

Massachusetts Institute of Technology
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22.812 NUCLEAR ENERGY ECONOMICS AND POLICY ANALYSIS
Spring 2004

An Illustration of the Use of Depreciation

The following example is intended to illustrate how depreciation is used to calculate income taxes. It compares the income statements and net cash flows of a simple firm in two cases: A) when the initial investment is expensed, and B) when it is capitalized. A few accounting terms first need to be defined. Note that these should not be taken as precise accounting definitions. Also note that each of these items is defined for a given year (or quarter.)

Operating Revenues: revenues that a company receives as a result of its operation (sales for instance.)

Operating Expenses: labor expenses, supply purchases, utility costs etc.

Operating Income: Operating Revenues - Operating Expenses.

Taxable Income: Income from which to calculate taxes (the relationship between taxable income and operating income is described below.)

Taxes Taxable Income * Corporate Income Tax Rate.

Net Income: Taxable Income - Taxes.

Income Statement: Description of the company's operation.

Net Cash Flow: Total Cash Inflow - Total Cash Outflow.

A Pizza Delivery Business

We consider a pizza delivery business about to be started by a certain Mr. Smith. Mr. Smith wants to buy pizzas from the local pizzeria, and deliver them to customers. Assume that Mr. Smith has enough personal savings to purchase a \$6,000 car at the beginning of year 1. Also assume that Mr. Smith wants to operate his business for four years and then retire. The car value at the end of the 4 years is assumed to be zero. Mr. Smith expects to sell \$ 20,000 of pizzas per

year. He believes his gas expenditures and pizza purchases from the pizzeria will amount to \$10,000 per year. The income tax rate is assumed to be 30%.

We want to build the income statement of Mr. Smith's business for years 1 to 4. We will first consider the case of expensing the car purchase, and then the case of capitalizing it.

A) EXPENSING THE CAR PURCHASE

We first assume that the car purchase is treated as a regular operating expense, just as pizza or gas purchases. We will say that the car purchase is expensed. In this simple case, taxable income is by definition equal to operating income. Following the accounting relationships given above, the income statements of Mr. Smith's business for year 1 to 4 are then given by table 1.

The total cash inflows for Mr. Smith's company are equal to the operating revenues. The total cash outflows are equal to the sum of the operating expenses (including the car purchase), plus the income taxes paid to the government. It is then easy to check that for any given year net cash flow is equal to net income.

	Year 1	Year 2	Year 3	Year 4
Op. Revenues	20,000	20,000	20,000	20,000
- Op. Expenses	10,000	10,000	10,000	10,000
- Car Purchase	6,000	-	-	-
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- Op. Income	4,000	10,000	10,000	10,000
- Taxable Inc.	4,000	10,000	10,000	10,000
- Taxes	1,200	3,000	3,000	3,000
- Net Income	2,800	7,000	7,000	7,000

Table 1

The car purchase is expensed

B) CAPITALIZING THE CAR PURCHASE

Purpose of capitalization

Because of the car purchase, the net income of year 1, as given by table 1, is strikingly different from those of years 2 to 4. This reflects the true cash flows affecting Mr. Smith. However, it does not truly reflect the economics of the business: from the income statement of table 1, it takes \$16,000 of expenses to produce \$20,000 of revenues during year 1, but only \$10,000 during years 2 to 4. Yet the operation of this delivery business did not change at all between year 1 and year 2. To correct this "distortion", the car purchase should be "spread" more evenly over the 4 years of the car operation, so that the income statement better reflects the true "health" of the firm's activities. This is the purpose of capitalization. Companies are required by law to capitalize those of their important expenditures that cover several years of operation (such expenditures are called capital investments or capital expenditures.) In the case of Mr. Smith's company, the car purchase is a capital expenditure and it has to be capitalized. This means that the car purchase item of table 1 is replaced by some "Depreciation Allowances". The series of depreciation allowances is called depreciation schedule. Depreciation allowances are usually not included in the calculation of the operating income (see table 2), but are deducted from it to obtain the taxable income. Hence:

$$\text{Taxable Income} = \text{Operating Income} - \text{Depreciation Allowances}$$

The total sum of the depreciation allowances over the 4 years of operation has to equal the car purchase price (remember that we assumed no car salvage value at the end of year 4.) But there are numerous ways to "spread" the purchase cost over the 4 years. The law proposes several of them, the simplest being known as straight line depreciation: depreciation allowances are constant over the life of the investment. Note that depreciation calculations are accounting procedures. As such they usually do not consider inflation or time value of money.

Capitalization of the car purchase

We assume that the car purchase is capitalized with straight line depreciation over the four year period. The depreciation allowances per year is then: $6,000/4 = 1,500$, and the income statements for years 1 to 4 are given by table 2.

	Year 1	Year 2	Year 3	Year 4
Op. Revenues	20,000	20,000	20,000	20,000
- Op. Expenses	10,000	10,000	10,000	10,000
- Op. Income	10,000	10,000	10,000	10,000
- Depr. Allow.	1,500	1,500	1,500	1,500
- Taxable Inc.	8,500	8,500	8,500	8,500
- Taxes	2,550	2,550	2,550	2,550
- Net Income	5,950	5,950	5,950	5,950

Table 2

The car purchase is capitalized

Net cash flows vs. net income

The net cash flows are now different from what they were (because taxes changed), and are also different from the new net incomes. During the first year, Mr. Smith sells \$20,000 of pizzas, purchases \$10,000 of gas and pizzas, pays \$2,550 of taxes (see table 2), and purchases the car for \$ 6,000. The net cash flow of year 1 is then:

$$\begin{aligned} \text{NCF} &= 20,000 - 10,000 - 2,550 - 6,000 \\ &= - 1,450 \end{aligned}$$

The net income of year 1, by contrast, is \$5,950 (as reported in table 2.) During year 2 to 4, Mr. Smith sells \$20,000 of pizzas, purchases \$10,000 of gas and pizzas, and pays \$2,550 of taxes (see table 2.) His net cash flow for years 2 to 4 is therefore:

$$\begin{aligned} \text{NCF} &= 20,000 - 10,000 - 2,550 \\ &= - 7,450. \end{aligned}$$

The corresponding net income is \$5,950.

For any given year, it is easy to verify that:

NCF - Net Income + Depreciation Allowances - Capital Expenditure.

Note that this is not a definition but only a property of net cash flow. Depreciation allowances are added back because they were subtracted from the operating income to calculate the net income. This simple accounting formula is important because it allows us to relate the concept of accounting depreciation that we just developed with that of economic depreciation, defined as the loss of value of a capital asset with time.

To see this, consider the case where there is no capital expenditure (year 2, 3 or 4). We then have:

Net Cash Flow - Net Income + Depreciation Allowances.

The net cash flow is what Mr. Smith actually pays or receives at the end of each year as a result of his delivery business. The depreciation allowances can be seen as amounts of money that are put aside in a separate account, and that correspond to the loss of car value during the year considered. If the car is believed to lose \$1,500 in value in a given year, Mr. Smith could conceptually put \$1,500 of the money he makes during this year in this special account. The remainder would be his net income. The cumulative amount of money put aside this way would reach \$6,000 at the end of year 4, and could then be used to replace the car. Note that this separate account would be a pure accountant's artifice, and would not earn interest.

It is important to remember that Mr. Smith is never required to set aside this money (even if he indeed wanted to replace the car at the end of year 4.) He can put all the net cash flow in his personal bank account and use it the way he wants. In this sense, depreciation is only an arbitrary accounting procedure, it is never a cash expense that has to be paid.

[Simple analogy: if you buy a PC for \$2,000, and after one year it is worth only \$1,500, in some way, you have "lost" \$500. And yet, you did not have to pay \$500 to anybody, during this past year.]

Tax considerations

It was stated previously that depreciation is introduced so that income statements better reflect the activity of a company during a given period. However, only cash flows matter for companies, and depreciation allowances are not cash expenses. From this perspective, one might think that companies should not be concerned about depreciation and depreciation schedules. In reality they are concerned about them, because depreciation allowances are important to calculate income taxes (see table 2.)

Taxes in table 2 are constant over the life of the investment. This is because we chose straight line depreciation and assumed constant operating revenues and expenses. Note that the total amount of taxes received by the government is: $2,550 * 4 = 10,200$ (we neglect the time value of money here.) In table 1, the total amount of taxes was: $1,200 + 3,000 * 3 = 10,200$. Hence, depreciation does not change the total amount of taxes paid. However, it is easy to see that the distribution of the tax cash flows over time changes. In the case considered, introducing depreciation shifted \$ 1,350 from years 2, 3 and 4 to year 1. Because of the time value of money, companies always prefer to postpone expenditures as much as possible (provided of course that the amount of the expenditure does not change.) This is true for taxes too, which explains why companies prefer depreciation schedules with high depreciation allowances during the first years. It also explains why companies prefer to expense their expenditures rather than to capitalize them (when they legally can.)

Suggested Exercise:

As an exercise, the income statement and cash flow calculations of Mr. Smith's business can be redone, assuming that the car is sold at the end of year 4 for \$2,000 (salvage value = \$ 2,000). Keeping straight line depreciation, one finds net incomes of \$2,300 per year, and net cash flows of \$1,300 for year 1, \$7,300 for years 2 and 3, and \$9,300 for year 4.

C) CONCLUSION

The simple case discussed above illustrated the following ideas:

1. Depreciation is an accounting procedure, not a cash expense.
2. Depreciation is supposed to reflect in the income statement the loss of value of capital assets with time.
3. Depreciation schedules only really matter for tax calculations. Possible depreciation schedules for a given class of investment are determined by law.
4. In a given year, higher depreciation allowances mean lower taxes. Since companies prefer to postpone taxes, they prefer depreciation schedules with high depreciation allowances during the early years of the project.
5. Companies are required by law to capitalize their capital investments. They can (and do) expense any other expenditure.
6. Net cash flows describe the actual flows of money associated with the investment during a given period, whereas net incomes describe the "theoretical" financial result of the investment during this period, by taking depreciation into account.