

EFFECTS OF RAINFALL RELATED TO TEMPERATURE CHANGES WITH MATHEMATICAL MODELS IN MAWLAIK TOWNSHIP

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ABSTRACT

The rainfall change is a prominent effect to cause climate conditions throughout the world. The climate change is happened to destroy the people lives and properties. Therefore, it is tempt to study the prediction of rainfall flow using the inverse regression analysis in SPSS Statistics Software. The temperature and rainfall data is obtained from Meteorological Department. The dependent variable is defined as the annual mean rainfall and the independent variable is referred to as annual mean temperature for this analysis. This is to be a useful tool for agricultural sector and local government authorities.

KEYWORDS

Temperature, Rainfall, Inverse Regression Equation, SPSS Software

1. INTRODUCTION

Everybody living in the world is facing problems of climate change. It is destroyed a lot of people and their properties causing severe weather conditions such as flood and drought. The temperature had increased by warming approximately 0.2°C per decade over the past 30 years ago all over the world [1]. Problems of climate change have happened to many reasons such as forest destruction and air pollution and so on. Many forests have been destroyed to build infrastructures, bridges, and roads for developing a global communication system [2]. It has been grown to cause air pollution problems because of the automobile transportation system and fuel gas evolution. All of the above reasons, the global warming problem plays a significant role in living all organisms.

Many researchers have been modified and developed mathematical models to determine the relationship between temperature changes, rainfall, and discharge flow, and time-period and so on. Numerous studies had been found to investigate either climate conditions or global warming in Myanmar nowadays. The rainfall and temperature changes are the basic concepts to cause serious climate conditions [3]. These changes are very important for the agricultural sector to grow the plant leaf and other vegetation.

Mawlaik is one of the agricultural townships located in the Eastern part of Myanmar, while agriculture is dependent upon the temperature and rainfall condition during the growing season. The conditions of rainfall and temperature changes are prominent indicators of severe weather conditions. The prediction of rainfall due to temperature changes plays an important factor in agricultural land. For this reasons, this study has to tempt to predict the rainfall condition concerning temperature changes affecting the agricultural sectors and protecting people's lives. Numerous studies had been found to investigate either climate conditions or global warming in Myanmar nowadays.

2. METHODOLOGY

Rainfall and temperature changes data in Mawlaik Township were obtained from Meteorological Department. Mean annual rainfall and mean annual temperatures were used to predict the regression model for the observation of temperature and rainfall fluctuation in that region. The regression models are driven from the running of SPSS Statistics Software. This software is a simplified statistical tool for the tasks of regression analysis and curve estimation and so on [4, 5]. The best fit model using regression analysis in this software provides the ranking goodness of the fit.

The simple linear regression equation is as follow:

$$y = a + bx \quad (1)$$

where y = dependent variable

a = constant

b = intercept

x = independent variable

Sometimes linear regression model cannot be used the relationship between data based on time-dependent. Therefore, it is used to an additional consideration model as an inverse regression model [5]. The following inverse regression equation is expressed as

$$y = a + b (1/x) \quad (2)$$

Where y is the dependent variable, x is the independent variable, “ a ” is constant and “ b ” is model intercept in the regression coefficient. The data is transformed as an inverse equation form to analyze the relationship between temperature and rainfall.

3. RESULTS AND DISCUSSION

The rainfall data and temperature data are calculated by using the regression analysis in this study. Firstly, the mean annual rainfall prediction is investigated by analyzing the simple linear regression model based on time-dependent. The model is not given a good fit option. In this model, the coefficient of determination (R^2) is 0.0615 and the significant error is greater than 5 % according to 95% confident interval. The diagram of the mean annual rainfall is demonstrated in Figure 1. And then, the mean annual temperature is calculated by using linear regression model based on time-dependent. The diagram of the mean annual temperature is shown in Figure 2. In this figure, the coefficient of determination (R^2) is 0.1334. Moreover, the significant error is greater than 5 %. Therefore, it is not to be a good fit model.

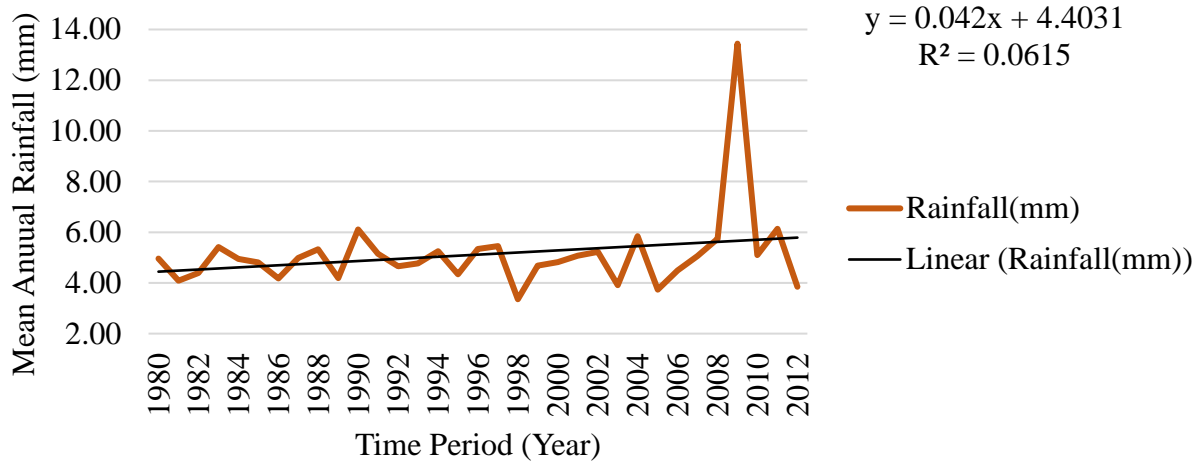


Figure 1. Diaphragm of Mean Annual Rainfall

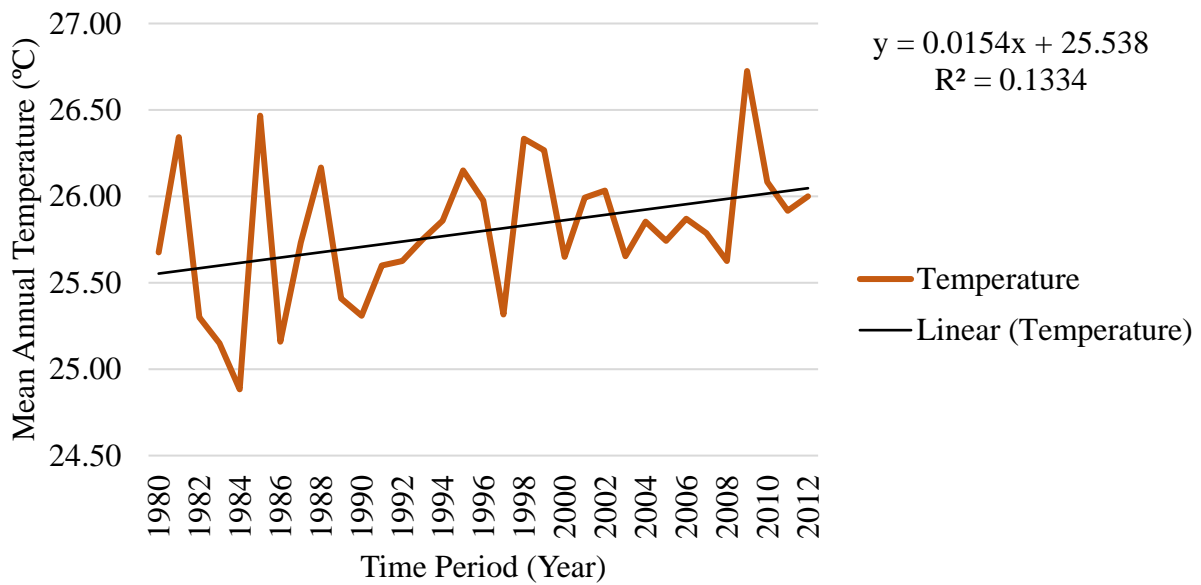


Figure 2. Diaphragm of Mean Annual Temperature

Table 1. Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.294	.087	.057	1.589

Table 2. Analysis of Variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	7.424	1	7.424	2.941	.096
Residual	78.253	31	2.524		
Total	85.676	32			

Table 3. Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 / Temperature	-782.769	456.451	-.294	-1.715	.096
(Constant)	35.463	17.698		2.004	.054

y = rainfall

Finally, this study has been considered to predict rainfall concerning temperature changes by computing inverse regression analysis. This regression model is studied to analyze only the 90 % confidence level. The regression model is a good fit option because the significant error is less than 10% as shown in Table 1. The proposed equation is expressed as

$$Y = -782.769 (1/\text{Temperature}) + 35.463$$

The diagram of the observed and predicted mean annual rainfall is described in Figure 3. In this figure, the observed values are a little different from the predicted value. These differences are not made to be a problem according to the result of the analysis. This model is to forecast the rainfall conditions as a beneficial tool for agricultural sectors.

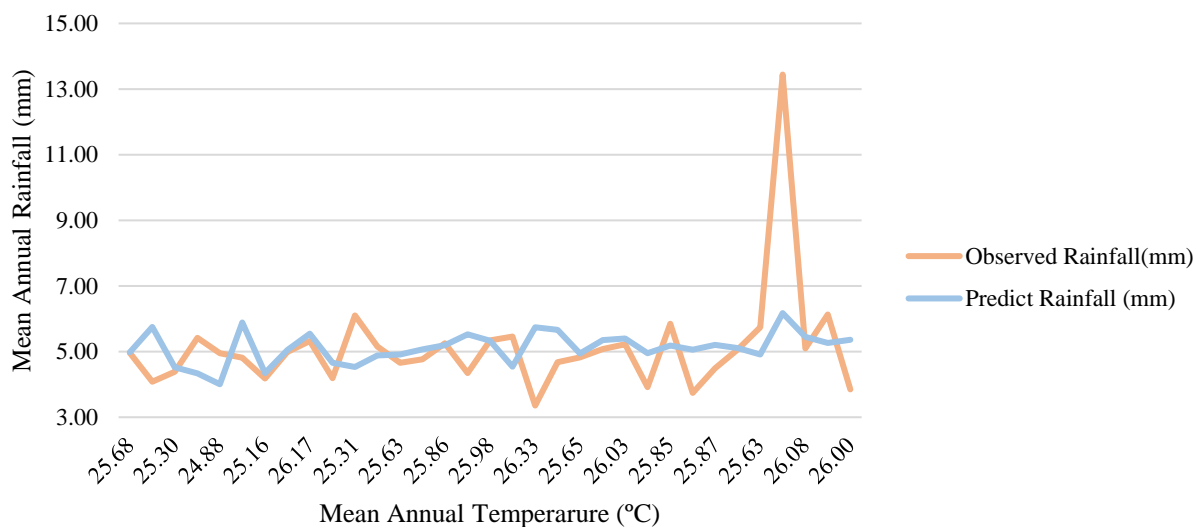


Figure 3. Diagram of Observed and Predicted Mean Annual Rainfall

4. CONCLUSION

To be performed in this result, the rainfall conditions of the study area are best revealed by using the inverse regression model. The regression model is assumed to predict the rainfall fluctuation concerning temperature change for forecasting weather conditions. The best fit model will be proposed for future work. In this study, the predicted equation is a beneficial issue for local government authorities and agricultural sectors and so on.

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