Analysis of the Application of the Hedonic Price Method in Setting House Rental Prices in the Coastal Area of Padang City

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A B S T R A C T

This research investigates how structural, location, and environmental attributes impact residential rental rates in Padang City, a region challenges by disaster risks and limited facility access. The study aims to identify key determinants affecting rental costs. A quantitative research design was employed, utilizing questionnaires for data collection, followed by analysis through multiple linear regression. Finding reveal that all three independent variables significantly affect rental pricing, as reflected by an F-value of 61,607, substantially surpassing the critical threshold of 2,69. These insights are valuable for shaping more effective housing policy strategies.

INTRODUCTION

West Sumatra Province is one of the provinces on the island of Sumatra that is prone to earthquakes. The province is located at the meeting point of the Indo-Australian and Eurasian plates, which causes faulting and subduction of the Indo-Australian plate (Daswita et al,. 2023). Padang is one of the cities in West Sumatra Province that has various disaster potentials. Among the most risky disaster potentials in Padang are earthquakes and tsunamis. This is due to Padang's location, which is close to the meeting point of the Indo-Australian plate and the Eurasian plate (Ruddin et al., 2022).

The geographical location of Padang City, which is close to the Megathrust fault around the Mentawai Islands, could trigger earthquakes and tsunamis. Public awareness of the risk of earthquakes and tsunamis on the west coast of Padang City has increased. This concern is entirely justified, given that Padang City is directly located on the edge of the Indonesian Sea. According to digitalization results, the coastline of Padang City spans 68,126 kilometers, meaning that urban residents living and working along the coastal areas are highly vulnerable to tsunamis. If a tsunami were to occur, at least 6 districts or 30 urban areas would be directly affected (Ophiyandri et al. 2022).
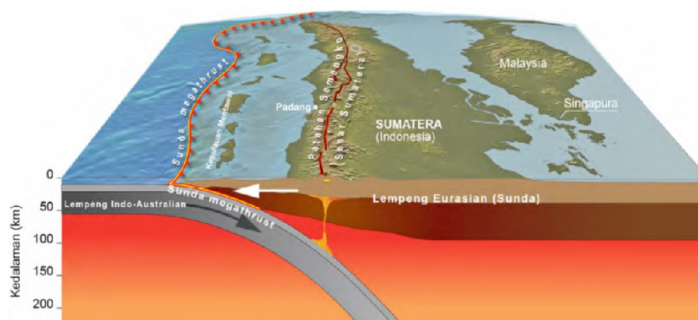

Figure 1. The earthquake and tsunami in Padang, West Sumatra, were caused by the Sunda Megathrust fault

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Earthquakes can occur at any time and are difficult to predict. The vibrations caused by earthquakes can damage everything on the earth's surface, including buildings and other infrastructure, which can result in loss of life and property damage (Rajif and Syafriani 2021). Given these conditions, the risk of natural disasters is a crucial factor for people who want to rent a house in the coastal area of Padang City. Prospective tenants must consider various aspects, including the potential for natural disasters that may occur. Despite facing this risk, its strategic location makes it close to various strategic facilities. This makes rental homes one of the sources of income for the people of Padang City.

In environmental economics, the value of natural resources or the environment can be measured using the concept of "Willingness to Pay" (WTP). WTP is rooted in the idea that individuals have unique preferences for goods and services. When faced with choices, they will demonstrate preferences for one good or a package of goods over another. Willingness to pay has several approaches, including the stated preference approach and the revealed preference approach (Allen, 2017 : 40). Specifically for real estate, the approach used is the Hedonic Price method. In the context of housing, the hedonic pricing approach views real estate as a combination of various attributes, with property prices estimated by regressing them against a set of housing features, including location, structural aspects, and environmental factors. Numerous studies have demonstrated that this method is highly effective in evaluating the individual elements that contribute to housing value (Saptutyningsih et al, 2015).

Hedonic Price Theory suggests that the worth of a good like real estate originates not from the item as a whole, but from the attributes it possesses. Essentially, the utility and satisfaction gained from a home are derived from its specific features. The core principle of the hedonic pricing method lies in analyzing how variations in a property's characteristics influence its market value. The marginal contribution of each property quality to its price is referred to as the attribute of the hedonic price, which is then used to estimate and predict prices (Liang et al, 2021). In the hedonic pricing framework, the value of each attribute such as housing quality is reflected as its marginal impact on the overall price, making it's a key component for accurately estimating and forecasting property value (Aminuddin, Hana, and Maimun 2022).

The hedonic price method is used to determine how the price of a good, such as the price of renting a house, changes in response to changes in the surrounding environmental factors. Therefore, to analyze the factors that influence the price of renting a house, the hedonic price method can be used effectively by considering the attributes of the house and the surrounding environmental conditions (Dwike Chandradraderia 2022).

Previous studies have shown that structural characteristics have a positive impact on house prices (Safuno, 2012). In addition to structure, previous studies have shown that location is one of the most crucial factors in determining housing prices (Chen and Hao 2006). Furthermore, research conducted by Mepriyanto et al., (2019) found that a pollution-free environment significantly and positively affects house prices.

There is a dilemma in setting rental prices for houses located on the coast of Padang City, because the coastal area of Padang City is in two different conditions, namely being close to and located in an area prone to natural disasters and, in another condition, being close to strategic facilities. The coastal area of Padang City has a unique rental property market dynamic. Understanding how the characteristics of the structure, location, and surrounding environment of the coastal area influence rental prices is crucial and exploring, especially as demand for housing in this area continues to rise.

Generally, housing attributes can be grouped into three main categories: location, structural, and environmental (Goodman 1989; Williams 1991). By holding other factors constant, the implicit value of each housing characteristic can be derived from the regression coeficients. This makes the hedonic pricing method effective for isolating and estimating the specific impact of each attribute on everall house prices. Therefore, this study aims to examine the influence of structural characteristics, location, and environment on house rental prices in the coastal area of Padang City.

Based on the above description, the hypotheses proposed are: H1: Structural characteristics, location, and environment simultaneously influence house rental prices; H2: Structural characteristics significantly influence house rental prices; H3: Location characteristics significantly influence house rental prices; and H4: Environmental characteristics significantly influence house rental prices.

RESEARCH METHOD

This research adopts a quantitative methodology. The target population consists of rental houses located in coastal regions of Padang City. The study relies on quantitative data as primary source of information. In this study, primary data was obtained directly through questionnaires distributed to homeowners and tenants in the coastal area of Padang Utara District.

The data collection technique used in this study was a survey using questionnaires for variables such as structural characteristics, location characteristics, environmental characteristics, and house rental prices.

Table 1. Variable Measurement Indicators

No	Variable	Indicators	Measurement
1	House Rental Price (Y)	House Rental Price	Rupiah (natural logarithm of house prices)
2	Structural Characteristics (X_1)	Number of bedrooms	Quantum data
		Number of living rooms	Quantum data
		Number of kitchens	Quantum data
		Number of bathrooms	Quantum data
		Building floor	1 (has a tiled floor), and 0 (non tiled floor)
		Number of building floor	Quantum data
		Decoration quality	1 (has initial decoration), 0 (if not)
		Building age	Years
3	Location Characteristics (X_2)	Distance to *Central Business District* (CBD)	1 (if there is a CBD within 2.000 meters of the house), 0 (otherwise)
		Distance to education facilities	1 (if there are education facilities within 4.000 meters of the house), dan 0 (if not)
		Distance to shopping and leisure centers	Km (natural logarithmic form)
		Distance to public transportation	Km (natural logarithmic form)
		Distance to health facilities.	Km (natural logarithmic form)
4	Environmental Characteristics (X_3)	Distance to the waterfront	Km (natural logarithmic form)
		Distance to disaster prone area	1 (if located in a disaster prone area within 500m), dan 0 (if not)
		Air Quality	1 (if in an area with poor air quality), and 0 (if not)
		Noise.	1 (if in an area with high noise), and 0 (if not)

Source: Data Process

Before conducting the test, the first step was to transform the variables into natural logarithms for the variables of house rental prices, distance to the beach, distance to health facilities, and distance to public transportation.

This research employed multiple linear regression analysis to examine the influence among the variables. Prior to performing the regression analysis, classical assumption test were carried out to verivy

the model's validity. One of these tests wa the normality test, which assesses whether the data follow a normal distribution, the heteroscedasticity test to ensure that the error variables had the same variance, and the multicollinearity test to detect high correlations between independent variables. After meeting the classical assumption tests, the influence between the research variables was tested using the following regression equation:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots\dots (1)$$

Where y = house rental price (in rupiah), X_1= structural characteristic variable, X_2= location characteristic variable, X_3 = envirnmental characteristic variable, a= regression constant, b= regression coefficient, e = Standard Eror.

RESULTS AND DISCUSSION

This research applies multiple linear regression analysis to investigate how structural, location, and environmental attributes affect rental housing prices in the coastal region of Padang City. A summary of the descriptive statistics for each variabl is presented in the table:

Table 2. Results of descriptive statistical analysis

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Structural Characteristic	100	4.00	59.00	18.1400	12.67147
Location Characteristic	100	11.00	22.00	17.8300	1.83708
Environmental Characteristic	100	2.00	12.00	8.0400	1.92758
House Rental Price	100	15.00	20.00	17.6000	1.09175
Valid N (listwise)	100				

Source: Dara Process

Table 2 shows that the structural attributes range from a minimum of 4 to a maximum of 59, averaging 18,1400 with a standard deviation of 12,67147. The location variable span from 11 to 22, with mean of 17,8300 and a standard deviation of 1,83708. Environmental factors have values between 2 and 2, an average of 8,0400, and a standard deviation of 1,92758. Meanwhile, rental price varies from 15 to 20, averaging 17,600 and featuring a standard deviation of 1,09175.

Following the descriptive statistical analysis, multiple linear regression was applied to test the research hypotheses. Prior to this analysis, a prerequisite test wa conducted specifically, a normality test using the one sample Kolmogorov-smirnov method. The outcomes of this normality test are presented in the table:

Table 3. Hasil Uji Normalitas

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		100
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.69179900
Most Extreme Differences	Absolute	.086
	Positive	.051
	Negative	-.086
Test Statistic		.086
Asymp. Sig. (2-tailed)		.064[c]

Source: Data Process

The normality test yielded a significance value of 0,064. Since this significance value is greater than 0,05 (0,064>0,05), it indicates that the residuals are normally distributed. The subsequent prerequisite test conducted is the multicollinearity test, with the results presented in the following table:

Table 4. **Multicollinearity Test Results**

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	X1	.971	1.030
	X2	.973	1.028
	X3	.990	1.010

a. Dependent Variabel: Y

Source: Data Process

Table 4 show VIF value the three independent variables > 10. It is concluded that three is no multicollinearity. And for the last prerequisite test, the heteroscedasticity test using the Glejser test.

Table 5. **Heteroscedasticity Test Results**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.361	.553		-.652	.516
	X1	-.003	.004	-.096	-.946	.346
	X2	.031	.025	.125	1.243	.217
	X3	.049	.034	.144	1.436	.154

a. Dependent Variabel: ABS_RES

Source: Data Process

According to the analysis results, the heteroscedasticity test shows that all three independent variables have significance values exceeding 0,05. This indicates that heteroscedasticity is nor present in the data, allowing the analysis to continue to the next stage.

After all prerequisite tests were conducted, hypothesis testing was carried out using multiple linear regression analysis. Multiple linear regression analysis was used to test the effect of structural characteristics (X1), location characteristics (X2), and environmental characteristics (X3) on house rental prices (Y) in the coastal area of Padang City. The results of the regression analysis are as follows

Y= 19,403 + 0,063 (X1) – 0,066 (X2) – 0,217 (X3)…………………..……(2)

This equation can be interpreted as follows:

Regression Constant (19,403): If the structural characteristics variable (X1), location characteristics variable (X2), and environmental characteristics variable (X3) are all 0, then the rental price of a house (Y) will show a growth rate of 19,403%. This indicates the baseline rental price when there is no influence from the three characteristics being studied.

In addition, the coefficient value for structural characteristics (X1) is 0.063. Every 1% increase in structural characteristics will significantly increase the rental price of a house (Y) by 6.3%.

On the other hand, location characteristics (X2) do not have a significant impact on house rental prices, as indicated by a significance value of 0.069, which is greater than 0.05.

Corversely, the coefficient for environmental characteristics (X3) is -0,0217. Every 1% increase in environmental characteristics will cause a significant 21,7% decrease in house rental prices (Y).

Hypothesis testing was conducted simultaneously and partially with the following results

Table 6 F-test results

			ANOVAª			
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	77.661	3	25.887	61.607	.000[b]
	Residual	40.339	96	.420		
	Total	118.000	99			

a. Dependent Variable: Y
b. Predictors: (Constant), X3, X2, X1
Source: Data Process

The results of the study indicate that there is an influence of structural characteristics, location, and environment on house rental prices, as the sig value is < 0.05.

Table 7. R Test Results

			Model Summary	
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.811ª	.658	.647	.64822

a. Predictors: (Constant), X3, X2, X1
Source: Data Process

The results of Table 7 show that the R square value is 0.658, meaning that the contribution of the variables of structural characteristics, location, and environment to the rental price of houses is 65.8%.

Table 8 T-test Results

		Coefficientsª				
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	19.403	.798		24.305	.000
	X1	.063	.005	.726	11.985	.000
	X2	-.066	.036	-.111	-1.836	.069
	X3	-.217	.048	-.268	-4.475	.000

a. Dependent Variable: Y
Source: Data Process

The following summarizes the partial analysis results: a. hypothesis 2, the test yield a significance level of 0,000 (p<0,05) which allows up to accept H2; b. hypothesis 3, the location variable shows a significance of 0,069 (p>0,05) and t-value of -1,836 which is less than the critical t of 1,98. Thus, H3 is rejected this indicates that location characteristics exert a negative but statistically insignificant effect on rental prices; hypothesis 4, the envrimenmental variable has a p-value of 0,000 (p<0,05) and t-value of -4,475, so H4 is accepted. This confirm that environmental factors have a significant negative impact on rental costs.

Discussion

This study shows that structural characteristics, location, and environment significantly influence house rental prices in the coastal areas of Padang City. These findings are consistent with the hedonic price method Chin and Chau (2003) which states that housing products are considered diverse because they are differentiated based on location, structural, and environmental attributes. Buyers tend to seek in-depth information about the attributes contained in a housing unit before making a decision. The finding of this study are supported by a study conducted by Riyanto, (2021) which states that property prices are influenced by various factors such as structural characteristics, accessibility, and the environment of the property itself. This is also supported by the results of a study conducted by Fikri et al (2024) which reveals that structural dimensions and location attributes have a significant influence on the formation of selling prices.

The results of hypothesis 2 show that structural characteristics have a positive and significant effect on house rental prices, with a significance value of 0.000<0.05 and a t-value of 11.985 > 1.98. In other words, improved structural features such as construction quality, room count, and interios aminities tend to lead housing owners to set higher rental price. This observastion is consistent with assumptions of the hedonic price method, which suggest that consumers are willingness to pay for attributes they perceive as more valueable.

Supported by research findings by Riyanto (2021), the physical characteristics of houses have a significant influence and strong correlation with residential property prices around the Arbotum Sylva green space. This is also supported by the findings of Fikri et al (2024) which state that several significant independent variables that affect house selling prices are part of the structural dimension or internal factors of the house. In line with this, studies by Rahadi et al. (2014) and Famuyiwa Babawale (2014) also found that the physical quality of a house significantly influences its price. Based on the research conducted by (Dwike Chandradraderia 2022) the structural characteristics of a house have a positive and significant influence on the determination of rental prices. Factors such as the size of the house, type of flooring, type of roof, and the size of the house positively influence rental prices.

Furthermore, the test results show that the location characteristic variable has a regression coefficient of -0,066 and a significance value of 0,069, which exceeds the 0,05 threshold. This suggests a negative but statistically insignificant relationship between location characteristics and house rental price in the coastal region of Padang City.

The negative effects identified, although insignificant, may indicate the presence of other more dominant factors in determining rental prices in the area. This differs from studies covering larger areas with higher location heterogeneity, where location factors typically show a strong and significant influence on property prices. This finding is supported by research conducted by Riyanto (2021), who states that there are different results related to distance to the city. This is because location is the last consideration in the decision to purchase a house, so even if the house is far from the city center, this does not have a significant effect on the selling price of the house.

The regression analysis revealed that the environmental characteristics variable has a coefficient of -0,217 and a significance level of 0,000, which is below the 0,05 threshold. This indicates that there is a negative and significant relationship between environmental characteristics and rental prices for houses in the coastal area of Padang City. The interpretation is that an increase in certain environmental attributes is correlated with a decrease in rental prices for houses.

In this study, environmental characteristics had a negative and significant effect on house rental prices in the coastal areas of Padang City. One of the reasons for this was the indicators used, namely distance to disaster-prone areas, air pollution, and noise. These three indicators illustrate the negative effect on house rental prices. The proximity of houses to disaster-prone areas is a key factor that can suppress rental prices. In the coastal areas of Padang City, the most relevant types of disasters are tsunamis,

coastal erosion, or flood potential. The closer the rental house is to these high-risk zones, the greater the concerns of tenants. Noise pollution has a negative effect on property prices, and the higher the noise level, the greater the negative impact on the price of a house.

This finding is in line with the "hedonic price" theory, which states that people are willing to pay more for properties based on the property's ability to provide comfort to its owners. The results of this study are supported by research conducted by Kambu (2019), who also found that environmental variables have a significant negative influence on price formation. There are new and unique findings in the application and interpretation of the hedonic price model, where environmental characteristics generally have a positive correlation with house prices. However, this finding shows a weak negative correlation with house price formation in the coastal areas of Padang City. This indicates that there are specific factors in the coastal environment where, as certain environmental characteristics improve, rental values decrease, which may differ from the context of other studies.

CONCLUSION

Overall, the results of the study show that structural characteristics, location characteristics, and environmental characteristics play different roles in influencing house rental prices. It was found that structural characteristics have a positive and significant effect on house rental prices. This means that houses with better structures tend to have higher rental prices. Conversely, location characteristics show a negative but insignificant influence on rental prices. This indicates that while there is a tendency for rental prices to decrease with certain location characteristics, the statistical influence is not strong enough. Meanwhile, environmental characteristics have a negative and significant influence on rental prices. This means that certain environmental factors in the coastal areas of Padang City can cause a substantial decrease in rental prices.

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