

Analysis of Factors that Affect on Optimization of Residential Sales in Tasikmadu – Malang City

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Abstract— Basic human needs consist of three things clothing, food and shelter, for that everyone will always try to meet these basic needs. After the needs for clothing and shelter are met certainly everyone will try to satisfy housing needs in every level of public life by taking into account desire and capability. Based on Rencana Detail Tata Ruang (RDTR) Bagian Wilayah Pengembangan (BWP) North Malang planned residential zone development is planned to cover an area of approximately 1.610,90 hectare. This research using descriptive statistical techniques, with this technique analysis, influence factors determining of development housing demand will be analyzed. Multiple linear regression used to determine how much influence the independent variables off the dependent variable. Linear programming that relies on mathematical models or symbolic models as a container to find optimum limit that must be achieved to maximize profits. Determination of housing purchase is influenced by factors of house prices, facilities available, home location, environment and income both simultaneously and partially; price factors, available facility factors and environmental factors predominantly influence the purchase of housing; to get the maximum profit, then the optimal composition of the type of houses being built is type 45/98 (A) 54 units, type 50/112 (B) 0 units, with the benefit of Rp. 13.260.870.000,- for Patraland Palace and type 45/72 (A) 96 units, type 50/84 (B) 0 units, with the benefit of Rp. 23.610.280.000,- for Royal Atletik Residence.

Keywords— Determining factors purchase of housing, optimum.

I. PRELIMINARY

Basic human needs consist of three things: clothing, food, and shelter, for that everyone will always try to meet these basic needs. After the need for clothing and shelter is met, of course everyone will try to meet the need for a house at every level of community life by paying attention to existing tastes and abilities. Housing and settlements have a strategic function in their role as a center for family education, cultural nurseries, and improving the quality of future generations.

Malang City is the second largest city in East Java after Surabaya, and is one of the largest cities in Indonesia in terms of population. Along with the development of Malang City, it has an impact on the increasing demand for decent housing. Because the need for a proper house is one of the basic needs for humans after food and clothing are very important aspects of life.

Based on the Detailed Spatial Plan (RDTR) for the Development Area Section (BWP) of North Malang. The housing zone development plan is planned for an area of approximately 1,610.90 hectares in the high density housing sub zone and the medium density housing sub zone. The high density house sub zone is planned to cover approximately 144.54 hectares and the medium density house sub zone is planned to be approximately 1,466.36 hectares.

Based on the aforementioned conditions, there are issues related to location factors, direction of urban development, environmental conditions, ease of access, quality of buildings and the availability of infrastructure, facilities and utilities that greatly determine community decisions in meeting the need for livable houses in a housing. For this reason, a study was held with the title, "Analysis of Factors That Influence the Optimization of Housing Sales in Tasikmadu Village, Malang City".

II. LITERATURE REVIEW

A. Construction Project Management

According to Ervianto (2009), construction projects can be divided into two types of building groups, namely: buildings and civil buildings. The two groups of buildings actually overlap, but are generally planned and implemented by different disciplines of planning and executing.

B. Housing

According to Kurniasari (1998), home is a place where every human being lives his life and is not disturbed by other people at certain times and provides a sense of security. A house is needed by humans as a shelter to maintain survival, besides that it is also a physical vessel for the development of socio-economic culture, a place for building character and personality, and a place to carry out various activities and social identities. According to Suparno and Sastra (2006), housing is a basic need in addition to the need for food and clothing.

According to Awang Firdaus Vauestate (1997) in Wijaya (2013) explains that the factors that influence the demand for cluster type housing are: 1) House prices; 2) available facilities; 3) Location of the house; 4) Environment; 5) Income.

C. Optimization

According to Astuti, 2013, optimization as a normative approach can identify the best solution of a problem that is directed at the maximum or minimum point of an objective function.

Optimization issues include optimization without constraints and optimization with constraints. In unconstrained optimization, the factors that become constraints on the

objective function are ignored so that in determining the maximum or minimum value there are no restrictions on the various available options of item X. In optimization with constraints, factors that become constraints on the objective function are considered because they also determine the maximum and minimum points of the objective function (Herjanto, 2007).

D. Statistics

Inferential statistics are statistics that are used to analyze sample data and the results will be generalized (referenced) for the population in which the sample is drawn. There are two kinds of inferential statistics, namely: parametric and non-parametric statistics. Parametric statistics are used to analyze interval or ratio data, which are taken from normally distributed populations. Meanwhile, non-parametric statistics are used to analyze nominal and ordinal data from a distribution-free population. So it doesn't have to be normal. In this case, the correlation and regression techniques can act as inferential statistics.

E. Multiple Linear Regression

In examining the relationship between several variables using regression analysis, the researcher first determines one variable called the dependent variable or more independent variables. To obtain a multiple linear regression model, it is obtained by estimating its parameters using the method of estimating the parameters of the multiple linear regression model, namely the Ordinary Least Square / OLS method and the maximum likelihood estimation (MLE) method (Kutner et.al., 2004).

The f test, which is a test to see how all the independent variables influence the dependent variable together. If the model is significant, the model can be used for prediction / forecasting, on the other hand, if it is not significant, the regression model cannot be used for forecasting. The f test is done by comparing the f count with the f table.

The t test is an analytical technique to compare one independent variable. This technique is used to test whether a certain value is significantly different from the average of a sample. The t test basically shows how far the influence of one independent variable individually in explaining the variation of the dependent variable. The objective of the t test is to test the regression coefficient individually.

F. Linear Programming

Linear programming is a mathematical method, which can be used to assist in planning and decision making. Linear programming is concerned with the use of limited resources in the midst of competing activities in the best way. Linear programming includes planning activities to get optimal results, which is the best result (according to a mathematical model) among all possible alternatives (Taha, 1996).

The functions formed in the linear programming model consist of two kinds of functions, namely the objective function and the constraints function. These two functions are functions that become the initial models of a linear programming model (Sudarsana, 2009).

The simplex method is used to solve a linear programming problem that uses more than two activities (decision variables). The model in the simplex method is converted into a table, then several mathematical steps are taken (Taha, 1996).

III. RESEARCH METHODS

The design of this study uses qualitative research methods by quantifying the purchase interest and priority of the community's desires towards purchasing a housing and by making direct observations in the field through observation (direct observation), interviews with predefined informants and documentation studies, and distributing questionnaires.

A. Research Variable

This study used a research instrument in the form of a questionnaire consisting of questions in which each question had several answers provided, while the variables used were as follows:

- The Independent Variable (X) consists of:
House Price (X1), Available Facilities (X2), House Location (X3), Environment (X4) and Income (X5).
- Dependent variable (Y)
Housing demand (Y) is how individuals, groups and organizations select, buy and use goods and services, ideas or experiences to satisfy their needs and desires for the products and services provided by housing providers.

B. Data analysis technique

Data analysis techniques in analyzing the factors that influence the determination of housing purchases in Tasikmadu Village, Lowokwaru District, Malang City and the composition in optimizing sales to produce the maximum housing composition are:

- Descriptive Statistics
This study uses descriptive statistical techniques, in which the factor analysis technique that influences the determination of housing purchase in Tasikmadu Village, Lowokwaru District, Malang City is analyzed with the help of a Likert scale with a scale of five levels or gradations with the type of data is ordinal data. According to Kinnear in Sekaran (2001), this Likert scale is related to statements about a person's attitude towards something, for example agreeing, disagreeing, happy, not happy and good, not good.
- Multiple Linear Regression Analysis
This analysis is used to determine how much influence the independent variables, namely: house price, available facilities, house location, environment and income to the dependent variable, namely housing demand.
- Linear Programming
Linear programming is a group of quantitative analysis techniques that rely on mathematical models or symbolic models as the container. In this study, the strategy of maximizing sales can be recognized and handled when using the simplex method, by looking at the existing form of the equation. The purpose of the Linear program analysis above is to determine the optimum

limit that must be achieved to maximize profits from home sales, so that it can be known how many units. houses that can be built so that the relationship between supply and demand is balanced at the optimum point. The limitations used in this method are land area, production costs, implementation time and market demand.

IV. DATA ANALYSIS AND DISCUSSION

A. Validity and Reliability Test Results

A good questionnaire must be tested for validity and reliability first so that the research results obtained will be good. Sugiyono (2002) states that an instrument that is declared valid and reliable is a valid instrument, meaning that the measuring instrument used to obtain data (measure) is valid. Valid means that the instrument can be used to measure what should be measured. While a reliable instrument means that when used to measure multiple times it will produce the same data. The results of the validity and reliability test can be seen from the cronbach Alpha value, the value of cronbach neglected. Good validity and reliability are closer to 1. According to Sekaran (2006) "Validity and reliability that is less than 0.6 is not good, while 0.7 is acceptable; validity and reliability with Cronbach alpha 0.8 or above is good".

TABLE 1. Test of Instrument Validity and Reliability

Variable	Cronbach Alpha Reliability	Information
House Prices	0,789	Baik
Available Facilities	0,739	Baik
Home Location	0,740	Baik
Environment	0,796	Baik
Income	0,758	Baik

Source: Analysis Results, 2020

From the results of the validity and reliability testing in table 1, it is known that the test results of the variable house prices, available facilities, house location, environment and income are all valid and reliable because they have exceeded the number 0.6 and the average is valid and reliable with Cronbach alpha above. 0.76 is good.

B. Regression Analysis Results

To find out whether the variable House Price (X1), Available Facilities (X2), House Location (X3), Environment (X4) and Income (X5) simultaneously and partially have a significant effect on the determination of housing purchase in Tasikmadu Village.

TABLE 2. Regression Factors on House Prices, Available Facilities, House Location, Environment and Income.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.687	.876		3.435	.000
	Harga_Rumah	.337	.085	.631	5.341	.000
	Fasilitas_Tersedia	.325	.067	.623	4.289	.000
	Lokasi_Perumahan	.242	.043	.484	3.141	.000
	Lingkungan	.274	.059	.538	3.510	.000
	Penghasilan	.261	.056	.530	3.234	.000

Source: Analysis Results, 2020

Based on Table 2 above, the multiple linear regression equation in this study is as follows:

$$Y = 2.687 + 0.337 X1 + 0.325 X2 + 0.242 X3 + 0.274 X4 + 0.261 X5$$

The constant regression coefficient is 2.687, which means that the determination of housing purchase in Tasikmadu Village is influenced by the factors of house prices, available facilities, house location, environment and income of 2.687. While the regression coefficient of several independent variables is positive, meaning that the factor of house prices, available facilities, house location, environment and income, has a positive relationship with the determination of housing purchases in Tasikmadu Village, meaning that it has a unidirectional relationship or in other words the house price factor. , the available facilities, the location of the house, the environment and the income will be followed by a high decision to determine the purchase of housing in Kelurahan Tasikmadu.

C. Simultaneous Test (Test f)

To test the effect of house prices, available facilities, house location, environment and income simultaneously on the determination of housing purchases in Tasikmadu Village, the f statistical test (f test) was used. If the calculated f value > the f table value, then the factor of house price, available facilities, home location, environment and income simultaneously has a positive and significant effect on the determination of housing purchase in Tasikmadu Village. The test results can be seen simultaneously in table 3 as follows:

TABLE 3. Test Results f / Simultaneous Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	224.367	5	56.227	72.522	.000 ^a
	Residual	75.073	94	.764		
	Total	299.440	99			

Source: Analysis Results, 2020

From Table 3, it is obtained the calculated f value of 72.552, with a significance of 0.000, while the F table at the 95% confidence interval or a = 0.05 is 2.70. By comparing the calculated f value with the f table, then f count (72.552) is greater than f table (2.70). Thus the factors of house prices, available facilities, house location, environment and income simultaneously have a positive and significant effect on the determination of housing purchases in Tasikmadu Village.

D. Partial Test (t test)

To test the effect of house price factors, available facility factors, house location factors, environmental factors and income factors on the determination of housing purchases in Tasikmadu Village, the t statistical test (t test) is used. If the t value > t table value, the house price , the facilities available, the location of the house, the environment and the income have a significant effect on the determination of the purchase of housing in Kelurahan Tasikmadu. The results of partial hypothesis testing can be seen in Table 4 below:

TABLE 4. Partial Test Results Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.687	.876		3.435	.000
	Harga_Rumah	.337	.085	.631	5.341	.000
	Fasilitas_Tersedia	.325	.067	.623	4.289	.000
	Lokasi_Perumahan	.242	.043	.484	3.141	.000
	Lingkungan	.274	.059	.538	3.510	.000
	Penghasilan	.261	.056	.530	3.234	.000

Source: Analysis Results, 2020

Judging from Table 4 above, it is obtained the t value of each independent variable and if the t value of each independent variable will be compared with the t table value using the 95% confidence level or $\alpha = 0.05$ then the t table value is 1.984. Thus the results of the t test explain that each factor of house price, available facilities, house location, environment and income has a significant effect on the determination of housing purchase in Tasikmadu Village.

E. Optimization Results

The optimization method used is the simplex method. This simplex method is one of the linear programming models. Linear Program Model is also called model formulation. Linear programming models are used to show a process model in which all problems involve achieving the subject of objectives with a set of constraints such as resource constraints.

In the Linear Program model, there are 2 (two) kinds of functions, namely the objective function and the constraint function. The objective function is a function that describes the goals / objectives in a linear program problem related to the optimal arrangement of resources to obtain maximum profit or minimum cost. The objective function always has one target, namely maximizing or minimizing a value. In general, the value to be optimized is expressed as Z. The constraint / limitation function is a form of mathematically presenting the limits of the available capacity which will be allocated optimally to various activities. The boundary function is also a linear relationship of the decision variables. Boundaries can take the form of limited resources or guidelines.

To find out the optimal number of house types, the calculation is carried out using the simplex method where the calculations are assisted by using the QM for Windows version 3.0 program. This problem can be formulated as follows:

$$\begin{aligned}
 \text{I. Patraland Palace} & : Z_{\max} = 244 X_1 + 255 X_2 \\
 & \quad 98 X_1 + 112 X_2 \leq 11.000 \\
 & \quad 184 X_1 + 221 X_2 \leq 10.000 \\
 & \quad X_1 \leq 96 \\
 & \quad X_2 \leq 120 \\
 & \quad X_1 : 3 X_2 \\
 \text{II Royal Atletik Residence} & : Z_{\max} = 244 X_1 + 267 X_2 \\
 & \quad 72 X_1 + 84 X_2 \leq 15.000 \\
 & \quad 155 X_1 + 172 X_2 \leq 15.000 \\
 & \quad X_1 \leq 96 \\
 & \quad X_2 \leq 120 \\
 & \quad 3 X_1 : X_2
 \end{aligned}$$

From the results of calculations using the QM for Windows version 3.0 program, the result is a decimal value in

determining the number of houses to be built, because it is impossible to build a house in decimal value.

• **Patraland Palace**

Slack variable, which is an additional variable used for an inequality, so that it can change the form of the inequality into an equation. The results of the Patraland Palace Iterations Coefficient are shown in Figure 1 below:

Cj	Basic variables	244 X1	255 X2	0 slack 1	0 slack 2	0 slack 3	0 slack 4	0 artfcl 5	0 surplus	0 quantity
Phase 1 - Iteration 1										
	cj-zj	1	3	0	0	0	0	0	0	-1
0	slack 1	98	112	1	0	0	0	0	0	11,000
0	slack 2	184	221	0	1	0	0	0	0	10,000
0	slack 3	1	0	0	0	1	0	0	0	96
0	slack 4	0	1	0	0	0	1	0	0	120
1	artfcl 5	1	3	0	0	0	0	1	-1	0
Iteration 2										
	cj-zj	0	0	0	0	0	0	0	-1	0
0	slack 1	0	-182	1	0	0	0	-98	98	11,000
0	slack 2	0	-331	0	1	0	0	-184	184	10,000
0	slack 3	0	-3	0	0	1	0	-1	1	96
0	slack 4	0	1	0	0	0	1	0	0	120
0	X1	1	3	0	0	0	0	1	-1	0
Phase 2										
	cj-zj	0	-477	0	0	0	0	-244	244	
0	slack 1	0	-182	1	0	0	0	-98	98	11,000
0	slack 2	0	-331	0	1	0	0	-184	184	10,000
0	slack 3	0	-3	0	0	1	0	-1	1	96
0	slack 4	0	1	0	0	0	1	0	0	120
244	X1	1	3	0	0	0	0	1	-1	0
Iteration 4										
	cj-zj	0	0	0	0	0	0	0	0	0
0	slack 1	0	0	1	0	0	0	0	0	0
0	surplus	0	0	0,0054	0	0	0	-1	1	0
0	slack 3	0	0	0	1	0	0	0	0	0
0	slack 4	0	1	0	0	0	1	0	0	120
244	X1	1	1,2011	0	0,0054	0	0	0	0	0

Figure 1. Patraland Palace Iterations Coefficient
Source: Analysis Results, 2020

Figure 2 is the final result based on the results of calculations using the QM for Windows version 3.0 program made by rounding off the decimal form of the final iterations of the coefficient calculations.

	X1	X2		RHS	Dual
Maximize	244	255			
Constraint 1	98	112	<=	11000	0
Constraint 2	184	221	<=	10000	1.3261
Constraint 3	1	0	<=	96	0
Constraint 4	0	1	<=	120	0
Constraint 5	1	3	>=	0	0
Solution->	54.3478	0		13260.87	

Figure 2. Linear Programming Result of Patraland Palace
Source: Analysis Results, 2020

Based on Figure 2, it can be concluded that in order to get the maximum benefit, the optimal composition of the type of houses built is 54 units of type 45/98 (A), 0 units of type 50/112 (B), with benefits of Rp. 13,260,870,000, -

• **Royal Athletics Residence**

Slack variable, which is an additional variable used for an inequality, so that it can change the form of the inequality into an equation. The results of the Royal Athletic Residence Coefficient Iterations are shown in Figure 3 below:

Cj	Basic variables	244 X1	267 X2	slack 1	slack 2	slack 3	slack 4	artfcl 5	surplus	Quantity
	Cj-zj	3	1	0	0	0	0	0	-1	
0	slack 1	72	84	1	0	0	0	0	0	15,000
0	slack 2	155	172	0	1	0	0	0	0	15,000
0	slack 3	1	0	0	0	1	0	0	0	96
0	slack 4	0	1	0	0	0	1	0	0	120
1	artfcl 5	3	1	0	0	0	0	1	-1	0
Iteration 2										
	Cj-zj	0	0	0	0	0	0	-1	0	
0	slack 1	0	60	1	0	0	0	-24	24	15,000
0	slack 2	0	0	0	1	0	0	0	0	15,000
0	slack 3	0	0	0	0	1	0	0.3333	0	96
0	slack 4	0	1	0	0	0	1	0	0	120
0	X1	1	0.3333	0	0	0	0	0.3333	0	0
Phase 2										
	Cj-zj	0	0	0	0	0	0	0	0	
0	slack 1	0	60	1	0	0	0	-24	24	15,000
0	slack 2	0	0	0	1	0	0	0	0	15,000
0	slack 3	0	0	0	0	1	0	0.3333	0	96
0	slack 4	0	1	0	0	0	1	0	0	120
244	X1	1	0.3333	0	0	0	0	0.3333	0	0
Iteration 4										
	Cj-zj	-557.0	0	0	0	0	0	-267.0	267.0	
0	slack 1	-180	0	1	0	0	0	-84	84	15,000
0	slack 2	-361.0	0	0	1	0	0	-172.0	172.0	15,000
0	slack 3	1.0	0	0	0	1	0	0	0	96
0	slack 4	-3	0	0	0	0	1	-1	1	120
267	X2	3	1	0	0	0	0	1	-1	0
Iteration 5										
	Cj-zj	3.3895	0	0	0	0	0	0.0	0	
0	slack 1	0	0	1	0	0	0	0	0	
0	surplus	0	0	0.0058	0	0	0	-1	1	
0	slack 3	1.0	0	0	0	1	0	0	0	96
0	slack 4	0	0	0	0	0	1	0	0	
267	X2	0.9012	1	0	0.0058	0	0	0	0	
Iteration 6										
	Cj-zj	0	0	0	0	0	0	0.0	0	
0	slack 1	0	0	1	3.6977	0	0	0	0	
0	surplus	0	0	0.0058	2.0968	0	-1	1		
244	X1	1	0	0	1.0	0	0	0	0	96.0
0	slack 4	0	0	0	0.9012	1	0	0	0	
267	X2	0	1	0	0.0058	0	0	0	0.6977	

Figure 3. Iterations of Royal Athletic Residence Coefficients
Source: Analysis Results, 2020

Figure 4 is the final result based on the results of calculations using the QM for Windows version 3.0 program made by rounding off the decimal form of the final calculation of the iterations coefficients.

	X1	X2		RHS	Dual
Maximize	244	267			
Constraint 1	72	84	<=	15000	0
Constraint 2	155	172	<=	15000	1.5523
Constraint 3	1	0	<=	96	3.3895
Constraint 4	0	1	<=	120	0
Constraint 5	3	1	>=	0	0
Solution->	96	6977		23610.28	

Figure 4. Linear Programing Result of Royal Athletic Residence
Source: Analysis Results, 2020

Based on Figure 4, it can be concluded that in order to get maximum benefits, the optimal composition of the type of house built is 96 units of type 45/72 (A), 0 units of type 50/84 (B), with the benefits of Rp. 23,610,280,000, -

V. CONCLUSION

Based on the results of research, analysis and discussion, the following conclusions are obtained:

A. The factors that influence the determination of housing purchase are the price of the house, the facilities available, the location of the house, the environment and income. This is based on the calculation results obtained by the value of F count (72.552) > F table value (2.70) so that both

simultaneously and partially the factors mentioned above affect the determination of housing purchase in Tasikmadu Village, Lowokwaru District, Malang City.

B. The most dominant factors in determining housing purchase as a basis for housing demand and development are price factors, available facilities and environmental factors. This is based on the calculation results obtained which show that the calculated value of the price factor (5.341) > the value of t table (1.984) and t count of available facilities (4.289) > t table (1.984), and t count of environmental factors (3.510) > t Table (1,984) means that these three factors are the most dominant in influencing the determination of housing purchase in Tasikmadu Village, Lowokwaru District, Malang City.

C. Total composition in optimizing housing development projects in order to generate maximum profits in line with market demand, namely by building houses as follows:

- Patraland Palace: 54 units of type 45/98 (A), 0 units of type 50/112 (B), with a profit of Rp. 13,260,870,000, -
- Royal Atletik Residence: houses for type 45/72 (A) as many as 96 units, house for type 50/84 (B) as many as 0 units, with a profit of Rp. 23,610,280,000, -

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