, find the minimum rental that would satisfy the lessor and calculate the NPV to the lessee.
- In Section 25-5 we stated that if the interest rate were zero, there would be no advantage in postponing tax and therefore no advantage in leasing. Value the Greymare Bus Lines lease with an interest rate of zero. Assume that Greymare does not pay tax. Can you devise any lease terms that would make both a lessee and a lessor happy? (If you can, we would like to hear from you.)
- A lease with a varying rental schedule is known as a *structured lease*. Try structuring the Greymare Bus Lines lease to increase value to the lessee while preserving the value to the lessor. Assume that Greymare does not pay tax. (Note: In practice the tax authorities will allow some structuring of rental payments but might be unhappy with some of the schemes you devise.)
- Nodhead College needs a new computer. It can either buy it for \$250,000 or lease it from Compulease. The lease terms require Nodhead to make six annual payments (prepaid) of \$62,000. Nodhead pays no tax. Compulease pays tax at 35%. Compulease can depreciate the computer for tax purposes over five years. The computer will have no residual value at the end of year 5. The interest rate is 8%.
 - What is the NPV of the lease for Nodhead College?
 - What is the NPV for Compulease?
 - What is the overall gain from leasing?
- The Safety Razor Company has a large tax-loss carryforward and does not expect to pay taxes for another 10 years. The company is therefore proposing to lease \$100,000 of new machinery. The lease terms consist of eight equal lease payments prepaid annually. The lessor can write the machinery off over seven years using the tax depreciation schedules given in Table 6.4. There is no salvage value at the end of the machinery's economic life. The tax rate is 35%, and the rate of interest is 10%. Wilbur Occam, the president of Safety Razor, wants to know the maximum lease payment that his company should be willing to make and the minimum payment that the lessor is likely to accept. Can you help him?
- How does the position of an equipment lessor differ from the position of a secured lender when a firm falls into bankruptcy? Assume that the secured loan would have the leased

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equipment as collateral. Which is better protected, the lease or the loan? Does your answer depend on the value of the leased equipment if it were sold or re-leased?

21. How would the *lessee* in Figure 25.1 evaluate the NPV of the lease? Sketch the correct valuation procedure. Then suppose that the equity lessor wants to evaluate the lease. Again sketch the correct procedure. (*Hint*: APV. How would you calculate the *combined* value of the lease to lessee and lessor?)

CHALLENGE

22. Magna Charter has been asked to operate a Beaver bush plane for a mining company exploring north and west of Fort Liard. Magna will have a firm one-year contract with the mining company and expects that the contract will be renewed for the five-year duration of the exploration program. If the mining company renews at year 1, it will commit to use the plane for four more years.

Magna Charter has the following choices.

- Buy the plane for \$500,000.
- Take a one-year operating lease for the plane. The lease rate is \$118,000, paid in advance.
- Arrange a five-year, noncancelable financial lease at a rate of \$75,000 per year, paid in advance.

These are net leases: all operating costs are absorbed by Magna Charter.

How would you advise Agnes Magna, the charter company's CEO? For simplicity assume five-year, straight-line depreciation for tax purposes. The company's tax rate is 35%. The weighted-average cost of capital for the bush-plane business is 14%, but Magna can borrow at 9%. The expected inflation rate is 4%.

Ms. Magna thinks the plane will be worth \$300,000 after five years. But if the contract with the mining company is not renewed (there is a 20% probability of this outcome at year 1), the plane will have to be sold on short notice for \$400,000.

If Magna Charter takes the five-year financial lease and the mining company cancels at year 1, Magna can sublet the plane, that is, rent it out to another user.

Make additional assumptions as necessary.

23. Reconstruct Table 25.2 as a leveraged lease, assuming that the lessor borrows \$80,000, 80% of the cost of the bus, nonrecourse at an interest rate of 11%. All lease payments are devoted to debt service (interest and principal) until the loan is paid off. Assume that the bus is worth \$10,000 at the end of lease. Calculate after-tax cash flows on the lessor's equity investment of \$20,000. What is the IRR of the equity cash flows? Is there more than one IRR? How would you value the lessor's equity investment?

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