

Probability Model For An Autoregressive Model

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1 Autoregressive Model

Let $AR(K)$ denote an autoregressive model of order K , which is defined as

$$y_n = \alpha + \sum_{k=1}^K \beta_k y_{n-k} + \epsilon_n \quad (1)$$

where α is a constant, β_1, \dots, β_K are the parameters of the $AR(K)$ model, and $\{\epsilon_n\}$ is assumed to be a white noise series with mean 0 and variance σ^2 .

2 Probability Model

Here we use an improper prior for α, β , and σ to illustrate the idea. A weakly informative prior or informative prior could be added if more knowledge of the parameters is available. The probability model for this $AR(K)$ model is described as:

$$y_n \sim \text{Normal}(\mu_n, \sigma)$$

$$\mu_n = \alpha + \sum_{k=1}^K \beta_k y_{n-k}$$

$$\alpha \sim \text{Uniform}(-\infty, \infty)$$

$$\beta \sim \text{Uniform}(-\infty, \infty)$$

$$\sigma \sim \text{Uniform}(0, \infty)$$