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Linear and Logarithmic Models of Monthly Incomefor Food and Transportation Budgets

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Abstract:
Background: Purpose of The Study*: to find out the correlation and estimation of food and transportation budgets based on monthly income.*
Materials and Methods: *The quantitative methodology in this study used correlation, partial correlation and curve estimation analysis methods. Which means comparing between variable X (income) with variable Y, Y_1 (Food Budget) and Y_2 (Transportation Budget). The data were collected from 100 respondents who are workers with monthly income, regardless their marital status and ages. All data is processed by using SPSS V.21.*
Results: *The correlation results in this study show a greater correlation between the income and food budget than income and transportation budget. Partial correlation with the control variable shows the same value of correlation between income and the two variables, food budget and transportation budget. Using the estimation curve as linear model, the food budget has positive value related to income, while logarithmic model shows the negative estimation between monthly income and food budget. The estimation curve of the transportation budget show the negative estimation either linear or logarithmic models.*
KeyWord : *Income, budget, correlation, estimation*

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I. Introduction

Indonesia is one of the largest countries in Southeast Asia and known as a country that has a very large population of 371,000,066 in 2020. However, the income of working people in Indonesia are set based on minimum wage rates by the government. Individuals will use the income to fulfil their needs and be required to divide it into several budgets to meet their daily needs. Thus, the daily economic activity should be made under right decision by tailoring the expenditures and income[1]. Furthermore, to be able to make best decision, individuals need the economic literary in making financial decision. Basically, human needs everything in their life, and tend to fulfil all their wants. The workers with various level of income also need to spend their income for many products to support their activities, such as food and transportation. However, the income level is a constraint for fulfilling all needs, thus individuals should set budgets in order to afford all needs based on the existed resources.

The need for food related to eating habits and its trend shows the more varied diet[2]. Although food is basic need for human beings, but fashion foods are growing rapidly of which some people worry the obesity and other health issues. Individuals consume foods based on their real needs and also preferences. Needs are all things that humans need to sustain life and to obtain welfare and comfort. In addition to needs, a budget is also very necessary in meeting the needs of a person or individual because with the budget, someone's finances will be used according to the desired needs. Food is one of basic physiological need which requires individuals to fulfil it, if not, individuals experience anxiety and stress[3].

The budget itself means a process that is arranged systematically, which includes all company activities that are expressed in monetary units for a certain period to come. A budget is viewed as a structure mechanism in spending while shopping[4]. Each individual will certainly budget some of the income in order to meet their daily needs to buy the goods or services they need. This study aims to examine the simple and partial correlations along with the estimation in linear and logarithm models of workers' monthly income and their monthly budgets on food and transportation.

II. Literature Review

This study focuses on issue of personal budgeting based on personal income. Personal budgeting explains the practices to group the expenditures into some spending limits[5]. Effective budgeting and budgetary control is an aspect of financial management aimed at ensuring effective planning for and use of financial

resource to achieve service delivery targets. With the budget, a clear statement of intent can be provided, often more accurate than the policies or plans on, either for individuals or institution even for the country development issues.When money in individual's budget for a particular product category was scarce, consumers were less likely to buy goods in specific category[6]. Discussing personal budget cannot be separated from financial planning of an individual which allow an individual to understand and analyze his/her current situation and take some decision on their financial goals and opportunities[7]. Theoretically, a budget is defined as expression of plans, goals and objectives in given period and provide the control over the changing situations to solve and anticipate problems before occurring[8].

The budgets set by the individuals will be based on income which is disposable for consumption and sometimes the budget has constraints that impact individuals to response to every stimuli differently[9]. The importance of budget information is to understand the constraints to anticipate the outcome changes. There is a very few of studies that specifically discuss the food budget for personal or households. However, the budgeting issue is able to be implemented in personal case. Budgeting on transportation is also required once the individuals have activities outside of the house for their mobility. The expenditure for transportation of an individual is related to consumption pattern and consumption categories[10].

The economic motives arise when an individual has desire to able to fulfil their needs in daily basis. Especially when the industrial products are offered massively in the market places. As budgeting relates to financial decisions and literacy, the individuals need to make good financial decision and control their resources[11]. Furthermore, making decision needs the autonomy, competence and all the awareness of situation. In theory, individuals put the basic needs as the priority in fulfilling needs. Maslow's theory started with physiological needs including foods, as primary needs, while transportation is considered as the secondary needs.

In order to be able to set the budget for food and transportation, individuals needs to access the personal income. Personal income has relationship with the hierarchy within firms and the influence of the hierarchy is stronger than any other factors[12]. Personal income is considered as disposable income and reduced from personal income tax[13]. Personal income is often varied based on the wage income earning class into several classes or wage income groups among the workers[14]. Simply put the budget constraints limits consumers behavior by forcing consumers to choose a combination of affordable goods. The budget set determines the combination of goods and what can reach consumers, consumer spending on an item is added its expenditure is not exceeds consumers income.

III. Methodology

This study measures the partial correlation between variable X (Income) and Y_1 (Food budget) and Y_2 (Transportation Budget). Partial correlation consists of two variables as controlling and controlled variables. In this study, controlling variable is income (X) and controlled variables. The data used is 100 workers regardless their marital status, job position and ages. The respondents who considered as samples were taken purposively and asked to fill out the questionnaires indicated their monthly income and budgets for food and transportation. Once the correlation is found, the analysis was then proceed to the linear and logarithm estimation. The relationship among variables well represent the following conceptual framework (Figure no 1).

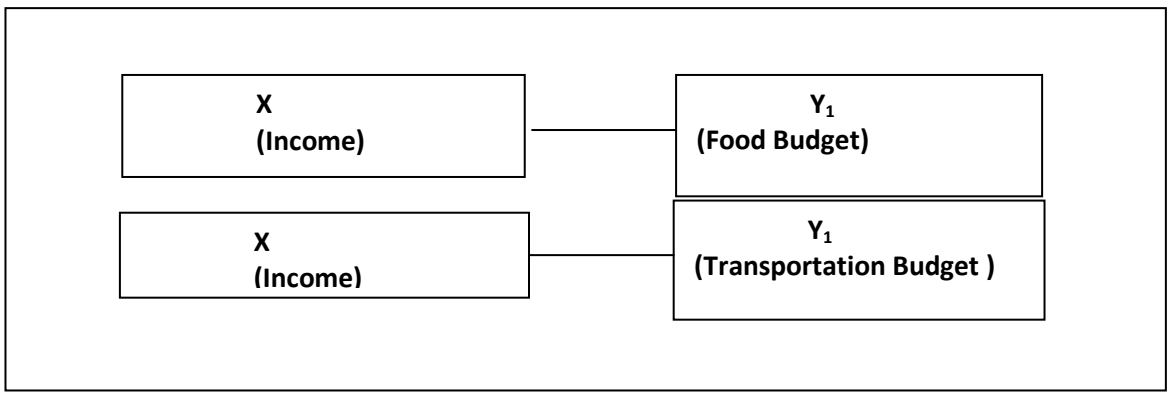

Figure no 1 : Conceptual Framework

The above framework illustrates Y_1(food budget)and Y_2(transportation budget) have correlation with X(income).The correlation analysis can be used to find out the correlation between food budget and transportation budget with income. Correlation analysis is a method of statistical evaluation of the strength of a relationship between two numerically measurable continous variables. Correlation is a statistical analysis

technique used to find relationships between two variables that are quantitative. Two variables are said to be correlated if changes in one variable are followed by changes to other variables regularly in the same direction (positive) or opposite (negative). Correlation coefficient can be interpreted as follows:
0.00-0.199 = very low
0.20-0.399 = low
0.40-0.599 = moderate
0.60-0.799 = strong
0.80-1.000 = very strong

A simple correlation analysis which is used by most of social science studies, determines the strength of a relationship between two variables or data set[15] which is indicated by coefficient of correlation (R or r)[16]. The value of "R", numerically is usually determined by a decimal value under a certain predefined range (depending on the algorithm). Based on the value of the coefficient in the given range, its strength and direction can be determined. The concept of correlation was first proposed by Sir Francis Galton in 1894, which was further mathematically described by Karl Pearson[17]. Correlation is meant for exploring the degree of relationship between two variables in consideration. This paper primarily considers the applications of Pearson's Simple Linear Correlation in exploring the relationship between variables.

IV. Analysis and Discussion

Being processed by SPSS V.21, this section shows how the data collected from respondents are treated using correlation, partial correlation, linear and logarithm analysis.

Table no 1: Descriptive Statistic

	Mean	Std. Deviation	N
Food_budget	1,225,240.00	514,101.965	100
Transportation_budget	571,400.00	471,646.632	100
Income	3,950,426.72	1,013,521.462	100

Table no 1 shows the mean values of food budget, transportation budget and income of the respondents. It indicates that not all income will be used for food and transportation budgets and the mean of food budget is higher than transportation. Food budget has higher mean values because of the nature of the products. People, basically, need more food than transportation. Mean value of the income indicates the higher rate of minimum wage rate in Surabaya, Indonesia for common workers.

Tabel no 2: Correlation Analysis between Income (X) and Food Budget (Y_1)

		Food_budget	Income
Food_budget	Pearson Correlation	1	.408**
	Sig. (2-tailed)		.000
	N	100	100
Income	Pearson Correlation	.408**	1
	Sig. (2-tailed)	.000	
	N	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

Table no 2 shows the correlation between income and food budget. Pearson correlation value is 0.408 with Sig. value is 0.000, indicates the strong correlation between income and food budget. This correlation is moderate because it lies between 0.40-0.599. As the physiological needs, food is the priority regardless the income level and the individuals should get this need fulfilment before reaching higher level of need, if not, the individuals will get stressed[11].

Tabel no 3: Correlation Analysis between Income (X) and Transportation Budget (Y_2)

		Income	Transportation_budget
Income	Pearson Correlation	1	.457**
	Sig. (2-tailed)		.000
	N	100	100

Transportation_budget	Pearson Correlation	.457**	1
	Sig. (2-tailed)	.000	
	N	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

Table no 3 shows the correlation between income and transportation budget. Pearson correlation value is 0.457 with Sig. value is 0.000, indicates the strong correlation between income and transportation budget. The correlation value of these two variables is higher than the other correlation set of income and food budget.

Tabel no 4: Correlation Analysis between Food Budget (Y_1) and Transportation Budget (Y_2)

		Food_budget	Transportation_budget
Food_budget	Pearson Correlation	1	.452**
	Sig. (2-tailed)		.000
	N	100	100
Transportation_budget	Pearson Correlation	.452**	1
	Sig. (2-tailed)	.000	
	N	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

Table no 4shows the correlation between food and transportation budget. Pearson correlation value is 0.452 with Sig. value is 0.000, indicates the strong correlation between food and transportation budget. The correlation value of these two variables is high enough.

Tabel no 5: Partial Correlation Analysis with Income as Control Variable

Control Variables			Food_budget	Transportation_budget	Income
-none-[a]	Food_budget	Correlation	1.000	.452	.408
		Significance (2-tailed)	.	.000	.000
		df	0	98	98
	Transportation_budget	Correlation	.452	1.000	.457
		Significance (2-tailed)	.000	.	.000
		df	98	0	98
	Income	Correlation	.408	.457	1.000
		Significance (2-tailed)	.000	.000	.
		df	98	98	0
Income	Food_budget	Correlation	1.000	.327	
		Significance (2-tailed)	.	.001	
		df	0	97	
	Transportation_budget	Correlation	.327	1.000	
		Significance (2-tailed)	.001	.	
		df	97	0	

a. Cells contain zero-order (Pearson) correlations.

Table no 5 shows the partial correlation between income, food and transportation budget. The control variable used is income. Thus the Pearson correlation value between income and food is the same as the value between income and transportation which shows 0.327 with Sig. value is 0.001. This partial correlation has lower value than previous correlation.

Tabel no 6: Model Summary and Parameter Estimates of Food budget

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	0.167	19.608	1	98	0.000	407,039.565	0.207
Logarithm	0.142	16.200	1	98	0.000	-10,123,935.623	748,770.477

After measuring the correlation and partial correlation, the other analysis used in this study is linear and logarithm models. Table no 6 shows the model summary and parameter estimates of food budget either linear and logarithm models. The curve estimation is used to predict the statistical data using the curve and regression plot. R square of the linear equation is higher than logarithm. It means that the estimation lines of both are different. The illustration of this curve is displayed in Figure no 2. The linear model of food budget in

this study is $Y_1 = 407,039.565 + 0.207X$, means that without income, the food budget will stand still positively. The previous study stated that personal budget constraint will not affect the consumption because consumers do not actually have to pay money, but they may use other payment methods to fulfil food needs[18]. The logarithm model is $Y_1 = -10,123,935.623 + 748,770.477X$. Without income, the percentage of monthly budget will change negatively or decrease. The logarithm shows the change based on percentage but the linear based on unit.

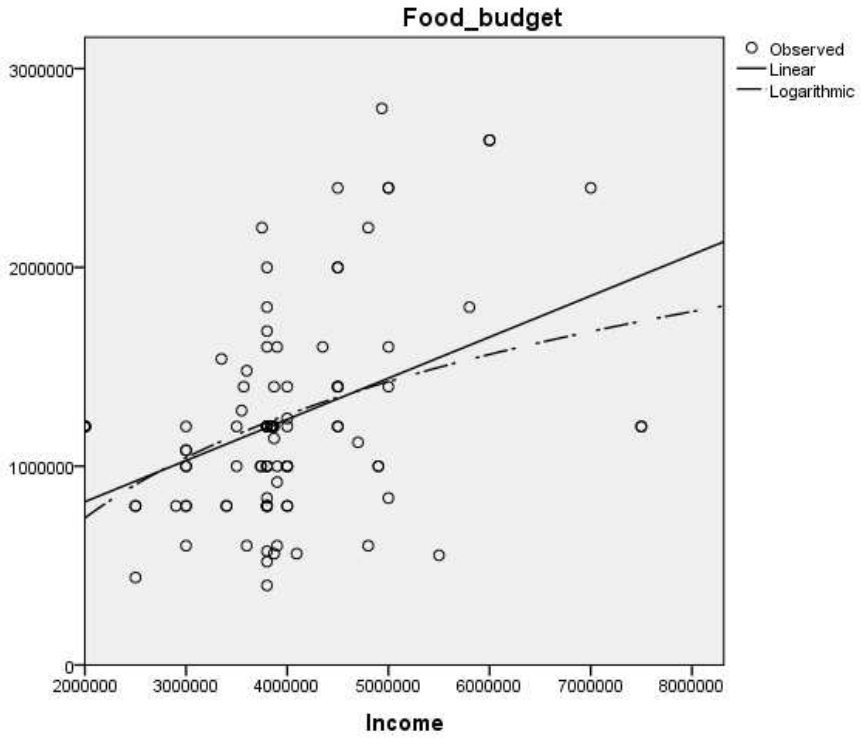

Figure no 2: Plot models for Food budget

Figure no 2 shows the difference of the linear and logarithm models of food budget. The value is different because the R Square of both is different. Logarithm is lower than linear.

Tabel no 7: Model summary and parameter estimates of transportation budget

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	0.209	25.941	1	98	0.000	-269,634.716	0.213
Logarithm	0.142	16.271	1	98	0.000	-9,860,209.694	688,233.368

Table no 7 is the summary and parameter of transportation budget. There is a big difference between R square linear and logarithm. The illustration of this curve is displayed in Figure no 3. The linear model of transportation budget in this study is Y_2=-269,634.716+0.213X and the logarithm model is Y_2=-9,860,209.694+688,233.368X. Without income, the percentage of monthly transportation budget will change negatively or decrease.

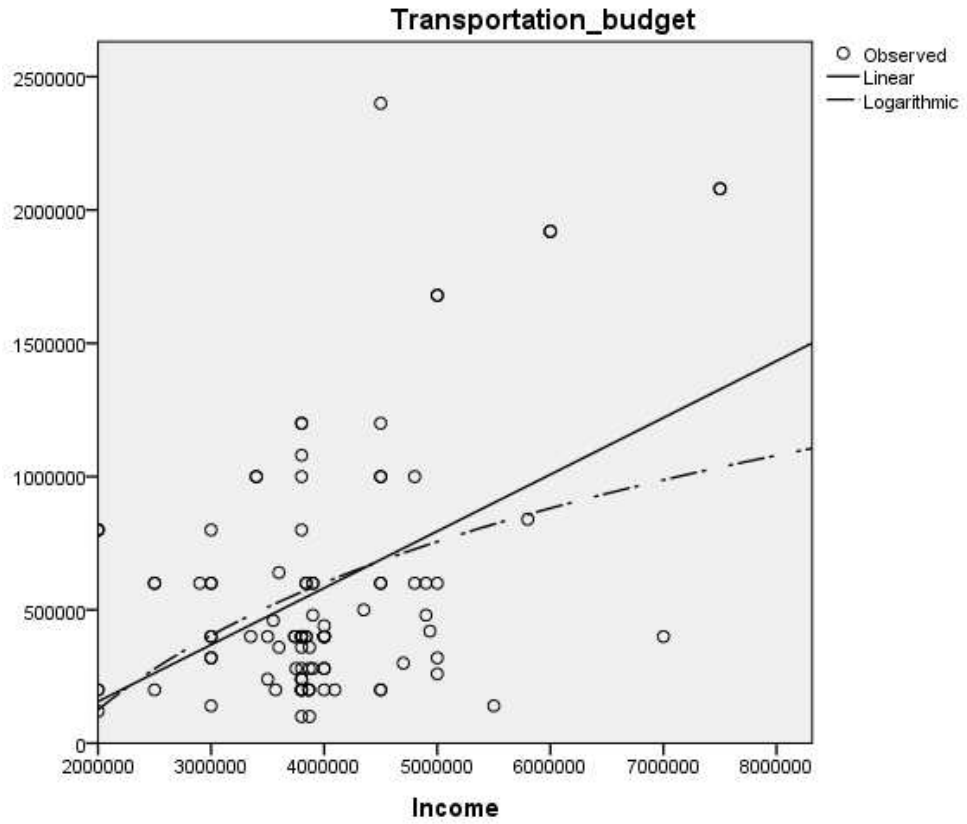

Figure no 3: Plot models for Transportation budget

Figure no 3 shows the difference of the linear and logarithm models of transportation budget. The value is different because the R Square of both is different. Logarithm is lower than linear. The differences of food and transportation budget estimation curve models may occur as the nature of products. Food is a primary need of the human being but transportation is secondary or even tertiary so the inexistence of income will reduce the budget for transportation, but not for food budget. Back to personal budgeting, this results shows the nuance of personal commitment and flexible demand because of uncertainty[5]. Although the plot models of food and transportation models show the increasing trend but this can be different to other situations where ceteris paribus in economy does not exist.

Monthly income seems to make a constraint to budgeting process either food or transportation. The individuals have different behavior in disposing their income. The concept of budget constraint in economics will indeed force the individuals to choose their combinations in consuming goods. It regulates individuals to set their budget based on the income. Table no 1 indicates that not all the income will be fully spent for food and transportation. Respondents might use their income for some other needs which are not detected in this study.

As the daily needs, food and transportation in modern life cannot be separated from workers' daily activities. Regardless the income level they have, the attempt to meet the needs should be considered by their wise income allocation[1]. Budgets in food and transportation should be set under their income because they need to save some funds for future uncertainty. Budget for food as shown in Table no 6, in linear model, will be positive although the income is zero because of the basic need issue, but logarithmically, without income value, the individuals will reduce their budget on foods, as preference issues. Workers who stay outside home longer tend to spend more meals due to their preferences[2]. Other study showed that budgeting intent is influenced by psychological and life cycle factors as well that are not discussed in this study[4].Thus, budgeting process seems to relate to activity-based budgeting that usually used for organization, but individually, people who have high mobility focuses on creating the budget based on the activities[19].

The workers also set the budget for food and transportation by considering their income and their intention to saving. Respondents who were chosen as workers with monthly salary and wages regardless their position and function at work, will decide to allocate their income into food or transportation budgets. However the allocation process needs the knowledge, skills, and attitude towards monetary management[7]. If they

understand and are aware of their own funding situation, they will change their consumption and replace each of food and transportation to maximize their satisfaction.

V. Conclusion

From the second results of the correlation analysis above shows that income correlates with food and transportation budget. According to the income, the food budget has the lower correlation value (0.408) than transportation budget (0.457). However, both correlation values are moderate. In reality, the budget for food and for transportation itself has an important role in fulfilling individual needsbecause food and transportation are directly related to individuals. The moderate level of correlation is due to the nature of products. Both products are important for workers as respondents, but when there is the decrease of the income, food budget (for basic food needs, not the fashion food) will still exist but transportation budget will be set to fit to the income. Shortly, the food budget is the priority of the income disposal. The implication of the study is to enrich the literature on food and transportation personal budgets and understand how the budget will change because of the circumstances and alter the outcome and evaluate the budget information. This study has limitations in some areas, such as the number of respondents, the variables used and the analysis techniques that may be able to improve in the future research.

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