

Title: Comparison of Predictive Ability of Time Domain Model and Frequency Domain Model on Rainfall in Los Baños

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Abstract:

Whether in agriculture or non-agriculture activities, rain plays a crucial role in the success or failure of man's endeavors. Concerns on statistical techniques in investigating hydrologic events are getting some attention nowadays specifically in an agricultural and science-based town like Los Baños, Laguna. This study aimed to compare forecasts of daily and monthly total rainfall using time domain approach (AutoRegressive Integrated Moving Average process with Generalized AutoRegressive with Conditional Heteroskedasticity or GARCH volatility) and frequency domain approach (using SIMulation of METEOrological Variables or SIMMETEO). It utilized daily and total monthly rainfall, minimum and maximum temperature, solar radiation, number of wet days and Southern Oscillation index (SOI) from January 1, 1971 to March 31, 2007. Using the daily rainfall data, simple ARMA(7,7) model with GARCH and Generalized Error Distribution (GED) was the postulated model in forecasting using time domain approach. Upon comparing the forecasts using ARMA model and SIMMETEO approach, it was found out that forecasts using SIMMETEO provided better results than that of ARMA model since it yielded lower mean difference compared to the actual data, shorter forecasts intervals, lower RMSE, AIC and MAPE can be obtained both in one-step ahead forecasts from March 1 to 31, 2007 and aggregated forecasts from April to December 2007. For the monthly total rainfall, two postulated time domain models were sought: SARIMA with GARCH and GED and Regression with SOI with SARIMA with GARCH and GED errors. Comparing monthly forecasts using time domain approach and frequency domain approach (SIMMETEO), SIMMETEO forecasts gave smaller mean difference to the actual data, shorter forecasts intervals and lower RMSE and AIC values both for one-step ahead forecasts from January 2006 to March 2007 and forecasts from April to December 2007, thus forecasts using SIMMETEO gave better forecasts. Thus, SIMMETEO is a useful tool in providing better daily and monthly forecasts for rainfall. Although, SIMMETEO provides good forecasts estimates, summaries of minimum and maximum temperature and solar radiation are needed in the said method. Also, better estimates can be obtained if the summary data provided is at least 30 years. Alternative methods like ARIMA models with GARCH volatility can also be useful in providing adequate rainfall forecasts.

Keywords: SIMMETEO, ARIMA with GARCH volatility, forecasting, rainfall forecasting.