A technique for entrapping a time series' future optima

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In statistics and mathematical finance, a time series is a sequence of data points, measured typically at successive times spaced at uniform time intervals. Time series forecasting is described as the usage of a model to forecast future events based on known, past events; that is to predict future data points before they actually occur.

Recently was implied the usage of non-value oriented future approximations, approached as time-oriented ones, referring to the future point a time series would be locally optimized by exploiting the usage of unconstrained optimization iterative schemes. The revolutionary characteristic of those techniques, named *backtrack* techniques is accommodating time-oriented forecasts, through their usage that enables the forward step with quite accuracy. Such applications focus on the selection of some past points that affect the time series' evolution instead of exploiting all past data that may carry misleading information. A major inconsistency of the backtrack methods is that the estimated future point deriving from their application is either an optimum or a point that eventually would lead to an optimum one; hence the forecast is not strictly accurate. On the other hand as the method approximates the optimum, it is most possible that the application of any optimization technique would finally converge to a steplength that leads to the closest local optimum. Thus, if the simultaneous application of two different optimization methods results to an interval amongst forecasts that is relatively narrow, it is rather possible that the future optimum woould be entrapped in-between these two forecasts, that is the double-technique interval.

The basic idea of this paper is the usage of two different optimization methods for the future step of the backtrack methodology, with completely different convergence characteristics, in order to entrap the future optima in a time range. The interval is estimated through the joint exploitation of two different optimization methods, however based on the same past dataset. Different convergence characteristics of the methods result to the interval that is eligible to envelop the local optima; for the same reason the interval's width tends to decrease as the time series approaches its critical value. Moreover, this interval's width may be used as an approximation of the error in the accuracy of future optimum convergence. The advantage of the new methodology is that the convergence of the two different optimization techniques to the same future optimum is proved. The new methodology was applied to various time series and the results are quite satisfactory. Moreover, numerical results confirm that in most cases the time interval resulting from application of the new methodology is narrow and sufficiently precise in identifying the future optimum.