


# Building A Model (Step-By-Step)

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# Building A Model

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## 5 methods of building models:

- 1. All-in
  - 2. Backward Elimination
  - 3. Forward Selection
  - 4. Bidirectional Elimination
  - 5. Score Comparison
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- Stepwise Regression

# Building A Model

## **“All-in” – cases:**

- Prior knowledge; OR
- You have to; OR
- Preparing for Backward Elimination



# Building A Model

## Backward Elimination

**STEP 1:** Select a significance level to stay in the model (e.g.  $SL = 0.05$ )



**STEP 2:** Fit the full model with all possible predictors



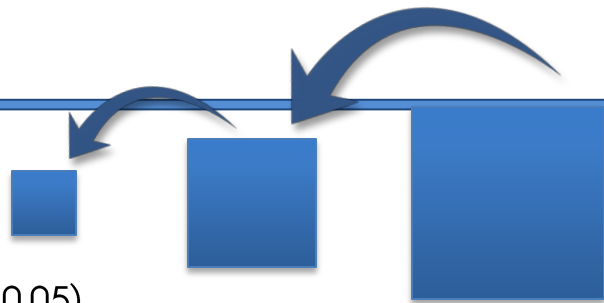
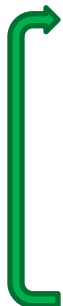
**STEP 3:** Consider the predictor with the highest P-value. If  $P > SL$ , go to STEP 4, otherwise go to FIN



**STEP 4:** Remove the predictor



**STEP 5:** Fit model without this variable\*



**FIN:** Your Model Is Ready

# Building A Model

## Forward Selection

**STEP 1:** Select a significance level to enter the model (e.g.  $SL = 0.05$ )



**STEP 2:** Fit all simple regression models  $y \sim x_n$ . Select the one with the lowest P-value



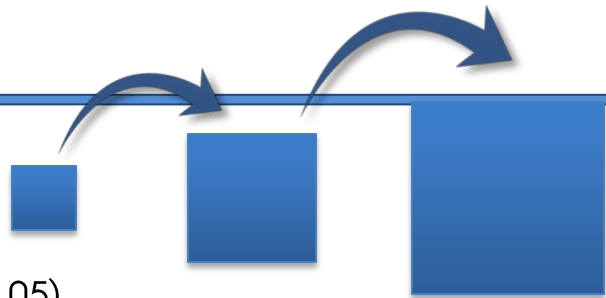
**STEP 3:** Keep this variable and fit all possible models with one extra predictor added to the one(s) you already have



**STEP 4:** Consider the predictor with the lowest P-value. If  $P < SL$ , go to STEP 3, otherwise go to FIN



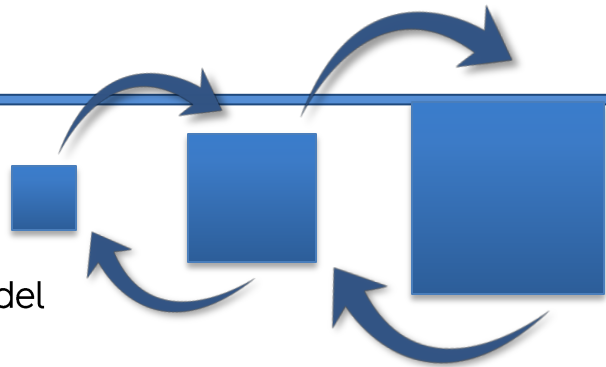
**FIN:** Keep the previous model



# Building A Model

## Bidirectional Elimination

**STEP 1:** Select a significance level to enter and to stay in the model  
e.g.: SLENTER = 0.05, SLSTAY = 0.05



**STEP 2:** Perform the next step of Forward Selection (new variables must have:  $P < \text{SLENTER}$  to enter)

**STEP 3:** Perform ALL steps of Backward Elimination (old variables must have  $P < \text{SLSTAY}$  to stay)

**STEP 4:** No new variables can enter and no old variables can exit

**FIN:** Your Model Is Ready

# Building A Model

## All Possible Models

**STEP 1:** Select a criterion of goodness of fit (e.g. Akaike criterion)



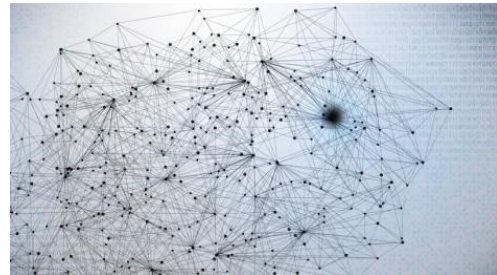
**STEP 2:** Construct All Possible Regression Models:  $2^N - 1$  total combinations



**STEP 3:** Select the one with the best criterion



**FIN:** Your Model Is Ready



**Example:**  
**10 columns means**  
**1,023 models**