

Forecasting air pollution rates in industrial centers using a trigonometric regression approach: A case study for Kocaeli-Turkey

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Abstract

Around the world air pollution is a leading social worry since several decades and although serious precautions taking into account it is still being considered as a hazardous problem in many industrial zones. Many reasons of air pollution are human-induced causes and therefore this can be prevented or at least reduced by some measures. Therefore, forecasting of air pollution is an important issue for officials taking precautions as soon as possible. This paper proposes a trigonometric $Y_t = \mu + A\cos(w_k t) + B\sin(w_k t) + e_t(t)$ time series model approach as an alternative to the traditional models for analyzing air pollution rates. As a main air pollution measurement index, monthly average amounts of Particulate Matter ,PM₁₀ is used. Kocaeli is the most important industrial city of Turkey with the 13% share of Turkish manufacturing industry. Hence, data were obtained monthly from the air monitoring stations in the city of Kocaeli between the period of 2005 and 2013. The stationarity of time series data was checked by the HEGY and the periodogram based unit root tests. We predicted the PM₁₀ values by using this trigonometric regression approach and found a good fit of the data. The future values of PM₁₀ were also forecasted by the estimated model to grip authorities' attention to air pollution in Koceli.

Keywords: Air Pollution, PM10, seasonality, stationarity, periodogram, forecasting.

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