

# Code documentation

This document describes the R code that can be used to replicate the empirical results reported in the paper *Multiscale Inference and Long-Run Variance Estimation in Nonparametric Regression with Time Series Errors*. The overall structure of the code is as follows. There are four main files each of which produces a specific part of the simulations and applications:

`main_size.r` produces the simulation results for the calculations of size for our multiscale method in comparison to the dependent SiZer, that are reported in Section 5.1.1.

`main_power.r` produces the simulation results for the calculations of power for our multiscale method in comparison to the dependent SiZer, that are reported in Section 5.1.2.

`main_lrv.R` produces the simulation results for our long-run variance estimator and its comparison with the estimator from Hall and Van Keilegom (2003) and the oracle one. These results are presented in Section 5.2.

`main_app.R` produces the application results from Section 6, where our multiscale test of the hypothesis  $H_0 : m' = 0$  is applied to the UK temperature time series and the global temperature time series.

These main files read in a number of functions which are collected in the folder `functions`. The simulation and application results are stored either as figures or as `.tex` files (for tables) in the folder `plots`. The tables and figures look exactly as in the paper up to a seed.

Each main file is divided into several blocks with each block being responsible for one method of calculations with either a table or a series of plots as a result. Each block has a title that shortly describes what this block is responsible for. The blocks are separated by a series of hashes (`#`) and are independent of each other. If you want to reproduce one specific type of calculations, you need to run the code in the very beginning of the main file (that contains all the references to the libraries and auxiliary functions) and then the code for corresponding block. You do not need to run previous blocks.

In order to run the code on your computer, you will need R packages `Rcpp` and `xtable`. These packages are freely available on [CRAN](https://cran.r-project.org/).

All programs are written in R with some functions in C++. They are all quite self-explanatory and commented. The code is self-sufficient, the parts from C++ are parsed on the fly and the shared library is then built and its exported functions and `Rcpp` modules are made available in the specified environment. Additional compilation is not necessary.