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Effectiveness Analysis of Travel Time For Mode Alternatife Trnasportation Becak Motor

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ABSTRACT
The purpose of this research is to obtain a model of user behavior modes of transportation in the city of Semarang in choosing the two modes of transportation, namely Modes A (rickshaw) and Mode B (motorized rickshaws), using the approach of Logit Binomial Model with three variables (cost, time and distance) with method stated preference. From the data processing, which consists of travel time, travel expenses, the distance traveled and the proportion of modal choice between Modes A and Mode B based on the cost of travel, travel time and travel distance, is analyzed with regression analysis, correlation, analysis of variance, multiple linear regression, linear interpolation.
In this study of three variables, namely the analysis of costs, time and distance, researchers modeling the behavior of users rickshaws and motorized rickshaws gradually. The first researchers to model the Binomial logit model with two variables: cost and time, then the modeled user behavior mode again with the same analytical model with variable costs and the distance. Both models were then compared with regards variable costs in the first model as a reference to obtain the magnitude of the difference in cost, the time difference and the difference in distance as well.
From the analysis of representative models obtained by the magnitude of the difference in cost (CA-CB) = Rp. 600.00, the time difference (T A-TB) = 28 minutes and the difference in distance (LA-LB) = 2800 meters. The value of these three variables indicate user behavior modes of transport will start selecting a motorized rickshaw on the difference in cost, the time difference and the difference in the distance. Comparison of the two models use the value of R2 = 0546 and 0772. The coefficient of determination indicates that there are other factors that influence the selection of this mode, in addition to the cost factor, travel time and mileage. So the many factors that affect the passengers in the response mode selected, it is expected that the resulting model of modal choice the better.
Keywords: Becak Motor, time efektifity

I. NTRODUCTION

1.1. Background

Rickshaw is a means perangkutan very popular in Indonesia. This vehicle is a modification of the two-wheeled pedal bicycle. Rickshaw transport development in Indonesia is different from one region to another. The development of transport rickshaws today is there are shuttles that provide motor tricycles. It is seen in a suburban area (Suburban). For the Makassar city, there are motorized tricycles around the area Biringkanaya , Tamalanrea , Tallo ,and so on. Seen from the point of view of topography, these areas have varying heights, so up and down the road alignment and berbelokbelok. Service area (coverage area) motor tricycles obviously bigger than the paddle rickshaws.

Motor tricycles growth showed an increase. Even thrive in the district, like Biringkanaya , Tamalanrea , Tallo and so on, even in the district. This has become one of the considerations the need for studies on tricycles.

With the emergence of these motorized tricycles, raises several questions, which is the identification of problems in this study. Is a motorized rickshaw, a new problem in urban traffic? Is it necessary traffic arrangements motorized rickshaw? Whether its existence is acceptable? How legality? But in this study, is not intended to answer all the questions

above, given the limited human resources, money and time. Research

This is limited only to analyze the behavior of this transport service users. To the extent the cost difference, time difference and the difference between what distance rickshaw service users to switch from a motorized rickshaw pedicab? And this study, expected to be the initial milestone in resolve problems concerning the existence of a rickshaw. Because when viewed from the standpoint of tourism, rickshaws have an existence and potential in the development in the field of tourism.

1.2 Objectives

The purpose of this study was to observe the existence of a motorized rickshaw from the point of view of traffic. Given the growing and evolving presence of the creativity of society, the demand for motorized rickshaw transportation needs be compared with other public transport (tricycles pedal) by observing the behavior of service users public transportation taking into account several factors: the cost factor, the factor of time and distance factors. Observations conducted by Stated Preference method, with the approach of Logit Binomial Model

Thus there will be established a transportation mode choice model with variable cost, time and distance. Expected from this model can be seen the level of demand for transport services motorized rickshaw.

1.3 Model Selection Mode

1.3.1 Logit Binomial Model

This study will observe the election chances of modes with only involves two alternative modes, namely choosing betor modes (motorized rickshaw) and tricycles. Thus, the logit model can be presented in the form of Logit Binomial Model, formulations can be presented in the following forms:

$$p(B) = \frac{e^{V(B)}}{e^{V(B)} + e^{V(A)}} \qquad (1)$$

dimana :

p(A) = Probailitas choose modes tricycles
p(A) = Probailitas choose modes of motorized rickshaws
V(A) = Deterministic function of an alternative mode of tricycles
V(B) = Deterministic function of an alternative mode of motorized rickshaws

1.4 Stated Preference Data Collection

Methods This method is to collect information on the desire of people to the various options . Can also be used to estimate the level of the needs of passengers against a new transport . The basic principle of the method Stated Preference is collecting information from respondents with a wide choice of hypothetical situations . The definition of the situation is the attribute utility that will be used as observation variables , namely : cost, distance and time

II. ANALYSIS OF LAND DATA PENGO

2.1.Identifikasi Moda Pedicab Pedicab and Motorized

Rickshaws in the city of Makassar is growing very rapidly in almost all districts , only in areas with hilly topography there are no rickshaws mode . As with the motorized tricycles , this mode - area thrive in the area with a variety of conditions . That's because the characteristics of the mode of motorized rickshaws that can operate in areas with flat topography and up and down . Here is a recapitulation of population data rickshaws and motorized rickshaws in the city of Makassar:

Table 1 Population rickshaw and rickshaw motto r in Makassar

NO	Sub District	Population	
		Rickshaw 1	Motorized Rickshaw
1	Biringkanaya	558	-
2	Tamalanrea	451	-
3	Tallo	1158	-
4	Bontoala	578	-
5	Panakukkang	587	-
6	Mariso	127	-
7	Manggala	75	-
8	Tamalate	-	14
9	Ujung Pandang	-	-
10	Rappocini	6	6
11	Makassar	**66**	-
12	Ujung Pandang	420	1
13	Ujung Tanah	-	-
14	Wajo	614	8
Number		**5203**	**29**

2.2 Characteristics Selection

Mode One subdistrict (Tamalanrea)

2.2.1 Difference Difference Cost And Time

$$In\frac{P(B)}{P(A)} = 2.207546 - 0.0017028\ (C_A - C_B) - 0.029228\ (T_a - T_B)$$

……(5.24)

Then observed probability passengers choose bentor or P (B) based on the model obtained . Need a little note here that the variable costs and time have known the value of equality , so it can be seen only with one variable . The result can be seen in the image below:

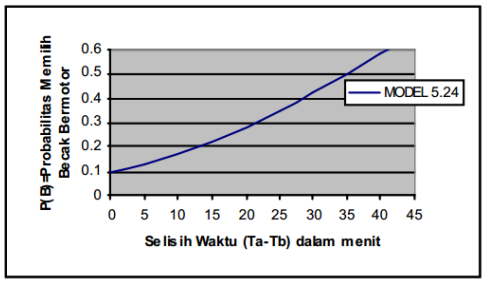

Figure 1 Relationship Chart Selection betor probability (P (B)) with the change in the difference in time (TA - TB) in District Tamalanrea.

From the picture above , it appears that the greater the difference in cost with a motorized rickshaw pedicab rickshaw then the probability of selecting the larger motor .

2.2.2 Difference Difference Cost And Distance

$$In\frac{P(A)}{P(A)} = 1.60549 - 0.00103\,(C_A - C_B) + 0.000195\,(L_A - L_{B)}$$

……(5.24)

Then observed probability passengers choose bentor or P (B) based on the model obtained . Need a little note here that the variable costs and distance have known the value of equality , so it can be seen only with one variable . The result can be seen in the image below:

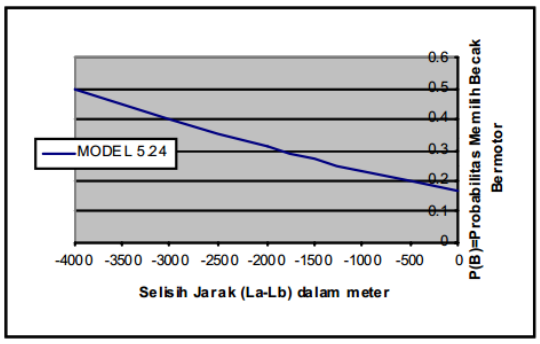

Figure 2 Graph Relations betor Selection Probability (P (B)) for the Variable Cost

and distance with changes in foreign Distance (Lamar LB) in District Tamalanrea

From the picture above , it appears that the farther the distance to the motorized rickshaw pedicab { (La - Lb) << 0 } then the probability of selecting the larger motorized tricycles . 2.3 Characteristics 2.3.1 Selection Modes Whole Semarang Difference Difference Cost And Time

$$In\frac{P(B)}{P(A)} = 2.4391852 - 0.0018143\,(C_A - C_B) - 0.0517182\,(T_A - T_B)$$

……(5.30)

Then observed probability passengers choose bentor or P (B) based on the model obtained . Need a little note here that the variable costs and time have known the value of equality , so it can be seen only with one variable . The result can be seen in the image below

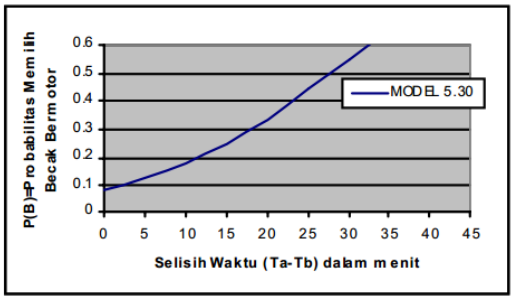

Figure 3 Relationship Chart Selection Probability Bentor (P (B)) with changes
The time difference (TA - TB) in Makassar

From the picture above , it appears that the greater the difference in cost with a motorized rickshaw pedicab rickshaw then the probability of selecting the larger motor .

2.3.2 Difference Difference Cost And Distance

$$In\frac{P(A)}{P(B)} = 1.6685 - 0.000105\,(C_A - C_B) + 0.000363\,(L_A - L_B)$$

……..(5.30)

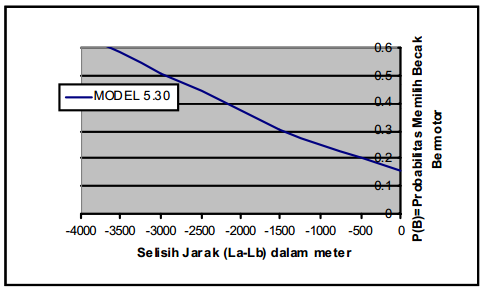

Figure 4 Selection Probability graph betor Relations (P (B)) for the Variable Cost and distance with changes in foreign Distance (Lamar LB) in Makassar .

From the picture above , it appears that the greater the difference in distance with a motorized rickshaw pedicab rickshaw then the probability of selecting the larger motor .

2.4 Assessing Model

2.4.1 Summary of Statistical Analysis

To view the entire output of statistical analysis , the following table are presented the results of statistical analysis outputs for all models . This is done to examine which model best represents the actual conditions . Most models represent actual conditions r2 is the largest and standard error the smallest.

Var . free	Coefficient	Value	Var . Free	Coefficient	Value	Var . Free	Coefficient	Value
charge	constant	1.9853	time	constant	2.8021	cost and time	constant	2.2072546
	paramcter X1	-0.0019		paramcter X1	-0.1234		paramcter X1	-0.0017029
	R square (R2)	0.9971		R square (R2)	0.9874		parameter X2	-0.0292286
							stand. Error	0.5887612
							R square (R2)	0.7719937

Table 2 Results of Statistical Analysis Output Mode Selection betor Gajah District of Mungkur For Difference Cost and Time

Var . Free	Coefficient	Value	Standard Error	T-Test	P-Value
Charge	Intersept	2.097908153	0.054155669	38.73847723	1.97651E-08
	Parameter x1	-0.00192043	4.28977E-05	-44.76769455	8.31969E-09
Model 5.6	R Square	0.997015143			
	Standard Error	0.069502189			
	F-Test	2004.146475			
Distance	Intersept	2.7095653	0.119162865	22.73833639	3.05881E-06
	Parameter x1	0.00116346	5.32913E-05	21.83210078	3.74208E-06
Model 5.15	R Square	0.989618816			
	Standard Error	0.140995403			
	F-Test	476.6406243			
the cost and distance	Intersept	1.605497623	0.29196837	5.498875186	1.18217E-05
	Parameter x1	-0.001034704	0.000215526	-4.800829515	6.89112E-05
	Parameter x2	0.00019513	0.000135148	1.44382393	0.161716553
MODEL 5.24	R Square	0.614450021			
	Standard Error	0.806216199			
	F-Test	19.12436945			

Table 4 Results Output Mode Selection Statistical Analysis betor whole Makassar For Difference Cost and time

Var . Free	Coefficient	Value	Var . Free	Coefficient	Volue	Var . Free	Coefficient	Volue
Charge	constant	-2.7106	Time	constant	-2.9146	cost and	constant	-2.4391769
	paramcter X1	0.1617		paramcter X1	0.1617	time	paramcter X1	0.0018144
	R square (R2)	0.9941		R square (R2)	0.9966		paramcter X2	0.0517144
MODEL 5.28			**MODEL 5.29**			**MODEL 5.30**	stand. Error	0.8270204
							R square (R2)	0.7079545

Table 5 Results Output Mode Selection Statistical Analysis betor whole Makassar For Difference Cost and distance

Var free	Coefficient	Volue	Standard Error	T-Test	P-Value
Charge	Intersept	2.761227049	0.142458835	19.38263108	1.22113E-06
	Parameter x1	-0.002551325	0.000112844	-22.60926484	4.90095E-07
Model 5.28	R Square	0.988398598			
	Standard Error	0.18282852			
	F-Test	511.1788568			
Distance	Intersept	2.866575215	0.109346885	26.2154263	1.50929E-06
	Parameter x1	0.001502341	4.89014E-05	30.72183182	6.85726E-07
Model 5.29	R Square	0.994730357			
	Standard Error	0.12938098			
	F-Test	943.8309501			
the cost and distance	Intersept	1.668522139	0.391902061	4.257497738	0.000274383
	Parameter x1	-0.0010525	0.000289296	-3.638148734	0.001307331
	Parameter x2	0.000363066	0.000181406	2.001405005	0.056778517
MODEL 5.30	R Square	0.546494812			
	Standard Error	1.08216445			
	F-Test	14.46055724			

2.4.2 Sensitivity

The level of sensitivity of the model , indicated by a change in the probability P (B) is obtained at each stage of the counting . Then i is searching for a motorized rickshaw election probability value is P (B) with the change in the difference in costs .

table 6 Sensitivity Logit Binomial Model Selection betor Tamalanrea

Charge		Distance		The distance and cost	
(a)	-0.00192043	(a)	0.00116346	(a1)	0.001034704
(b)	2.097908153	(b)	2.709565	(a2)	0.00019513
Δc	100	ΔL	-500	(b)	-1.605497623
				Δc (Rp)	100
				ΔL (meter)	-500
Ca-Cb	P(B)	La-Lb	P(B)	Ca-Cb	La-Lb	P(B)
0	0.109925073	0	0.062896841	0	0	0.16789796
100	0.130102857	-500	0.107039684	100	-500	0.197788067
200	0.153346352	-1000	0.176333655	200	-1000	0.231518835
300	0.179883712	-1500	0.276591451	300	-1500	0.269072601
400	0.209875089	-2000	0.405770545	400	-2000	0.310258519
500	0.243382885	-2500	0.549457061	500	-2500	0.35468945
600	0.280342279	-3000	0.685342113	600	-3000	0.40177682
700	0.320536493	-3500	0.795497435	700	-3500	0.450748919
800	0.363582086	-4000	0.874169886	800	-4000	0.500694176
900	0.408929311	-4500	0.925414593	900	-4500	0.550625584
1000	0.455880973	-5000	0.95682058	1000	-5000	0.599557224
1100	0.503630128	-5500	0.975354504	1100	-5500	0.646580614
1200	0.551313158	-6000	0.986049095	1200	-6000	0.690928647
1300	0.598071198	-6500	0.992140305	1300	-6500	0.732018201
1400	0.643110852	-7000	0.995583896	1400	-7000	0.769467743

Charge		Distance		The distance and cost	
(a)	-0.0019	(a)	-0.1234	(a1)	-0.001702897
(b)	1.9853	(b)	2.8021	(a2)	-0.029228642
Δc	100	Δt	5	(b)	2.207254599
				Δc (Rp)	100
				Δt (menit)	5
Cb-Ca	P(B)	Tb-Ta	P(B)	Cb-Ca	Tb-Ta	P(B)
0	0.121399651	0	0.057673731	0	0	0.099703851
100	0.143094562	5	0.101704049	100	5	0.131809654
200	0.167925487	10	0.173171458	200	10	0.172275595
300	0.19607931	15	0.279247394	300	15	0.221988208
400	0.227661832	20	0.41749127	400	20	0.281173102
500	0.262669252	25	0.570045494	500	25	0.349057936
600	0.300962087	30	0.710364314	600	30	0.423672486
700	0.342246177	35	0.819397582	700	35	0.501937982
800	0.386065737	40	0.893536853	800	40	0.580108622
900	0.431812511	45	0.939488719	900	45	0.654456518
1000	0.478752873	50	0.966353586	1000	50	0.721949814
1100	0.526071463	55	0.981525936	1100	55	0.780677923
1200	0.572926367	60	0.989927851	1200	60	0.829923995
1300	0.618508179	65	0.994529911	1300	65	0.869954446
1400	0.662094325	70	0.997035543	1400	70	0.901679217

Table 7. Sensitivity Logit Binomial Model Selection betor Makassar City

Charge		Distance		The distance and cost	
(a)	-0.00255132	(a)	0.001502341	(a1)	-0.001052
(b)	2.761227049	(b)	2.866575215	(a2)	0.000363066
Δc	100	ΔL	-500	(b)	1.668522139
				Δc (Rp)	100
				ΔL (meter)	-500
Ca-Cb	P(B)	La-Lb	P(B)	Ca-Cb	La-Lb	P(B)
0	0.059928625	0	0.054278073	0	0	0.159301981
100	0.075967085	-500	0.103229683	100	-500	0.201407165
200	0.095860158	-1000	0.204228693	200	-1000	0.25134138
300	0.12028441	-1500	0.351787102	300	-1500	0.308806209
400	0.149899985	-2000	0.534367072	400	-2000	0.372899441
500	0.185271637	-2500	0.708180553	500	-2500	0.441792625
600	0.226763428	-3000	0.836913803	600	-3000	0.513001631
700	0.274417568	-3500	0.915623831	700	-3500	0.583686742
800	0.327840202	-4000	0.958241589	800	-4000	0.651090177
900	0.386128398	-4500	0.979808144	900	-4500	0.712947533
1000	0.44787461	-5000	0.990348617	1000	-5000	0.767750213
1100	0.511271114	-5500	0.995412556	1100	-5500	0.814807973
1200	0.574307097	-6000	0.997825355	1200	-6000	0.854142433
1300	0.635016777	-6500	0.998970437	1300	-6500	0.886288254
1400	0.691715952	-7000	0.999512859	1400	-7000	0.912078665

Charge		Distance		The distance and cost	
(a)	-0.1617	(a)	-0.161	(a1)	-0.001814306
(b)	2.7106	(b)	2.914	(a2)	-0.051718232
Δc	100	Δt	5	(b)	2.439185209
				Δc (Rp)	100
				Δt (menit)	5
Cb-Ca	P(B)	Tb-Ta	P(B)	Cb-Ca	Tb-Ta	P(B)
0	0.062836069	0	0.05187219	0	0	0.080783988
100	0.079212745	5	0.10912855	100	5	0.119933159
200	0.099404874	10	0.21527324	200	10	0.17443595
300	0.12405074	15	0.38045732	300	15	0.246808812
400	0.153763868	20	0.57894046	400	20	0.336925389
500	0.189057925	25	0.75481476	500	25	0.440693765
600	0.230248953	30	0.87330379	600	30	0.549916212
700	0.277345171	35	0.93914776	700	35	0.654529918
800	0.32994547	40	0.97187469	800	40	0.746056653
900	0.387176918	45	0.98723909	900	45	0.820003238
1000	0.447702628	50	0.99426047	1000	50	0.879960088
1100	0.509818682	55	0.99742841	1100	55	0.91634775
1200	0.571633015	60	0.99884982	1200	60	0.944402103
1300	0.631289803	65	0.99945974	1300	65	0.96342452
1400	0.687184929	70	0.99970357	1400	70	0.976101826

Study Results 2.4.3 Representative Models

To facilitate reading , the model r representatif (5:24 and 5:30) is converted in the form of modal choice models in a motorized rickshaw or P (B) (equation 5.12) . M aka equation becomes as follows :

MODEL D ENGAN VARIABLE COSTS AN D TIME

Model 5:24

$$P(B) = \frac{1}{1+e^{(2.2075460.0017028(C_A - C_B) - 0.029228(T_A - T_B))}}$$

Model 5.30

$$P(B) = \frac{1}{1+e^{(2.4391852 - 0.0018143(C_A - C_B) - 0.0517182(T_A - T_B))}}$$

MODEL D ENGAN VARIABLE COSTS AN D THE DISTANCE

Model 5:24

$$P(B) = \frac{1}{1+e^{(-1.6054976 + 0.0010347(C_A - C_B) + 0.0001951(L_A - L_B))}}$$

Model 5.30

$$P(B) = \frac{1}{1+e^{(-1.668522 + 0.0010525(C_A - C_B) + 0.0003630(L_A - L_B))}}$$

Comparative Study 2.4.4 Representative Models

To get the value of the difference between the variable cost, variable time and ak jar variables simultaneously , two types of models that have been obtained , ie a model with a variable cost- and time models with var iabel - distance costs , then combined by making the variable cost on - time cost model as a reference. Here is the recapitulation of the differences of the variables for each model of representative :

MODEL WITH VARIABLE COST – TIME

- For the condition of the districts ; Tamalanrea districts (Model 5:24) the value of P (B) = 0.5 the difference in cost (Ca - Cb) = 697.5238 Rupiah w ime difference (Ta - Tb) = 34.8762 minutes
- To condition the whole Makassar (Model 5:30) the value of P (B) = 0.5 the difference in cost (Ca - Cb) = 554.2986 Rupiah w ime difference (Ta - Tb) = 27.7149 minutes

MODEL WITH VARIABLE COST - DISTANCE

- For the condition of the districts ; Tamalanrea districts (Model 5:24) the value of P (B) = 0.5 the difference in cost (Ca - Cb) = 798.6101 Rupiah the difference in distance (La - Lb) = 3993.0506 meters
- To condition the whole Makassar (Model 5:30) the value of P (B) = 0.5 the difference in cost (

Ca - Cb) = 581.7416 Rupiah ak jar difference (the Old Lb) = 2908.7080 meters

With linear interpolation method of the above models are combined to obtain the value of a difference of three variables simultaneously secar . Here are the combined result of two types of models :

Representative Model District of Tamalanrea (Model 5:24)

- Cost Difference (Ca - Cb) = 697.5238 ≈ 700 rupiah
- The time difference (Ta - Tb) = 34.8762 ≈ 35 minutes
- Difference in distance (La - Lb) = 3487.6192 ≈ 3500 meters

Model Representative entire Makassar (Model 5:30)

- Cost Difference (Ca - Cb) = 554.2986 ≈ 600 rupiah

The time difference (Ta - Tb) = 27.7149 ≈ 28 minutes

- Difference in distance (La - Lb) = 2771.4929 ≈ 2800 meters Representative District of Tamalanrea Model (Model 5:24)
- Cost Difference (Ca - Cb) = 697.5238 ≈ 700 rupiah
- The time difference (Ta - Tb) = 34.8762 ≈ 35 minute
- Difference in distance (La - Lb) = 3487.6192 ≈ 3500 meters

Model Representative entire Makassar (Model 5:30)

- •Cost Difference (Ca - Cb) = 554.2986 ≈ 600 rupiah
- The time difference (Ta - Tb) = 27.7149 ≈ 28 minutes
- Difference in distance (La - Lb) = 2771.4929 ≈ 2800 meters

CONCLUSION

From the analysis , observation and discussion in the previous chapter to the topic of the study , some conclusions can be obtained as follows :

1. That epresentatif r model is a model with a binomial logit using two independent variables , namely the cost - distance and charge - time with r2 the largest and the smallest standard error .

MODEL D ENGAN VARIABLE COSTS AN D TIME

Model 5:24 (the Model District of Gajah Mungkur)

$$P(B) = \frac{1}{1+e^{(2.2075460.0017028(C_A-C_B)-0.029228(T_A-T_B))}}$$

5:30 Model (the Model Whole Semarang)

$$P(B) = \frac{1}{1+e^{(2.4391852-0.0018143(C_A-C_B)-0.0517182(T_A-T_B))}}$$

MODEL D ENGAN VARIABLE COSTS AN D THE DISTANCE

Model 5:24 (the Model District of Tamalanrea)

$$P(B) = \frac{1}{1+e^{(-1.6054976+0.0010347(C_A-C_B)+0.0001951(L_A-L_B))}}$$

5:30 Model (the Model Whole Makassar)

$$P(B) = \frac{1}{1+e^{(-1.668522+0.0010525(C_A-C_B)+0.0003630(L_A-L_B))}}$$

2. From a comparative study with the results of previous studies, with reference to the difference in cost in previous studies, we can conclude voting behavior modes of motor tricycles and pedicabs as ber ber participate.
   - For the condition of every district in the city of Makassar .
     people will begin to shift to using a motorized rickshaw on the difference costs (Ca-Cb) = Rp. 700,00, the time difference (Ta-Tb) = 35 minutes, the difference in distance (Lamar Lb) = 3500 meters
     This mode choice behavior, occurs in the area topography relative variety shows great difference values. This shows that the in the area of people still tend to use rickshaws, although transportation fares are relatively expensive, because the range of services has many obstacles. In addition, users of transport services in the region tricycles The economy has a relatively high level.
   - To condition the whole City of Makassar
     People will begin to wish to use a motorized rickshaw on the difference in the cost of Rp. 600.00, a difference of 28 minutes, 2800 meters difference ak jar.
3. The comparative study of the use value of r2 = 0.546 and r2 = 0772. Value The coefficient of determination, shows that there are factors Another influence on the selection of this mode, in addition to the cost factor, time the travel and mileage . These factors include factor conditions i dar topography of an area . Areas with topography up and down , people opt to use a motorized rickshaw , although rates transportation is relatively expensive . So the more factors affect passengers in response to the selected mode , it is expected that the model The resulting modal choice the better .

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