Calculation Example: Inflation and Returns

Question:

Fred bought an investment property for $**500,000** (t=0).

He rented it for one year at $**30,000** paid at the end of the year (t=1). He sold it at the end of that year for $**520,000** (t=1).

Over that time the Consumer Price Index (CPI) rose from **110** to **123.2**.

What were the nominal and real total, capital and income returns on the investment property?

Note that since the rent and sale prices weren't stated as being real, you would assume that they are nominal amounts.

Answer: For the nominal total, capital and income (rental) returns:

$$
\begin{aligned}
r_{total\ nominal} &= r_{capital\ nominal} + r_{income\ nominal} \\
&= \frac{P_1 - P_0}{P_0} + \frac{C_1}{P_0} \\
&= \frac{520{,}000 - 500{,}000}{500{,}000} + \frac{30{,}000}{500{,}000} \\
&= 0.04 + 0.06 \\
&= 0.1
\end{aligned}
$$

The nominal capital return was 4%, the nominal income return 6%, and the total nominal return was 10% over the past year.

These are all effective annual rates, and they are also **nominal** rates of return since they haven't been reduced by inflation. To find the real rate of return, we first find the inflation rate from the consumer price index (CPI).

$$CPI_0 = \frac{CPI_T}{\left(1 + r_{inflation}\right)^T}$$

$$110 = \frac{123.2}{\left(1 + r_{inflation}\right)^1}$$

$$r_{inflation} = \frac{123.2}{110} - 1 = 0.12$$

which is a 12% effective annual rate.

We can use the Fisher equation to find the real total and capital returns on the property. For the total real return:

$$1 + r_{total\ real} = \frac{1 + r_{total\ nominal}}{1 + r_{inflation}}$$

$$1 + r_{total\ real} = \frac{1 + 0.1}{1 + 0.12}$$

$$r_{total\ real} = \frac{1 + 0.1}{1 + 0.12} - 1$$

$$= -0.017857143$$

$$= -1.786\%$$

So the investment property was actually not a great investment since its real total rate of return was negative.

However, if Fred didn't buy the property and just kept his cash under his bed, he would have had a real return of -10.714%: (=(1+0)/(1+0.12)-1).

This is because the prices of a typical consumers' "basket of goods and services" would have risen by 12% over the year.

To find the real capital return we use the Fisher equation:

$$1 + r_{capital\ real} = \frac{1 + r_{capital\ nominal}}{1 + r_{inflation}}$$

$$1 + r_{capital\ real} = \frac{1 + 0.04}{1 + 0.12}$$

$$r_{capital\ real} = \frac{1 + 0.04}{1 + 0.12} - 1$$

$$= -0.071428571$$

To find the real income or rental return, we **can't** use the Fisher equation. There are two ways to do it:

Method 1 for real income return:

$$r_{total\ real} = r_{capital\ real} + r_{income\ real}$$

$$-0.017857143 = -0.071428571 + r_{income\ real}$$

$$r_{income\ real} = -0.017857143 + 0.071428571$$

$$= 0.053571428$$

Method 2 for real income return:

$$r_{income\ real} = \frac{C_{1\ real}}{P_0}$$

$$= \frac{\left(\frac{C_{1\ nominal}}{\left(1 + r_{inflation}\right)^1}\right)}{P_0}$$

$$= \frac{\left(\frac{30{,}000}{(1 + 0.12)^1}\right)}{P_0}$$

$$= \frac{26{,}785.71429}{500{,}000}$$

$$= 0.053571428$$

Notice that the income return is barely affected by inflation, but the total and capital returns are.

Another interesting thing is that the real total return (-1.179%) is approximately equal to the nominal total return minus inflation -2% (= 10% - 12%). Similarly for the real capital return.

Questions: Inflation

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