



# Valuation of Residential Properties by Hedonic Pricing Method- A State of Art

<sup>1</sup>Anita Kanojia, <sup>2</sup>Mohammed Yasir Khan, <sup>3</sup>Umesh Jadhav

**Abstract**— The Hedonic Pricing Method (HPM), also known as hedonic Regression method (HRM) and Hedonic Demand Method (HDM) is used in estimating the value of attributes or the demand of attributes. Hedonic goods are analyzed by "Hedonic price model" and it makes possible to calculate the suitability of price indices in the commodity markets. Hedonic attributes involve immovable properties, such as apartment, computers, cars, home things, mobile phones etc. The features of these goods form their prices. Marginal effects of features of attributes in forming the prices of hedonic goods can be determined by this approach. In other words, the parameters obtained from estimating the hedonic price model describes the marginal value of characteristics of goods. The HPM has been widely used in real estate and housing market research in the recent past. The idea behind the HPM is that the commodities are characterized by their constitute properties, hence the value of a commodity can be calculated by adding up the estimated values of its separate properties. In this paper, emphasis is given on case study related to applicability of hedonic Pricing method, its methodology, comparison with other methods and its limitations.

**Index Terms**—Hedonic Pricing Method, marginal value, price indices, attributes.

## I. INTRODUCTION

Real estate market, in particular housing market, has a big importance in economic and social area. From the end of previous century till now the housing market has been developing in stage. The development of housing market is explained by several factors: accelerated urbanization process, increasing investment in houses, real estate direction of funds earned abroad by residents etc.

As heterogeneous goods a house has three major peculiarities unlike other goods. First, it includes many other goods and meets different requirements of the family. Second, the house is immovable. That is why the location of house is playing very important role in forming its price. Third, the demand in the housing market is more stable than in the market of other goods, which could be explained by the fact that a house cannot be substituted by other goods. The characteristics of houses generate their prices. Hedonic price method helps in defining the influence of these characteristics on the price of houses.

First section of working paper has been devoted to background research about hedonic pricing method. The second section describes the methodology adopted, case study for applicability of HPM. The last section is comparison with other economic valuation methods and its scope and limitations.

## II. BACKGROUND RESEARCH

The hedonic approach to valuing environmental benefits has its roots in agricultural economics (see, e.g., Waugh 1928, Vail 1932). Waugh related the price of asparagus, tomatoes, and hothouse cucumbers to various dimensions of perceived quality (e.g. for asparagus, color, size, and uniformity of spears). In another agricultural context, the value of agricultural land was empirically related to soil fertility and distance from market. In yet another agricultural context this method—not yet known as the “hedonic method”—was employed to isolate “quality” changes from fertilizer price indexes as the former related to changing percentages of nitrogen N, phosphoric acid P, and potash K (see Griliches 1958 for discussion of the early history).

The method first became known as the “hedonic method” as a result of Andrew Court’s (1939) work at General Motors. Court was interested in separating quality improvements from price increases as automobiles improved rapidly during the early decades after their first introduction. One can implicitly value the horsepower, size, various other model features with this method, and that valuation could in turn be used to increase GM profit by providing more high-value but low-cost features. In a now-classic article, Solow used what was essentially the hedonic method in a time series context, holding constant measurable inputs to explain GDP growth—his now-famous “residual” (technological change) was seen to account for a quite large percentage of economic growth, the fore-runner of modern endogenous growth models. It is Griliches (1961), however, who is generally viewed as the “modern father” of the hedonic method. He introduced many refinements in the method in the context of separating quality improvements from price increases to allow construction of better price indices to more accurately measure GDP growth. Early studies tended to

focus on either the demand side or the supply side, with Rosen (1974) being the first to present a full general equilibrium discussion. The earliest environmental application of the hedonic method was that of Ridker and Henning (1967). They established that housing prices in St. Louis were higher in cleaner areas, other things equal. There has been a proliferation of property value studies since that time.

### III. METHODOLOGY

#### Step 1: Reconnaissance survey

This includes identification of site, & environmental service.

#### Step 2: Pilot Survey

This includes identification of new variable that influence the property rate.

#### Step 3: Secondary Survey

This includes collection of data as follows:

- Residential property sales in the region for a specific time period (usually one year).
- Rate of value zone, value zone map.
- Annual Schedule of Rates (Ready reckoner).

Data on housing prices and characteristics are available from municipal offices, multiple listing services, and other sources.

#### Step 4: Primary Survey

This data include sample household survey:

- Selling prices and locations of residential properties property characteristics that affect selling prices, such as lot size, number and size of rooms, and number of bathrooms
- Neighborhood characteristics that affect selling prices, such as property taxes, crime rates, and quality of schools
- Accessibility characteristics that affect prices, such as distances to work and shopping centers, and availability of public transportation
- Environmental characteristics that affect prices

In this case, the environmental characteristic of concern is the proximity to open space. The researcher

might collect data on the amount and type of open space within a given radius of each property, and might also note whether a property is directly adjacent to open space. Often, this type of data may be obtained from computer-based GIS (geographical information systems) maps.

#### Step 5: Data Analysis & Conclusion

Once the data are collected and compiled, the next step is to statistically estimate a function that relates property values to the property characteristics, including the distance to open space. The resulting function measures the portion of the property price that is attributable to each characteristic. Thus, the researcher can estimate the value of preserving open space by looking at how the value of the average home changes when the amount of open space nearby changes.

#### How to Use the Results?

The results can be used to evaluate agency investments in open space preservation. For example, specific parcels may be under consideration for protection. The hedonic value function can be used to determine the benefits of preserving each parcel, which can then be compared to the cost.

### IV. CASE STUDY

#### Case Study Example of the Hedonic Pricing Method—Values of Environmental Amenities in Southold, Long Island [ref.]

##### The Situation

The town of Southold, Long Island, New York has coastlines on both the Peconic Bay and Long Island Sound. Compared to the rest of Long Island, it is a relatively rural area, with a large amount of farmland. However, population and housing density are rapidly increasing in the town, resulting in development pressures on farmland and other types of open space.

##### The Challenge

The Peconic Estuary Program is considering various management actions for the Estuary and surrounding land areas. In order to assess some of the values that may result from these management actions, a hedonic valuation study was conducted, using 1996 housing transactions.

##### The Analysis

The study found that the following variables that are relevant for local environmental management were had significant effects on property values in Southold:

- Open Space: Properties adjacent to open space had,

on average, 12.8% higher per-acre value than similar properties located elsewhere.

- **Farmland:** Properties located adjacent to farmland had, on average, 13.3% lower per-acre value. Property values increased very slightly with greater distance from farmland.
- **Major Roads:** Properties located within 20 meters of a major road had, on average, 16.2% lower per-acre value.
- **Zoning:** Properties located within an area with two- or three-acre zoning had, on average, 16.7% higher per-acre value.
- **Wetlands:** For every percentage point increase in the percent of a parcel classified as a wetland, the average per-acre value increased by .3%.

### The Results

Based on the results of this study, managers could, for example, calculate the value of preserving a parcel of open space, by calculating the effects on property values adjacent to the parcel. For a hypothetical simple case, the value of preserving a 10 acre parcel of open space, surrounded by 15 “average” properties, was calculated as \$410,907.

## V. ADVANTAGES

- The method’s main strength is that it can be used to estimate values based on actual choices.
- Property markets are relatively efficient in responding to information, so can be good indications of value.
- Property records are typically very reliable.
- Data on property sales and characteristics are readily available through many sources, and can be related to other secondary data sources to obtain descriptive variables for the analysis.
- The method is versatile, and can be adapted to consider several possible interactions between market goods and environmental quality.

## VI. ISSUES AND LIMITATIONS

- The scope of applying this model is restricted and limited to measuring the environmental benefits related to housing prices only.
- A prerequisite of the model is that everyone should have prior knowledge of the potential positive and negative externalities that are associated with

purchasing the real estate property. For example, it is important that they know before-hand about the level of pollution in a locality situated near an industrial site. This however is not the case in reality.

- The availability and accessibility of data directly affects the amount of time and the expense that will be undertaken to carry out an application of the model.
- This method estimates people’s willingness to pay for the supposed variation in environmental qualities and their consequences. However, if the people are unaware of the relation between the environmental qualities and their benefits to them or the property, then the value will not be reflected in the price of the property.
- **Market Limitations:** This model makes an assumption that, given their income, people have the opportunity to choose the combination of attributes they prefer. What it fails to see is that the real estate market can also be affected by external factors such as interest rates, taxation, etc. For example: Suppose a family wishes to purchase a property near a popular city center, having a garden and of a large area. In reality - it may be possible that a house near the city center is comparatively smaller in size or does not have a garden.
- **Multicollinearity:** Sometimes, there could be a case when larger properties are only available in cleaner non-polluted areas and smaller properties are found in more urban and polluted environments. In such cases, it would be difficult to separate pollution and the size of property exactly.
- **Price Changes:** Another assumption is that prices in the market will automatically adjust to any changes in the attributes. In reality, there is a lag especially in localities where purchase and sale of real estate is limited.
- The model is relatively complex to interpret and requires a high level of statistical knowledge and expertise.

## VII. CONCLUSION

The Hedonic price function takes the following form:

$$\text{Price} = f(N, S) + e$$

Where, the price is a function of the house's structural characteristics, neighborhood or location characteristics and environmental characteristics, e is an error term.

The hedonic pricing method is used to estimate the value of environmental amenities that affect prices of marketed goods. Most applications use residential housing prices to estimate the value of environmental

amenities. The method is based on the assumption that people value the characteristics of a good, or the services it provides, rather than the good itself. Thus, prices will reflect the value of a set of characteristics, including environmental characteristics that people consider important when purchasing the good. The hedonic pricing method may be used to estimate economic benefits or costs associated with:

- Environmental quality, including air pollution, water pollution, or noise.
- Environmental amenities, such as aesthetic views or proximity to recreational sites.

The hedonic pricing method is relatively straightforward and uncontroversial to apply, because it is based on actual market prices and fairly easily measured data. If data are readily available, it can be relatively inexpensive to apply. If data must be gathered and compiled, the cost of an application can increase substantially.

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