

## Probabilistic forecasting of the solar irradiance with recursive ARMA and GARCH models - DTU Orbit (09/11/2017)

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Forecasting of the solar irradiance is a key feature in order to increase the penetration rate of solar energy into the energy grids. Indeed, the anticipation of the fluctuations of the solar renewables allows a better management of the production means of electricity and a better operation of the grid-connected storage systems. If numerous methods for forecasting the mean of the solar irradiance were recently developed, there are only few works dedicated to the evaluation of prediction intervals associated to these point forecasts.

Time series of solar irradiance and more specifically of clear sky index show some similarities with that of financial time series. The aim of this paper is to assess the performances of a commonly used combination of two linear models (ARMA and GARCH) in econometrics in order to provide probabilistic forecasts of solar irradiance. In addition, a recursive estimation of the parameters of the models has been set up in order to provide a framework that can be applied easily in an operational context.

A comprehensive testing procedure has been used to assess both point forecasts and probabilistic forecasts. Using only the past records of the solar irradiance, the proposed model is able to perform point forecasts as accurately as other methods based on machine learning techniques. Moreover, the recursive ARMA-GARCH model is easier to set-up and it gives additional information about the uncertainty of the forecasts. Even if some strong assumption has been made regarding the statistical distribution of the error, the reliability of the probabilistic forecasts stands in the same order of magnitude as other works done in the field of solar forecasting.

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