

## A Critical Review of Hedonic Price Model on Rental and House Prices in Housing Market

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### Abstract

*The hedonic price model introduced by Court (1939) was implemented on automobile price regression. Later the model was used for estimation and forecasting. The modification of the hedonic model by Lancaster's (1966) consumer theory and Rosen's theoretical (1974) model, upgraded the model to be extensively used in the scientific investigation of various aspects of housing markets. This paper reviews the theoretical background of hedonic price model and its concept. The paper further reviews the empirical issues of the application of the hedonic on housing and rental prices in the housing market with the critical examination. Previous empirical studies of the effects of physical structural and location of the housing property are identified and reviewed. The study relates the hedonic price model and repeat sales model for the identification of advantages and limitation over the other. The study recommends future research to critical review repeat sales model and another pricing models.*

**Keywords:** Hedonic Price model, House Price, Housing Market, Rental Price.

### Introduction

Housing property is heterogeneous in nature. It is difficult to find two houses with exact similarity. Each property has a specific feature that makes it different from one another. The heterogeneity of housing property makes the construction of house price and rental index difficult compared to other price indices. The houses are characterized by different attributes, out of which physical structure and location of the property are more paramount. These attributes determined the value of the property. The physical structure attributes include the type of property, the size of the property, number of bedrooms, number of bathrooms/toilets, and size of the kitchen and other tangible characteristics of the house. The location factor constitutes the structure of the area, environment, infrastructure and social demographic factors. These attributes of the property make the housing property to be composite good where each attribute contributes to the price value of the property. Unlike other goods, the housing property is unique it is characterized by its complexity, durability, and heterogeneity. Hence, to model these features of housing property, the approach of hedonic price model was introduced. Consequently, the pricing or renting value of a house in relation to another make the property to differ with one another due to the specific attributes. Therefore, the heterogeneity and composition features of housing property are what motivate this study to critically review the hedonic pricing model from housing market perspective. The hedonic model captures all the features of the property to determine its value. Many studies have utilized the technique to examine the property features that contribute in determining the rental value and price of the property. These features consist of physical structures and location of the property. As a result of the importance of technique in terms of capturing all the attributes of the housing property, this paper critically reviews the literature of application of the hedonic pricing model on rental price index and house price index in the housing markets. The paper

categorized the features of housing property into two main categories that include physical structures and location of the property. The objective of this conceptual paper is to review the hedonic model as the techniques of construction house/rental price index in the housing market. The paper is organized into the following sections. After an introduction in that comes in the first section, the second section, reviews the theoretical framework of the hedonic techniques and the concept of the model. The third section discusses the Empirical application of the model on rental and house Prices. The fourth section compared hedonic and other pricing technique in the housing market. The section concludes with limitations of hedonic pricing techniques and recommendation for future study.

### **Hedonic Price Model - Theoretical Framework**

The basic idea of the hedonic model was first introduced by Court (1939) for his automobile price regression. The author was interested in identifying the improved quality of automobile that increases the price of manufactured automobile in General Motors. Since then, the model has been used for various commodities. Later on, Griliches (1961) refined the model in the context of separating quality improvement and increase in price. He reviewed the idea by adopting quality changes through econometric analysis and used it for price and quantity measurement. The author also made the contribution of using hedonic model for estimation and forecasting. After the initiative of the hedonic model by the previous authors, Lancaster (1966) and Rosen (1974) contributed greatly towards the theoretical work on hedonic prices. Lancaster (1966) developed a Lancaster preference model based on a hedonic approach by considering consumer preference theory. The author argued that the demand for a product is not based on the product itself rather it is based on the utility derived from the characteristics of the product. The more utility derived by the customer from the attributes of the property, the more the customer is willing to pay for the property. Hence, this indicates the relationship between the product and its characteristics that give raises to hedonic price model which described the influence of these features determine the value of the product. The second contribution comes from Rosen (1974), the author laid down the conceptual foundation of the approach by bringing out the theoretical application of the model to the residential housing market. Rosen's contribution of the model has paved way for many authors to determine factors responsible for measuring property price. The two approaches contribute in valuing the attributes of the property that determine the value of the housing market price.

However, the two approaches look at the goods from different perspectives. Lancaster model assumes that attributes of goods are members of the goods. The goods are consumed in the combination subject the value of the goods. While Rosen's model assumes that the variety of the attributes of the goods are not choosing by purchasing a combination of goods. Rather, each good for the variety of products are consumed separately. Thus, Lancaster model is more suited to consumer goods while Rosen Model is more suited to durable goods. Furthermore, on the development of hedonic price model, Monson (2009), introduced regression analysis to determine the correlation between housing characteristics and housing price using the hedonic pricing model to predict future transaction costs. This contribution of the scholars made the model to a very vital technique for construction of rental price and house price index for determining dynamic changes in the housing market.

### **Concept of Hedonic Model**

A hedonic model is the most common used technique to determine the house price or rental value in the housing market because the technique focuses on the features of the property. The word hedonic is the Greek word that means pleasure, therefore the pleasure derives from the used of the property is what determine its price (Chin and Chau (2003). According to the theory of utility from the economic perspective, pleasure refers to the utility or derives from the consumption of goods and services.



According to Monson (2009), housing property could be compared to a bag of groceries, where each item in the bag contributes to its overall price. Likewise, each characteristic of the house such physical structure, the location of the property and other attributes of the property add value the overall price of a property (Malpezzi, 2002). Meanwhile, Diewert (2009a) asserted that the hedonic model describes the relationship between the attributes of the property, house price, and rental value. These characteristics determine the home price or rental value of the property. Once there is a change in the value of the property, there will be an expectation that the characteristics have been changed (Pakes, 2003). Therefore, the hedonic approach can be used to measure house price or rental value based on the influence of the property's characteristics. Meanwhile, the hedonic model describes the contribution of each attribute of property to determine the house prices and the rental value. Similarly, the method used to identify and quantify the significant features of the property in determining its rental value (Zietz, Zietz, & Sirmans, 2007). The hedonic approach is well established technically and the most reliable tool in valuing the housing characteristics that determine the house price and rental value (Des Rosiers, Theriault, Kestens & Villeneuve, 2002).

### Review of Empirical on Application Hedonic Price Model on Rental and House Prices

Housing properties are multidimensional commodities in nature which are characterized by durability, immobility, and heterogeneity (Chau, Ma & Ho, 2001). Typically, housing attributes are classified into two major classes of physical structure and location attributes. Therefore, the house price and rental value can be expressed as a function of physical structure and location of the property variables. The implicit price of each housing attribute, *ceteris paribus*, can be derived from the regression coefficients represented as.

$$p_{i,t} = f(\text{Characteristics}_{i,t}) + \varepsilon_{i,t}$$

Where  $p$  is representing the price of the property  $i$  in period  $t$ ,  $f$  is the hedonic function of the characteristics that determined the property price and rental value and  $\varepsilon$  is an error term. All the prices information uses in this method comes directly from the hedonic function as described above. The measure characteristics of the property are categorized in physical structure and location of the property. Thus, the hedonic price approach permits to estimate the effects of each housing attribute on housing prices or rental value, holding all other factors constant.

### Physical Structure

The physical structure attributes of the property include the type of the property; size, number of bedrooms, number of bathrooms/toilets, and size of the kitchen and any other tangible characteristics of a house. According to Akpom (1996), physical structural attributes determine house price and rental rate in the housing market than other attributes. The study reveals the higher influence of physical structure compared to location and other environmental factors. In addition, an increase in a physical structure in terms of number or size increases the house price and rental value significantly. Similarly, the study of Ibrahim, Cheng and Eng (2005) focused more on the physical structure as a significant variable that influences residential price and rental value. The study further identified the importance of total floor area and level of the floor as the determinants of the price and rental value in various submarkets of Singapore. The study indicated that the property with large floor area has a high price and rental value while the flat that is located at the higher level has low rental value. Similarly, Marco (2006), consider the physical structure to determine the rental value and house price on major residential are in New York City like Manhattan residential area. The study discovered that the quality of housing structure positively affects the house price and rental value of the property. In addition, the study further focused more on the level of household income and revealed that the higher medium

household income is more attracted by the quality structure of the property. The study also concludes that increase in rental value is correlated with higher medium household incomes and the location of the residential higher medium household also determined the high rental rate. Oust (2013) focused on the hedonic model by considering features of housing property such type of houses, a number of bedrooms, square meters, and location of the property for the period from 1970 to 2008 to construct rental index in Oslo (capital city of Norway).

### **Location of the Property**

The second category of attributes of housing property is location factor, this factor constitutes the structure of the area, environment, infrastructure, neighborhood and social demographic factor that surround the area. The proximity of the property to important areas like the city center, transport stations and places of work are also part of location factor. Okpala (1987) argued that some location condition factor that determines the value of house differed between developed and developing countries. For instance, the heating problem in the location that is close to the industrial area is an important factor that negatively affects the value of houses in the United States (McDonald & Smith, 2009). However, in developing countries, it may even add value to the property due to the proximity to industries considered more important to co-workers to access their place of work due to poor transportation facilities in developing countries compared to the developed countries. Can (1990) highlighted the importance of neighborhood characteristics in an urban area, where proximity to schools, parks, transport stations and bodies of water stands as significant factors that positively determine the rental rate of a property and vice versa. According to Case and Shiller (1990), location factors that have neighborhood proximity to schools, place of work, city center and other important areas, influence the house price and rental of the property. Similarly, Selim (2008) concludes that location is an important factor that determines the residential property price and rental value. The study determines house prices in turkey and revealed that residential properties which are located in the urban area are more expensive in terms both rental and house value. The study also concludes that rent in urban areas is higher compared to the rural areas. Likewise, Amenyah & Fletcher (2013), empirically proved that location of the property significantly determines the price and rental value of the property. The study also indicates the priority in terms of rental value on the houses that are located very close to the places of work. According to Kauko (2014), location is more important than the building structure of the property in determining both rental and residential value. The author cited an example of Bratislava residential market in Slovakia, where new apartments of high quality in terms of building structure remain unusable as they are not located in the area that suit the demand of consumers. The previous studies indicate that the physical structure and the location of property play an important role in determining the price and rental value of the property. The review further shows that the two factors could be used for the construction of rental and house price indexes for estimation and forecasting dynamic changes in the housing market.

### **Comparing Hedonic Price and Repeat Sales Model**

The hedonic price model is surrounded by the limitation of valuing the price of the attribute of the property. As a result of the limitation of the hedonic model, Case and Shiller (1987), considered repeat sales model more applicable than the hedonic model. The repeat sales model focuses on the property that has undergone sales or rents at least twice (Case and Shiller, 1989; Diewert, 2009b; Grover & Grover 2014). The first price and the second price are compared to measure the price changes on the same price. According to Bracke (2012), repeat rents occurred more common than repeat sales. Hence, construction rental price index could be more applicable that house price index using this model.



However, Case and Shiller (1989) argued that appreciation (in terms of renovation) or depreciation (in terms of age) on the property affects the changes in the property price at the time interval between the first and the second transactions. Therefore, this brings the issue of considering the physical attributes of the property that is measured by the hedonic price model. Hence, for the repeat sales model to suit the construction of rental price index or house price index, there has to be an assumption that the physical structure of the property has to remain constant (Case & Shiller 1987; Case & Quigley 1991, and Clapp and Giaccotto 1998). This assumption makes the model inefficient because the value of the property for the previous year is not the same as the present year due to the issue of depreciation.

### Conclusions

The hedonic price model captured all the attributes of the property that play a vital role to determine the value of the property. This made the model to be the scientific technique of measuring the value of a property. The technique estimates the individual contribution of each attribute of a property on the gross housing price. The model assists researchers to observe the effects of individual attributes of housing property on the house price and rental value of the property. This provides information about the players of the housing market and how the housing operates. The model facilitates construction of house price index and rental price index that is useful for developers, investors and policy makers. However, despite important of hedonic price model in the housing market, the model is affected by some limitation. One of the major limitation is the problem of heterogeneity of the property. The features of a property that contribute to determine the property may not be applicable to another property. Another implication is the complexity of valuing each and every attribute of the property. As a result of the limitation of hedonic price model, the study recommends further research to focus on different alternative pricing models in the housing market.

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