

# Model Search Methods

## Backward Stepwise Selection

1. Let  $M_p$  denote full model which all predictors.
2. For  $k = p, p - 1, p - 2, \dots, 1$ 
  - Consider all  $k$  models that contain all but one of the predictors in  $M_k$ , for a total of  $k - 1$  predictors
  - Choose the best among these  $k$  models and call it  $M_{k-1}$ .  
Here, *best* is defined as having the smallest RSS or largest  $R^2$
3. Select a single best model from among  $M_0, M_1, \dots, M_p$  using cross validated prediction error,  $C_p$  (*AIC*), *BIC*, or Adjusted- $R^2$

requires training  $1 + \frac{p(p+1)}{2}$  models

### Example

$p = 3$

$M_3$ : full mode  $X_1$   $X_2$   $X_3$

$C_2$ :  $X_1, X_2$   $X_1, X_3$   $X_2, X_3$

lowest training RSS within  $C_1$

$\Rightarrow M_2$

$C_1$ :  $X_1$   $X_2$

lowest training RSS within  $C_2$

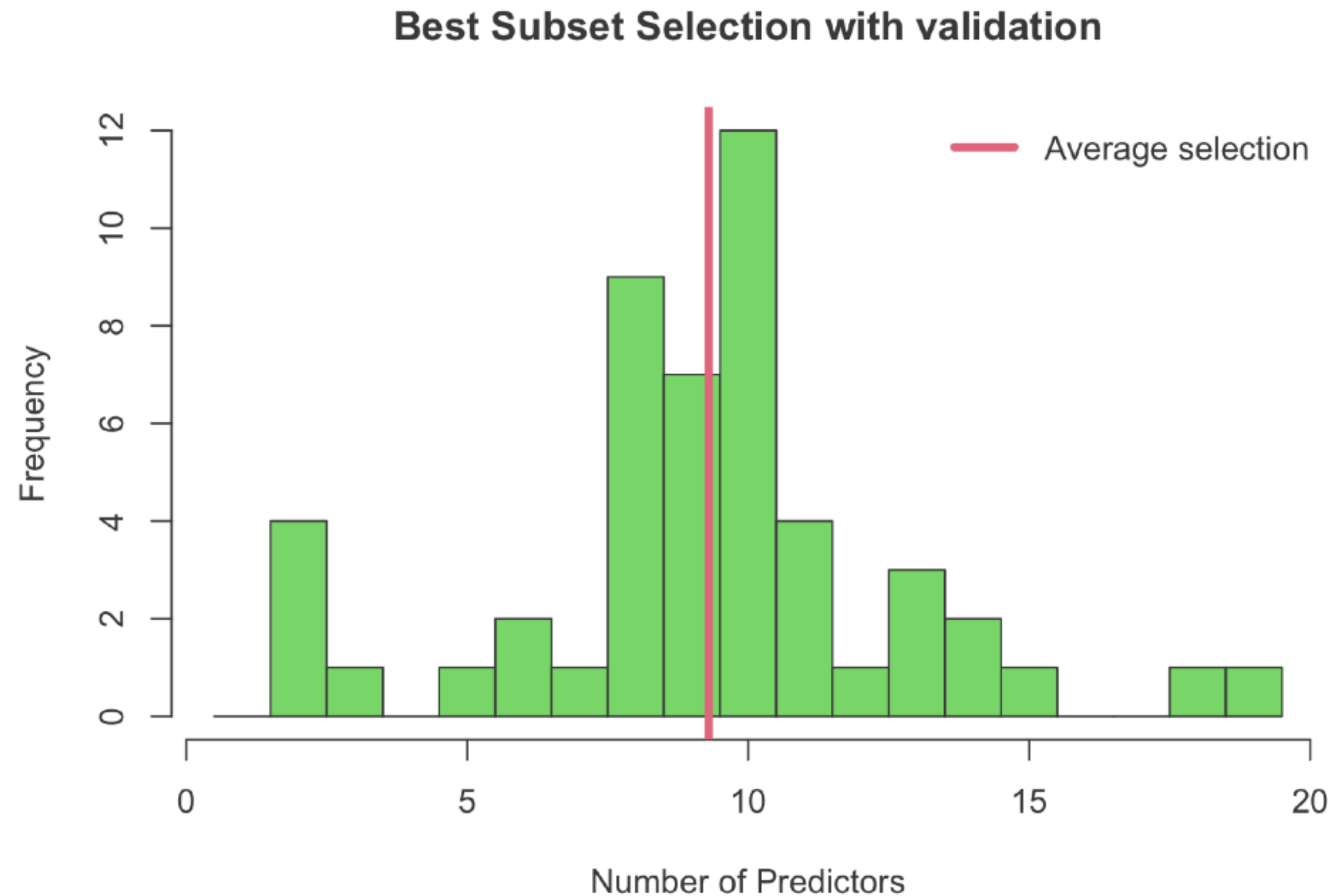
$\Rightarrow M_1$

$M_0$ : intercept only (null)

# Model Search Methods

## Best Subset Selection

validation approach based on 50 different seeds and storing number of predictors in selected model each time



[plot is made based on the 'hitters' data set used in this week's practical in ISLR2]