

Corporate Finance, Module 11, "Maximizing Net Present Value"

*Accounting Income and Economic Income*

(The attached PDF file has better formatting.)

Suppose the initial investment is \$100,000. The cash inflows are zero for the first four years and \$200,000 for the last year. The opportunity cost of capital is 10%. We use pro-rata depreciation over the five years.

- A. What is the accounting income each year?
- B. What is the economic income each year?

*Part A:* Using the definitions in the textbook, the accounting depreciation is \$20,000 each year. The accounting income is  $-\$20,000$  for each of the first four years and  $+\$180,000$  for the fifth year.

*Part B:* The present value at inception of the final cash flow is  $\$200,000 / 1.1^5 = \$124,184$ . The economic income is  $\$124,184 \times 10\% = \$12,418$  the first year, and so forth.

Year	Beginning PV	Ending PV	Economic Income
1	\$124,184	\$136,603	\$12,418
2	\$136,603	\$150,263	\$13,660
3	\$150,263	\$165,289	\$15,026
4	\$165,289	\$181,818	\$16,529
5	\$181,818	\$200,000	\$18,182

*Question:* The accounting income makes sense. The first four years, the initial investment depreciates but the first gets no cash; all the cash comes the last year. The economic income is not related to the actual transfers of cash.

*Answer:* This type of project is not uncommon; sometimes the accounting pattern makes sense and sometimes the economic income pattern makes sense. Let's use an example where the pattern of economic income makes sense, and where GAAP adopts a similar pattern.

*Illustration:* Sara, an elderly and ill woman, needs a full time nurse. She has five more years to live, and she hires Hagar to take care of her for these five years, with payment of \$200,000. In addition, Hagar receives food and board and a market based compensation as a live-in nurse; her work effort and the wages and not included in our illustration.

Hagar spends \$100,000 of her own money on the round-trip camel fare from Egypt to Canaan. Hagar's opportunity cost of capital is 10% per annum. The net present value is \$24,184, so it is a positive NPV project. Hagar recognizes the \$24,184 at inception, when she and Sara agree on the terms of employment. The \$100,000 investment is a five year investment, so the economic income that compensates for this investment is spread over five years.

The accounting income is the reverse. If the camel fare is depreciated over five years, or \$20,000 a year, the return on the investment for the five years is

- Year 1:  $-\$20,000 / \$100,000 = -20.00\%$
- Year 2:  $-\$20,000 / \$80,000 = -25.00\%$
- Year 3:  $-\$20,000 / \$60,000 = -33.33\%$
- Year 4:  $-\$20,000 / \$40,000 = -50.00\%$

- Year 5:  $+\$180,000 / \$20,000 = 900.00\%$

If the entire camel fare is written off the first year, the returns are  $-100\%$  the first year, zero for the intervening three years, and  $+\infty$  the last year.

*Question:* The economic income increases from year to year; shouldn't it stay the same?

*Answer:* In deflated terms, the economic income is the same from year to year. A nominal dollar is worth less and less each year, so it seems as though the economic income increases from year to year.

*Question:* Hagar and Sara is just a heuristic example. Do we see this in real life?

*Answer:* This is common in the pharmaceutical industry, commercial aircraft (design and building) industry, and any industry with long lead times. A firm may spend \$1 billion developing a new drug or a new aircraft. It gets a large return after ten years if the product is successful; it gets nothing if the product is not successful.