# An introduction to GAM(M)s

Stefano Coretta

12/07/2018

Time travel. . .

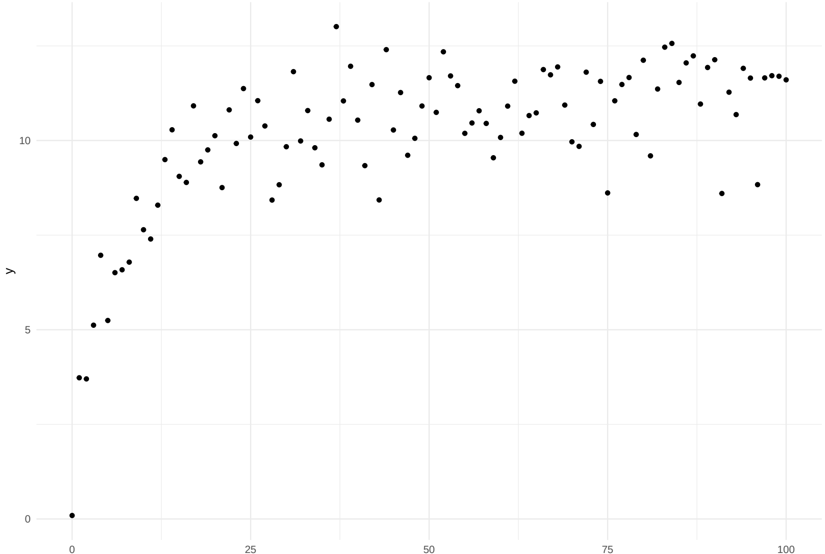
# Linear models

$$y = 3 + 2x$$

where $x = (2, 4, 5, 8, 10, 23, 36)$

# Linear models

Some (fairly) linear data...



# Linear models

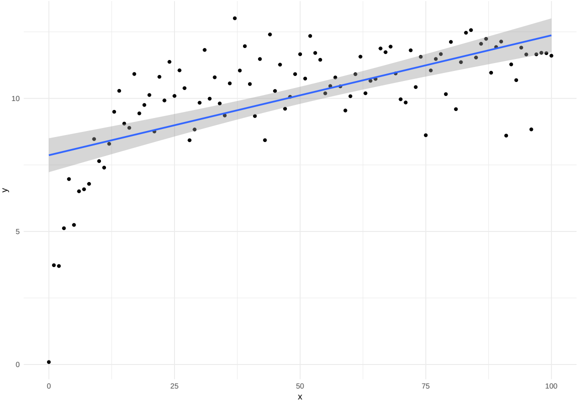
- A general formula: $y = \beta_0 + \beta_1 x$
  - $y$ is the **outcome variable**
  - $x$ is the **predictor**
  - $\beta_0$ is the **intercept**
  - $\beta_1$ is the **slope**
- We know $x$ and $y$
  - we need to estimate $\beta_0$, $\beta_1$
- We can add more predictors
  - $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_n x_n$

# Linear models

- code in R

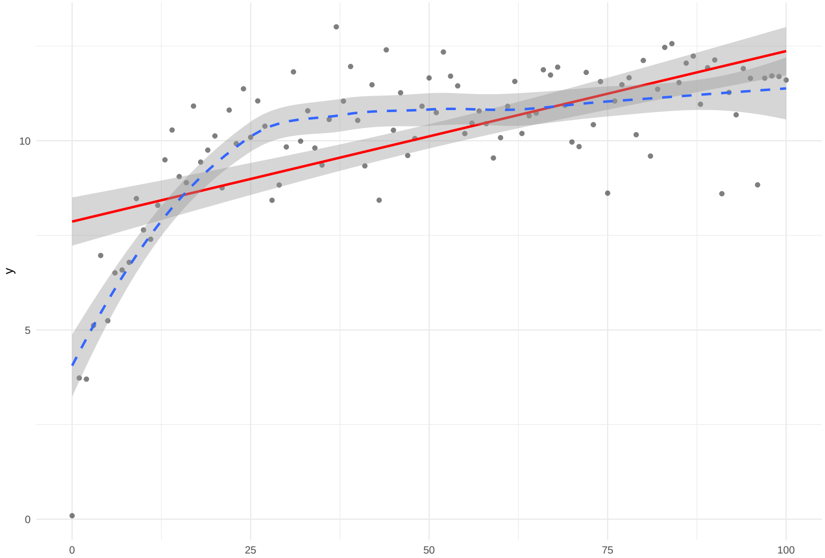
```
lm(y ~ x, data = sim_traj)
```

- estimated intercept and slope



# Linear models

## Is it linear?

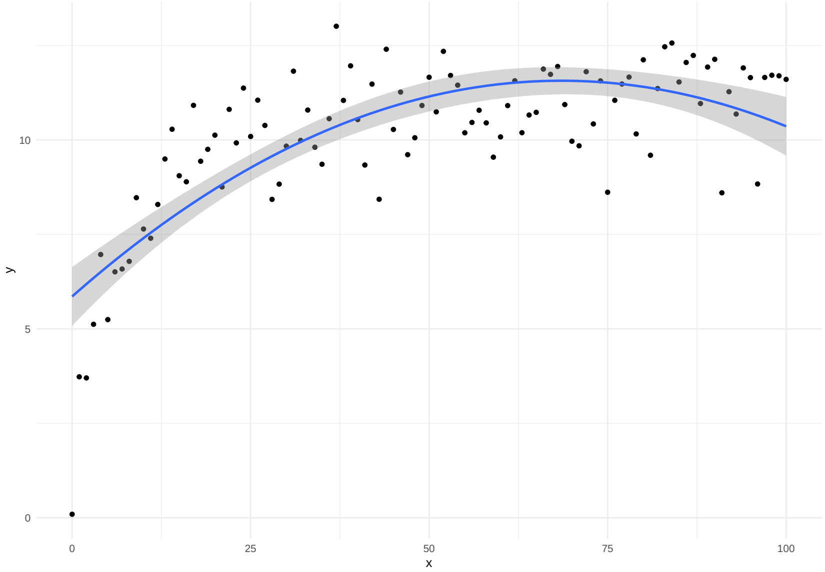


# Linear models with non-linear data

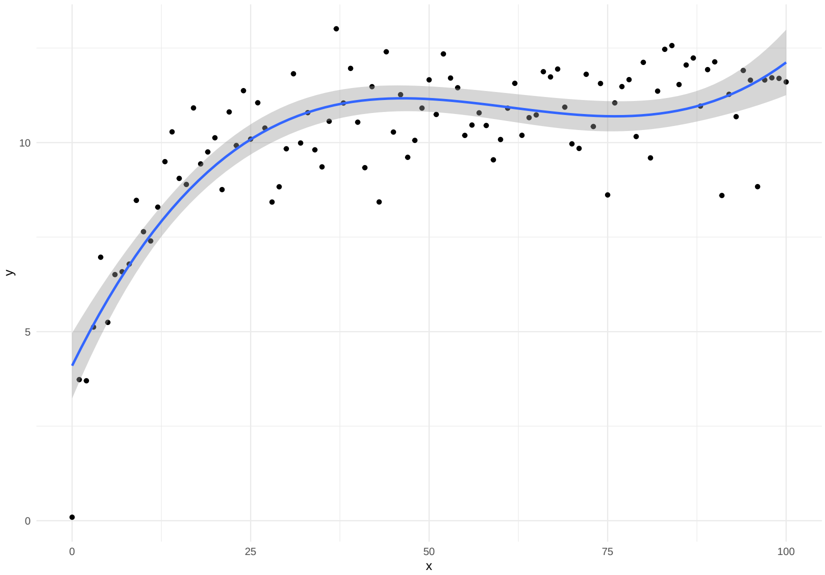
How to account for non-linearity in a linear model?

- Use **higher-degree polynomials**
  - quadratic: $y = \beta_0 + \beta_1 x + \beta_2 x^2$
  - cubic: $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \beta_3 x^3$
  - $n$th: $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \beta_3 x^3 + ... + \beta_n x^n$

# Linear models with non-linear data



# Linear models with non-linear data



# Linear models with non-linear data