An Interrupted Time Series Analysis Method for Healthcare Data Using the INGARCH Model: An Application to Psychotropic Drug Prescription Data in Japan

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Abstract

Interrupted time series analysis (ITSA) is generally performed in evaluating the effect of a health policy. Although segmented regression analysis methods are the standard methods for ITSA and are used to fit linear models to the data, these methods are oversimplified for real data. Further, ITSA data are often count time series data that total the number of cases of interest. Although several methods of analysis have been proposed and used for an ITSA, methods using a count time series model have merely been discussed and used. Thus, we propose to use a count time series model, the integer-valued generalized autoregressive conditional heteroscedastic (INGARCH) model, as an ITSA to evaluate a health policy. The INGARCH model is a count time series model which can model more complicated time series data than linear regression models; moreover, it has not been compared with segmented regression analysis methods. We applied the INGARCH model and segmented regression analysis methods (Poisson regression analysis (PREG) and generalized least squares (GLS)) to real psychotropic drug prescription data in Japan and then discussed the statistical behavior of these methods. We used psychotropic drug prescription data from a hospital in Japan for the ITSA. Several administrative policies for the prevention of multidrug use of psychotropic drugs have been enforced in recent years, and we evaluated the effects of the policies on the four types of psychotropic medicines (antidepressants, antipsychotic drugs, anxiolytics, and sleeping drugs). The test results differed according to the methods of analysis used. Segmented regression analysis methods by GLS and PREG fit linear regression models to the data but did not necessarily model the real time series data well. Conversely, INGARCH could model the more complicated time series behavior; thus, the results suggested that INGARCH can model more various types of count time series than segmented regression analysis.

[Keywords] interrupted time series analysis, INGARCH, segmented regression analysis, psychotropic drugs, prescription drug data, multidrug use

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