



Kernel Regression Model for Total Ozone Data

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Abstract

The present paper is focused on a fully nonparametric regression model for autocorrelation structure of errors in time series over total ozone data. We propose kernel methods which represent one of the most effective nonparametric methods.

But there is a serious difficulty connected with them – the choice of a smoothing parameter called a bandwidth. In the case of independent observations the literature on bandwidth selection methods is quite extensive. Nevertheless, if the observations are dependent, then classical bandwidth selectors have not always provided applicable results. There exist several possibilities for overcoming the effect of dependence on the bandwidth selection. In the present paper we use the results of [Chu and Marron \(1991\)](#) and [Kolářček \(2008\)](#) and develop two methods for the bandwidth choice. We apply the above mentioned methods to the time series of ozone data obtained from the Vernadsky station in Antarctica. All discussed methods are implemented in Matlab.

Keywords: total ozone, kernel, bandwidth selection.

1. Introduction

Antarctica is significantly related to many environmental aspects and processes of the Earth. And thus its impact on the global climate system and water circulation in the world ocean is essential.

The stratosphere ozone depletion over Antarctica was discovered at the beginning of the 1990s. The lowest total ozone contents (TOC) in Antarctica are usually observed in the first week of October. The formation of ozone depletion begins approximately in the second half of August, culminates in the first half of October, and dissolves in November. During the ozone depletion, the average ozone concentration varied at the time of its culmination in October from the original value over 300 Dobson Units (DU) in 1950s and 1960s to a level between 100 and 150 DU in 1990-2000 (see [Láška et al. \(2009\)](#)). One DU is set as a 0.001 mm strong