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FACTORS AFFECTING REAL ESTATE PRICE IN HUE CITY, THUA THIEN HUE PROVINCE

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Abstract. This study determines the impact of factors on property prices in Hue City, Thua Thien Hue province. It uses quantitative and qualitative analysis to statistically characterize the investigated subjects. The Likert scale with five levels and the regression method were used to evaluate the influence of relevant factors on real estate from 115 samples collected in the An Tay, An Cuu, and An Dong Wards, Hue City. The results show six factors affecting real estate prices: (i) Location, (ii) Shape and topography, (iii) Legal, (iv) Social factors, (v) Infrastructure, and (vi) Environmental conditions. The impact level of the factors are: Environmental conditions, 0.416; Shape and topography, 0.408; Location, 0.225; Infrastructure, 0.197; Legal, 0.195; and Social factors, 0.120. Depending on the type of street, the factors have different roles. For streets with good business potential, the important factor is Location with high profitability and stability, leading to high buyer demand, followed by Topographic and shape, Infrastructure, and Environment. An Cuu had the highest real estate price among the three surveyed wards, followed by An Dong and An Tay.

Keywords: real estate, property price, location, Hue City

1 Introduction

Land price is a macroscopic management tool to implement land management with economic means [6]. Proper land price management aims to make land prices an effective tool in land finance policy. This measure provides a stable and long-term source of income for the state budget, the healthy development of the real estate market and ensuring economic and efficient land use [3]. When land-use rights allow exchange like merchandise, the State sets a price bracket, and localities determine specific land prices. The State-regulated and market land prices should follow the market principle [4], and real estate valuation is one of the essential tools in establishing an appropriate management mechanism. The market-oriented economy is the basis for the transfer, lease, mortgage, capital contribution, etc. Therefore, it is essential to determine what factors influence real estate prices.

Hue City is in the process of accelerating the implementation of industrialization and modernization. The urbanization of the city proceeds fast, and real estate prices are always volatile and tend to increase, creating numerous problems in the implementation of compensation and clearance policies. The sesettlement upon land acquisition and financial obligations when being granted certificates of land-use rights, residential land use rights, etc.,

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lead to complaints and denunciations related to land acquisition for implementation. The number of projects is increasing, putting tremendous pressure on the government and affecting the city's socio-economic development, security, and order [1]. Moreover, the regulations on real estate prices must be in line with reality to better manage the real estate prices in the city. Therefore, it is necessary to study the factors affecting real estate prices in Hue City in the current period.

2 Methods

2.1 Data collection

Secondary data

Data were collected from state agencies, such as the Department of Natural Resources and Environment and the City People's Committee. These data are related to the natural, economic and social conditions in Hue City for research topics. In addition, the topics also collected seminar documents, specialized magazines, related essays, and data from real estate companies for reference and analysis.

Primary data

Semi-structured interview: The topic collected information by designing a questionnaire concerning the observed variables to the independent variables.

Consultation with knowledgeable people: Collecting opinions of price appraisers at Hoang Quan Valuation office, Hue branch.

Sampling: The data analysis method used in this study is based on the Exploratory Factor Analysis (EFA) model and multivariate regression. According to Tabachnick and Fidell [9], for multivariate regression, the minimum sample size was calculated according to formula (1)

$$n = 50 + 8 \times m \quad (1)$$

where n is the number of samples to be investigated; m is the number of independent variables. Therefore, the minimum sample size with six independent variables is 98.

Exploratory factor analysis: This analysis is based on research by Hair et al. regarding the expected sample size [2]. Therefore, the minimum sample size is five times the total number of observed variables. The suitable sample size for research using factor analysis is

$$n = 5 \times M \quad (2)$$

where n is the number of samples to be investigated; M is the number of variables observed. The research topic has 23 observed variables, and hence the minimum sample size is 115 (5 × 23).

We selected An Cuu, An Dong, and An Tay Wards to study because these areas are newly developed, and they are located in the west of Hue City. Therefore, the types of real estate transactions here are plentiful, diverse, and vibrant. The samples from An Cuu, An Dong, and An Tay were 45, 35, and 35, respectively.

2.2 Processing, analyzing, and dividing data

After being collected, processed, and divided into different topics, the data were analyzed with IBM SPSS Statistics 26 and Excel 2016. For assessing the impact of factors on property prices in Hue City, the study proposes a model of six factors: (1) Location; (2) Shape and terrain; (3) Legal; (4) Social factors; (5) Infrastructure; (6) Environmental conditions. Using quantitative and qualitative analysis (descriptive statistics) in SPSS, we determined the statistic characteristics of the surveyed objects. We used the 5-level Likert scale to appreciate the impact: 1. Strongly disagree; 2. Disagree; 3. Neutral; 4. Agree; 5. Strongly agree. Then, we calculated the distance of the Likert scale from formula (3):

$$\text{Range } (a) = \frac{\text{Max}-\text{Min}}{n} \quad (3)$$

where Max = 5; Min = 1; n = 5, and we get a = 0.8. We decentralized to evaluate the impact of the factors on real estate prices.

The scale was set as follows: Strongly agree: $m > 4.2$; Agree: $3.41 \le m \le 4.2$; Neutral: $2.6 \le m \le 3.4$; Disagree: $1.81 \le m \le 2.6$; Strongly disagree: $1 \le m \le 1.8$, where m is the average value of each factor in the research model [4].

Design scale

- *Influencing level of six factors on real estate prices (P)*: The level shows that the independent variables affecting property prices are: (1) Location (LO); (2) Shape and topography (SAT); (3) Legal (LE); (4) Social factors (SF); (5) Infrastructure (INF); (6) Environmental conditions (EC). Specific details of observed variables including 24 variables are presented in Table 1.

Table 1. Details of observed variables

Factors	Observed variables	Symbol
Location	The real estate is located at the intersection	LO1
	The real estate is located near the city center	LO2
	The real estate is located in frontage position or exhausted alley	LO3
	The width of the road enables to park cars comfortably	LO4
Shape and topography	The parcel of land has a beautiful, square shape	SAT1
	The area of the parcel of land	SAT2
	The terrain where is flooded in the rainy season	SAT3
	Real estate is located in a good direction (east, southeast, etc.)	SAT4
Legal	Real estate has full legal papers, land use right certificates, construction permits	LE 1
	There are policies to support loans with preferential interest rates for people with low or middle income	LE 2
	Policies on investment, planning and development zoning	LE 3
Social factors	The quality of healthcare and education	SF1
	The knowledge of the people and customs	SF2
	Security and order of the real estate sector is good	SF3
Infrastructure	Electrical system, streetlights, communication	INF1
	Good water supply and drainage system (especially in the rainy season)	INF2
	Convenient traffic road system	INF3
Environmental conditions	Good environmental conditions (fresh air, many trees, etc.)	EC1
	Quiet environment	EC 2
	The problem of environmental sanitation	EC 3
Real estate prices	Average income of people affects real estate prices	P1
	Other assets attached to land (houses, crops, etc.) affect real estate prices	P2
	The ability to generate income from real estate affects the value of real estate	P3

2.3 Testing the reliability of the influencing level

Cronbach's alpha

We used Cronbach's alpha test to estimate the rigour of the observed variables in the correlation scale. This test reflects the correlation between observed variables within the same factor. Cronbach's alpha coefficients must have values from 0.6 to nearly 1 to ensure that the variables in the same factor are correlated [7]. According to Nunnally and Burnstein, if a variable has a correlation coefficient of total Corrected Item – Total Correlation greater than or equal to 0.3, the variable is satisfactory; otherwise, this variable must be excluded from the scale [5].

Exploratory factor analysis

Exploratory factor analysis was used to reduce a set of *K* turns observations into a set of *F* more influential factors ($F \le K$). The criteria in EFA analysis: KMO coefficient (Kaiser-Meyer-Olkin) is an index used to consider suitability and must be 0.5 or greater ($0.5 \le KMO \le 1$). Then, sufficient conditions for factor analysis are appropriate [6]. The Bartlett's test (Bartlett's test of sphericity) was used to see if the observed variables in a factor are correlated. If Sig. Bartlett's Test <0.05, the observed variables are correlated [7].

The Eigenvalue value represents the variation explained by each factor. Only those factors with an initial eigenvalue value ≥1 are retained in the analytical model. Total variance explained: the percentage variation of observed variables explained by factors must be ≥50%. Factor loading is the criterion to ensure the practical significance of EFA. In the rotation matrix table, the coefficient of the uploaded observed variables must be ≥0.5 (50%). In the rotation matrix, if an observed variable is loaded with both factors, for ensuring the difference between the factors, it is only retained when the difference of the load factor at the two factors is ≥0.3 (30%). That observed variable is classified in the group with a higher load factor, and if the difference in the load factor value is less than 0.3, the variable is disqualified [8].

Correlation analysis

Before conducting multiple linear regression analysis, we must consider the correlation between independent and dependent variables. The condition for statistical significance is Sig. (2-tailed) <0.05, which means that the two variables are correlated. The correlation coefficient is from –1 to 1. A positive correlation indicates a relationship in the same direction; a negative correlation coefficient indicates an inverse relationship; the larger the correlation coefficient between factors, the closer the relationship between the dependent and independent variables.

Regression analysis

Regression methods were used to model causal relationships between variables, in which one variable is called the dependent variable, and the others are independent. This model is described as follows:

$$Y = \beta_1 \times LO + \beta_2 \times SAT + \beta_3 \times LE + \beta_4 \times SF + \beta_5 \times INF + \beta_6 \times EC \quad (4)$$

where Y is the dependent variable (influence of factors on property price, *P*); beta (β) is the regression coefficient (β_1, β_2, β_3, β_4, β_5, β_6); independent variables are LO, SAT, LE, SF, INF, and EC.

We used adjusted *R* squared to evaluate the model's suitability with the sample data set. However, the adjusted R^2 may not be valid when generalizing. In addition, it is necessary to check

the multicollinearity phenomenon with VIF (VIF < 2 for the Likert scale). Furthermore, the Durbin Watson test was used to check the independence of error or correlation of residues. The higher the standardized beta coefficient of a variable, the greater its influence on property prices.

3 Results and discussion

3.1 Building models of factors affecting real estate prices in Hue City

Verify the reliability of the scale

Data in Table 2 show that all factors have Cronbach's alpha coefficients >0.6. This means that the scale is very good and meets the requirements for reliability. These coefficients are meaningful and can be used in subsequent analysis.

Exploratory factor analysis

Independent variables

After testing the scale with the Cronbach's alpha test, we recognize that the reliability coefficients are all greater than 0.6, and the total variable correlation coefficients of the observed variables are greater than 0.3. Therefore, all variables can remain in the model, and factor analysis is conducted according to the Principal component analysis extraction method with varimax rotation.

Table 2. Cronbach's alpha coefficients

No	Variable groups	No. of variables	Cronbach's alpha
1	Location (LO)	4	0.845
2	Shape and terrain (SAT)	4	0.875
3	Legal (LE)	3	0.809
4	Social factors (SF)	3	0.759
5	Infrastructure (INF)	3	0.742
6	Environmental conditions (EC)	3	0.790
7	Price (*P*)	3	0.889

Source: Data processing results, 2020

Table 3. KMO, Bartlett's and total variance extracted for the independent variable

Factors to be evaluated	Corresponding value	Condition
Coefficient KMO	0.770	0.5 < KMO < 1
Sig. Bartlett's test	0.000	<0.05
Eigenvalues values	1.053	>1
Cumulative (%)	72.354%	>50%

Source: Data processing results, 2020

Data from Table 3 show that all the factors of the independent variable meet the requirements. Specifically, the value KMO (0.770) satisfies the condition $0.5 \leq KMO \leq 1$, thus factor analysis for discovery EFA is suitable for the actual data. The correlation between the observed variables Bartlett's is statistically significant with Sig. 0.000 (<0.05). Therefore, we conclude that the observed variables are linearly correlated with each other in each factor group. All the six factors have the eigenvalues value greater than 1, and they will remain in the model. In addition, the value of the extracted variance (cumulative) is 72.354% (>50%). It means that observed variables explained 72.354% of the factors change, and the EFA model is appropriate. With a sample size of 115, the factor loading should be greater than 0.5 (sample size from 100–350). Twenty-three observed variables with sufficient reliability of six independent variables to perform the analysis test are presented in Table 4.

Table 4. The results of EFA for the independent variable

Observed variables	Factors					
	1	2	3	4	5	6
SAT3	0.870					
SAT1	0.856					
SAT2	0.837					
SAT4	0.707					
LO2		0.827				
LO4		0.806				
LO3		0.767				
LO1		0.760				
LE 2			0.834			
LE 1			0.819			
LE 3			0.623			
EC 3				0.877		

Observed variables	Factors					
	1	2	3	4	5	6
EC 2				0.818		
EC 1				0.796		
INF2					0.855	
INF3					0.852	
INF1					0.621	
SF1						0.838
SF3						0.727
SF2						0.716

Source: Data processing results, 2020

The data show that all the variables satisfy the factor analysis conditions and are kept for analysis in the next step.

Dependent variables

After testing the reliability by Cronbach's alpha test for the dependent variable "P", we conducted the model's EFA factor analysis.

In table 5, comparing with factor analysis conditions, we see that coefficient KMO = 0.749 (>0.5) is qualified ($0.5 \leq KMO \leq 1$). It means it is consistent with the actual data. Bartlett's test has statistical significance Sig = 0.000 (<0.05); hence, the observed variables have a linear correlation with the representative factors. The eigenvalue is 2.460 (>1), and the variance extracted (cumulative) is 81.999% (>50%), meeting the standards of the EFA factor analysis method.

Table 5. KMO, Bartlett's and Total variance extracted for the dependent variable

Factors to evaluate	Corresponding value	Condition
Coefficient KMO	0.749	0.5 < KMO < 1
Sig. Bartlett's test	0.000	<0.05
Eigenvalue	2.460	>1
Cumulative (%)	81.999%	>50%

Source: Data processing results, 2020

Table 6. results of EFA for the dependent variable

Observed variables	Factors
	1
P2	0.911
P1	0.906
P3	0.900

Source: Data processing results, 2020

In table 6, the factor analysis was conducted according to the principal component analysis extraction method with a varimax rotation that cannot be rotated because the dependent variable has only one factor. Thus, only one factor was extracted from three observed variables. Their EFA coefficients are above 0.9, indicating that this factor has practical significance.

Correlation analysis

In statistics, the correlation coefficient is of particular importance. Correlation is simply the relative relationship between the variables. The purpose of running Pearson correlation is to test the strict linear correlation between the dependent and independent variables because the condition for regression is to be correlated first. We calculated new variables representing each group of variables according to the average value:

LO = (LO1 + LO2 + LO3 + LO4)/4

SAT = (SAT1 + SAT2 + SAT3 + SAT4)/4

LE = (LE 1 + LE 2 + LE 3)/3

SF = (SF1 + SF2 + SF3)/3

INF = (INF1 + INF2 + INF3)/3

EC = (EC1 + EC2 + EC3)/3

P = (P1 + P2 +P3)/3

After setting up the variables representing groups of factors withdrawn from the rotation matrix table in the previous step, we conducted correlation analysis. The correlation coefficients are presented in Table 7.

Table 7. Matrix of pearson correlation of factors affecting real estate prices

Correlate							
Factors		**P**	**LO**	**SAT**	**LE**	**SF**	**INF**	**EC**
LO	Correlation coefficients Pearson	0.545**	1					
SAT	Correlation coefficients Pearson	0.670**	0.416**	1				
LE	Correlation coefficients Pearson	0.543**	0.403**	0.455**	1			
SF	Correlation coefficients Pearson	0.496**	0.284**	0.385**	0.480**	1		
INF	Correlation coefficients Pearson	0.451**	0.184*	0.154	0.450**	0.289**	1	
EC	Correlation coefficients Pearson	0.436**	0.003	0.054	-0.085	0.012	0.063	1

** The correlation is significant at the level 0.01 (2-way).

* The correlation is significant at the level 0.05 (2-way).

Source: Data processing results, 2020

The results in Table 7 show that most of the independent variables have a significance level less than 0.05 concerning the dependent variable. This means that the independent variables have a linear correlation with the dependent variable. The most closely correlated with the dependent variable is SAT (0.670), followed by LO (0.545) and LE (0.543). The most negligible correlation with the dependent variable is EC (0.436). Thus, the independent variables are significant and can be included in the regression model to explain the variable "Price". Additionally, in Table 15, pairs of independent variables correlate closely with each other, such as SF with LE, 0.480; LE with SAT, 0.455; and LO with SAT, 0.416. Based on the correlation coefficient between the independent variables above, we can suspect that these independent variables can have a multicollinearity phenomenon. We only question and do not have any exact calculation and comparison to prove multiple collinearities between two independent variables. This question will be answered from the variance magnification coefficient (VIF) when analyzing the regression in the next step.

Regression analysis

The regression analysis gives the following parameters (Table 8).

Table 8. Regression model

Model	*R*	Coefficient of determination R^2	R^2 correction	Estimated standard error	Coefficient Durbin-Watson
1	0.912[a]	0.832	0.823	0.215	2.069

Source: Data processing results, 2020

The analytical results from Table 8 show that the adjusted R^2 coefficient is 0.823. This means that the independent variables can explain 82.3% of the variation of the dependent variable "*P*"; the rest 17.7% is due to external factors and random errors. Thus, the given model is consistent with the actual data. The regression model was tested to be consistent with the actual data. Still, because the population is very large, we only investigated a limited number of samples, thereby deducing the general properties of the population. The F-test was used to check the model significance.

The data in Table 9 show that the value of F-test = 97.390, and the significance level is 0.000 (<0.05), proving that R^2 of the population is nonzero. Therefore, the dependent variable is influenced by the independent variables. This means that the built-in linear regression model is suitable for the whole and can be used. The results are shown in Table 10.

Table 9. ANOVA result the regression model

ANOVA[a]						
Model		**Sum of squares**	**Degree of freedom df**	**Average squared**	**Statistical value F**	**Level of significance (Sig.)**
1	Regression	26.922	6	4.487	97.390	0.000[b]
	Residual	5.437	118	0.046		
	Total	32.358	124			

[a.] Dependent variable: *P*

[b.] Predictors: (Constant), LO, SAT, LE, SF, INF, EC

Source: Data processing results, 2020

Table 10. The results of regression model

Coefficients								
		Unstandardized coefficients		**Standardized coefficients**			**95% confidence Interval for *B***	
Model		***B***	**Std. Error**	**Beta**	***t***	**Sig.**	**Lower Bound**	**Upper Bound**
1	(Constant)	–0.040	0.169		–0.238	0.813		
	LO	0.152	0.029	0.225	5.178	0.000	0.751	1.331
	SAT	0.251	0.027	0.408	9.273	0.000	0.735	1.360
	LE	0.136	0.035	0.195	3.924	0.000	0.578	1.731
	SF	0.083	0.031	0.120	2.684	0.008	0.709	1.409
	INF	0.128	0.028	0.197	4.578	0.000	0.773	1.294
	EC	0.278	0.026	0.416	10.871	0.000	0.970	1.031

Source: Data processing results, 2020

3.2 Assessment of the factors affecting real estate prices in Hue City

The data in Table 10 and Table 11 show that the average score of all observed variables is within the agreement range of the Likert scale ($3.41 \leq m \leq 4.2$). It offers that people agree with observed variables of the factors influencing real estate prices in Hue City. The results show the influence of the above factors on real estate prices in this city. This effect follows the following standardized regression model.

$$P = 0.416 \times EC + 0.408 \times SAT + 0.225 \times LO + 0.197 \times INF + 0.195 \times LE + 0.120 \times SF$$

This regression model shows that Environment is the factor with the highest influence on real estate prices (0.416), followed by Topography (0.408), Location (0.225), Infrastructure (0.197), Legal (0.195), and Social factor (0.120).

– *Environmental factor*: According to Asian culture, if the real estate area is close to temples, martyrs, cemeteries, etc., its price decreases significantly. On the contrary, if the real estate is near the park, surrounded by trees, sanitation, a clean and beautiful living environment, etc., its price increases accordingly. Therefore, the environmental factor has a significant influence on real estate prices.

– *Topographic factor*: The terrain where the property is located affects its value. In low-lying areas often flooded in the rainy season or with tidal phenomena, such as coastal real estate, the property's price is low. In addition, the optimal land size and area of use satisfy the specific needs of the majority of buyers. Usually, the square of land with broad frontage is highly valued at a higher price. Therefore, the topographic factor significantly affects real estate prices.

– *Location factor*: Real estate transaction price depends on the property's specific location and the distance to public places. The closer to the centre, the higher transfer prices; in alleys, property's price depends on the width and surface texture of the alleys. The locations near public places or on the front of main traffic routes often attract a large number of people because these places are convenient for business or social facilities. The aforementioned real estates have a higher market price than those in other locations in the same region. Therefore, the location factor affects real estate prices.

– *Infrastructure factor*: In the same area, the land plots that are easy to access technical infrastructure (roads, electricity, domestic water, etc.) and social infrastructure (public buildings, such as schools, hospitals, markets, etc.) have a higher market price. However, this factor is relatively underestimated because of customers' financial capacity.

– *Legal factor*: Each real estate has a legal status to assert the rights to manage, use, decision on the form of management, use, etc. The customers do not agree to buy the land if it is disputable or unclear about the law; if the land parcel has an obvious origin, but the land use rights have not

been recognized, it takes time and expenditure to request the recognition of land use rights. However, in reality, Hue City's land management is paid a lot of attention, e.g., cadastral mapping, land use mapping, and LURC issuance have been completed. Usually, the estate (buildings) is fully built with an obvious origin, and the land use rights of the land plots are clearly established. Therefore, the legal factor has little influence on real estate prices.

– *Social factor*: Estate in areas with different socio-economic conditions has different prices. The more developed socio-economic conditions with higher population density and living standards, the higher the real estate market price. Due to various socio-economic conditions in each area, this factor the least affects real estate prices.

Table 11. People's assessment of the factors in the model affecting real estate prices

No	Factors	Average
1	P	3.85
2	LO	3.81
3	SAT	3.75
4	LE	3.79
5	SF	3.80
6	INF	3.63
7	EC	3.86

Source: Data processing results, 2020

4 Conclusion

The results of assessing the impact of factors on real estate prices in Hue City show that the actual real estate transfer price in the market is much higher than the State-regulated price. This difference is huge in locations with favourable infrastructure conditions, business, and concentrated populations. The estate located in the central area has a higher difference between the actual price and the price set by the State. The study identified six factors with a corresponding impact on real estate prices: Environment, 0.416; Topography, 0.408; Location, 0.225; Infrastructure, 0.197; Legal, 0.195; and Social Factors, 0.120. Environment and Topography are the most influential.

References

1. Department of Natural Resources and Environment of Hue City (2017), *Report on the implementation of the management of Natural Resources and Environment of Hue City from 2014 to 2017.*
2. Hair, Jr. J. F Anderson, R. E, Tatham, R. L. & Black, W. C. (1998), *Multivariate Data Analysis*, Prentical-Hall International, Inc.
3. Hoang Van Hung, Ta Ngoc Long, Trinh Huu Lien (2013), Building and developing digital cadastral database for land valuation and land management in Ngo Quyen Ward, Vinh Yen City, Vinh Phuc province. *Journal of Soil Science*, 5(56–62).
4. Likert, R (1932), *A technique for the measurement of attitudes,* New York University, New York.
5. Truong Van Long, Pham Thi Kim Ngan (2011), *Determining the degree of influence of factors affecting land prices and land use as a basis for land price determination in O Mon district, Can Tho City*, Master's thesis in land management.
6. Nunnally, J. C. & Bernstein, I. H (1994), *Psychometric thery (3, Ed),* New York: McGraw-Hill.
7. Nguyen Huu Ngu and Duong Quoc Non (2017), *Land Valuation Curriculum*, Hue University Publishing House.
8. Hoang Trong, Chu Nguyen Mong Ngoc (2008), *Analyze research data with SPSS*, Publisher statistics.
9. Tabachnick, B. G., & Fidell, L. S. (1996), *Using Multivariate Statistics (3rd ed.),* New York: Harper Collins