

**SOME ALTERNATIVE  
APPROACHES IN THE ANALYSIS  
OF ARFIMA(p,d,q) PROCESS**

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## Abstract

A long-memory process is a stationary process whose autocorrelations decay to zero slowly at a hyperbolic rate. There is ample evidence that this phenomenon occurs in various areas of human endeavor such as in economics, telecommunications and hydrology.

In this research, we analyze long-memory process using its most popular model – ARFIMA(p,d,q). We derive a weighted-least-square estimator of the long-memory parameter  $d$  based on the maximal-overlap estimator, a relatively efficient estimator of the wavelet variance. We show that this estimator is asymptotically unbiased and consistent for  $d$ . An asymptotically uniformly most powerful test for  $d$  based on this estimator is also derived. Using uncorrelated wavelet-like coefficients, we obtain maximum likelihood estimators of the ARFIMA(p,d,q) parameters. We also derive an estimator and some uniformly most powerful tests for the long-memory parameter based on local Lyapunov exponents – tools for analyzing chaos.

Finally, we apply some of these results in estimating and testing for the long-memory parameter  $d$  of the Nile river data – a well-known long-memory process.