Project Proposal: Leasing

John Sander

December 10, 2002

Firms often lease buildings and equipment instead of buying them. An economic analysis of this decision typically compares the after-tax cash flows for a lease and for debt issued to finance an outright purchase. Sometimes the analysis takes into account the fact that because the lessor owns the property at the termination of the lease, a lease eliminates the lessee’s risk regarding the uncertain resale value of the property at that point in time.

There doesn’t seem to be any published analysis of a more subtle advantage of leasing. Suppose that there is uncertainty about the future purchase price of an asset or about its productivity. By temporarily leasing the asset, the lessee is able to accumulate additional information about price and or productivity.

Let’s consider a trivial example. Let’s say that an asset that will produce an after-tax cash flow of $110,000 at the end of this year and then is equally likely to produce an after-tax cash flow of either $90,000 or $130,000 per year every year thereafter. This asset can either be purchased for $1 million or leased for $120,000 per year (for simplicity, assumed to be paid at the end of the year). If the investor’s required rate of return is 10%, then the present value of the expected cash flow is $1,100,000. It is profitable to spend $1,000,000 to purchase an asset with a present value of $1,100,000, giving a net present value of $100,000.

However, suppose that the investor leases the asset for a year before deciding on its purchase. If the after-tax cash flow turns out to be $130,000, the asset is purchased; otherwise, no purchase is made. Now the net present value is

\[
\frac{($110,000 - $120,000)}{1.10} + 0.5 \left( \frac{-$1,000,000}{1.10} \right) + \frac{($130,000/0.10)}{1.10} = $127,273
\]

. The lease provides a “flexibility option” that is worth $127,273 - $100,000 = $27,273. (Notice that perpetual leasing has an NPV of only

\[
\frac{($110,000 - $120,000)}{1.10} + 0.5 \left( \frac{($130,000 - $120,000)/1.10}{0.10} \right) = $36,364
\]

A similar analysis applies if the future cost of buying or leasing the asset are uncertain. In either situation, by allowing the purchase decision to be postponed, the lease has an option value. Similarly, the irreversible purchase of an asset extinguishes a lease’s option value.

We can generalize this analysis to include uncertainty over multiple time periods and a variety of parametric assumptions, and use dynamic programming to determine optimal leasing strategies and calculate the option value of a lease.

Although this example is trivial (i.e. the property is either worth $130,000 or $90,000 and nothing in between.) A lot of things could be looked at with this model. One could use a binomial model (with a success probability equal to .5), or a more complex probability distribution could be used. However, if this is made continuous dynamic programming can no longer be used.

References