

# Stepwise Regression

Mastering JMP

Scott Allen, Senior Systems Engineer  
Byron Wingerd, Principal Systems engineer



# Agenda

- What is Stepwise Regression?
- How does Stepwise Regression work?
- Stepwise Regression platform overview
- Examples

# Stepwise Regression

A method for selecting a subset of model effects for a linear regression model

# Why not use all the variables?

- Models with fewer parameters are easier to interpret and explain
- Models are more generalizable
- Avoid overfitting the model
- The data may not have enough observations to create a standard least squares model

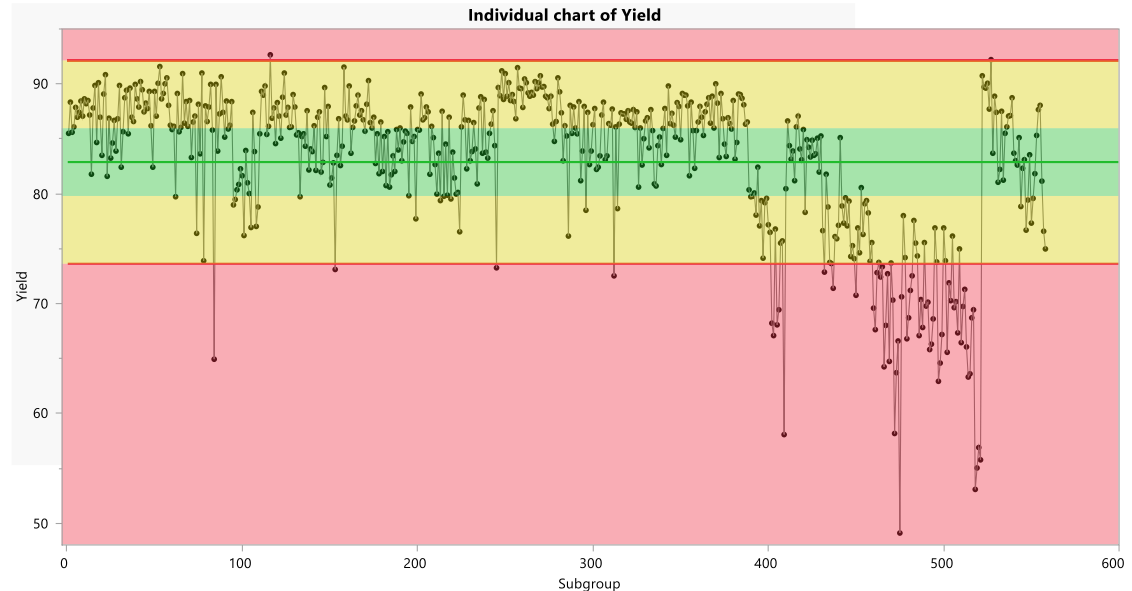
*Find the balance between simplicity and model accuracy*

# Production Problem

A multi-step manufacturing process averages 85% yield

Recently there was a time when numerous batches went out of the spec

A root cause analysis was launched to determine the variables that influence the yield



# Goals

1. Use Stepwise Regression to find Important Variables
  - Use different Stepwise methods
  - Evaluate Models
2. Use Stepwise Regression to build a model with higher order terms
3. Show how JMP Pro can streamline Stepwise Regression methods and build more robust linear models

# Stepwise Regression Methods

## Backward Elimination

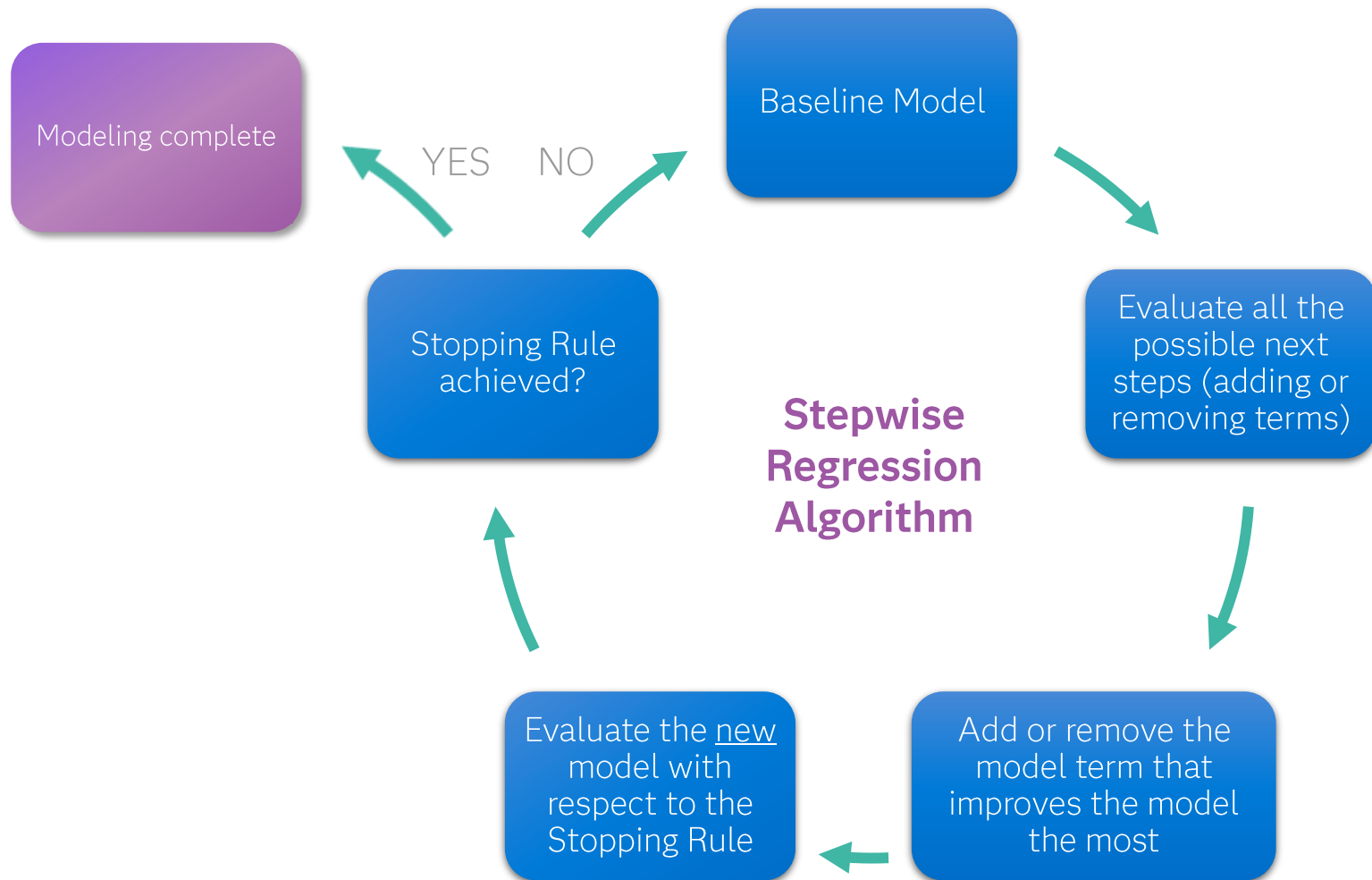
Start with all model terms, then remove the variable that is least important.

## Forward Selection

Start with the intercept only and then add model terms

## Mixed

Certain rules are in place on a forward selection or backward selection step



## Stepwise Regression Algorithm



## Hereditry of Effects

The presence of higher order effects (polynomials, interactions) is associated with the presence of the main effects

*If the  $X1*X2$  interaction is important, either  $X1$  or  $X2$  are also important*