SOUTHEAST ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Volume 3, Issue 1, 2018
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

A Regression Analysis of Electric Consumption of Households in Mangaldan, Pangasinan

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Abstract - *This study shows a regression analysis of the electric consumptions of every household in the municipality of Mangaldan. The data were collected using survey questionnaires with 52 sample size that is divided according to the number of population of the chosen ten barangay of Mangaldan and accompanied by an actual interview. The questionnaires composed of questions related to the consumption and the habits of the family member of every household on saving electric consumption, these questions was used identify and show factors that affect the consumption of electric. The researchers used Descriptive Statistics and Regression Analysis. Furthermore, Econometric Views (EVIEWS), a statistical program designed to help the researchers in the management of the quantitative data was also used. Four factors, that is, age, number of appliances, household size, and monthly income of the household had been tested to establish the significant factors that are relevant to the consumption of electric in Mangaldan. As a result, two models have been successfully established as a best model with respect to each model category. The factors that caused the electric consumption of every household in a non-log dependent variables are appliances and income. For the log dependent variable(s), income is the only factor. These two models were tested through satisfying the seven assumption of multiple linear regression model, and compared its info-criterion (akaike and Schwarz) and adjusted R-squared from the other model.*

Keywords- *electricity, consumption, household, regression, significance, unbiased*

INTRODUCTION

Electricity is one of the most important necessities of every households. Studying the amount of electricity consumed by every household seems to be affected by different factors.

The more appliances installed and persons involved in a household results in higher consumption of electricity. The researchers consider the total monthly income of the employed family members and the age of the respondent as factors that may affect the electric consumption of the household.

It is observed that households with higher income consume higher energy and has lesser involvement in conservation of energy compared to the households whom are conscious with their expenses practically because of lower income and employed member. The presence of that person staying in the house could add up to the usage of appliances and could take to higher consumption.

Many factors influence electricity prices generally the cost of build, finance, maintain, and operate power plants and the electricity grid. Some for-profit utilities also include a financial return for owners and shareholders in their electricity.

The influences of the factors are highly relevant to electricity, sources state that there are many factors that affect the electric, the habit of the family, characteristic of the home, electric appliances, and many more.

The Municipality of Mangaldan is a first class municipality in the province of Pangasinan, Region I (Ilocos Region) Philippines. The town of Mangaldan is one of the oldest towns in the province of Pangasinan. Mangaldan was formerly a cattle ranch. It gradually became populated by immigrants who divided the ranch among themselves. It was an encomienda in 1591. Its early settlers were noted for their looms, salakots and campilans.

According to the 2015 census, it has a population of 106,331. The total land area of the municipality is 4,847.78 hectares distributed in the thirty barangays [3].

Mangaldan is a part of the vast agricultural basin found in the central-eastern portion of the province of Pangasinan. It forms part of the major urban areas within the Lingayen Gulf which is known as the Mangaldan-Dagupan-Binmaley-Lingayen Corridor. It is eight (8) kilometers away from Dagupan City, 10 kilometers from the religious town of Manaoag and 18 kilometers from the provincial capital of Lingayen. It is accessible and could easily be reached by the regular means of land transportation.

Mangaldan is subdivided into 30 barangays composed of several puroks or sitios. All barangays are being categorized as Urban. The following are the thirty barangays of Magaldan, Pangasinan: Alitaya, Amansabina, Anolid, Banaoang, Bari, Bateng, Buenlag, David, Gueguesangen, Guesang, Guillig, Inlambo, Lanas, Landas, Maasin, Macayug, Bantayan, Malabago, Navaluan, Osiem, Nibaliw, Palua, Embarcadero, Poblacion, Pogo, Salaan, Guiguilonen, Salay, Talogtog, and Tebag.

The supply for electricity can be insufficient for the next succeeding years because of the increasing demand for electricity. For that reason, the government always reminds every household to practice energy conservation. Aside from the increasing monthly bill, the insufficiency of the electricity also makes the household aware on their electric consumption.

There are factors many affect the monthly electric consumption of every household. Definitely, the amount of electricity used depends on different factors. These factors are age, household size, number of employed household member, number of appliances and monthly family income.

OBJECTIVES OF THE STUDY

This study provides us information regarding Electric Consumption of the households in Mangaldan, Pangasinan.

To Filipino families, this will serve as a "springboard" of the household consumers which will motivate them to be a wise and responsible consumer.

The study aims to predict the factors that affect the electric consumption of every household in the Municipality of Mangaldan by coming up with a model that best predicts these factors. Also, this study provides the correlation of the factors that affect the electric consumption of the households.

MATERIALS AND METHODS

This chapter describes the research methodology used in the study. The intention is to enable the readers to judge how reliable the study's findings and to explore further the implications of the data.

Research Design

The researcher used several procedures in gathering data in the compilation of this study. The researchers used descriptive method to establish the study of what is common in the documentary analysis. On the other hand, documentary analysis is a technique used to gather requirements during the requirements elicitation phase of a project. As stated above, this research will partially base its finding through quantitative research methods for flexible and iterative approach.

Research Instrument

The research instrument used in this study is the questionnaire. The questionnaires usually form an integral part of descriptive surveys. In addition, the researchers conducted an interview consisting of factual questions related to facts about the respondent's personal information. Such data includes: age, sex, household size, number of employed family members, number of dependents, family monthly income, and number of appliances available.

Research Subject

The subject of the study is centered on household in the municipality of Mangaldan, Pangasinan.

Data Collection Procedure

The researchers used multiple data collection procedures for this study. Namely, questionnaires, interviews, documentary and data analysis. The main reason for adopting multiple procedures is the combination and integration of each procedures strengths and weaknesses.

Sampling Procedure

Volume 3, Issue 1, 2018
P-ISSN: 2672-2984
E-ISSN: 2672-2992
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This process aims to draw conclusions for the entire population after conducting a study on a sample taken from same population.

The formula that will be used in determining the sample size of the study is:

$$n = \frac{n_o}{1 + \frac{n_o}{N}}$$

Where:

$$n_o = \frac{\left(Z_{\propto/2}\right)^2 S^2}{d^2}$$

$$Z_{\propto/2} = 1.96$$

α = 0.10
z = distribution test
N = total population
n = sample space

Applying the data to determine the number of sample size and also to determine the number of respondent from the ten chosen barangay of Mangaldan. We obtained 52 sample size that is divided based on the number of population from the ten chosen barangays. Nine respondents from Anolid, seven respondents from Bari, , six respondent from Poblacion, four respondents from Bantayan, Guilig, Embarcadero, and Guiguilonen and three respondents from Amansabina.

Statistical Treatment of the Data

The respondent's responses were tabulated and the resulting data were then placed in a meaningful contingency table to add clarity and explain the statistical relationship of the variables involved in the study. Descriptive statistics and graphical representation of the response variable will also be made use of to visually investigate the characteristics of the given data set.

Multiple regressions are flexible method of data analysis that may be appropriate whenever a quantitative variable is to be examined in relationship to any other factors. The purpose of a multiple regression is to find an equation that best predicts the Y variable as a linear function of the X variables.

After determining the model, it must satisfy the seven assumption of the multiple linear regression.

Assumptions of Multiple Linear Regression:

The assumptions in multiple linear regression are essentially the same as for simple linear regression except for assumption 6 shown below:

1. Zero-mean of the error term

   The mean of the error terms (ε_t), given the independent variables (x_t), must be equal to zero, $E[\varepsilon_t] = 0$, t = 1, 2, …, n.

2. Homoscedasticity

   The variance around the regression line (residual) is the same for all the values of the independent variable. If the variance of the error term is constant,

   $$Var(\varepsilon_t) = \sigma^2$$

   for t = 1, 2, …, n, then homoscedasticity is present. If the error variance is not constant, then heteroskedasticity is present.

3. No Serial Correlation

   If the coefficient variance of the error terms ε_t and ε_s is equal to zero,

   $Cov(\varepsilon_t \varepsilon_s) = 0, s \neq t.$

   Then the relationship between the independent variable(s) X and the dependent variable Y is linear and conclude that there is no serial correlation.

4. Nonstochastic Explanatory Variable

   Each explanatory variable is nonstocahastic with values fixed in repeated samples such that

   $$\frac{1}{n}\sum_{j=1}^{n}(x_{jt} - x_j)^2 \neq 0$$

   for explanatory variable x_j, j= 1, 2,…, k.

5. Positive Degrees of Freedom

   The number of observations exceeds the number of coefficients to be estimated. (The difference n-k is called the degrees of freedom).

6. No Perfect Multicollinearity.

   The independent variables should not be correlated with one another. When independent variables are correlated, the term for this condition is multicollinearity.

7. Normality of error term

The error term (ε_t) are independently normally distributed, t = 1, 2, …, n.

SOUTHEAST ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Volume 3, Issue 1, 2018
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

RESULTS AND DISCUSSION

This chapter highlights the presentation and analysis of the data gathered and the interpretation of findings based on the results of the instrument used. It presents the different models used and the considered model of the household electric consumption in Mangaldan, Pangasinan, together with their assumptions. Graphical checks and other tests were also used to find the best regression model of the household electric consumption in Mangaldan, Pangasinan.

The table 1 shows the descriptive statistics of the dependent variable (electric bill) and independent variables (age, appliances, household size, and income) of every households in every barangay of Mangaldan, Pangasinan.

It shows that, with 52 respondents, the mean of the electric bill of households of the 10 barangays covered in the study was Php 1306.462 with a large standard deviation of Php 770.3071 indicate the fact that some barangays have relatively diverse electric consumption. One of the manifestation of the huge disparity is that the highest electric bill recorded is almost ten (10) percent higher than the lowest electric bill. One possible effect of this high standard deviation is that the mean of electric bill would be unduly pulled by a few extreme observation resulting in highly skewed (0.7181) distribution, thus the mean is highly significant than the median of electric bill (Php 1,100.00).

Table 1. Descriptive Statistics of the Different Variables in the Study

	E_BIL	Age	App	H_S	Inc
Mean	1306	50.8	7.34	4.67	1032
Median	1100	52	7.00	4.00	8950
Max	3452	90	15.0	11.0	3000
Min	150	21.0	3.00	2.00	1100
Std. Dev.	770	12.9	2.62	2.18	5999
Skew.	0.72	0.31	0.53	1.10	1.85
Kurtosis	2.97	3.54	3.05	3.77	6.56
Jarque	4.47	1.45	2.43	11.7	57.2
Prob.	0.11	0.48	0.30	0.00	0.00
Observ.	52	52	52	52	52

The mean of income is Php 10,325.96, and noticed that majority of the households has a higher income greater than the median average. The maximum income is Php 30,000 and Php 1,100 is the minimum. The standard deviation of the income has a large extreme value. The maximum value of the household size is 11 with minimum value of 2.

The descriptive statistics of the different variables is illustrated through histogram that can be seen in Figures 1, 2, 3, 4, and 5**.** These figures show the effect of standard deviation of the mean of electric bill, age, appliances, household and income that would be unduly pulled by a few extreme observations resulting in a skewed distribution. Thus the mean of electric bill, age, appliances, household and income are significantly higher than the median of electric bill, age, appliances, household and income.

Figure 1. Histogram of the Electric bill

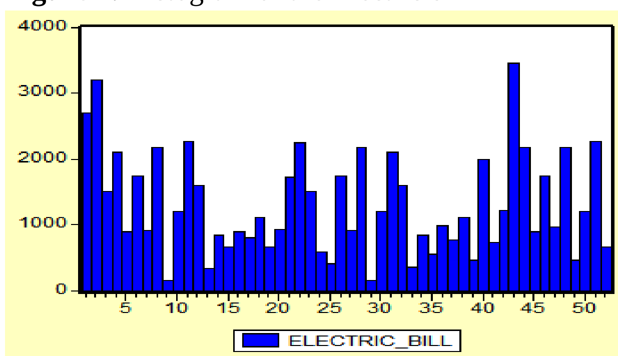

Figure 2. Histogram of Age

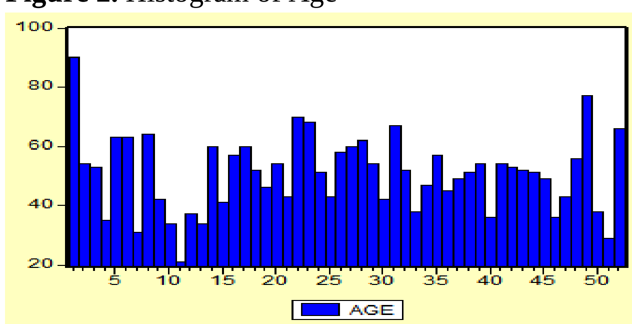

Figure 3. Histogram of Appliances

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Volume 3, Issue 1, 2018
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

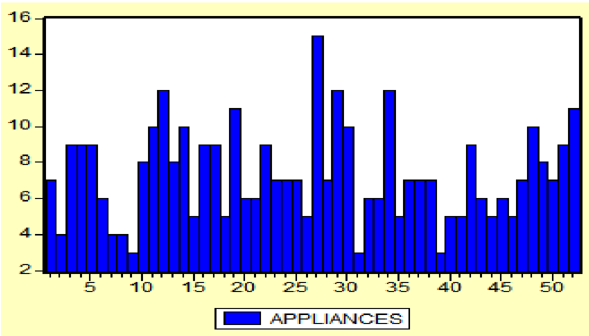


Figure 4. Histogram of Household

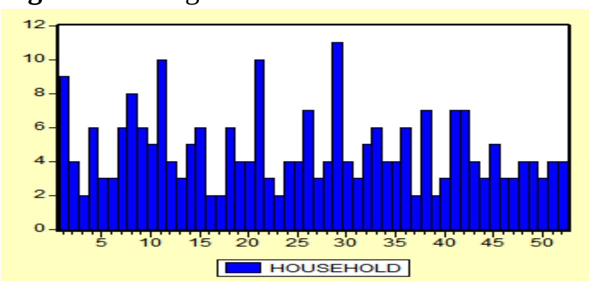


Figure 5. Histogram of Income

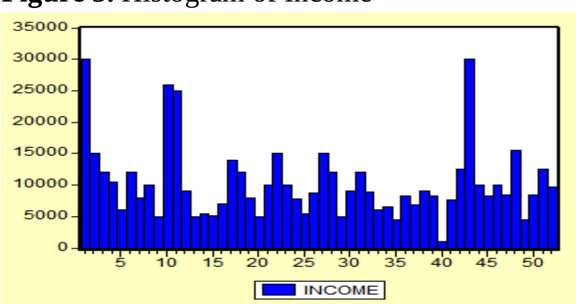


Table 2. Correlation Matrix of Dependent and Independent Variable

Correlation Matrix					
	E_BILL	AGE	APP.	H_S	INC
E_BILL	1.00	0.11	-0.14	0.054	0.650
AGE	0.110	1.00	0.003	-0.10	0.133
APP	0.141	0.003	1.00	-0.02	0.111
H_S	0.054	-0.10	-0.02	1.00	0.190
INC	0.650	0.133	0.111	0.190	1.00

Table 2 shows the correlation matrix of the dependent variable (electric bill) and the independent variables (age, number of appliances, household size and monthly income) of the ten barangays of Mangaldan. Table 2 shows that there exists a relationship between the age, number of appliances, household size and monthly income. The scatter plot of these independent variables versus the electric bill is shown in Figures 6, 7, 8, and 9.

Figure 6. Scatter Plot of Age vs. Electric Bill

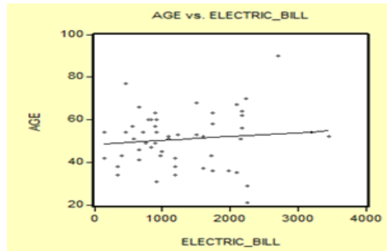


Figure 7. Scatter Plot of Appliances vs. Electric Bill

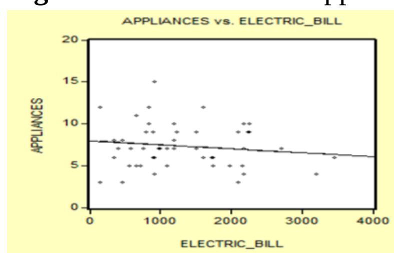


Figure 8. Scatter Plot of Household vs. Electric Bill

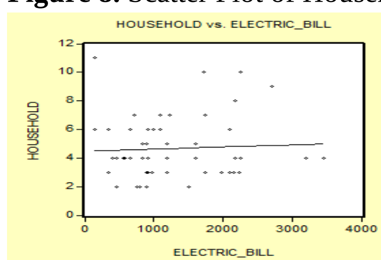
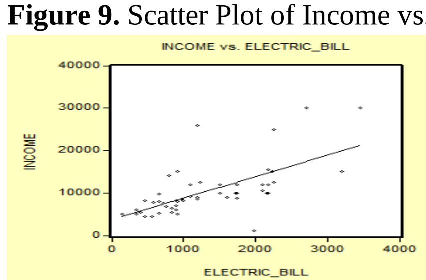


Figure 9. Scatter Plot of Income vs. Electric Bill



Since there are four (4) independent variables (age, number of appliances, household size and monthly income) and one (1) dependent variable (electric bill), the total number of model is 32, in which the first 16

SOUTHEAST ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Volume 3, Issue 1, 2018
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

model are a non-log dependent (y) model and the other 16 model are the log dependent (y) model. Table 3 shows these equations, where y is the electric bill, x_1 is the age, x_2 is the number of appliances, x_3 is the household size, and x_4 is the monthly income.

Table 3. Representations of the 16 Y Models

Model	Equations
1	$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$
2	$Y = \beta_0 + \beta_1 \log(X_1) + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$
3	$Y = \beta_0 + \beta_1X_1 + \beta_2\log(X_2) + \beta_3X_3 + \beta_4X_4$
4	$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3\log(X_3) + \beta_4X_4$
5	$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4\log(X_4)$
6	$Y = \beta_0 + \beta_1 \log(X_1) + \beta_2 \log(X_2) + \beta_3X_3 + \beta_4X_4$
7	$Y = \beta_0 + \beta_1\log(X_1) + \beta_2X_2 + \beta_3\log(X_3) + \beta_4X_4$
8	$Y = \beta_0 + \beta_1 \log(X_1) + \beta_2X_2 + \beta_3X_3 + \beta_4\log(X_4)$
9	$Y = \beta_0 + \beta_1X_1 + \beta_2\log(X_2) + \beta_3\log(X_3) + \beta_4X_4$
10	$Y = \beta_0 + \beta_1X_1 + \beta_2\log(X_2) + \beta_3X_3 + \beta_4\log(X_4)$
11	$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3\log(X_3) + \beta_4\log(X_4)$
12	$Y = \beta_0 + \beta_1\log(X_1) + \beta_2\log(X_2) + \beta_3\log(X_3) + \beta_4X_4$
13	$Y = \beta_0 + \beta_1 \log(X_1) + \beta_2 \log(X_2) + \beta_3X_3 + \beta_4 \log(X_4)$
14	$Y = \beta_0 + \beta_1 \log(X_1) + \beta_2X_2 + \beta_3 \log(X_3) + \beta_4 \log(X_4)$
15	$Y = \beta_0 + \beta_1X_1 + \beta_2 \log(X_2) + \beta_3 \log(X_3) + \beta_4 \log(X_4)$
16	$Y = \beta_0 + \beta_1\log(X_1) + \beta_2 \log(X_2) + \beta_3 \log(X_3) + \beta_4\log(X_4)$
17	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$
18	$\log(Y) = \beta_0 + \beta_1 \log(X_1) + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$
19	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2\log(X_2) + \beta_3X_3 + \beta_4X_4$
20	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3\log(X_3) + \beta_4X_4$
21	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4\log(X_4)$
22	$\log(Y) = \beta_0 + \beta_1 \log(X_1) + \beta_2 \log(X_2) + \beta_3X_3 + \beta_4X_4$
23	$\log(Y) = \beta_0 + \beta_1\log(X_1) + \beta_2X_2 + \beta_3\log(X_3) + \beta_4X_4$
24	$\log(Y) = \beta_0 + \beta_1 \log(X_1) + \beta_2X_2 + \beta_3X_3 + \beta_4\log(X_4)$
25	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2\log(X_2) + \beta_3\log(X_3) + \beta_4X_4$
26	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2\log(X_2) + \beta_3X_3 + \beta_4\log(X_4)$
27	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3\log(X_3) + \beta_4\log(X_4)$
28	$\log(Y) = \beta_0 + \beta_1\log(X_1) + \beta_2\log(X_2) + \beta_3\log(X_3) + \beta_4X_4$
29	$\log(Y) = \beta_0 + \beta_1 \log(X_1) + \beta_2 \log(X_2) + \beta_3X_3 + \beta_4 \log(X_4)$
30	$\log(Y) = \beta_0 + \beta_1 \log(X_1) + \beta_2X_2 + \beta_3 \log(X_3) + \beta_4 \log(X_4)$
31	$\log(Y) = \beta_0 + \beta_1X_1 + \beta_2 \log(X_2) + \beta_3 \log(X_3) + \beta_4 \log(X_4)$
32	$\log(Y) = \beta_0 + \beta_1\log(X_1) + \beta_2 \log(X_2) + \beta_3 \log(X_3) + \beta_4\log(X_4)$

The 16 non-log y models and 16 log y models has been regenerate in to a new models, this was done by including only the significant independent variables where the probability value of the coefficient of the independent variables must be less than the alpha level of significance (0.05), once it satisfy the condition the new regression model contains only the significant independent variable(s) and disregard the unsignificant independent variable(s). Table 4 below shows the summary of generating a new regression model.

Table 4. Reducing Estimation Equations through Significant Independent Variables

Model	Significant Independent Variables	New Generated Equation
1	X_2, X_4	$Y = \beta_0 + \beta_2X_2 + \beta_4X_4$
2	X_2, X_4	$Y = \beta_0 + \beta_2X_2 + \beta_4X_4$
3	X_4	$Y = \beta_0 + \beta_4X_4$
4	X_2, X_4	$Y = \beta_0 + \beta_2X_2 + \beta_4X_4$
5	X_4	$Y = \beta_0 + \beta_4X_4$
6	X_4	$Y = \beta_0 + \beta_4X_4$
7	X_2, X_4	$Y = \beta_0 + \beta_2X_2 + \beta_4X_4$
8	$\log(X_4)$	$Y = \beta_0 + \beta_4\log(X_4)$
9	X_4	$Y = \beta_0 + \beta_4X_4$
10	$\log(X_4)$	$Y = \beta_0 + \beta_4\log(X_4)$
11	$\log(X_4)$	$Y = \beta_0 + \beta_4\log(X_4)$
12	X_4	$Y = \beta_0 + \beta_4X_4$
13	$\log(X_4)$	$Y = \beta_0 + \beta_4\log(X_4)$
14	$\log(X_4)$	$Y = \beta_0 + \beta_4\log(X_4)$
15	$\log(X_4)$	$Y = \beta_0 + \beta_4\log(X_4)$
16	$\log(X_4)$	$Y = \beta_0 + \beta_4\log(X_4)$
17	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
18	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
19	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
20	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
21	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$
22	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
23	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
24	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$
25	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
26	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$
27	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$
28	X_4	$\log(Y) = \beta_0 + \beta_4X_4$
29	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$
30	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$
31	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$
32	$\log(X_4)$	$\log(Y) = \beta_0 + \beta_4\log(X_4)$

Table 5. Representation of the Newly Significant Non-log y Models

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P-ISSN: 2672-2984
E-ISSN: 2672-2992
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Model	Equations
A	Y = 1247.947656 - 41.41245766*X_2 + 0.03302220015*X_4
B	Y = 943.3384705 + 0.03305742216*X_4
C	Y = -3350.795792 + 508.4516258*LOG(X_4)

Table 5 shows the three newly significant regression model, since the other models have the same dependent and significant independent variables then it is considered as one.

Table 6. Representation of the Newly Significant log y Models

Model	Equations
D	LOG(Y) = 6.592981434 + 3.465372058e-05* X_4
E	log(Y) = 1.935536732 + 0.5500300332*LOG(X_4)

Table 6 shows the two newly significant regression model, since the other models have the same dependent variable and significant independent variable(s) then it is considered as one.

To find the best linear unbiased estimator (BLUE), we used Akaike Info Criterion, Schwarz criterion and Adjusted R-squared. Akaike Info Criterion and Schwarz Criterion are the model selection criteria in choosing a suitable model to characterize the underlying data. In comparing all the alternative models, smaller values of one of these two criteria will indicate a better model.

On the other hand Adjusted R-squared measures the proportion of the variation in the dependent variables accounted for by the independent variables. The high value of the R-squared validates the correctness of the model.

Table 7. Summarize Table of the Regression Models of a Non-log Dependent Variable (Electric Bill) Consumptions of Households in Mangaldan, Pangasinan

Model	Akaike	Schwarz	R-sqd.	Adj. R^2
A	15.5953	15.7079	0.4686	0.44686
B	15.6400	15.7151	0.4225	0.41090
C	15.8039	15.8790	0.3196	0.30598

Table 7 shows Akaike Info Criterion, Schwartz Criterion and Adjusted R-squared of the three model of non-log (y) dependent variables. Model A is considered as the best among the three models. Since model A has the lower value of info criterion (Akaike and Schwarz) and on the correctness of the models, it has the higher value of R-squared. Adjusted R-squared is significantly lower than R-squared, this normality means that some explanatory variable(s) are missing.

Table 8. Summarize Table of the Regression Models of a log Dependent Variable (Electric Bill) of Electric Consumptions of Households in Mangaldan, Pangasinan

Model	Akaike	Schwarz	R-sqd.	Adj. R^2
D	1.78131	1.85636	0.3246	0.31110
E	1.82608	1.90113	0.2937	0.27956

Table 8 shows Akaike Info Criterion, Schwartz Criterion and Adjusted R-squared of the three model of log (y) dependent variables. Model D is considered as the best among the two models.

Since model D has the lower value of info criterion (Akaike and Schwarz) and on the correctness of the models, it has the higher value of R-squared. Adjusted R-squared is significantly lower than R-squared, this normality means that some explanatory variable(s) are missing.

After several analysis Model A and D will be tested through the seven assumptions of Linear Regression. Thus, if the two models of these regression models satisfies all the assumptions, then the two models is considered as best model for a non-log and log model.

The assumptions has been tested, we've seen that there are two models that satisfy all the assumptions of Linear Regression. Therefore Model A is the best linear unbiased estimator among the three non-log model and model D Is the best linear unbiased estimator among the two log model of electric bill.

Volume 3, Issue 1, 2018
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

CONCLUSION

On the basis of the statistical analysis, the summary and findings are drawn:

1. In the descriptive data of Mangaldan, Pangasinan, the mean electric consumption of households is about Php 1302.462 and the median is Php1100.00. Observably, mean electric consumption of households is greater than the average of median. This means that majority of the household electric consumption is greater than the average of the median. The mean of income is Php 10325.96, and noticed that majority of the household has a higher income greater than the median average. The maximum income is Php30,000 and Php5,000 is the minimum. The standard deviation of the income have a large extreme value. The maximum value of the dependence is 1 with minimum value of 2.
2. In the scatter plot of household's electric consumption, age, number of appliances, household size, and monthly income, shows that there is a relationship between the dependent and independent variables.
3. In correlation matrix, we can determine if is a significant relationship between the dependent and independent such as age, number of appliances and household size.
4. The researchers determine the estimate equations for best possible model to forecast the electric consumption in the representations of model A equation (for non-log), $Y = \beta 0 + \beta 2X2 + \beta 4X4$, and model D equation (for log), $\log(Y) = \beta_0 + \beta_4 X_4$.

The number of appliances and income have great relationship with the dependent variable (electric consumption).

The researchers found out that the best model to forecast the electric consumption is the equation $Y = \beta 0 + \beta 2X2 + \beta 4X4$ of Model A for the nonlog model and equation $\log(Y) = \beta_0 + \beta_4 X_4$ of model D for log models.

This paper shows how easy it can be to reduce energy use at home. Although limited to a specific home and family style, it can be applied to a large amount of dwellings and has the advantage of being a simple proof showing that there is always room to make the house more energy-efficient. Very often, with just a few small changes in the household routines one can also add up over the year to the good savings on the utility bills. We explained that there are simple, inexpensive steps families can take to reduce their heating and cooling costs.

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