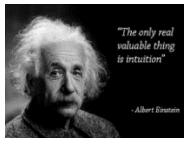
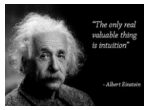
Piecewise Models

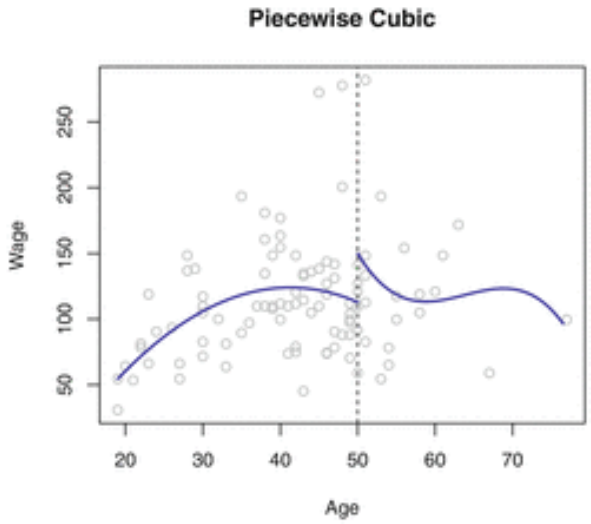


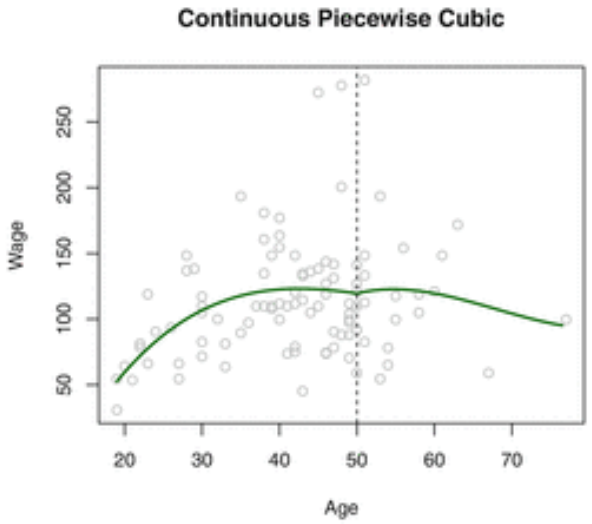
Piecewise Functions: Intuition

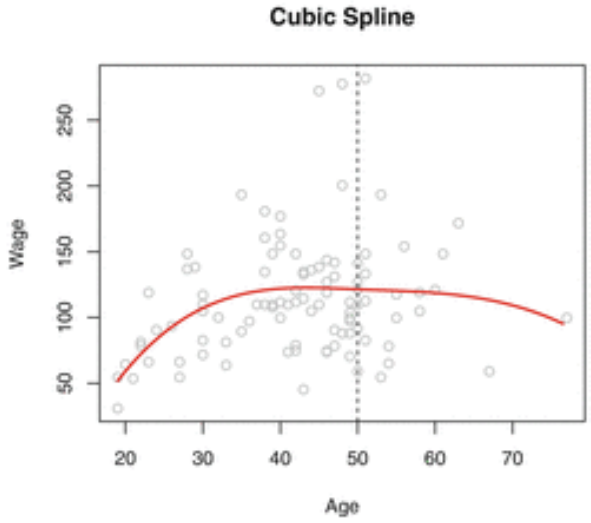
- The **simplicity** of the idea of breaking up the data into sections and applying a **Step** function is appealing, but **simplistic**
- If the data shows a particular pattern within a data section, **why predict** a **simple average** for the entire range?
- And, what is the most appropriate **prediction** at the **"knots"** – i.e., the points where the function steps up or down?
- It may be more appropriate to **fit** a **different regression** function within each of the **sections**, yielding various possible models:
  - **Step Function** – a flat average (no slope) for each section
  - **Piecewise Linear** – a different linear regression per section
  - **Piecewise Polynomial** – a different polynomial per section
  - **Spline** – a piecewise function, but connected at the **"knot"** (i.e., **no jumps** a the knot
  - **Smoothing Spline** – a combination of **Ridge** (i.e., shrinkage) and **Spline**, which has the effect of **smoothing** the curve at the knot; how much smoothing is determined by a **tuning** parameter λ

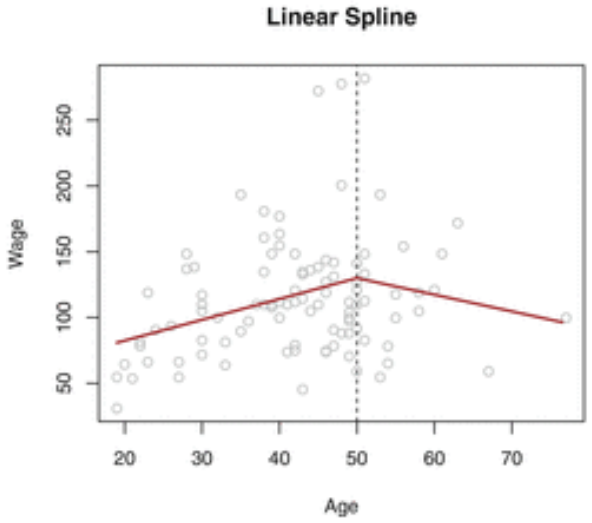


Piecewise Functions Illustrations









KOGOD SCHOOL
of
BUSINESS