

# A Spatial Hedonic Analysis of The Effects of Swiftlet Farm on House Prices

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*Abstract* - The swiftlet farming industry is fast-growing and contributes to the nation's economic growth. However, the sector gives rise to adverse environmental impacts related to hygiene, health, and noise issues. Dirty and noisy environments caused by bird droppings and audio systems adversely affect the health and well-being of the surrounding population, making the area less desirable for businesses and investments and causing house prices to fall. Moreover, the limited knowledge and market evidence on swiftlet farming impacts on house prices highlights the importance of the study. The lack of knowledge on the effects of swiftlet farming on house prices may cause inaccurate market interpretations and decisions by property market players. To address the research gap, this study aims to determine the impact of the swiftlet farm on house prices in Johor Bahru. The Hedonic price model analyses ten years of transaction data along with distances from the swiftlet farm on house prices. The study's findings show a decline in prices for houses located 2,000m from swiftlet farm. The price impact established in this study assists investment, valuation, and buying and selling decisions by the property market players.

*Keywords* - Swiftlet farming, Animal operation, Hedonic price model, Spatial hedonic model, House prices

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## **1. Introduction**

Swiftlets are birds that resemble swallows, sparrows, and house swifts on the surface, although they are unrelated to these species. Typically, swiftlets are found in Southeast Asian nations like Brunei, Malaysia, and Indonesia. The swiftlet farming sector is one of the most promising agro-related enterprises, attracting more and more business owners across Southeast Asian nations. The raw or unprocessed bird's nest sells for between RM 2,000 and RM 6,000 per kg, making the edible bird's nest (EBN) sector a multimillion-dollar business. The cleaned nest industry is one of those unaffected by the global recession. Retail prices for the cleaned nest range from RM 8,000 to RM 20,000/kg. Despite its positive impacts on a business and nation's economy, it is also likely that there may be unpleasant or negative effects from swiftlet farms related to hygiene and health. Swiftlet farms close to residential areas have received numerous complaints about swiftlet droppings and noise pollution (Wong, 2017) caused by ineffective management measures (Tan, 2009). Residential areas affected by negative externalities are considered unattractive and undesirable for purchase, rent or investment (Suhaimi et al., 2021; Zihannudin et al., 2021), resulting in price or rent discounts. Previous studies include Ables-Allison and Connor (1990), Palmquist et al. (1997), Hamed et al. (1999), Park et al. (2004), Herriges (2005), Milla et al. (2005), and Dupraz et al. (2018) observed price discounts for houses located near animal operations. Thus, there is a high possibility that the same impact can be observed from swiftlet farms.

This study aims to determine the impact of the swiftlet farm on house prices by taking Johor Bahru as the study area. This paper offers two benefits. Firstly, it expands academic knowledge on swiftlet farm impacts on house prices. Secondly, it guides property market participants in property valuation, investment, and buying and selling decisions. This paper is structured as follows. An overview of the literature on Animal Operations (AO) impact on the housing market is provided in the second section, followed by an elaboration on the methodology used in the third section. The fourth section examines the impact of swiftlet farms on house prices and discusses the result. The fifth section concludes the findings of this study. Based on previous studies findings, it is hypothesised that swiftlet farms will negatively impact the housing market through price discounts.

## **2. Animal Operations Impact on The Housing Market**

Real estate lacks value if it serves no purpose, is unrestricted, or is not efficiently required as a utility derived just from bricks and mortar. Still, some of its distinguishing characteristics include the consumer's preferred location, neighbourhood, and infrastructure. Property values play a significant role in the global real estate industry and are influenced by several variables. This includes locational, structural, and neighbourhood (Suhaimi et al., 2021; Zihannudin et al., 2021). Structural attributes include bedrooms, bathrooms, fireplace, garage, square footage, lot size, structural age and pool existence. Neighbourhood attributes include socio-economic characteristics of neighbours, quality of neighbouring structures, ownership/rent, ethnic composition, schools, tax districts and environment quality. Location attributes include proximity and access to various amenities. Alonso's bid-rent theory states that people are prepared to pay a percentage of their income for location. A house in a desirable location will command a higher price during the bidding process, whereas a home in an undesirable area will command a lower price.

The management of animals and farms, as well as distance and concentration, may all impact the pricing of surrounding homes (Edwards and Massey, 2011). The worry of losing services, the risk of air and water pollution, and the likelihood of a rise in odour and/or insect-related nuisances might lower home prices (Hribar, 2010). It has been reported that AO such as swine and poultry farms decreased housing prices between 0.3% and 16% (Palmquist et al., 1997; Hamed et al., 1999; Herriges, 2005; Milla et al., 2005; Dupraz et al., 2018) and will continue to reduce house prices with each additional animal (Ables-Allison and Connor, 1990; Park et al., 2004). The Hedonic price model was employed in all of the earlier experiments carried out in the United States. Swiftlet farms exhibit the same cleanliness and health issues as other AO. Thus, properties close to the swiftlet farms will also suffer.

## **3. Methodology**

The study was carried out in Johor Bahru, Malaysia's second-largest metropolitan centre, with more than 876,000 residents. Six housing developments—Taman Bukit Tropika, Taman Desa Cemerlang, Taman Desa Jaya, Taman Ehsan Jaya, Taman Gaya, and Taman Johor Jaya—that make up the neighbourhood were chosen as the study area. There are 4,600 terrace residences in this neighbourhood, 50 shop lots, and a swiftlet farm close by, which is quite disruptive to the

region and raising the vacancy rates. The swiftlet farm is situated in a 1,540 square foot, two-story retail lot structure in Taman Desa Jaya. Due to the majority of shop lots being shuttered, the area around the shop lot remains undeveloped.

**Table 1.** Descriptive statistics

<b>Variables (N=3,857)</b>	<b>Min.</b>	<b>Max.</b>	<b>Mean</b>	<b>Std. Dev.</b>
Price (RM)	50000	395000	187915.71	84752.454
Land Area (m <sup>2</sup> )	61.000	641.103	142.684	61.558
Main Floor Area (m <sup>2</sup> )	22.480	280.230	107.458	41.486
Ancillary Floor Area (m <sup>2</sup> )	0.000	813.050	20.227	15.842
Number of Bedrooms	2	4	2.91	0.892
Tenure	0	1	0.96	0.197
Terrace Middle	0	1	0.87	0.333
Terrace End	0	1	0.04	0.198
Terrace Corner	0	1	0.07	0.253
Semi-D	0	1	0.02	0.134
≤1,000m Distance	0	1	0.40	0.491
>1,000m to ≤2000m Distance	0	1	0.40	0.489
>2,000m Distance	0	1	0.20	0.398
Year (Before and After)	0	1	0.45	0.498
Transaction Year	1	20	11.51	5.568

A complete set of structural characteristics, sale and location information for all single-storey terrace and semi-detached houses sold between 2000 and 2019 in Johor Bahru was obtained from the Department of Valuation and Property Services, Johor Bahru. Meanwhile, spatial data was obtained from the Johor Bahru City Council. The distance variable was generated from an overlay of swiftlet farm buffers and the location of houses in ArcGIS 9. After data compilation, duplicates and outliers were eliminated to ensure high-quality data for analysis. The accepted data range is as follows; the number of bedrooms between 2 and 4, transaction price between RM 50,500 and RM 395,000, main floor area between 22.480 m<sup>2</sup> and 280.230 m<sup>2</sup>, terrace and semi-

detached house type, located within 3000 metres of the swiftlet farming house. After data cleansing, 3,857 properties were selected from a total of 4,601 transactions obtained by researchers. Most homes (98%) are either intermediate, end or corner terrace houses, with property sales, mainly occurring after the swiftlet farm operation. Table 1 tabulates the dataset.

The dataset was analysed using the Hedonic price model to quantify the price effects of each housing attribute, including distance from the swiftlet farm. The following equation illustrates the house price function.

$$P = f(L, S, N) \quad (\text{Eq. 1})$$

P represents house prices, L represents locational attributes, S represents structural attributes, and N represents neighbourhood attributes.

Meanwhile, equation 2 below defines the general equation for the Hedonic price model:

$$Y_{it} = \beta_0 + \beta_1(X_{1m1}) + \beta_2(X_{2m2}) + \beta_3(X_{3m3}) + \beta_4(X_{nmn}) + \varepsilon_i \quad (\text{Eq. 2})$$

Where;  $Y_{it}$  = Forecasted House Price;  $m$  = Price of house  $i$  at time period  $t$ ;  $X$  = Property attributes;  $\beta$  = Regression coefficient;  $\varepsilon_i$  = Error term

For this study, the dependent variable is Price (RM). Meanwhile, independent variables include land area, main floor area, ancillary floor area, tenure type of house, number of bedrooms, transaction year and distance from swiftlet farm.

R Squared ( $R^2$ ), Adjusted R Squared ( $\underline{R}^2$ ), F value and Sum of Estimated Errors (SEE) were used to assess the model's performance. A good model will have  $R^2$  and  $\underline{R}^2$  near to 1, a high F, and a low SEE value (Adi Maimun et al., 2012). Additionally, according to O'Brien (2007), a model with a VIF value less than five and a tolerance value greater than 0.2 shows no signs of multicollinearity.

#### 4. Results and Discussion

Table 2 tabulates the regression results. Model 1 illustrates results for price impacts before the operation of the swiftlet farm. Meanwhile, Model 2 shows results for price impacts after the operation of the swiftlet farm. Overall, based on the  $R^2$  and  $\underline{R}^2$ , Model 1 can explain 75% of the variation in prices using land area, main floor area, ancillary floor area, number of bedrooms, type of tenure, type of house, year of transaction and distance from swiftlet farm with 32309.70 SEE. Meanwhile, Model 2 can explain 56% of the variation in prices with 58158.17 SEE using similar factors as Model 1. There was also no evidence of multicollinearity.

**Table 2:** Regression Results

	<b>Model 1: Before</b>		<b>Model 2: After</b>	
	<b>B</b>	<b>t</b>	<b>B</b>	<b>t</b>
<b>(Constant)</b>	-44044.031**	-6.339	91835.239	7.027**
<b>Land Area</b>	403.868**	23.496	601.938	14.245**
<b>Main Floor Area</b>	604.669**	23.152	469.998	8.192**
<b>Ancillary Floor Area</b>	861.048**	9.331	317.186	1.619
<b>Number of Bedrooms</b>	21250.284**	11.911	36662.351	8.884**
<b>Tenure</b>	-19978.173**	-4.526	-39892.480	-6.210**
<b>Terrace End</b>	-6154.555	-1.635	46811.013	5.050**
<b>Terrace Corner</b>	-22607.455**	-6.306	48240.447	6.128**
<b>Semi-D</b>	-44141.734**	-7.216	-26415.389	-2.171*
<b>&gt;1,000m to ≤2,000m Distance</b>	11624.028**	6.967	6865.798	2.016*
<b>&gt;2,000m Distance</b>	11117.030**	5.433	15446.767	3.795**
<b>Transaction Year</b>	917.229**	3.454	-20406.246	-31.803**
$R^2$	0.751		0.560	
$\underline{R}^2$	0.750		0.557	
<b>SEE</b>	32309.70		58158.17	

**Note:**

Dependent variable - Price

\* denotes p-value significant at 0.05 level

\*\* denotes p-value significant at 0.01 level

All variables except the type of tenure and building comply with the theory. This result may reflect the impact of building conditions and building age on prices. Residential areas within 2,000m and 3,000m from the pre-constructed swiftlet farm showed almost identical prices. However, a regression performed on houses transacted after the construction/operation of the swiftlet farm revealed some price effects. After the operation of the swiftlet farm, homes within 2,000m distance were priced lower compared to the prior operation of the swiftlet farm. Nonetheless, the negative impact began to diminish beyond 2,000m as house prices rose before the swiftlet farm operation. The results of this study corroborated those of Ables-Allison and Connor (1990), Palmquist et al. (1997), Hamed et al. (1999), Park et al. (2004), Herriges (2005), Milla et al. (2005), and Dupraz et al. (2018) regarding price reductions for homes close to AO.

## **5. Conclusion**

This study has managed to establish the impacts of the swiftlet farm on house prices by taking a sample of the swiftlet farm and surrounding houses in Johor Bahru as a study area. A hedonic analysis on 3,857 house observations observed a price discount impact for houses located near swiftlet farm. This result confirmed the results of earlier research on the detrimental effects of AO on housing values. This study contributes to the sparse body of research on the impact of animal husbandry on home prices. It emphasises the significance of swiftlet farms to be included in valuing properties to ensure accurate value estimation.

Also, precautions should be exercised when making leasing, purchasing, or investment decisions for houses near the swiftlet farm. To mitigate the negative impacts of swiftlet farms on the surrounding environment, efficient management and strict rules and regulations are crucial. Since much of the research is mainly centred on residential properties, it is suggested that future studies explore the impacts of swiftlet farms on other property market sectors, such as the commercial property market. Swiftlet farm may also impact the business turnovers and productivity of nearby commercial buildings such as shophouses and office buildings. Other research may also explore impacts on the property rental market.

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