

Corpfm, Mod 9: Depreciation Tax Credit

Intuition: Depreciation Tax Credit

(The attached PDF file has better formatting.)

Question: What is a depreciation tax credit?

Answer: Consider a scenario with no taxes, the NPV is \$W, and the IRR is R%. What is the NPV with a tax rate of τ ?

Question: The firm keeps only $(1 - \tau)$ of the cash flows, so the NPV is $(1 - \tau) \times \$W$.

Answer: The answer depends on how quickly the firm depreciates its initial investment. Quicker depreciation of the initial investment for tax purposes leads to a higher NPV. Your answer is correct only if the initial investment is depreciated immediately.

Suppose a firm buys machinery for \$40 million, which last 4 years. It expect to earn \$14.5 million a year from the machinery, and its cost of capital is 12% per annum.

If the tax rate is zero, the net present value (in \$000,000) is

$$-40 + 14.5 / 1.12 + 14.5 / 1.12^2 + 14.5 / 1.12^3 + 14.5 / 1.12^4 = \$4.04$$

If the tax rate is 35% and all cash flows are taxable income (either positive or negative), the net present value is

$$(1 - 35\%) \times (-40 + 14.5 / 1.12 + 14.5 / 1.12^2 + 14.5 / 1.12^3 + 14.5 / 1.12^4) = \$2.63$$

This is your solution: $(1 - 35\%) \times \$4.04$ million = \$2.63 million.

If the tax rate is 35% and the machinery is depreciated 25% each year, the cash flows each year depend on the depreciation. At time 0, the firm has a cash outflow of \$40 million. At time 1, 2, 3, and 4, the firm has pre-tax income of \$14.5 million and a tax payment of $35\% \times (\$14.5 \text{ million} - 0.25 \times \$40 \text{ million}) = \$1.575$ million. The after-tax cash flow is $\$14.5 \text{ million} - \$1.575 \text{ million} = \12.925 million. The NPV is

$$-40 + 12.925 / 1.12 + 12.925 / 1.12^2 + 12.925 / 1.12^3 + 12.925 / 1.12^4 = (\$0.74)$$

Question: Why is this called a depreciation tax credit? The tax depreciation causes the NPV to be lower, not higher.

Answer: We calculate the net present value as the sum of

- ! the initial investment
- ! the after-tax cash flows
- ! the depreciation tax credit

$$-40 + (14.5 / 1.12 + 14.5 / 1.12^2 + 14.5 / 1.12^3 + 14.5 / 1.12^4) \times (1 - 35\%) + (10 / 1.12 + 10 / 1.12^2 + 10 / 1.12^3 + 10 / 1.12^4) \times 35\% = (\$0.74)$$

The initial investment is not tax deductible, so the pre-tax and after-tax cash flows are the same. The tax credit, or the tax refund on the investment, is spread over the depreciation period. The present value of this credit is inversely related to the length of the depreciation.

If the tax rate is 35% and the machinery is depreciated 50% each of the first two year, the net present value is

$$-40 + (14.5 / 1.12 + 14.5 / 1.12^2 + 14.5 / 1.12^3 + 14.5 / 1.12^4) \times (1 - 35\%) + (20 / 1.12 + 20 / 1.12^2) \times 35\% = \$0.46$$

