

A Summary Comparison of Hedonics and Property Appraisal

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The following is a brief, non-technical introduction to hedonic price models and property appraisal. The purpose is to better inform the reader about these two techniques, how they are performed, what they are used for, and any respective advantages and/or disadvantages associated with each.

Hedonic Pricing Model

A Hedonic Pricing Model is a way of estimating the value of a single attribute (or combination of attributes) which comprise a product or service. The hedonic pricing model is commonly used in real estate economics to determine how the value of housing characteristics impact homes' sales' prices. Characteristics often examined in real estate include number of bedrooms, number of full bathrooms, distance from schools, quality of school district, distance from parks, whether or not a home is located on a water body, and so on. These characteristics (also called independent variables) together combine to explain the sale price of a home. After being collected, these characteristics can be imported into statistical computer programs such as Stata or SPSS to be analyzed. Statistical estimation of the hedonic pricing model assigns a dollar value to each attribute of a home, after all other housing attributes have been simultaneously taken into consideration (i.e. "controlled for"). The model can then be used to draw conclusions about how each attribute effects the price of homes.

Attributes can be examined in isolation, or together, when estimating their pricing impact on homes. That is, one could look only at how many bedrooms a home had and the effect on price of additional bedrooms. Or, one could look at the effect on price of adding both additional bedrooms and bathrooms. The hedonic pricing model posits that the sales price of a home is a mathematical function (traditionally a linear additive function) of the types of attributes described above. Thus a hedonic pricing model may be formulated as follows:

Sales Price = β_1 *Number of Bedrooms + β_2 *Number of Bathrooms + β_3 *Distance from Schools + β_4 *On Water + β_5 *Lawn Grass + β_6 *Garage Ports.

The value that each attribute contributes to the total sales price is represented by the β 's which precede the attribute (called coefficients). These coefficients are what the statistical

estimation process produces. If the attribute is determined to contribute to the sales price of homes, it is said to be “statistically significant,” whereas if it does not contribute it is said to be “not statistically significant.” If the attribute is not statistically significant, we can find no evidence that it contributes to the sales price of homes and therefore cannot interpret the coefficient on that attribute. For example, the specific type of grass that a home’s lawn is made of (Kentucky bluegrass, Bermuda, etc.) may be an attribute that is speculated to impact a home’s sales price. After estimation of the model, if the coefficient on the “Lawn Grass” variable is not found to be statistically significant, we would determine that the specific grass used in home lawns does not contribute to explaining any part of a home’s sale price.

If the coefficient is statistically significant, on-the-other-hand, it can be interpreted as follows: Imagine two identical houses with the same number of bedrooms, same number of full bathrooms, same distances from a park, same quality school district, both located on a lake, but one home has an additional garage port. Furthermore, the variable “Garage Port” has a $\beta = \$5,000$ and is statistically significant. The additional garage port has been determined to contribute \$5,000 to the sales price of the home. This same type of interpretation applies to homes with environmental amenities.

This technique has been used extensively throughout the last 30 years by the U.S. Environmental Protection Agency, state level environmental and economic agencies, and environmental economists for valuing not only physical attributes of homes, but also their environmental attributes. Because the environmental attributes which are associated with a home (for example being on a lake, having cleaner air, being far in distance from a landfill, etc.) are not directly traded in markets, they do not have a direct “price” attached to them. But, obviously individuals still value these environmental amenities. In the specific case of housing, environmental attributes are inextricably linked to homes through the spatial proximity and location of the home itself. As such, homes with more positive environmental amenities attached to them will have higher sales prices, after taking into consideration all of the other home’s attributes. The exact value of the contribution of the environmental amenity to the sale price of a home, is revealed through the hedonic analysis after controlling for all of these other possible attributes. The hedonic price model allows analysts to place value on the environmental and physical attributes of homes and determine the impact of each attribute on homes’ sales’ prices in isolation from the others.

It is important to highlight that the hedonic pricing model is based on the fact that market prices of goods (in this example housing) are affected by their characteristics. The price of a house is directly affected by the number of bedrooms and bathrooms it has, as well as whether it is or is not on a lake. This model helps to estimate the value of an attribute (or a combination of attributes) based on transactions and sales data which reflect buyers’ actual willingness to pay.

Property Appraisal

Property Appraisal and/or traditional home assessment is usually done every five to seven years for municipal tax purposes, or when a house is expected to be placed on the market and sold. In the property appraisal process, a home appraiser goes to a specific home and walks through the property. The appraiser notes any obvious physical damage or defects which may devalue the home, counts the number of bedrooms, number of full or half bathrooms, what type of heating and cooling systems are installed, whether the basement is finished or not, if the home has water frontage and the overall general condition of the property. After this, the appraiser researches similar homes that have recently sold in the area with comparable attributes (these homes are often called “comps”). For this reason, property appraisal is sometimes called the comparable sales method. The appraiser tries to find recently sold homes located in close proximity geographically and with as many similar characteristics as possible to the one being appraised. The characteristics the appraiser can find which most closely match may vary, but will usually involve standard items like number of bedrooms and bathrooms, architectural style and perhaps age built. Difficulty arises because appraisers cannot go into the comparable homes though, so they research the comparable attributes through other sources. After compiling the “comps”, the appraiser can use the information to develop a final report with their findings and provide an estimate on the fair market value of the home. This estimate can then be used in the consideration of setting the price of the home in the event it is being sold or the amount the owner should be paying in taxes. The actual value of individual, specific attributes of the home are not isolated and determined with this method.

Advantages and Disadvantages of the Hedonic Pricing Model

The primary advantage of using a hedonic pricing model, in comparison to property appraisal, comes from the method’s ability to isolate the effect that one attribute of a product or service has on the good or service’s total price. This allows the value of changing a single attribute at a time to be determined, if the remaining variables used in the model are considered unchanged. This method is also able to statistically determine what characteristics of a product seem to influence buyer’s willingness-to-pay for a good or service, not just what someone may believe (or want to believe) influences price. An advantage and disadvantage is that Hedonic Pricing Models require large amounts of data in the form of home sales, with many different attributes of each home sold collected and coded for analysis. This is an advantage in that a large amount of data on a significant number of actual transactions is included in the analysis. But,

this can be costly and time-intensive to collect, making it infeasible for many situations where the added rigor of the analysis and accompanying expense cannot be justified. Lastly, to understand hedonics in its entirety and correctly implement the computer programming to analyze the data requires a greater understanding of statistical modeling and the economic theory underlying the technique.

The Advantages and Disadvantages of Property Appraisal

The main advantage of property appraisal, in comparison to hedonics, is that it allows the “fair market value” of a single home to be estimated based on its characteristics and on what people have paid in recent home sales for similar, but not identical, homes. In particular, this value estimate is provided without the home actually having to be sold (where in the sale itself would determine the actual value of the home) and allows this value to be estimated in a rather inexpensive fashion in terms of both time and money. It is a relatively intuitive and straightforward process, which requires an understanding of the local real estate market and economy, but does not require any statistical understanding to implement. In addition, the data requirements are not very large, as oftentimes only a few homes with similar characteristics and geographic proximity are used as comparables. The main disadvantage of traditional home assessment is that the “fair market value” of a home is a best estimate based on the appraiser’s judgement. This comes from a limited set of data points in similar homes which have sold, but not on any actual sale of the home being appraised in question to definitively determine its actual value in the market. In addition, while hedonics is able to provide an estimate of the marginal value of different attributes (or combinations of attributes), property appraisal cannot.

Repeat Sales Method of Valuing a Neighborhood

One additional method of interest is the Repeat Sales Method. This method can also be used to establish the change in value of a home or neighborhood over time. The repeat sales method uses the sale of homes at different points-in-time to see how the overall value of the neighborhood changes. That is, it specifically focuses on homes which have sold multiple times over whatever time period is under consideration. In this method, a large amount of data must be collected on home sales from a specific start time (e.g. 1990). Homes which sold multiple times during this period are matched and as the price of the homes change through time an assessment on the change of value for the neighborhood (or geographic area) can be determined.

The main advantage of repeat sales is that in its basic form it only needs a home and the prices it has sold at over the time period in consideration. This is basic information that can

usually be collected easily from county or municipal records. It provides a simple way to examine the change of an area's value over time. The main disadvantage of the repeat sales method is that it does not account for homes that have only sold once or homes that have been passed down in a family or otherwise never sold during the time period considered. Another disadvantage is that the only variables in the model are time and the price of the homes. There are no variables controlling for improvements or additions made to the home overtime which may influence changes value.