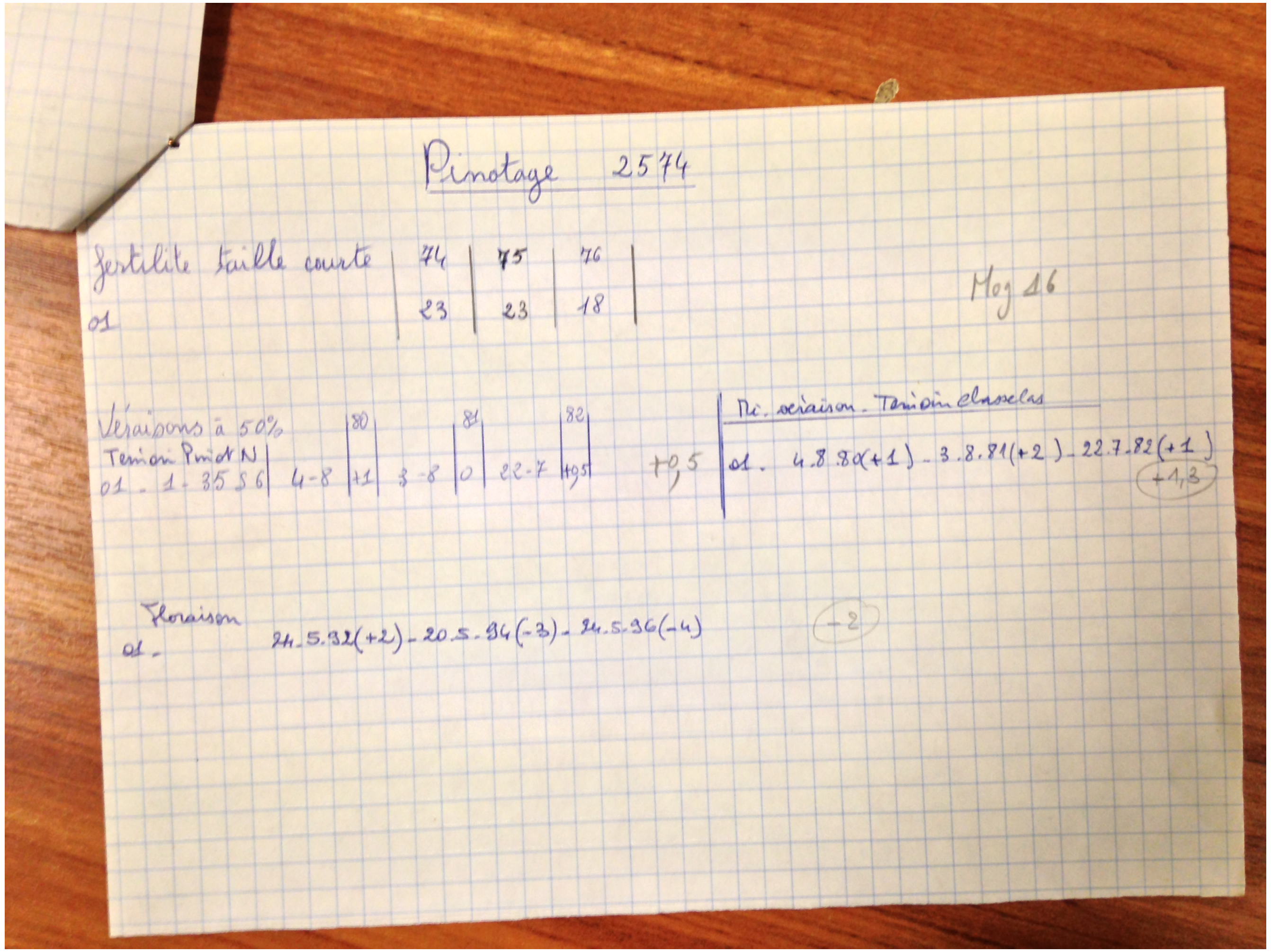
Duration of interphenophases in winegrapes

1. Domaine de Vassal

- Research vineyard in France
- Plant many varieties and clones for experiments and data collection
- Vines are planted for 5 years
- Except Chasselas

2. The data:

- Chasselas is continually grown as the baseline variety
- Phenology is measured relative to Chesselas
- If budbreak for Chasselas is April 15, then
  - April 15 = 0
  - April 14 = -1
  - April 16 = +1



3. The data:

- Data years 1956 – 2013
- Hinge year for model = 1980
    - Earliest start year for simulated data will be 1961
    - Years in simulated data count down from the start year

4. Questions:

- Has the duration of interphenophases changed since the 1980s?
- If so, does the change differ between varieties?
- Interphenophase = time between phenophases (budburst to flowering)

5. Model: Single Slope

Duration.predicted ~ N(mu, e)

$mu = a_{var} + B*year$

$a_{var} \sim N(mu_{var}, sigma_{var})$

$B = -0.2$

$e \sim U(0, 20)$

Written as an equation:

$Duration.predicted = a_{var} + B*year + e$

- **So each variety has unique intercept but will only draw one value from beta's distribution so all varieties have same slope (for now).**

6. Model: Variety Slope

Duration.predicted ~ N(mu, e)

$mu = a_{avar} + B_{bvar}*year$

$a_{avar} \sim N(mu_{avar}, sigma_{avar})$

$B_{bvar} \sim N(mu_{bvar}, sigma_{bvar})$

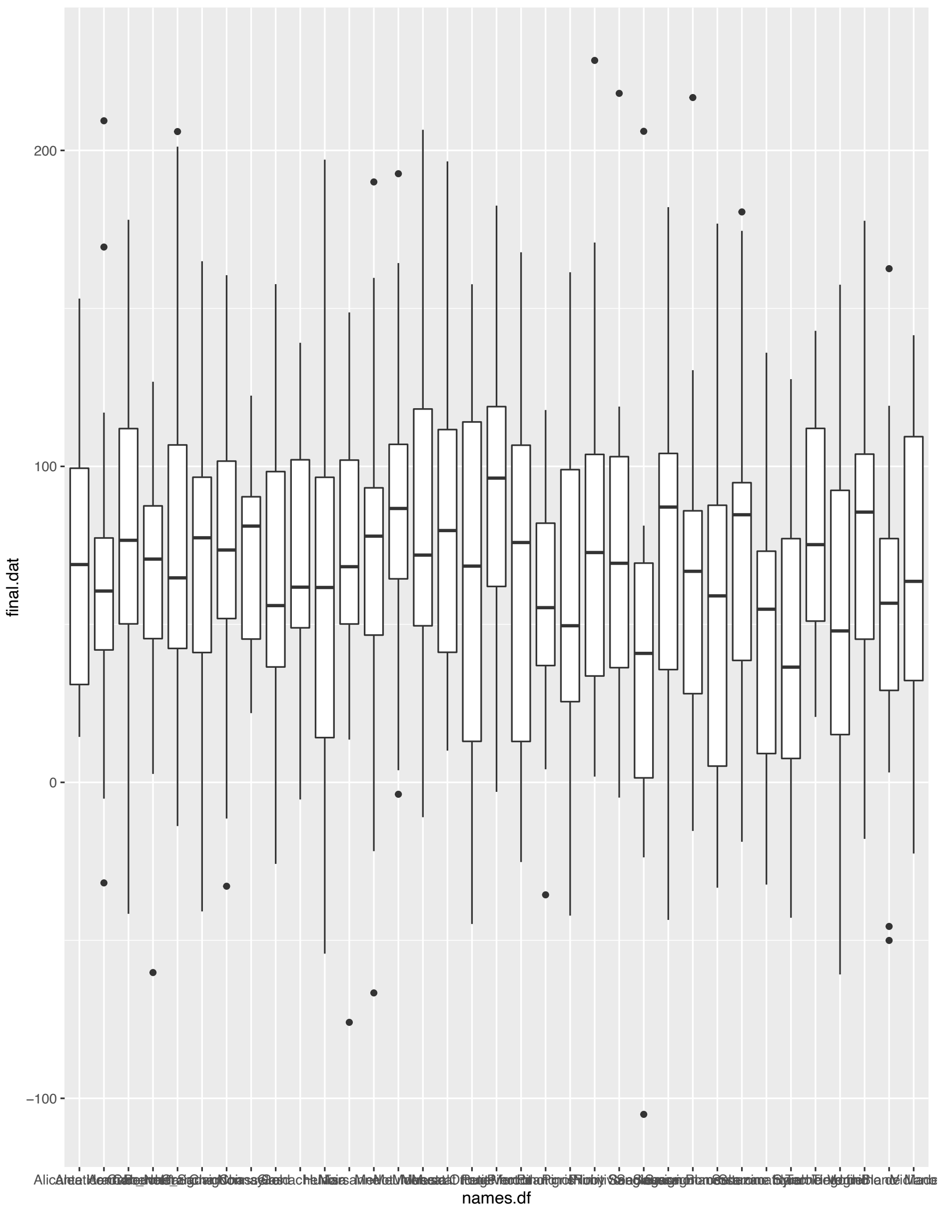
$e \sim U(0, 20)$

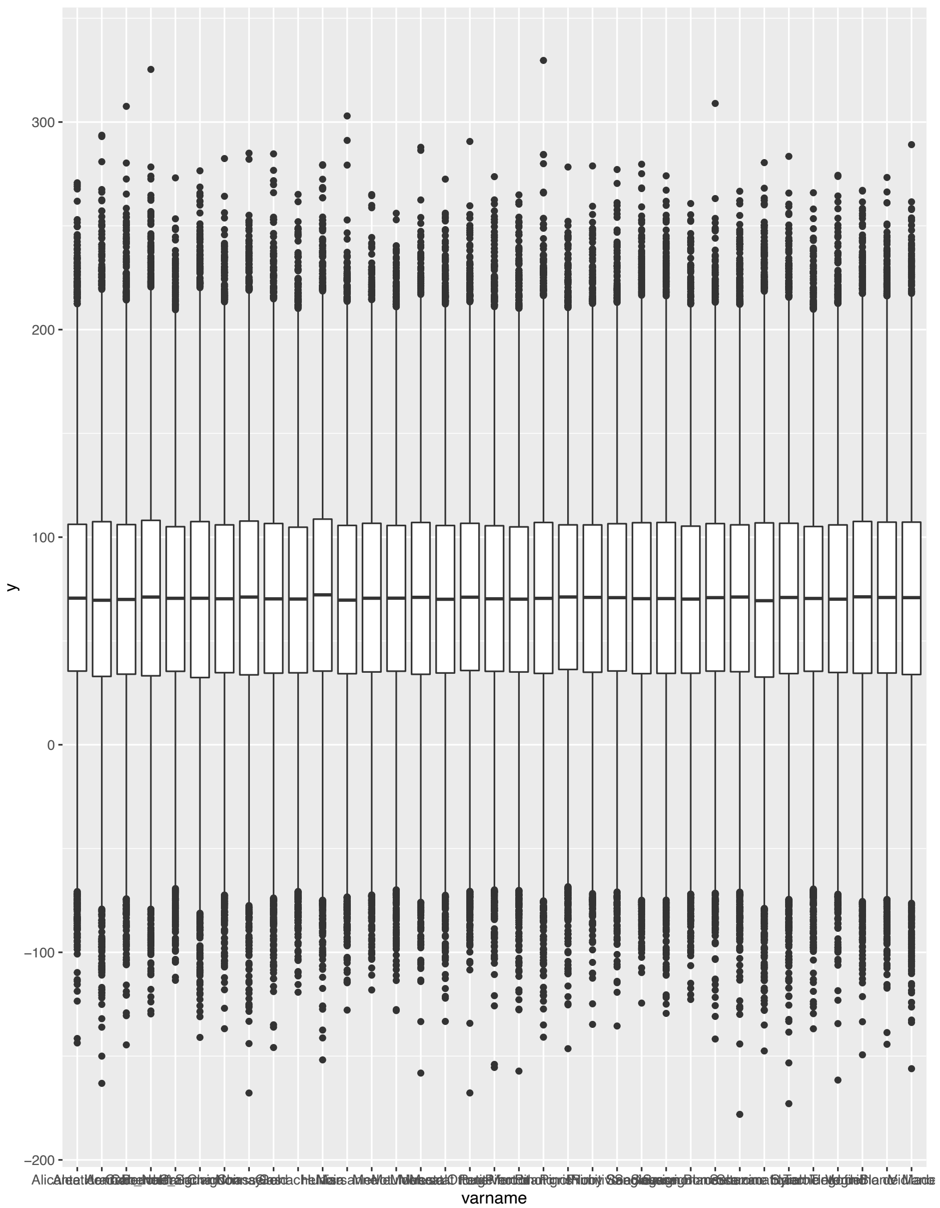
Written as an equation:

$Duration.predicted = a_{avar} + B_{bvar} *year + e$

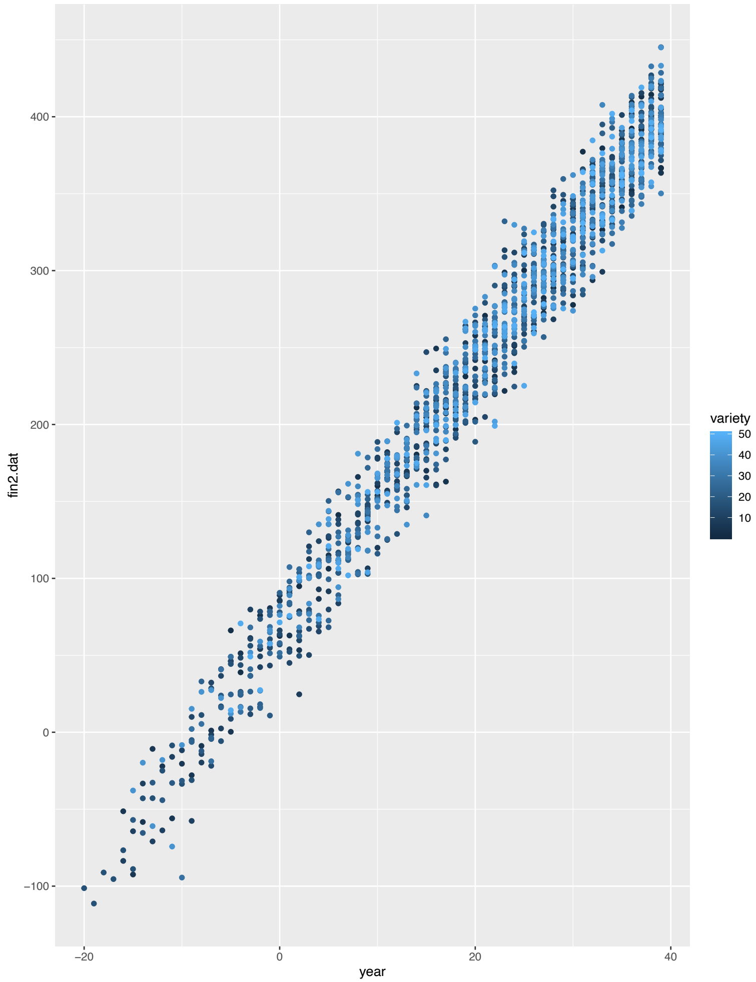
- **So each variety has unique intercept and unique slope.**

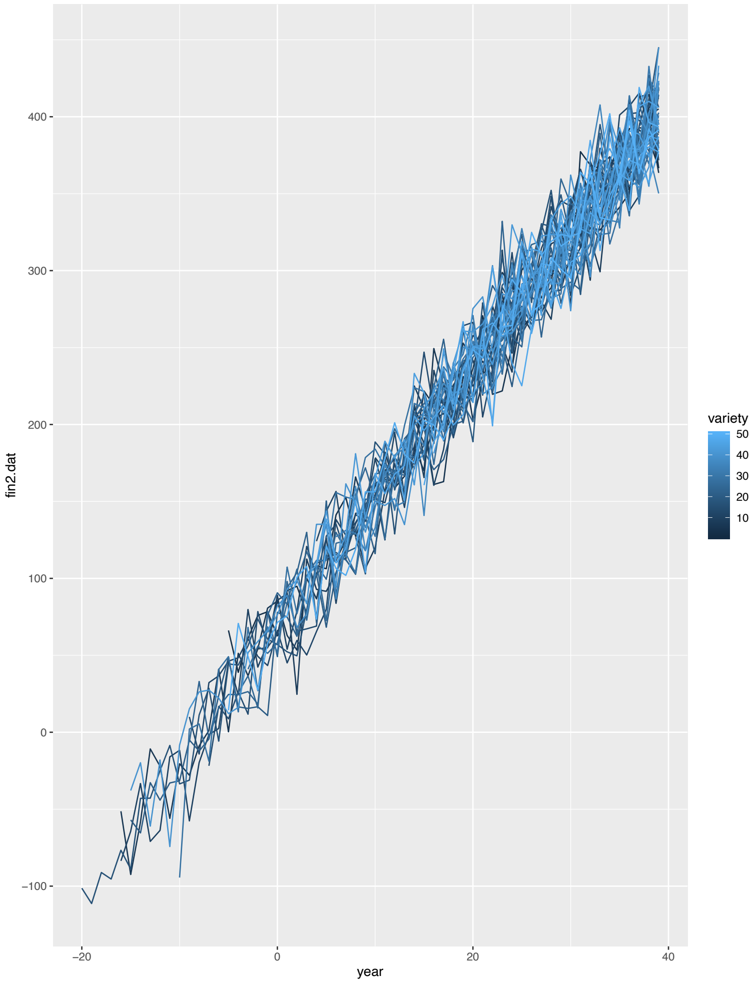
7. Intercept-Only Results

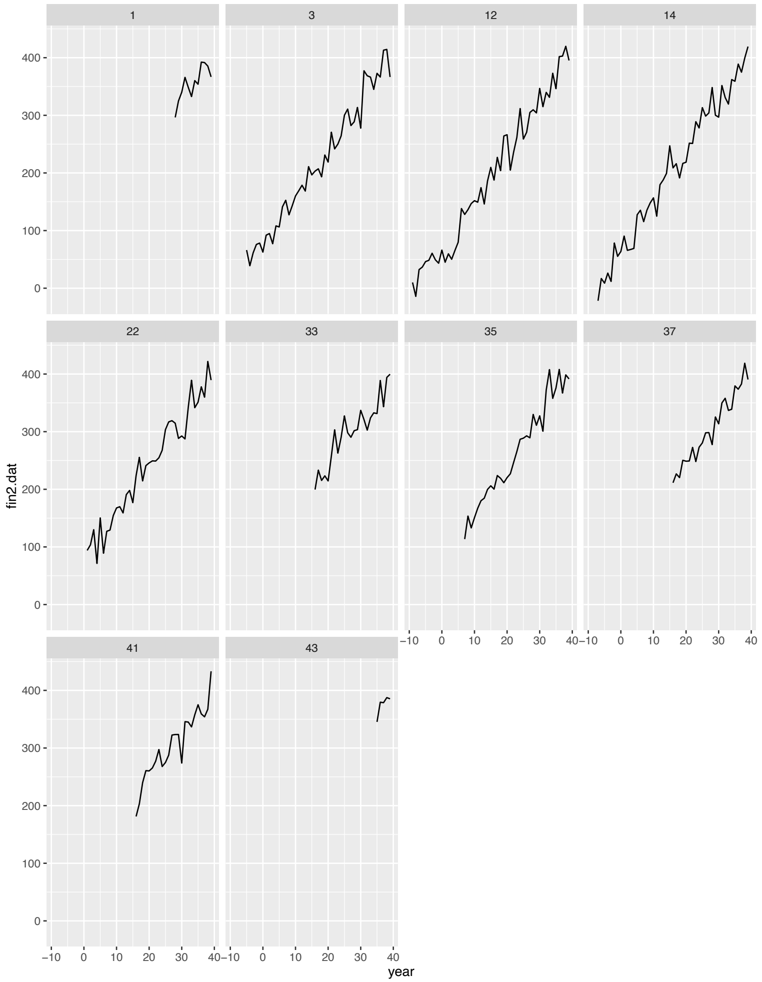




8. Single-slope Results (all start years = 2020)



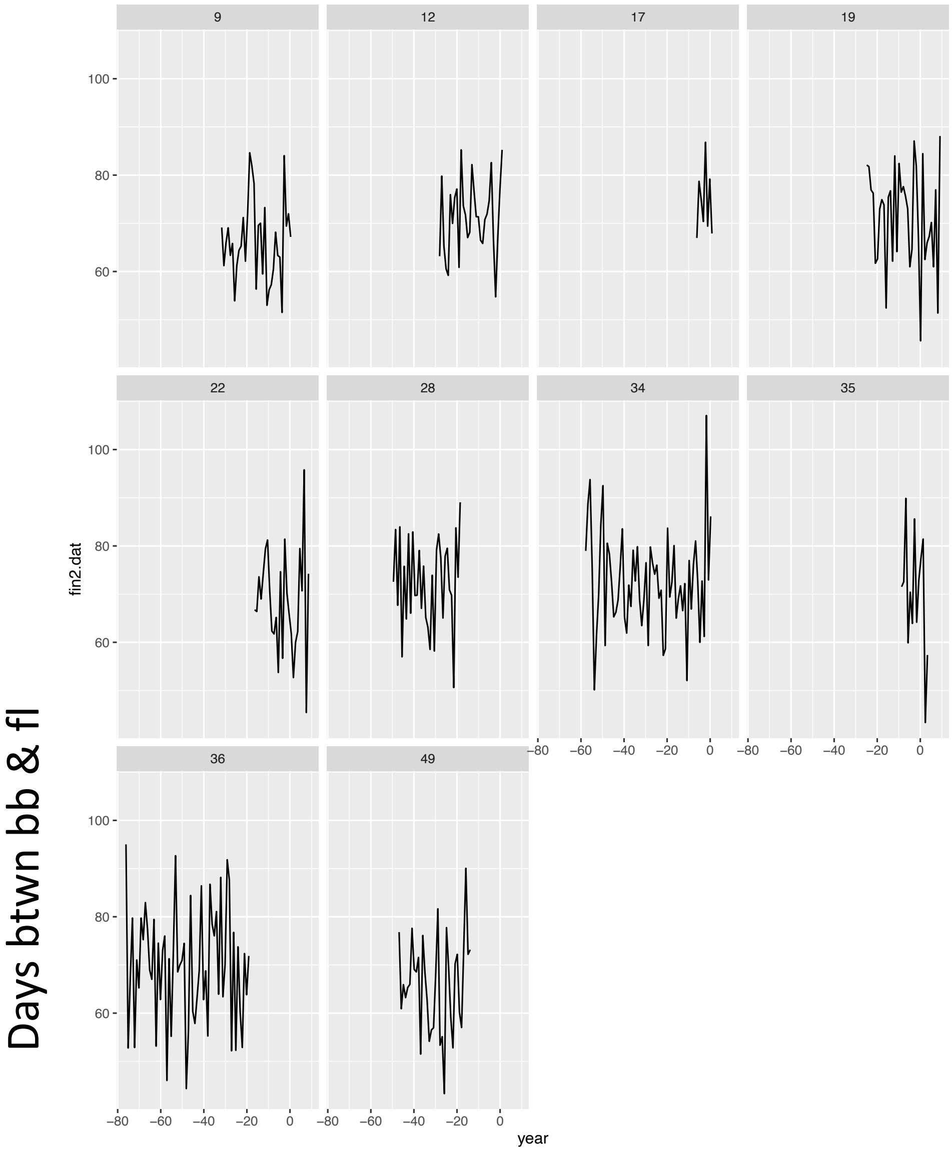




9. New Simulated Data

New for April 7

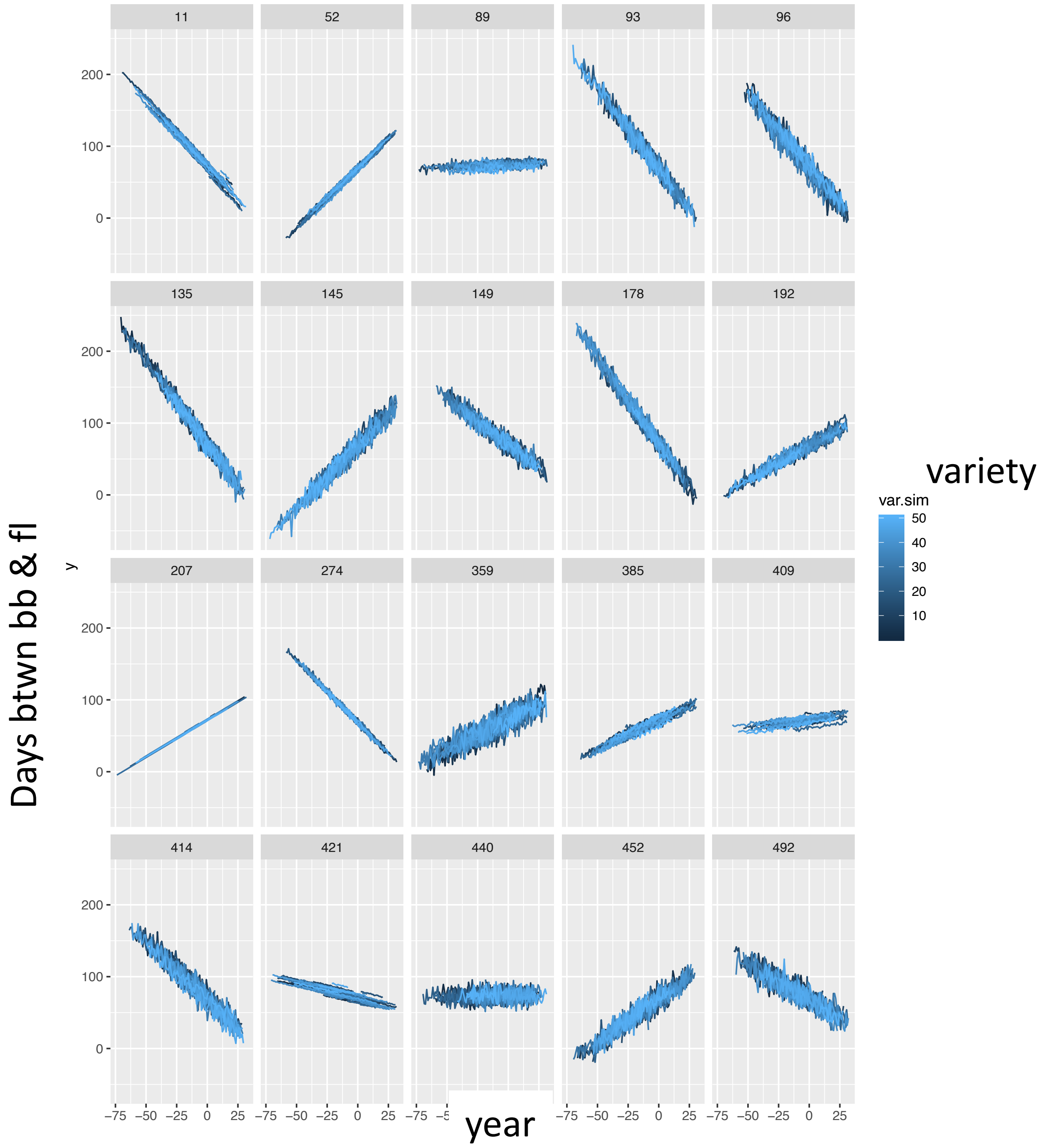
Examples of simulated data: varying start years



10. First set of priors and results

Priors

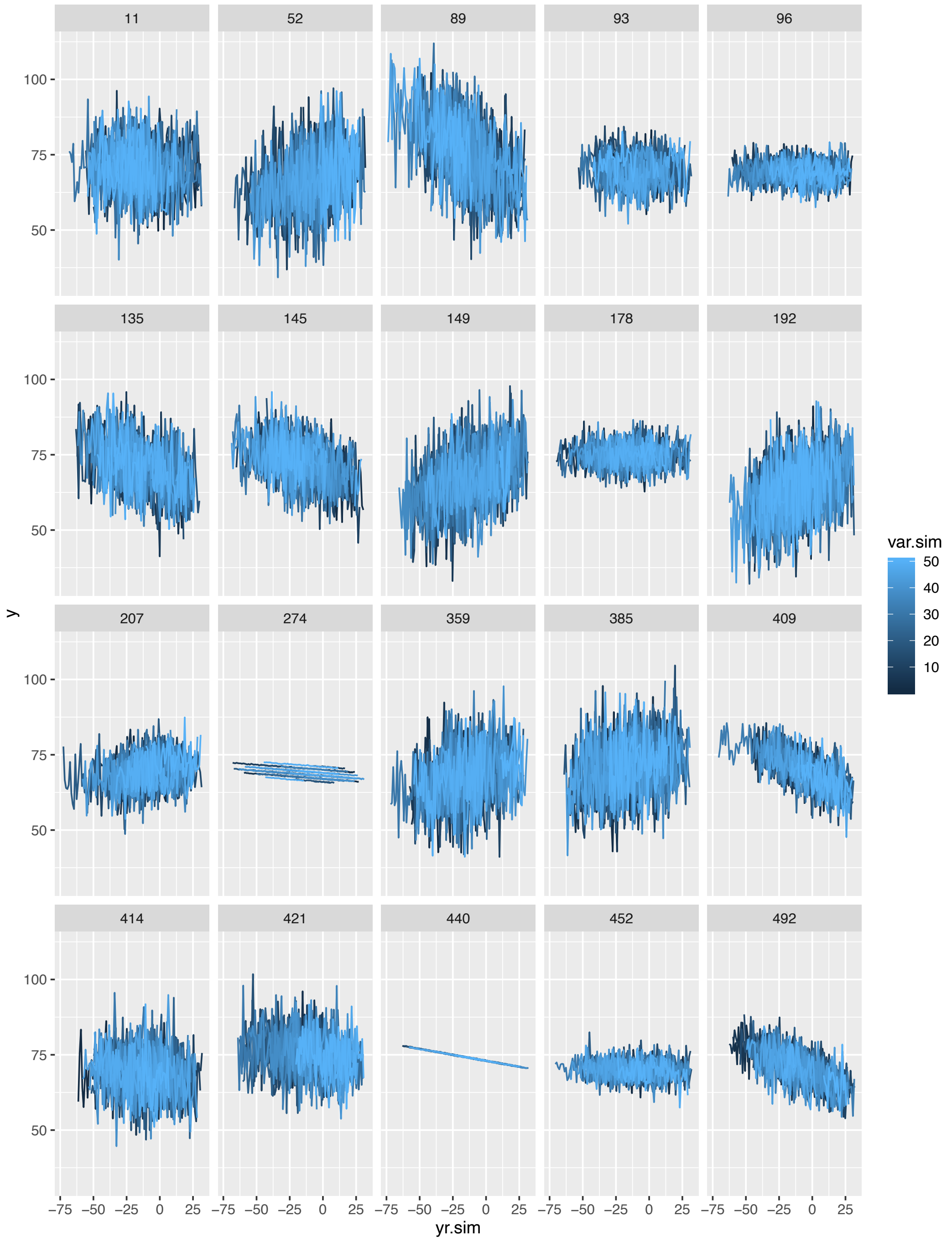
- a.mu ~ N(70, 5)
- a.sigma ~ U(0, 5)
- B.mu ~ N(0, 1)
- B.sigma ~ U(0, 1)
- E ~U(0, 10)



11. Second set of priors and results

Prior

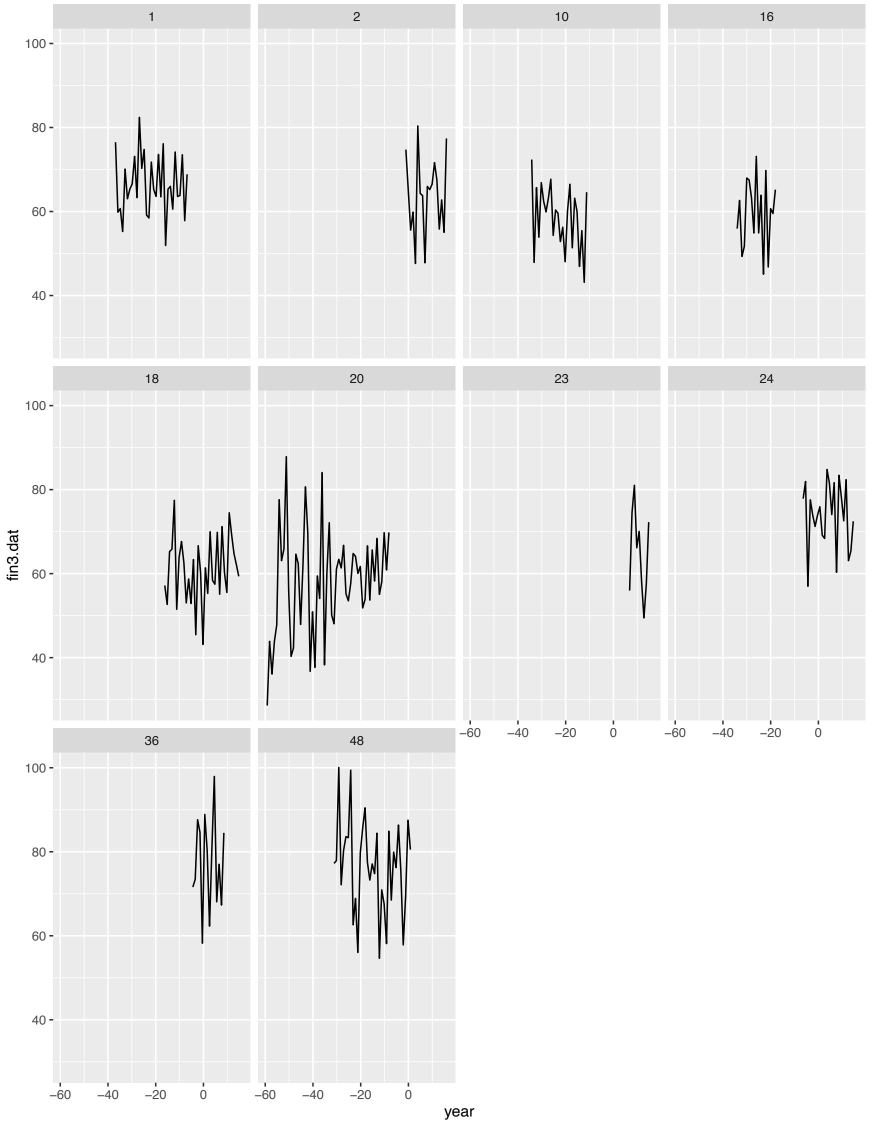
- a.mu ~ N(70, 2)
- a.sigma ~ U(0,2)
- B.mu ~ N(0, 0.1)
- B.sigma ~ U(0, 0.1)
- E ~ U(0, 10)

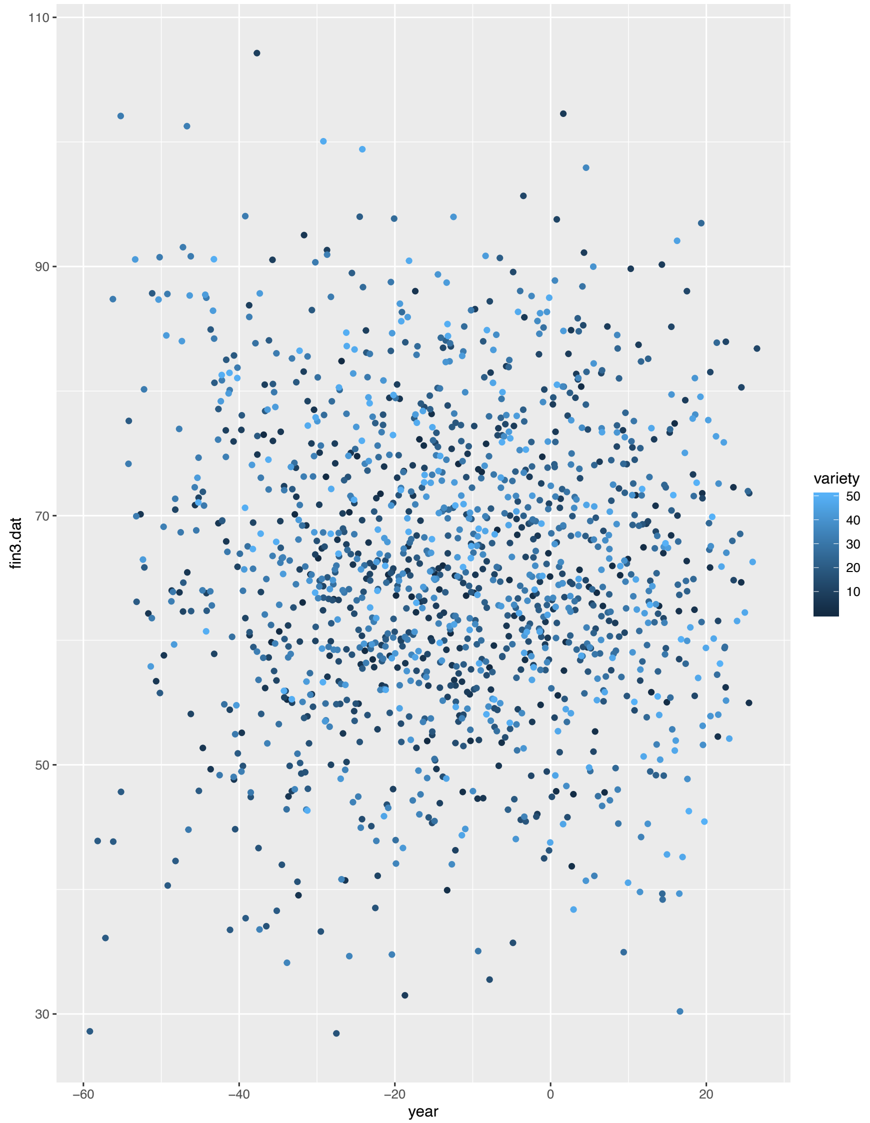


12. Varying Slopes: Simulated Data

Priors

- $a_{var} \sim N(65, 5)$
- $B_{var} \sim N(0, 0.2)$
- $E = 10$

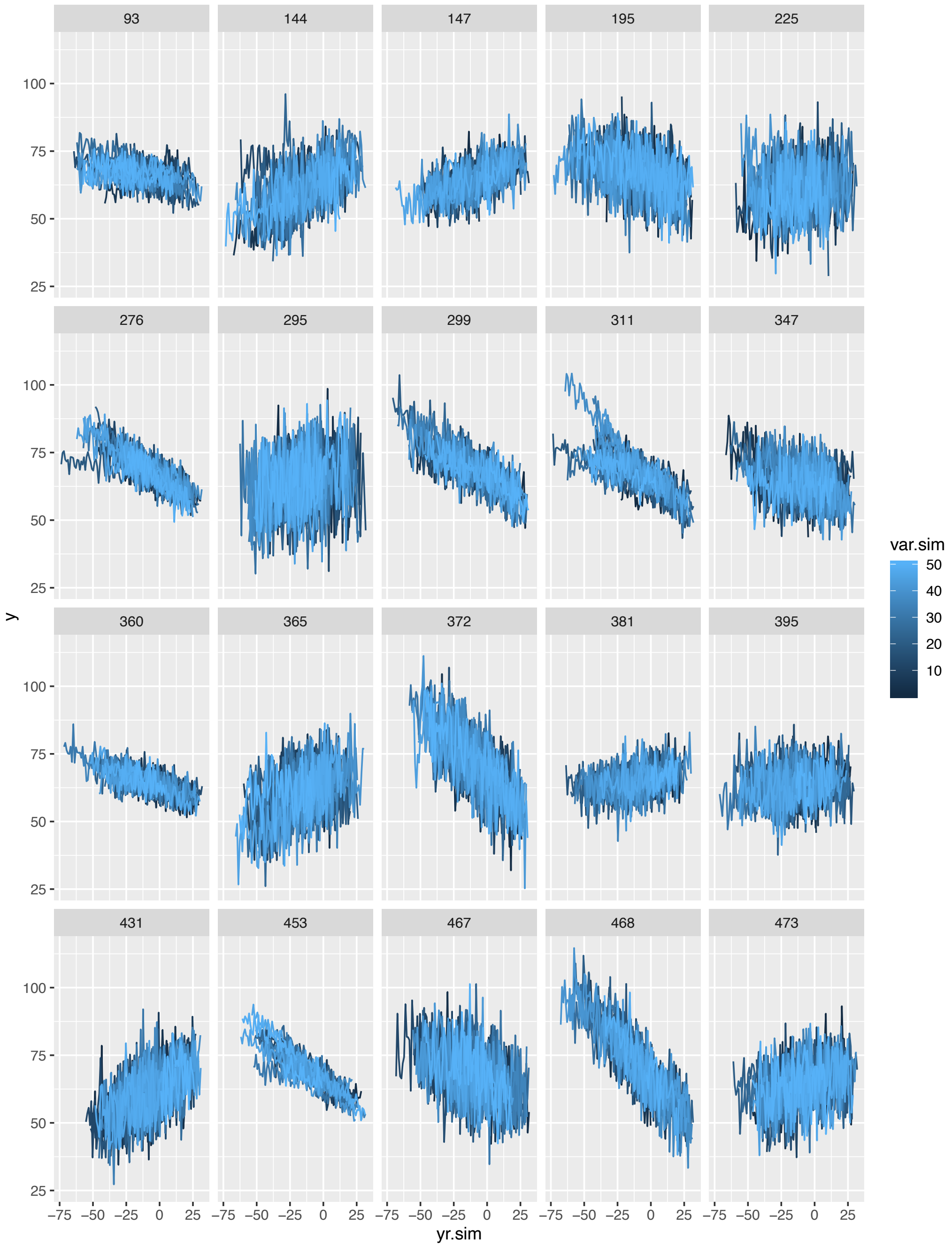




13. Varying Slopes: Prior Check

Priors

- $mu_{avar} \sim N(65, 2)$
- $sigma_{avar} \sim N(0, 2)$
- $mu_{bvar} \sim N(0, 0.2)$
- $sigma_{bvar} \sim N(0, 0.2)$
- $E \sim N(0, 10)$



12. Questions

- Need to fix the year so it does not go to -80. Something to do with the start year needing to be late enough so the count down does not go lower than -24
  - Decided to ignore this problem for the moment
- Need to constrain variation - Make error smaller? Slope? Intercept sigma?