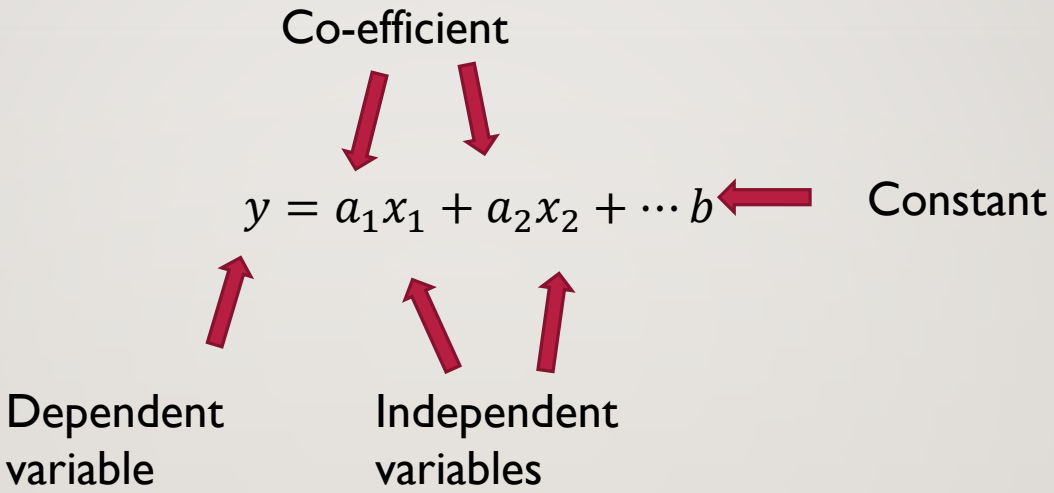
MULTIPLE LINEAR REGRESSION

SIMPLE LINEAR REGRESSION

Multiple Linear Regression



ASSUMPTIONS OF LINEAR REGRESSION

- Linearity
- Homoscedasticity
- Multivariate normality
- Independence of error
- Lack of multicollinearity

DUMMY VARIABLE

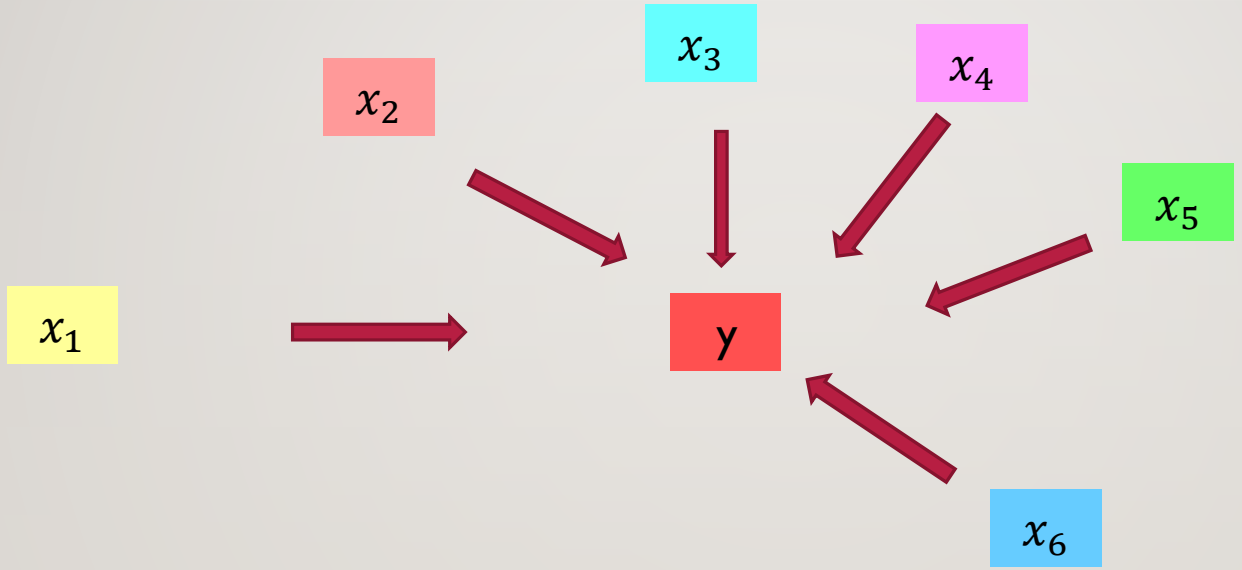
Profit	R&D	Admin	Marketing	State
192261.8	165349.2	136897.8	471784.1	New York
191792.1	162597.7	151377.6	443898.5	California
191050.4	153441.5	101145.6	407934.5	New York
182902	144372.4	118671.9	383199.6	New York
166187.9	142107.3	91391.77	366168.4	California

Dummy Variable

New York	California
1	0
0	1
1	0
1	0
0	1

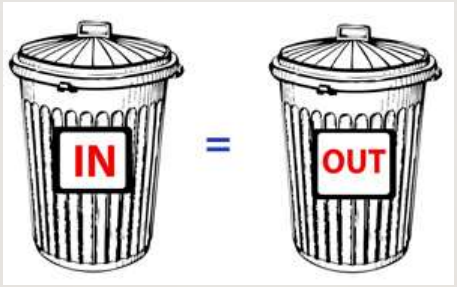
$$y = b + a_1x_1 + a_2x_2 + a_3x_3 + ??? + a_4x_4$$

BUILD A MODEL(1/3)



CONTD.(2/3)

1).



2).

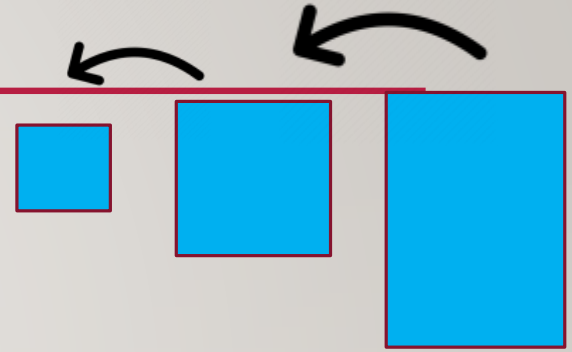
CONTD.(3/3)

- There are 5 methods to build the model:
  1. All-in
  2. Backward Elimination
  3. Forward Selection
  4. Bi-directional Elimination
  5. Score Comparison

ALL-IN METHOD

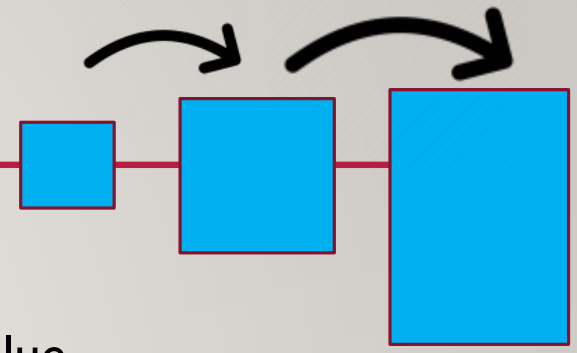
- Prior Knowledge
- You have to
- Preparing for backward elimination

BACKWARD ELIMINATION METHOD



1. Select a significance level to stay in the model (e.g. SL = 0.05)
2. Fit the full model with all possible predictors
3. Consider the predictor with the highest P-value. If P > SL , go to step 4 otherwise Finish.
4. Remove the predictor
5. Fit the model without the variable.

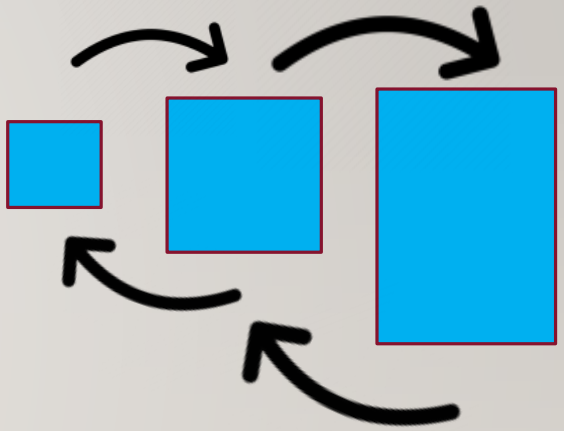
FORWARD SELECTION METHOD



- Select a significance level to enter the model (e.g. SL = 0.05)
- Fit all the regression models $y \sim x_n$. Select the one with the lowest P-value
- Keep this variable and fit all possible models with one extra predictor added to the ones you already have.
- Consider the predictor with the lowest P-value. If P < SL, go to STEP 3, otherwise FINISH.

BIDIRECTIONAL ELIMINATION

- Select a significance level to enter and to stay in the model. (e.g. SLENTER = 0.05, SLSTAY = 0.05)
- Perform the next step of the Forward Selection (new variable must have: P < SLENTER to enter)
- Perform all the steps of Backward Elimination method (old variable must have P < SLSTAY to stay)
- No new variables can enter and no old variable can exit.
- Finish your model.



ALL POSSIBLE MODEL

- Select a criterion of goodness of fit (e.g. Akaike criterion)
- Construct All Possible Regression Model $2^n - 1$ total Combination.
- Select the one with the best criterion.
- Fin your model.

THANK YOU