

Detection of instabilities in various models

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The talk will concern the problem of detection of certain instabilities in statistical models. It is usually formulated in terms of hypothesis testing and estimation problem. The observations X_1, \dots, X_n are obtained at ordered time points and the basic task is to decide whether the model remains stable (without instabilities) during the whole observational period or whether the model changes at some unknown point(s) or become generally unstable. As soon as instabilities (changes) in the model are detected also the time of change and other parameters of the model in the periods where the model is stable have to be estimated.

Such problems are also called change-point problem, disorder problems or testing for presence of structural breaks (in econometrics) or testing for stability or segmented regression or switching regression in the regression setup. General models for instabilities have appeared to be quite useful in applications, e.g., meteorology, climatology, statistical quality control, medical research, financial time series and econometrics etc.

If all n observations are available at the beginning of the statistical analysis we speak about a *retrospective setup*. If observations are arriving sequentially and after each new observation we have to decide whether the observations obtained so far indicate an instability or not we have a *sequential setup* or *monitoring*. Statistical procedures (tests and estimators) for detection of a change were developed applying various principles. As a motivation can serve the case of the known change point which leads to a variant of the two-sample problem eventually the k sample problem.

The talk will focus on several particular models with instabilities. At first some toy examples will be presented. Afterwards results on instabilities in time series of counts, tests for martingale difference hypothesis (from financial econometrics), etc. Some theoretical results will accompany applications.