

# An applied methodology for the prediction of time series' local optima

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## Abstract

Time series prediction is directly connected with the major problem of portfolio optimization [1]; its solution is detected in numerous research and in many statistical methodologies which have implied towards the investigation of the best set of assets [2].

In finance, the time series theory is mainly applied for the prediction of the stock market prices or in applications regarding the currency levels [3, 4]. In practice, however, what any investor seeks for includes the points where the maximization of profit (or the minimization of loss), could be achieved; that in the mathematical spectrum is known as finding local minima and local maxima, respectively.

In [5], are proposed gradient unconstrained optimization algorithms being used in the process of the Lipschitz constant estimation towards the approximation of the objective functions optimas.

More detailed, the estimation of the Lipschitz constant is calculated on sequenced points that come from the repetitive process of optima finding, and their function values, as well. Furthermore, in [5] is proved that the use of this stepsize, given from the Lipschitz constant estimation, leads to local optimum point.

This paper attempts to forecast a time series future optima by applying the suggestions described in [5]. Thus,  $n - 1$  past and known points from the time series are chosen in such way that they apply the conditions described

on [5]; furthermore these points represent sequence points of a repetitive process that leads to local optima of the objective function (in our case this is the daily closing price of a stock). According to the analysis produced in [5], if a sequence's next point represents a time series future point, then this would, finally, be in the neighborhood of local optimum.

The proposed methodology was tested on the daily closing prices of the Athens' Stock Market. The series consists of the daily closing prices of 18 years - from 1985 until 2002 - that include a period of significant ranges for the Greek stock market. Our sample's characteristics are: (a) numerous stock prices, randomly selected, (b) different periods of time, and (c) different number of known closing prices.

The results obtained provide clues that the proposed methodology predicts the local maxima and minima in a rather successive rate. What, however, should be furtherly investigated is the degree that each characteristic of the sample and their occasional fluctuations may affect the results' accuracy.

## References

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