Appraising the Usefulness of Hedonic Pricing Method as an Effective Model in Environmental Valuation

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ABSTRACT
The study characterized the calculation procedure and indicates the fields of application of the hedonic approach in environmental valuation as well as its classical linear regression model used in estimating environmental amenities. The study adopted a secondary sources of data collection and the qualitative data were analyzed using content analysis. The study showed that hedonic pricing method is used to estimate economic values for ecosystem or environmental services that directly affect market price. The calculation procedure of hedonic model describing relationship use the function of: $P_i = f(X_i, \alpha_i, \varepsilon_i)$, where X_i = vector of asset attributes, α_i = vector of model parameters, and ε_i = random variable. Functioning of the hedonic regression model is based on data collected with performed statistical analysis that indicated that variables are significant to present predictive and real values resulting from observation: $y_i \alpha_o X_o + \alpha_1 X_1 + ... \alpha_k X_k + \varepsilon_j$; where: y_i = response variable, $X_o X_1, ... X_k$ = explanatory variables, $\alpha_o, \alpha_1 ..., \alpha_k$ structural parameters, and ε_j = random variable. This study shows that hedonic pricing method can be a reliable method for appraisal and estimation of the effects on non-market environmental goods and services, on property prices and other amenities.
Keywords: Application, Environment, Valuation, Hedonic Pricing Method, Regression Analysis

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I. INTRODUCTION

At the height of the latest real estate cycle, proper underwriting fundamentals seem to have been lost because of what some call irrational exuberance fueled by inexpensive capital chasing deals. As a result, the market value of real estate far outweighed the true, or intrinsic value. Understanding the intrinsic value of a real estate asset and the characteristics that contribute to its potential transaction price (market value) is imperative for proper valuation and can only be calculated by fastidious underwriting. It can be admitted that economically the price of goods and services and welfare amount fluctuates when the price of the environmental goods is changed. Khorshidoust (2013) states generally that there is not any formal and legal market for this trend to be observe and record the behavior or performance of markets as a tool to measure the changes of the amount of welfare of the people connected with quality of the environment.

Due to the existence of such problems, there are several methods to estimate and determine the price of environment in urban or beyond urban locations and the most common of them are travel cost method, hedonic pricing method, hedonic pricing method, conditioned valuating method and imposed losses compensation method (Mohammed, 2002). The two first method (travel cost and hedonic) are affected by persecuted based on market and in fact are emerged based on the relationship between environmental goods and the goods which are exchanged in a certain market (Des Rosiers, 2002). It should be noted that on the whole hedonic method uses statistical techniques to isolate and differentiate environmental values and is related with the differences in housing prices (Khorshiddoust, 2013).

The hedonic pricing model has been one of the most widely accepted methods for estimating the monetary tradeoffs for quality attributes private goods and spatially delineated environmental amenities. Hedonic pricing method is one of the important types of the pricing model that reflects the fair value of the product by taking into account many factors the will have an impact on the price of the product. It has also been found to enjoy wide acceptance in environmental applications, as well, which its studies have been associated

with air pollution etc. To estimate these environmental values, the price composition must be presented and analyzed. Assessing the economic pricing of the environmental amenities, hedonic pricing method would be based on the hypothesis that people usually determine by their environmental consumption preference levels through choosing their houses. Based on the above premises, the study will present application of hedonic pricing methods in environmental valuation techniques, which uses classical linear regression model for estimation. This is the intention of assessing its field of applications, benefits and weakness as well as the calculation procedures of hedonic pricing methods.

II. LITERATURE REVIEW

A. Concept of Hedonic Pricing

The hedonic pricing method relies on the assumption that a class of differentiated products can be broken down into a number of characteristics (Khorshiddoust, 2013). Also, the hedonic pricing method is based on the premises that people value a good because of the attributes associated with that good (Des Rosiers, 2002). The underlying goal when generating a hedonic pricing method is to create an accurate predictive model (Monson, 2009). However, hedonic pricing models is used to measure the influencing effect of these characteristics on the overall transaction price (Monson, 2008). According to Dunse, White and Dehring (2007), the technique of hedonic pricing is usually focused on property or sometimes labor market. It is also used to estimate the value of variables (environmental quality and amenities variables) that affect prices of marketed goods. The method valued the services provided, (characteristics of environmental good), rather than the good itself (Kauko, 2002). Hedonic pricing method starts with a regression of property prices (or wages) against all their valuable characteristics (Smith, 2001).

B. Definition of Hedonic Pricing Method

Hedonic pricing method can be defined as a pricing model of the goods sold which takes into consideration the internal as well as external factors (Anonymous, 2006). Hedonic pricing is a "model that identifies price factors according to the premises that price is determined both by internal characteristics of the good being sold and external factors affecting it" (Hargrave, 2019). The most common example of the hedonic pricing method is in the property market, wherein the price of a building or a piece of land is determined by the characteristics of the property itself (i.e., its size, appearance, features like solar panel or state-of-the-art faucet features, and condition), as well as characteristics of its surrounding environment (i.e. if the neighborhood has a high crime rate and /or is accessible to schools and a down town area, the level of water and air pollution, or the value of other home close by) (Hargrave, 2019). A hedonic pricing model of often used to estimate quantitative values for environmental or ecosystem services that directly affect market prices for homes (Bond and Hopkins, 2000).

C. Method of Hedonic Pricing Model

Smith (2001) states that the method is based on assumption that the people value the characteristics of (or services by) an environmental good, rather than the good itself. Thus, sale price will reflect the value of the set of influencing variables (property, neighborhood, accessibility and environmental characteristics), that people consider important when purchasing the environmental good (Kauko, 2002). The method started with a regression of house prices (or wages) against all their valuable characteristics (Anderson, 2018). This leads to a hedonic price function of the following shape (Des Rosiers, 2002):

$V = V (P, N, A, E)$

Where:

V	=	Value of residential property
P	=	Property characteristics
N	=	Neighborhood characteristics
A	=	Accessibility characteristics
E	=	Environmental characteristics (which is the main focus in environmental valuation).

From this function, calculation of the willingness to pay for a marginal change in each of these explaining variable sets in as the implicit price of the amenity under investigation (Owusu-Edusei and Espey, 2003). This will result to the demand curve from the implicit prices for specific amenity to be derived (Kauko, 2002). The demand curve is then used for estimating the economic value of an amenity such as natural beauty (Des Rosiers, 2002).

D. Areas of Application of Hedonic Model in Environmental Valuation

Hedonic pricing is a determinant of how much (and how much more) people are ready to spend on the environmental goods (independent variable), such as environmental quality, (air pollution, water pollution, or noise) and environmental amenities (views or proximity to recreational sites and open spaces) (Owusu-Edusei

and Espey, 2003). In the same vein, Des Rosiers (2002 explains that hedonic pricing has often been used to measure the (negative) value of noxious facilities and for the value of environmental goods such as air quality improvement. He also noted that it has been applied to value job risks and to value natural sites or parks that might have a positive influence on houses prices. The hedonic pricing method measures revealed preferences and it includes the consumers surplus as it measures the total area underneath the demand curve (Mohammed, 2002). Hedonic pricing has often been used in imputing the value of clean air and clean air is not a traded good, but evidence from revealed preferences suggests that a positive relationship exist between housing price and the quality of air (Owusu-Edusei and Espey, 2003). Movement of housing prices might therefore enable the valuer to impute the value of clean air through regression analysis. The hedonic pricing method was not developed to determine the total value of nature, but to determine the value of amenities only, not like the non-use values of nature (Kauko, 2002). From the above assertion of Des Rosiers (2002), hedonic pricing method can be applied to value amenities such as natural beauty, and may not be enough to capture the total economic value of a nature site. Beauty is only one attribute of a natural site, and all other welfare generating characteristics of the site, such as biomass production cannot be captured by this method (Anonymous, 2006).

III. ENVIRONMENTAL GOODS AND SERVICES TO BE CAPTURED

It can be difficult to determine which environmental goods or services that captured in hedonic pricing method. Anderson (2018) posit that the buyers of properties must be aware of the services provided by natural capital for those services to be reflected in property price. He also stated that most of the value captured is assumption from cultural services, such as recreation and attractive views, rather than regulating services such as carbon sequestration and temperature regulation which people are less likely to be aware of. The types of environmental services which could be captured as they potentially overlap with other ecosystem services include (Anderson, 2018); physical health benefits, recreation, urban cooling, carbon sequestration, provisioning services such as food and material production, air quality regulation and noise regulation.

A. Model Specification for Hedonic Regression

The hedonic pricing method does not have a pre-defined functional form. Anderson (2018) however, suggests that there are many reasons to believe that the relationship between property price and the environmental variable to be non-linear in nature. And the non-linearity is expected as "purchasers cannot treat individual housing attributes as discrete items from which they can be pick and mix until the desired combination of characteristics is found". Several models are used according to Khorshidoust (2013), in estimating additional explanatory variables introduced to progressively assess the robustness of results. For example, the environmental variables estimated will include; structural neighborhood, socio-economic characteristics, and environmental amenities.

B. Determinants of Hedonic Pricing Model

This model is generally used in the built environment to determine the prices of the environment based on internal and external characteristics (Dunse, White and Dehring, 2007). The determinants are (Sieg, smith, Badzat and Walsh, 2001);
  i. The price as per the hedonic pricing model may change as per the parameters used in the analysis; some may give more weight to the external environment less to the internal
 ii. Some may give lesser weightage to the external environment and more to the internal
iii. Hence this pricing may differ from customer to customer and one investor to another
 iv. It gives a strong picture of the pricing analysis by analyzing a large amount of data
  v. It also takes account the environmental and macro-economic factors to derive the correct price of the goods.

C. Advantages of Hedonic Pricing Model

Some major advantages of hedonic pricing method include (Smith, 2001):
  i. It focuses more on the consumption patterns of the customers and has the ability to price fairly
 ii. It takes into account both internal and external factors that will affect the decision-making of the buyer
iii. Gives more preference to the likes and dislikes of the buyer to buy an environmental good
 iv. A 360-degree approach in order to price a particular product.

D. Disadvantages

The Disadvantages include (Mrozek and Jay Lor, 2020):
  i. It does not take into account the information which is hidden from the buyer of the product
 ii. It sometimes does not take into account the interest rates and other taxes that can have a massive impact on the pricing
iii. Changing government policies can be very difficult to derive a price

iv.   A costlier process to execute

E.   Limitations
  i. It gives more weight to external macro factors thus ignoring the internal ones which might be of more weight
  ii. A complex model to execute.

F.   Reasons for the Use of Hedonic Pricing Method
According to Bond and Hopkins (2000), hedonic pricing method is selected based on:
  i.   Property prices in the area appear to related to proximity to open space
  ii. Data on real estate transaction and open space parcels are readily available, thus making this the least expensive and least complicated approach.
 iii. General characteristics of the hedonic pricing method

IV.   DEVELOPING HEDONIC PRICING MODELS

According Monson (2009), hedonic pricing model is developed by using the coefficients generated from a regression analysis with a relationship that can be described as "market price which is a function of each tangible and intangible environmental characteristics and other outside influencing factors. This is illustrated in the following equation:
Market price = f (tangible and environmental features, other influencing factors)
Other influencing factors include assets sold in a non-fair market. The underlying good when generating a hedonic pricing model is to create an accurate predictive model (Monson, 2019). Based on relationship between environmental goods and the goods which would be exchange in a certain market, Khorshiddoust (2013) stated hedonic method uses statistical techniques in isolating and differentiating environmental values as it relates with the differences in property prices. To estimate environmental values using hedonic model, price composition of property and its location must be presented to show for the quality of the environments (Bond and Hopkins, 2000). To develop hedonic model, Khorshiddoust (2013) argue that the "hidden price function" would be presented with mathematical representation as:
$P = f (X_1, ……………………………. X_n)$
Where, p is the price of good or the pre supposed product and X_1 to X_n are the characteristics of that good or product.

V.   ENVIRONMENTAL VALUATION STUDIES OF HEDONIC PRICING METHOD APPLICATION

Pu, Guo and Xiao-yu (2005); Wen Hai-zhen (2005); Brasington and Hite (2005) used linear hedonic price model for Hangzhou city, china and tested 2,473 housing samples and field survey data of 290 housing community. The study found that the demand for environmental quality is based on the estimation of relationship between house prices and the environmental dis-amenities and confirmed that nearby point-source pollutants depress house price. In the same vein, Chan et al (2006) investigated how air pollution affects the transaction prices of high-rise apartments in Hong Kong using a three-dimensional Roynolds- Stress turbulence model and stimulated the air pollution level of each unit in high-rise apartment buildings in a densely populated area. The study concluded by estimating the marginal willingness to pay for the air quality improvement using hedonic price analysis. To also indicated the application of hedonic pricing method in environmental valuation; Cebula (2009); Coulson and Zabel (2012) studied housing market of the city of savannah, Georgia and its historic landmark district. The concluded by questioning how coefficient estimates can be interpreted for environmental goods in hedonic property value models where markets are dominated by foreclosures. Beekmans (2013) also applied a hedonic price analysis of the value of industrial sites of an urban area, the industrial site. The study established that there is relationship between environmental services (for example clean air, or the concentration of atmospheric particles) and houses price clear for the owners of the houses and to be valued practically. These studied did not indicate any area of hedonic pricing method applications, which is the main subject of the present study.

VI.   RESEARCH METHODOLOGY

For the purpose of conducting this study, a qualitative research approach was adopted with extensive literature review within the research topic. Secondary sources of data collection were applied that comprises of theories, formulas and research findings through internet, journals and books. Content analysis was used to analyzed the qualitative data as to identify measurable values of hedonic linear regression analysis. The analyzed qualitative data analyzes and categories common ideas of hedonic pricing method in environmental valuation.

VII. RESULTS AND DISCUSSION

A.   Field of Applications of the Hedonic Pricing Methods in the Environmental Valuation

Some researchers conducted using hedonic pricing method that are related to the environment in a certain way, is presented below in Table 1:

Table 1: Applications of Hedonic Method to Environment Researcher and Year Area of Environment Studied

a	Anderson and Crocker (1971); Harrison and Rubinfield (1978); McDoughll and Wright (1980); Li and Brown (1980); Figuerora, Rogat and Firinguetta (1996); Cragg and Khan (1997); Edwards and Anderson (1989; Pu, GUO and Xin (2005)	Studies the effect of air pollution on residential property values
b.	Ridker and Hening (1967)	Studied the effect of air pollution on residential properties in locations where a lot of people with different ancestor live.
c.	Witte, Sumka and Erekson (1979) Brookshine, D. S. et al (1982); Graves, P. et al, (1998)	Studied the effects of social and economic factors on residential properties price.
d.	McMillan, Reidand Gillen (1980); Hughes and Sirmans (1992)	Estimated the effect of sound pollution on houses price
e.	Benson, E. D. et al. (1980)	Studied the role of access to public welfare services on houses price
f.	Nelson (1980); Levesque (1994); Uyeno, Hamilton and Bggs (1993).	Assessed the effects of sound pollution resulting from closeness to airport on houses price.
g.	Pamquist, Roka and Vekina (1997)	Focused on closeness to mines and its effect on price of residential areas
h.	Kawasake and Mitsuru (1996)	Studied the effects of earthquake on the price of residential areas before and after incident happened
i.	Smith and Palmquist (1993); Lansford and Jones (1995)	Estimated the effect of closeness of houses to seaside and their prices
j.	Bejranonda (1996); Dorfman, Keeler and Krisel (1996)	Studied the relationship between soil decay and reducing houses price
k.	Crane	Viewed different environmental indexes on the price of residential areas
l.	Khorshiddoust (1994)	Studied the influence of pollution resulting from waste aggregation and solid locations on the price of residential areas
m.	Sheng-hua and GUO Xiaoyu (2005); Wen Hai-Zhen (2005) Brasington and Hite (2005)	Used linear hedonic price model to test 2,473 houses sampled from 290 housing community surveyor, and found the demand for environmental quality is based on the estimation of relationship between house prices and environmental dis-amenities.
n.	Chau	Investigated how air pollution affects the transaction prices of high-rise apartment using a three-dimensional Reynolds stress turbulence model to stimulate the air pollution level of each unit.
o.	Chekmezova (2007)	Estimated marginal willingness to pay for the air quality improvement using hedonic price analysis.
p.	Komarova (2009)	Valued environmental impact of air pollution and calculated implicit prices of the environmental level of air quality in the area.
q.	Cebula (2009)	Studied housing market and its historic landmark district
r.	Coulson and Zabel (2012)	Questioned the interpretation of coefficient estimates for environmental goods in hedonic property value model where markets are dominated by foreclosures.
s.	Beekmans (2013)	Applied a hedonic price analysis of the value of industrial sites of an urban area.

Source: Author's Field Investigation, 2022.

Table 1 showed majority of researches conducted in environmental valuation that present the benefits representing non-consumptive use values of environmental goods and services. The benefits derived from the pleasant landscape, clean air, clean water, peace, quiet and screening as well as recreational activities; hedonic pricing method estimating external benefits and costs of environmental goods or services associated with housing. Results also indicate that it searches for suitable variables for describing the environmental benefits in hedonic pricing method studies appreciating environmental characteristics that are reflected in the property prices.

B.   Benefits of Hedonic Pricing Model Applications

Hedonic pricing method is used to estimate economic values for ecosystem or environmental services that directly affect market prices (Owusu-Edusei and Espey, 2003). It is commonly applied to variations in housing

price that reflect the value of local environmental attributes (Des Rosiers, 2002). It can be used to estimate economic benefits or cost associated with (Owusu-Edusei and Espey, 2003):

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

Furthermore, the benefits of hedonic pricing method include (Dunse, White and Dehring, 2007):

i.   Allows for the implicit pricing of individual property variables for real estate that do not have an observable market price.
ii.   It measures the attributes that cause   a product to be different for homogenous products (Studenmund, 2001).
iii.   Useful in determining any potential impact on value ranging from a contaminant or detrimental condition to an enhanced location or positive physical attribute.
iv.   It enables the combination of property specific variable (Kauko, 2002).
v.   The methodology can be applied to actual situations to help identify the impact of specific external features on value.
vi.   The use of qualitative methods helps to explain impacts in term of facts and perceptions.

The basic premise of the hedonic pricing method is that the price of a marketed good is related to its characteristics, or the services it provides (Zabel, and Kiel, 2000).

C.   Challenges Associated with Hedonic Pricing Method

According to Owusu-Edusei and Espey (2003):

i.   It does not necessarily reflect the total value of an attribute.
ii.   It does not capture the full benefits from the provision of public goods such as open space, wildlife habitat corridors or cleaner water.
iii.   It does not capture passive-use value derived from individuals who may use the resource, but do not live proximate to it (Dunse, White and Dehring, 2007).
iv.   It is difficult to specify the explanatory (independent) variables which could be included as explanatory variables (Malpezze, 2003).

D.   Calculation Procedure of the Hedonic Pricing Method.

The relationship between the price of the asset (environment) p, and the set of its features (characteristics) (Baranzinc, Ramizez, Schaerer and Thalmann, 2008; Janik, 2012), is called a hedonic model or hedonic regression. In general, this relationship may be described with the use of the following function (Belniak and Wieczorak, 2017).

$P = f(X_1, a_1, \epsilon_1)$

Where:

X_1 - Vector of asset attributes

a_1 – Vector of model parameters

ϵ_1 – Random variable

In the hedonic pricing method, the valuation process consists of decomposition of the price of the asset into combination of the specific characteristics, which reflect the importance when it comes to pricing (Dunse, White, and Dehring, 2007). The calculation of the hedonic price method according to Kauko (2002) are similar to the calculations known from the comparative approach; but in this case, they are more general. The calculation procedure of the hedonic price method may be divided into two basic stages; during which the following take place (Belniak and Wieczorak, 2017):

a)   Collection of data on transactions regarding the given assets (in this case environment),
b)   Statistical estimation of the linear function that will describe the relationship between the value of the environmental good (response variable) and the specific features having a potential impact on price (explanatory variables).

In order to make it possible to estimate the price of environmental good using the created function, Ogunba (2013) noted that the data on transitions regarding the environment should include information both concerning the sale prices, location, as well as other significant measurable and immeasurable environment goods and services connected with the environment. Therefore, data collection at the early stage is very important to proper process in terms of consistency, coherency and completeness of information (Baranzini, et al; 2008).

i.   Construction of a Single-Equation in Classical Linear Regression Model in Hedonic Pricing Method

The basic model to described the relationship between the phenomena (variables) is the single-equation linear model, also called descriptive econometric model (Belniak and Wieczorek, 2017). The form of which is as follows (Nowak, 2002):

$Y_i = a_o x_o + a_1 x_1 + \ldots\ldots\ldots\ldots + a_k X_k + \epsilon_1$

Where:

Y_i –Endogenous variables (response variable)

$X_o, X_1, \ldots X_k$ – Exogenous variables (explanatory)

$A_o, a_i, \ldots a_k$ = structural parameters

$\in_1$ - random variable

The above –mentioned equation for a response variable "is composed or a sum of two components, i.e. certain linear combination of explanatory variables $(X_o, X_1\ldots, X_k)$ and a random variable $\in_j$(Goryl, Kukula, Osiewalski and Walkosz, 2009). The explanatory variables have a significant influence on shaping y_i, whereas the random variable $\in_j$ (random disturbances) makes allowance for the total impact of other factors (excluded for analysis), not present in the model, which have an impact on shaping the response variable y_i, however, of a random (secondary)nature. The $\in_j$ coefficient also provides for any possible, non-systematic, random errors of measurement of variables, as well as any deviations from the adopted analytical form of the model from the actual relationship between them".

ii.   Model Estimation

"The $\alpha_o, \alpha_1 \ldots \ldots \alpha_k$ coefficients that are present in the equation $y = \alpha_o \ X_o + \alpha_1 \ X_1 \ldots + \alpha_{k,} \ X_k + \in_j$ as the so-called structural parameters are not known in the linear regression model Goryl, et. al., 2009). Their task according to Belniak and Wieczorek (2017) is to make a quantitative description of the impact of the explanatory variables (next to which they are located) on the response variable. Most frequently, one of the exogenous variables (usually the first one) is defined to be identified as $X_o = 1$. Thus, α_o is called an absolute term of the model or regression constant (Goryl, et. Al., 2009). Hence estimation (determination) of structural parameters α_j (j = O, I, …. K) based on observation of the variables $y_i, X_i, \ldots X_k$ becomes the main task in the construction of a linear regression model. (Belniak and Wieczorek, 2017). The determination of model parameters takes place on the basis of a structural and statistical form of the model that is presented except that the probability conditions must be met, so that estimation of the parameters makes sense (Belniak and Wieczorek, 2017),

The assumptions for the linear model determinations are as follows (Nowak, 2020; Goryl et al; 2009):

1. $Y_i = \ X_1 \ \alpha_{j,} \ + \in_j$, i.e every observation is a linear function of xtj observation and the random component $\in t$,

2. X_i is a non-random matrix, thus the explanatory variables are non-random variable and their values are derived from observations for t- 1, 2, …...n,

3. $R(X_i) = k + 1 \leq n$, which means that the observation matrix X_i has got a full column rank, namely the observation matrix vectors X_i (column) are linearly independent and no collinearity of the explanatory variables occurs, and moreover the number of the explanatory variables together with the absolute term α_o is lower than the number of observations,

4. $E (\in_j) = O$, i.e. the value expected from the random component equals O, which means that the multidirectional disturbances are reduced;

5. $D^2 (\in_j) = \sigma^2$, i.e. the variance random components is constant for the entire sample, whereas random components of the observation are not correlated with each other and $\sigma^2 < +\infty$,

6. $\in_j \sim Nn$, which means that the random component $\in_j$, is characterized by an n-dimensional normal distribution .

The above mentioned assumptions form the so-called classical model of a normal linear regression, which is most often based on the so-called classical least square method. In order to be able to use this method for estimation of the structural parameters α_j (j = 0, 1, ….. k) on the basis of observation of variables y_i, x_i, all the six (6) assumptions described above must be absolutely fulfilled (Nowak, 2020; Goryl, et al; 2009)

iii.   Model Verification

The quality of calculation namely the fact how well the regression line reflects the reality (to what extent it corresponds to the observations), may be vertical inter alia by means R^2 determination factor. The value of the factor specifics what part of variation of the response variable y has been explained by the variation of all the explanatory variables $x_1 + x_2 + \ldots + x_n$ (Goryl, et. al., 2009). The R^2 determination factor assumes values within the range <0; 1,>.

It means that if $R^2 = 1$, then the linear regression function explains in 100% of variation of the response variable y. if $R^2 = 0$, it should be assuming that the linear regression equation doesn't describe or explain the variation of the endogenous variable other measurement methods, that can find out how well the regression line corresponds to empirical observation (Belniak and Wieczorek, 2017). These should include:

a.   Residual variance that is based on examination of residual component variance (Aczel, 2006).

b.   Standard deviation of residuals that reflects the mean difference between the observed values of the described variable and the theoretical values (Zehas, Pawelek and Wanat, 2013).

c.   Significance tests are conducted to determine, whether the given parameter assigned to the factor has got a real impact on the examined response variable (Nowak, 2002; Aczel, 2006).

E.   Uses of Regression Analysis

Regression analysis should be:

i.   Useful for the investigation of estimated impacts on property sales value of neighbouring disamenities (Des Rosiers, 2002).

ii.   The test for transparent and flexible allowing a variety of impacts to be tested simultaneously (Bond and Hopkins, 2000).

The influence of a variety of other characteristics impacts can be tested holding to square feet of living space. In line with the expression, Wyman, Dent and Sims (2017) asserted that the use of multiple regression analysis is useful particularly for the disamenities of estimated impacts on property sales values, neighbourhood characteristics being constant. And relying upon determining whether or not a causal relationship exists between the present of either (Bond and Hopkins, 2002; Des Rosiers 2002) Neighbouring dissamenities because those impacts can be tested, while holding the influence of a variety of other characteristics of the property. For instance, square meter of living space, neighbourhood characteristic is held constant.

VII.   CONCLUSION AND RECOMMENDATIONS

Hedonic price model are valuable tools for real estate professionals in determining the correlation between environmental characteristics and the transaction price, as well as to predict future transaction pricing. Among the conventional models of valuing and economic pricing of environmental goods and services, hedonic pricing method is based on hypothesis that people usually determine their environmental consumption preference levels through choosing their properties. Hedonic pricing model has the ability to estimate values based on concrete choices, particularly when applied to property markets with readily available, accurate data. At the same time, the method is flexible enough to be adopted to relationship among other environmental goods and external factors. Using these techniques can facilitate environmental valuation when traditional discounted cash-flow models cannot be populated, which can often be the case if an environmental asset is affected. The results from such a study can also produce answers to decisions on development such as what the environment attributes to include in an effort to generate highest values on the conservation or preservation of environmental goods. Therefore, hedonic pricing method should be applied in environmental valuation with its significant drawbacks, including its ability to not only capture consumer's willingness to pay, but for what they perceive are environmental differences and their resulting consequences.

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