MLE & MAP

LinyiGuo

2019/9/22

Considering the parameters from Bayesian standpoint

I am still not very clear about my goal until now, which is pretty bad. Sometimes, I think 'Oh here it is! This is what I want!' but after a few days(actually, often after meeting with Aaron or someone else), I realize 'What? This is what I want? What's the meaning of it?' I feel my goal of research is always changed although they are all related to seasonal adjustment. I just do not know what they want actually.

At first, I thought they just want to smooth the curve of series after seasonal adjustment, when I got there, they told me something else.

Now, appatently I can achieve any kind of smoothness of any kind of curve, but I achieved these by forcing parameters manually. In **frequentist**, we prefer to let the data to 'speak', which would be more convictive. From this point of view, it seems to be meaningless to have different smoothness curves, although the truth may be not one and only. Also, from **Bayesian**, we hope our data help us to adjust our prior and 'speak' as well.

From the results in frequentist and Bayesian, we could have a MLE or MAP value of parameters, and with the help of Kalman filter, we could plot the corresponding curves. In frequentist, the process can be achieved only once, but in Bayesian, we can apply the same procedure in different prior families and choose one better prior in one family.

Having saied so much, we need to show something real.

For the expression in SSM,

- $y_t = \mu_t + \gamma_t + \epsilon_t$, where $\epsilon_t \sim N(0, \sigma_y^2)$
- $\mu_{t+1} = \mu_t + \phi_t$, where $\phi_t \sim N(0, \sigma_\mu^2)$
- $\gamma_t = \sum_{j=1}^{s/2} \gamma_{jt}$
- $\gamma_{j,t+1} = \gamma_{jt} cos\lambda_j + \gamma_{jt}^* sin\lambda_j + \omega_{jt}$
- $\gamma_{j,t+1}^* = -\gamma_{jt} sin\lambda_j + \gamma_{jt}^* sin\lambda_j + \omega_{jt}^*$, where $\omega_{jt}, \omega_{jt}^* \sim N(0, \sigma_\gamma^2)$