Corporate Finance, Module 17

Depreciation Intuition

(The attached PDF file has better formatting.)

Question: It seems that the more assets we depreciate, the greater is the net present value. But depreciation is an accounting entry, not a cash flow; the net present value depends on cash flows, not accounting entries. Why does depreciation affect the NPV?

Answer: Book depreciation, such as GAAP depreciation, does not affect the NPV. The depreciation here is the tax depreciation, which affects the taxable income and the tax liability. The tax liability is a cash flow, which affects the NPV.

Question: If we have two projects, whose only difference is that one project depreciates an asset and the other project does not, which project has the greater net present value?

Answer: It depends what the choice is.

! If the choice is between *depreciating an asset* and *writing it off as an expense*, writing the asset off as an expense gives a greater net present value.
! If the choice is between *depreciating an asset* and *leaving it un-depreciated*, then depreciating gives a greater net present value. {In the homework assignment on maximizing net present value with an old and a new steel plant, we left the new plant un-depreciated; this was not realistic, but we had not yet covered depreciation.}

Illustration: Suppose a machine bought at the end of year 0 for $100,000 lasts one year, produces revenue in year 1 of $110,000, and has no salvage value. The opportunity cost of capital is 10% per annum, and the corporate tax rate is 35%.

If the machine is written off immediately, the tax liability in year 0 is a negative $35,000, so the cash outflow in year 0 is $100,000 – $35,000 = $65,000. The pre-tax cash inflow for year 1 is $110,000, so the after-tax cash inflow is $110,000 × (1 – 35%) = $71,500. The return is $71,500 / $65,000 – 1 = 10.00%.

If the machine is depreciated at the end of year 1, the after-tax cash outflow in year 0 is $100,000, since there is no tax liability or refund in year 0.

The *taxable income* in year 1 is $110,000 – $100,000 = $10,000. The tax liability is 35% × $10,000 = $3,500, and the *after-tax cash flow* is $110,000 – $3,500 = $106,500. The return is $106,500 / $100,000 – 1 = 6.50%.

Question: It seems that writing equipment off when the firm spends the cash is the only fair method; otherwise the firm is getting a return less than its opportunity cost of capital.

Answer: Suppose the firm buys a plant for $100,000 with a perpetual life. The opportunity cost of capital is 10% per annum and the plant produces income of $10,000 each year.

The firm borrows $100,000 from a bank at 10% per annum interest as a perpetual loan.

If the firm can write off the plant when it pays for it, its taxable income at inception (in year 0) is –$100,000, and it receives a tax refund of $35,000.

In all subsequent years, the firm earns $10,000 of revenue from the plant and pays $10,000 of interest. Since interest is tax-deductible (unlike stockholder dividends), the firm has no taxable income in subsequent years.

This firm has an investment with a $35,000 NPV, all of which is the tax refund from the government. But the firm never pays the tax back.

Question: That is not realistic. The firm can not get a tax refund unless it has paid taxes in past years.

Answer: That's fine. Assume this firm paid taxes of $35,000 the previous year. By buying the $100,000 plant, which is a zero NPV investment if there are no taxes, it recoups the taxes that it paid in the previous year.

Question: What is the fair method of depreciation vs writing off assets?

Answer: We don't judge normative issues, such as what is *fair* or what is *equitable* or what is good for society. An economist would say that taxes harm the economy and thereby harm society; Western Europe has weak economic growth and high unemployment because its tax rates are so high (among other reasons). Others say that someone must pay for social goods, and it is more equitable that wealthy citizens pay instead of less wealthy citizens.

Question: Are corporate taxes imposed primarily on wealthy citizens?

Answer: The incidence of corporate taxes depends on the slopes (elasticities) of supply and demand curves and on the average wealth of the consumers. The corporate taxes on production of yachts, which is paid by wealthy consumers and wealthy shareholders, is a progressive tax. The corporate taxes on auto insurance and workers' compensation, which falls primarily on high risk drivers and blue collar workers, is a regressive tax.

Question: If many corporate taxes are regressive taxes, why do we use them?

Answer: The easiest taxes to pass politically are taxes whose incidence is unclear to voters. High risk drivers and blue collar workers do not realize that they pay most of the federal income taxes on auto insurance and workers' compensation, so these taxes are easy to collect. That is why the state premium tax on insurance is imposed in every state.

Question: If we assume the corporate tax rate is good for society, what depreciation schedule is proper?

Answer: The proper depreciation schedule reflects the actual wearing out of the asset.