



Occam's Razor: No more things should be presumed to exist than are absolutely necessary, i.e., the fewer assumptions an explanation of a phenomenon depends on, the better the explanation.

(William of Occam)

# The Law of Parsimony

## Ockham's Razor

- ▶ Ockham's razor, sometimes known as the law of parsimony, is simply a maxim that states that simple explanations are usually better than complicated ones.
- ▶ **Ockham's razor** was originally proposed by a monk named William of Ockham. (He did not call it "Ockham's razor" or even "my razor." This is a name that has been given to it over time.)

- ▶ Another version of this principle is the Law of Parsimony . This says that if you are choosing between two theories, choose the one with the fewest assumptions.
- ▶ Assumptions here means claims of fact that have no evidence.
- ▶ A theory that doesn't have many assumptions, and is very simple, is called a parsimonious theory.

# Law of Parsimony

## **Law of Parsimony**

In the context of statistics, the law of parsimony can be interpreted as an adequate model which requires the fewest independent variables is the preferred model.

## Model building

- ▶ The traditional approach to statistical model building is to find the most parsimonious model that still explains the data.
- ▶ The more variables included in a model (overfitting), the more likely it becomes mathematically unstable, the greater the estimated standard errors become, and the more dependent the model becomes on the observed data.

## Model building

- ▶ Choosing the most adequate and minimal number of explanatory variables helps to find out the main sources of influence on the response variable, and increases the predictive ability of the model.
- ▶ As a rule of thumb, there should be more than 10 observations for each variable in the model.

# Overfitting

## Overfitting

- ▶ Overfitting occurs when a statistical model does not adequately describe of the underlying relationship between variables in a regression model.
- ▶ When overfitting happens, the model predicts the fitted data very well, but predicts future observations poorly.

# Overfitting

## Overfitting

- ▶ Overfitting generally occurs when the model is excessively complex, such as having too many parameters (i.e. predictor variables) relative to the number of observations.
- ▶ A model which has been overfit will generally have poor predictive performance, as it can exaggerate minor fluctuations in the data.



# Variable-Selection Procedures

## **Variable Selection / Feature Selection**

- ▶ In regression analysis, variable-selection procedures are aimed at selecting a reduced set of the independent variables - the ones providing the best fit to the model, in keeping with the Law of Parsimony.

- ▶ Occam's razor (or Ockham's razor) is a principle from philosophy. Suppose there exist two explanations for an occurrence.
- ▶ In this case the simpler one is usually better.
- ▶ Another way of saying it is that the more assumptions you have to make, the more unlikely an explanation is.
- ▶ Occam's razor applies especially in the philosophy of science, but also more generally.