DO VALUES OF EXISTING HOME SALES REFLECT PROPERTY VALUES?

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Do Values of Existing Home Sales Reflect Property Values?

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Abstract

In many locales, the average price of existing home sales is used as an of indicator home prices. This information is then used to establish the value of the property for tax purposes. A simple example is presented here to show that this approach can be very misleading. In this example, the average price of existing home sales is always rising at the rate of growth of the economy, and yet the price each home remains constant.

1 Introduction

In many jurisdictions, the average price of existing home sales is used as a barometer of the home values. These estimated home values are then used for purposes such as calculating the tax base for assessing property taxes. Yet it is not unusual to find that even when this technique implies that home values have risen substantially, many individual's find that their home will not sell for appreciably more than they paid for it. In the model presented below, it is shown that the average price of existing home sales may indicate that home values are continually rising, and yet *no home* will ever sell for more than its original sales price. An example is described in which any agent who observes the prices for sales of existing homes to rising at less than the real growth rate, should conclude that the value of his home is *falling – not rising!*

The reason for this result is that tracking the values of existing home sales, involves studying a rolling sample. If older homes are continuously leaving the sample (possibly because they are torn-down) and new more-expensive ones are introduced the average quality (and price) of the sample is increasing, even though the value of any individual home may not be changing.

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2 The Model

In the following model, time will be assumed to be discrete, and indexed by $t = 1, 2, ...$ In this economy the homes are uniformly distributed along some interval of the real line. For convenience, the initial distribution will be on the interval $[0, 1]$. Homes are discrete commodities, and can hold one, and only one household, so that initially the population of households is also uniformly distributed along this same interval. It will also be assumed that the "quality" of the home is also indexed by where it is along the same interval. A home at location x will be said to be of quality $f(x)$, where $f'(x) \geq 0$. That is, a home located at the point 0.7, is a better home than is one located at the point 0.3. Now, each period some fraction (δ) of the homes depreciate away. That is, they are essentially destroyed or lost from the economy. It will be assumed that these are the fraction of the homes on the "left-side" of the distribution, and therefore these are the oldest homes, and are of the lowest quality. This will be better motivated below, because these will also be oldest homes, so it stands to reason that they should be the ones that depreciate. At the same time, during this same period a fraction δ of newer better homes are added to this economy, so that there is always a mass of homes distributed along an interval of size 1. These new homes are added to the "right-side" of the interval of homes. However, in period 2, the homes are distributed along the interval $[\delta, 1 + \delta]$, while in period 3, the homes are distributed along the interval $[2\delta, 1 + 2\delta]$, and so on. In period t, it is $[(t-1)\delta, 1 + (t-1)\delta]$.[3]

When the old homes depreciate, or are destroyed, the household that inhabited that home is essentially lost to this economy. When a set of new homes are added to this economy, households come with these homes (i.e. they are not empty).

Each period a fraction α of the homes have their households match "go bad", and they are forced to leave the economy. Here we assuming an application of the law-of-large numbers for a continuum. They are then matched with some outside household who wants to inhabit the household. Consider a home that is located at point x. Agents have preferences of the following sort:

$$U(z, n) = z + c + (1 - n), \tag{1}$$

where $z = f(x)$ is the utility the agent gains from inhabiting the home, c represents the consumption good, and n represents labor effort. For the individual who inhabits the home, they derive utility $z > 0$ from doing so. For the agent who has to leave their home in a given period, it is assumed that $z = 0$ for these agents. The new agents who then wish to purchase the home are then identical to those agents who had previously owned the home, but for these agents $z > 0$. There may also be some technology that enables the individual to produce the consumption good, but this is not important to the study of housing choice considered here.

The price of the home is determined in the following manner. When an agent suddenly derives no utility from the home ($z = 0$), which happens with probability α, he is then matched with a prospective buyer, and they must bargain over the value of the home. The current owner is really identical to the potential new purchaser except for the latter $z > 0$, while for the former $z = 0$. One could think of the new buyer of the home as being

[3] One could also think of the fraction δ of low quality homes as being sold to richer individuals, who tear them down and replace them with much nicer newer homes.

identical to the existing owner when the latter purchased the home.[4] The purchaser can then produce the consumption good by using his labor effort, and then transfer the consumption good to the seller of the home in return for the title to the home. The purchaser can use labor to produce the consumption good, on a one-for-one basis (i.e. one unit of labor produces one unit of the consumption good). It is assumed that the home seller can make a take-it-or-leave-it offer to the potential home purchaser. Of course, this means that the home seller can extract all the surplus from the purchaser, and do so by asking a price which just makes the purchaser just indifferent between purchasing or not purchasing the home. Since the purchaser would obtain utility $U(z, n) = z + c + (1 - n)$ from purchasing the home, and utility $U(z, 0) = c + 1$, from *not* purchasing the home, the most that he would be willing to pay for it would be $n = z$. That is, the home price, which is measured in units of the consumption good (or equivalently - labor effort), is determined by the parameter z, which is a fixed characteristic of the home.

Now it should be clear that by construction, each time an existing home is purchased or sold, it sells for the same price that had previously sold for. That is, there is no appreciation in the value of *any* existing homes. Each one "turns-over" periodically, for the same price as before, until it is finally destroyed.

However, what is happening to the average value of existing home sales? Assume that the pricing function is given as follows: $f(x) = e^{Ax}$, for $A > 0$, so that the utility value of the home located at point x, is in fact just e^{Ax}. Further, suppose we calculate the value of homes sold in period t. It would then be calculated as follows:

$$\int_{(t-1)\delta}^{1+(t-1)\delta} e^{As} ds = \left[\frac{e^{As}}{A} \right]_{(t-1)\delta}^{1+(t-1)\delta} = \frac{e^{A\delta(t-1)} \left(e^{A} - 1 \right)}{A}.$$

and so the (gross) rate of change of home prices is then the following:

$$\frac{e^{A\delta(t)}}{e^{A\delta(t-1)}} = e^{A\delta} > 0, \tag{2}$$

which is a constant. Obviously there is escalation in the average price of existing home sales, even though no individual home sells for any more than the price at which it had originally been sold. Now let us try to obtain a handle on the magnitude of this growth rate. Let θ denote the net real growth rate of this economy. Let us suppose, as seems reasonable, that the cost of constructing a new home rises at this rate each period. That is, the cost of constructing a new home rises at the same rate as the growth rate of real economic activity. Now also note that the lifetime of a house in this example is $(1/\delta)$ periods. Hence the ratio of the value of a new home, to that of the home that it replaces in the sample, must then be the following:

$$e^{A} = e^{\theta/\delta},$$

which of course implies that $A = \theta/\delta$. Now inserting this into equation (2) shows that the gross growth rate of existing home prices must be e^{θ}. Hence the net growth rate of existing

[4] This analysis abstracts from any issues relating to the continual depreciation of a home, which would lower its value, or maintenance, which would raise its value.

home prices must be equal to the growth rate of real economic activity (θ).

What is happening here is that the stock of homes is continuously changing, with the average quality of these homes increasing. It is accurate to note that the average value of homes is rising, but it is wrong to conclude that the value of any particular home has increased. Furthermore, to increase a households property tax payment on the grounds that the value of their property has increased, would also be misguided. An agent who observes the prices for sales of existing homes to rising at less than the real growth rate, should conclude that the value of his home is falling – not rising!

3 Concluding Remarks

This example shows that great care must be taken in using the average price of existing home sales to estimate the value of existing homes. This can be problematic because this information can be utilized when obtaining the value of a property for tax purposes. It can also be misleading because home owners may view the continued escalation in the average price of home sales as an indicator of the value of their own home. These home owners will then be shocked when they attempt to sell their house, and find out that the value of their home has not risen in value nearly as much as they had expected.