PREDICTABILITY OF THE STOCK INDICES' BIGGEST FALLS

Shapoval A.B.

Finance Academy under the Government of the RF, Leningradsky pr. 49, 125468, Moscow, Russia; International Institute of Earthquake Prediction Theory

The paper investigates the distribution of the time between the biggest one-day falls of the stock indices. The falls are defined as the log-returns $r(t) = \ln\big(p(t+1)/p(t)\big)$, which are less than some negative r. Numbers $p(t)$ and $p(t+1)$ are the prices at days t and $t+1$. This inter-event distribution for indices Dow Jones (DJI) and Hans Seng (HS) is shown to differ from an exponential distribution if the conditions influencing the index time series vary insignificantly.

The inter-event distribution underlies the prediction algorithm aiming at the forecast of the indices' biggest falls (which are the target events of the algorithm) in advance. The algorithm switches the alarm on immediately after the fall. The alarm is switched off t days later or at the next fall depending on what happens earlier. The value of T is the only parameter of the algorithm to be tuned on some study sample non-intersecting the sample being used for the algorithm verification. The target event is called unpredicted if it occurs when the alarm is not switched on. Undertaking the retrospective analysis of DJI the algorithm predicts 42 target events among 54. Thus, the rate of the unpredicted events $n = 0.22$. The rate of the alarms $\tau = 0.34$. It means that the alarms occupy approximately a third of the time considered. The sum $n + \tau \approx 0.56$ is also obtained for the retrospective analysis of HS.

According to the decision making theory, n and τ are natural characteristics of the algorithms predicting rare events. Their most famous application probably involves the prediction of the strongest earthquakes. The characteristics n and τ are close to two errors appearing in the theory of the verification of the statistic hypotheses. The Poisson process satisfies to $n + \tau = 1$. The inaccessible ideal of the prediction is $n = \tau = 0$. The intermediate result $n + \tau \approx 0.56$ obtained for the biggest falls of DJI and HS gives a strong evidence of their predictability with a certain efficiency.

Conclusions.

- Either the sequence of the stock indices' falls has *locally* exponential inter-event distribution with a *variable* intensity or this sequence *possesses memory*.
- The decision making theory is able to estimate any prediction algorithm in terms of two natural output characteristics of the algorithm.
- In these terms one can demonstrate the *predictability of the biggest falls* skipping the majority of the sampled log-returns.