K-step prediction

The full Bayesian k-step prediction (with integrals of the pdfs) can be demanding to implement or even unfeasible. That is why, usually, the point variant (with point estimates of unknown variables) is used. This way of realization uses subsequent zero-step prediction from the model and substituting unknown variables by they point estimates. Also parameters are substituted as point estimates.

For regression model $y_t = a_1 y_{t-1} + a_2 y_{t-2} + e_t$ we get the following scheme

$$\hat{y}_t = \hat{a}_1 y_{t-1} + \hat{a}_2 y_{t-2}$$

$$\hat{y}_{t+1} = \hat{a}_1 \hat{y}_t + \hat{a}_2 y_{t-1}$$

$$\hat{y}_{t+2} = \hat{a}_1 \hat{y}_{t+1} + \hat{a}_2 \hat{y}_t$$

$$\dots$$

where $\hat{a}_1, \hat{a}_2$ are point estimates of the model parameters and the values of y_1 and y_{t+1} are replaced by the point estimates $\hat{y}_1$ and $\hat{y}_{t+1}$. The models without noise generate point zero-predictions.

This type of prediction can be used for estimation of a future output value - e.g. for prediction of the traffic intensity in some (reasonable long) period ahead.

K-step prediction for regression model with known parameters

Here, a lucid but practically not very realistic version of prediction is solved. The estimation is not necessary, but assumption of known model parameters in practical application can hardly be expected.

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K-step prediction for regression model with unknown parameters

This is the realistic situation. The model is defined only as for its structure and its parameters are continuously estimated.

Remark:

According to out agreement, the zero-step prediction $\hat{y}_t$ is computed at time t but y_t has not be measured, yet. That is, in program realization, at time t we first make prediction, them simulation (which means data measurement) and finally with new data we recompute the parameters i estimation.

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K-step prediction for regression model with real data

In practice, we do not simulate data but use values of data measured in a real system. This is what we show here in this example

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K-step prediction for categorical model

The prediction of a discrete output is demonstrated here. The program has practically the same structure as that with regression model only the generation from regression model is replaced by generation from categorical one.

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