September 19, 2019

1 model

$$f_1(x) = 3exp(-30(x-0.3)^2) + exp(-50(x-0.7)^2)$$

$$\begin{aligned} Y|\beta, \sigma^2, \gamma &\sim N(Z\Gamma\beta, \sigma^2 I) \\ \sigma^2 &\sim Inverse - Gamma(A, B) \\ \beta_j &\sim N(0, \sigma_\beta^2) \\ \gamma_j &\sim Bernoulli(\rho) \\ \rho &\sim Beta(C, D) \end{aligned}$$

2 Empirical Bayes

We need to calculate the likelihood $p(y|\rho)$ and select the hyper parameter ρ which maximize the likelihood

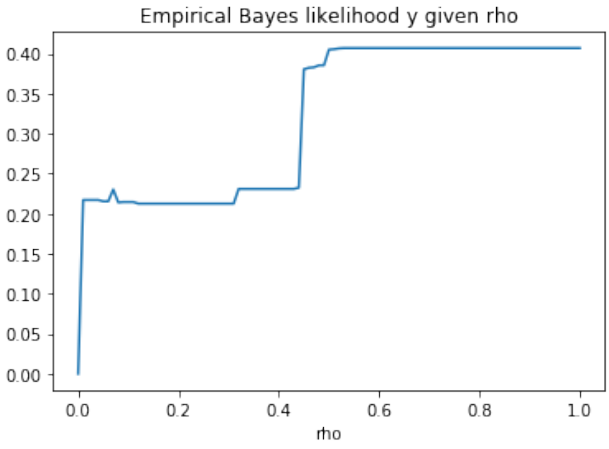

Figure 1: likelihood by changing of ρ

3 ρ with Beta prior

Sensitivity of variation family need to be checked. When sample size is small (n=800) varational distribution is sensitive by changing the distribution of ρ $Beta(\alpha, \beta)$, but if sample size has enough size(n=8000) result is more robust.

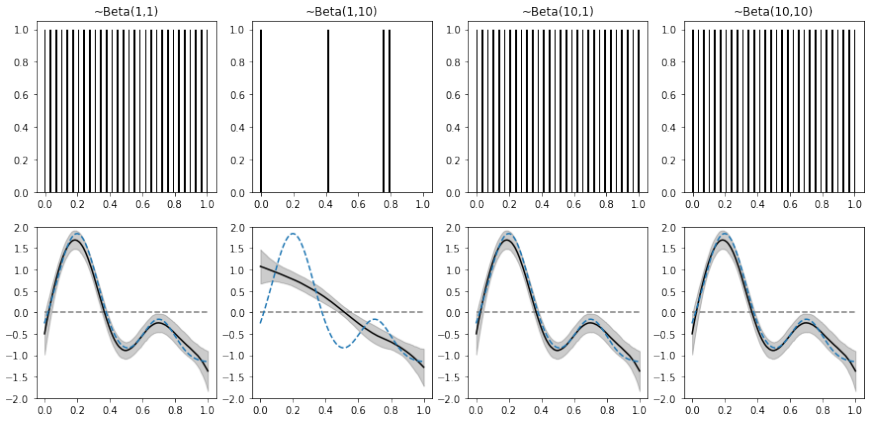

Figure 2: number of obs : 800 and posterior mean of ρ is 0.97, 0.12, 0.98, 0.8

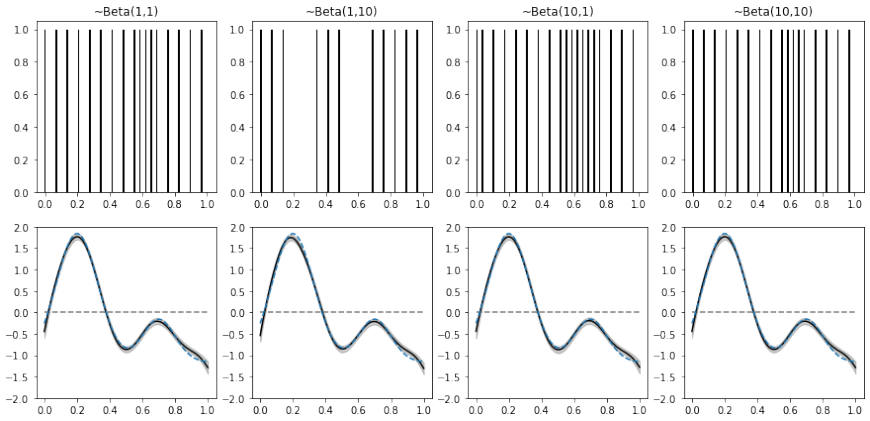

Figure 3: number of obs : 8000 and posterior mean of ρ is 0.56, 0.29, 0.70, 0.54