Performance Measures

Root Mean Square Error (RMSE)

$$SSE = \frac{1}{n}\sum_{i=1}^{n}(m_i - o_i)^2$$

$$RMSE = \sqrt{SSE}$$

Nash Sutcliffe Efficiency (NSE)

$$\sum_{i=1}^{n}(o_i - m_i)^2$$

$$NSE = \frac{}{\sum_{i=1}^{n}(o_i - \bar{o})^2}$$

Nash and Sutcliffe, 1970, J. of Hydrology

Widely used in hydrology

Range – infinity to +1.0

Overly sensitive to extreme values

BIAS or Percent Error (Err)

$$Err = \frac{(\bar{m} - \bar{o})}{\bar{o}} * 100$$

Useful for determining if there is a long term flow over or under estimation

*Others: Cor, R^2

Model Performance

```
#' nse
#'
#' Compute NSE between observation and model
#' @param  m  model estimates
#' @param  o  observations
#' @return nse

nse = function(m,o) {

err = m-o
meanobs = mean(o)
mse = sum(err*err)
ovar = sum((o-meanobs)*(o-meanobs))
nse = 1.0-mse/ovar

return(nse)
}
```