School of Economics and Management

Information Science III

9. Truth

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Announcements

- Office hours
  - No office hours on Tuesday, Nov. 8
  - Make-up: 15:10-16:30 on Thursday, Nov. 10
- Final Project
  - Instruction has been posted on KUTLMS
    - Presentation: in-class (Nov. 29)
    - Final paper (multiple figures and a memo): Due 6 pm on Nov. 30

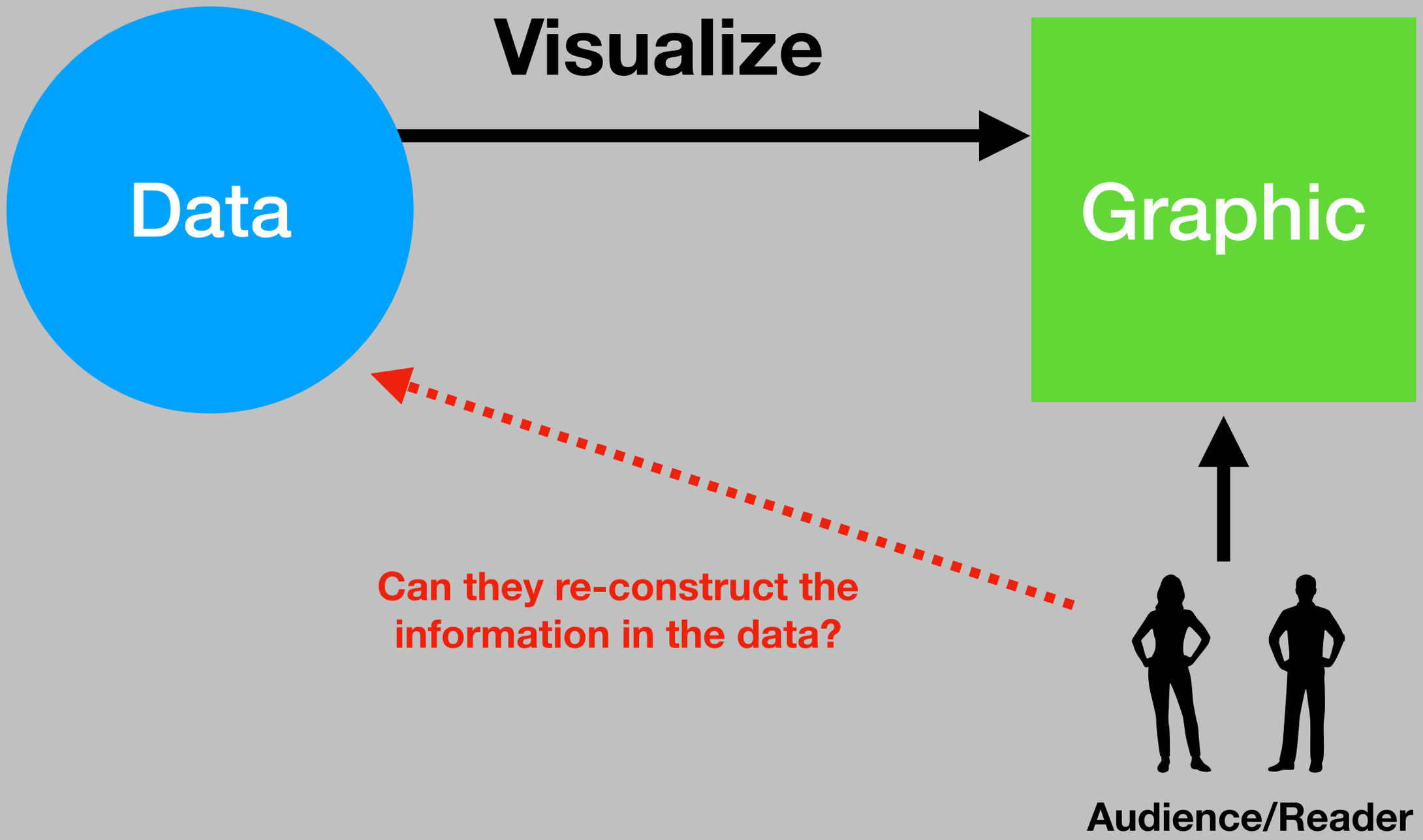
Today's Goal

- Understand how to tell the truth in data by visualization

Visualization and Truth

Visualizing Data

- When we visualize data:
  - Data have all the information
    - We cannot visualize what is not in the data
    - It might be difficult to understand data as they are
  - Graphics
    - Highlight some aspects of the data
      - ✦ A certain amount of information is lost
      - ✦ Easier to understand



Truth in Visualization

- Can your readers *get* information right from your graphic?
  - Even if you don’t lie, your graphic could deceive your readers/audience
  - The required accuracy varies depending on your purpose
- Can your readers understand your story promptly?
  - If it takes very long to understand your point, you might fail to tell the truth to the readers

Visual Encoding

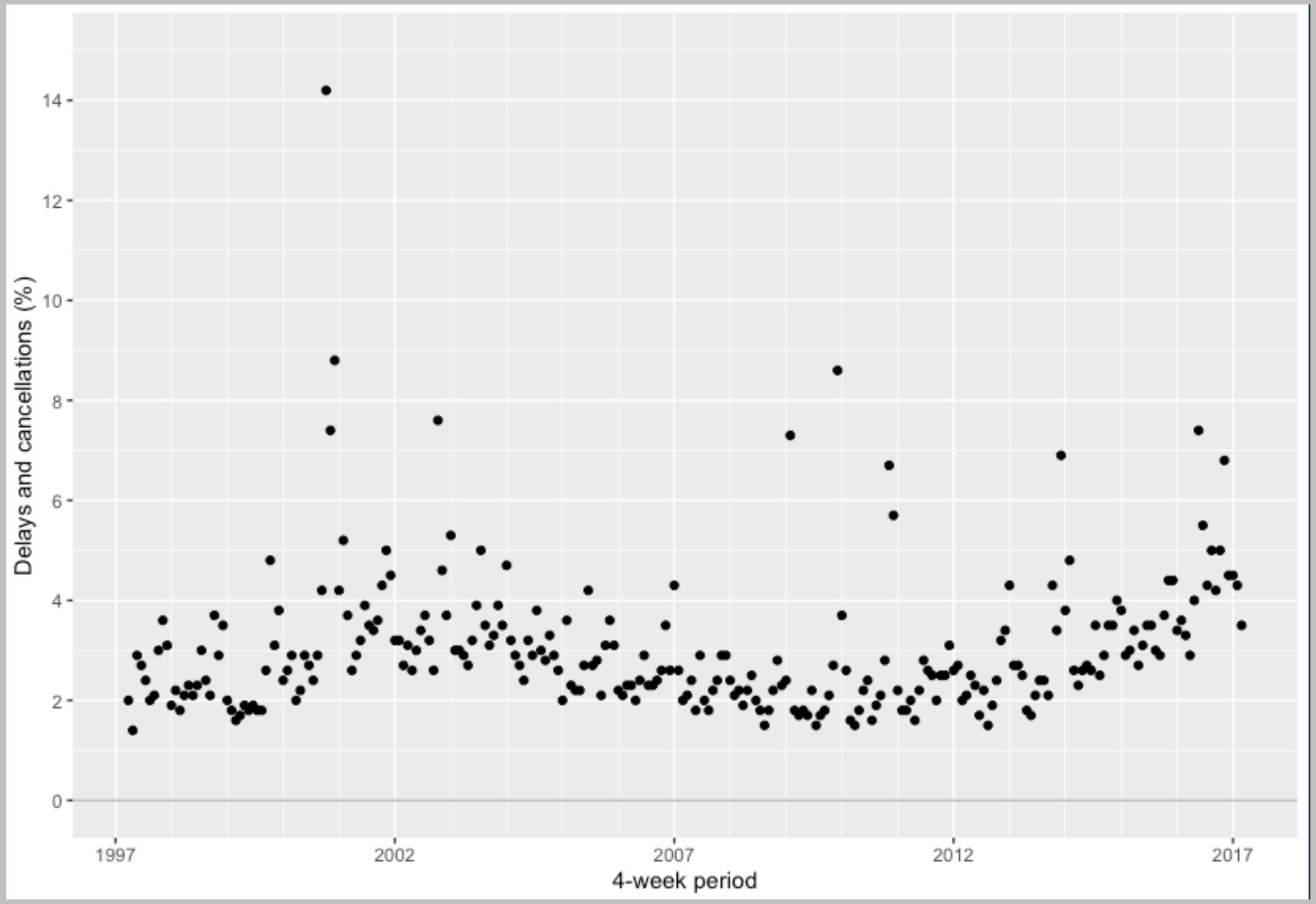
An Example

Example

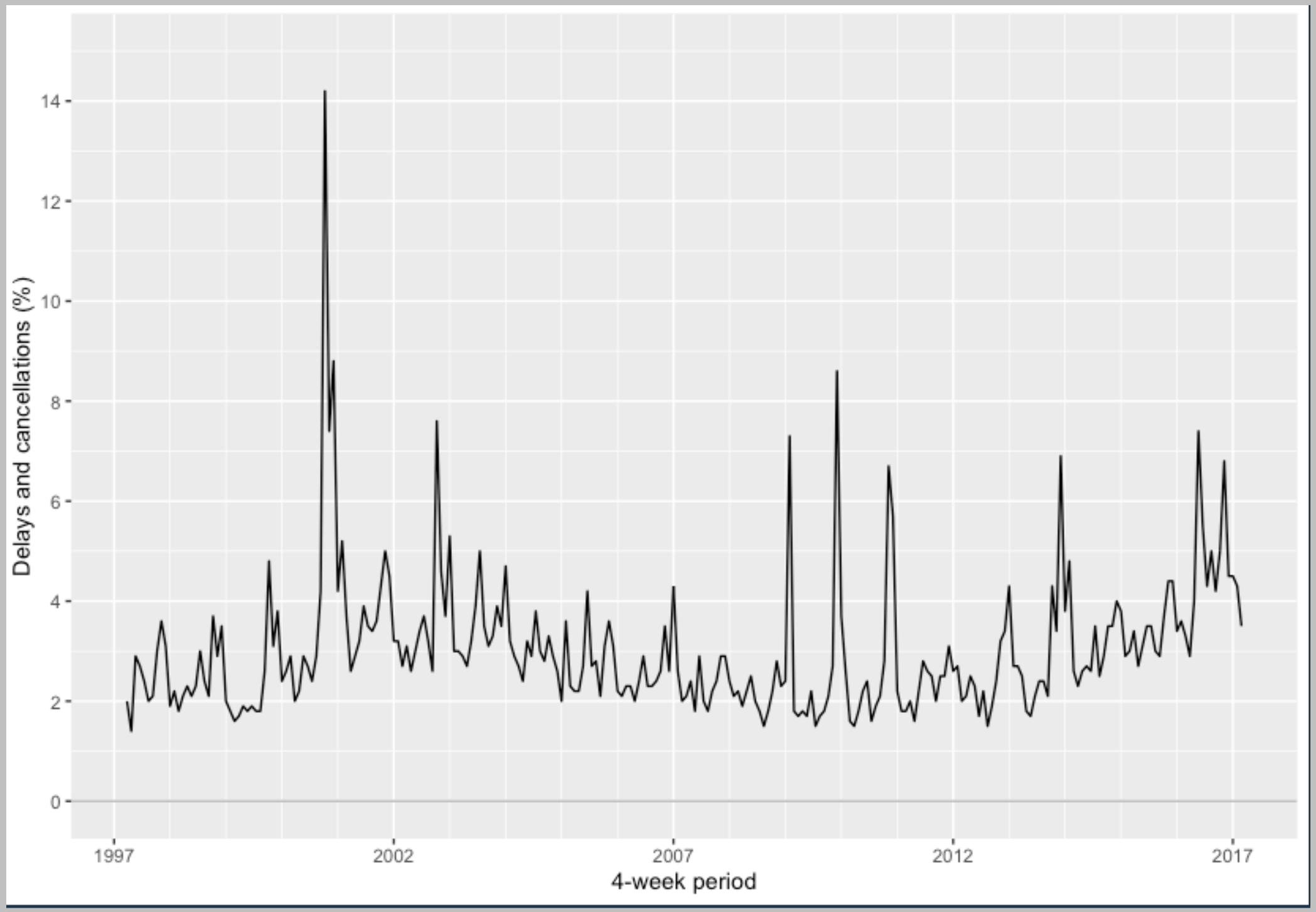
- Data: Train delays in London (info3_trains.csv)
  - Percentage of trains delayed or canceled [london_se]
  - Time [caltime]
    - Period within a year (13 4-week periods) [calperiod]
    - Year [calyear]
- Hypothesis (story): More trains are delayed in fall (autumn) because leaves fall on the rails

★How should we tell the story by visualizing data?

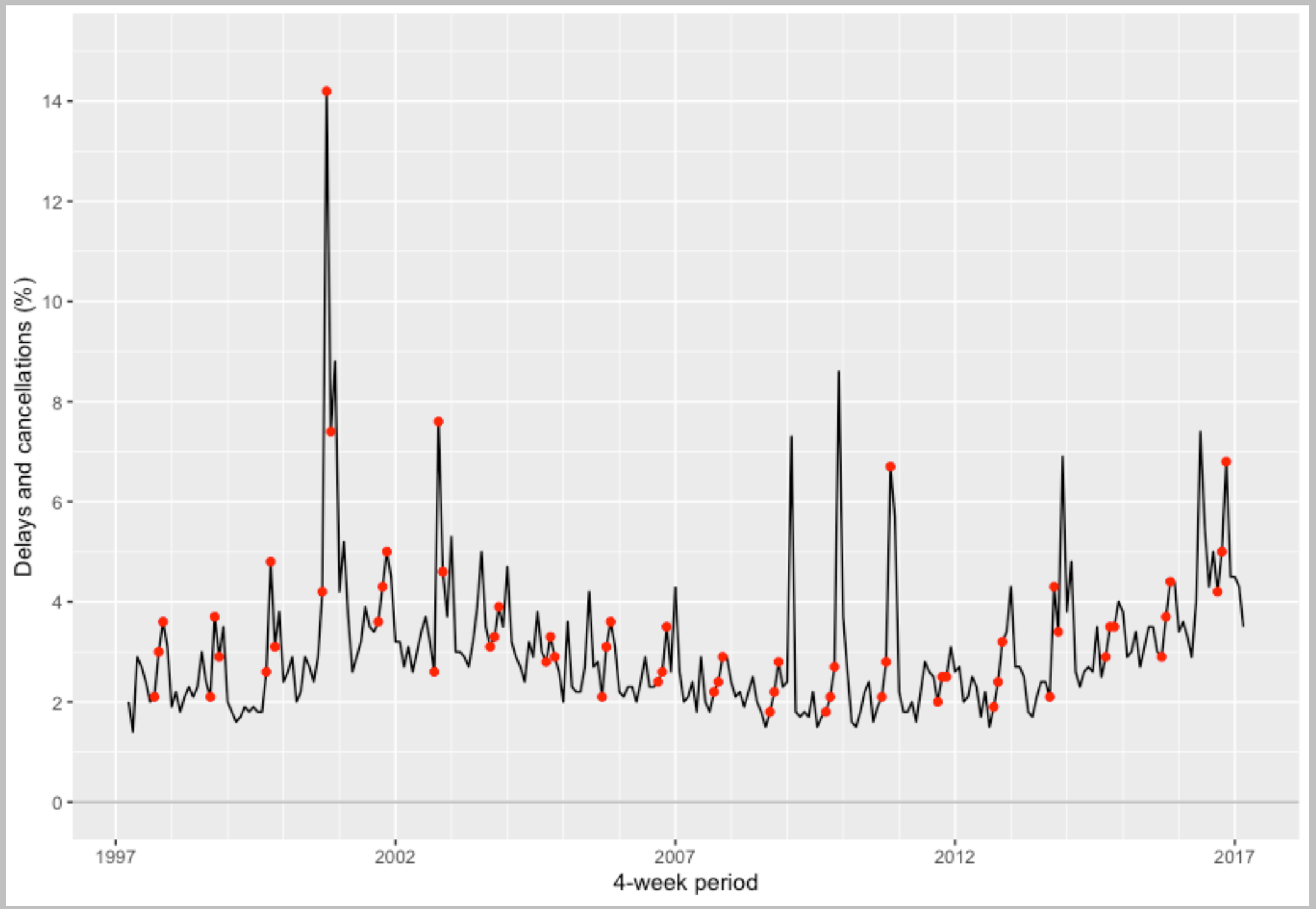
Scatterplot



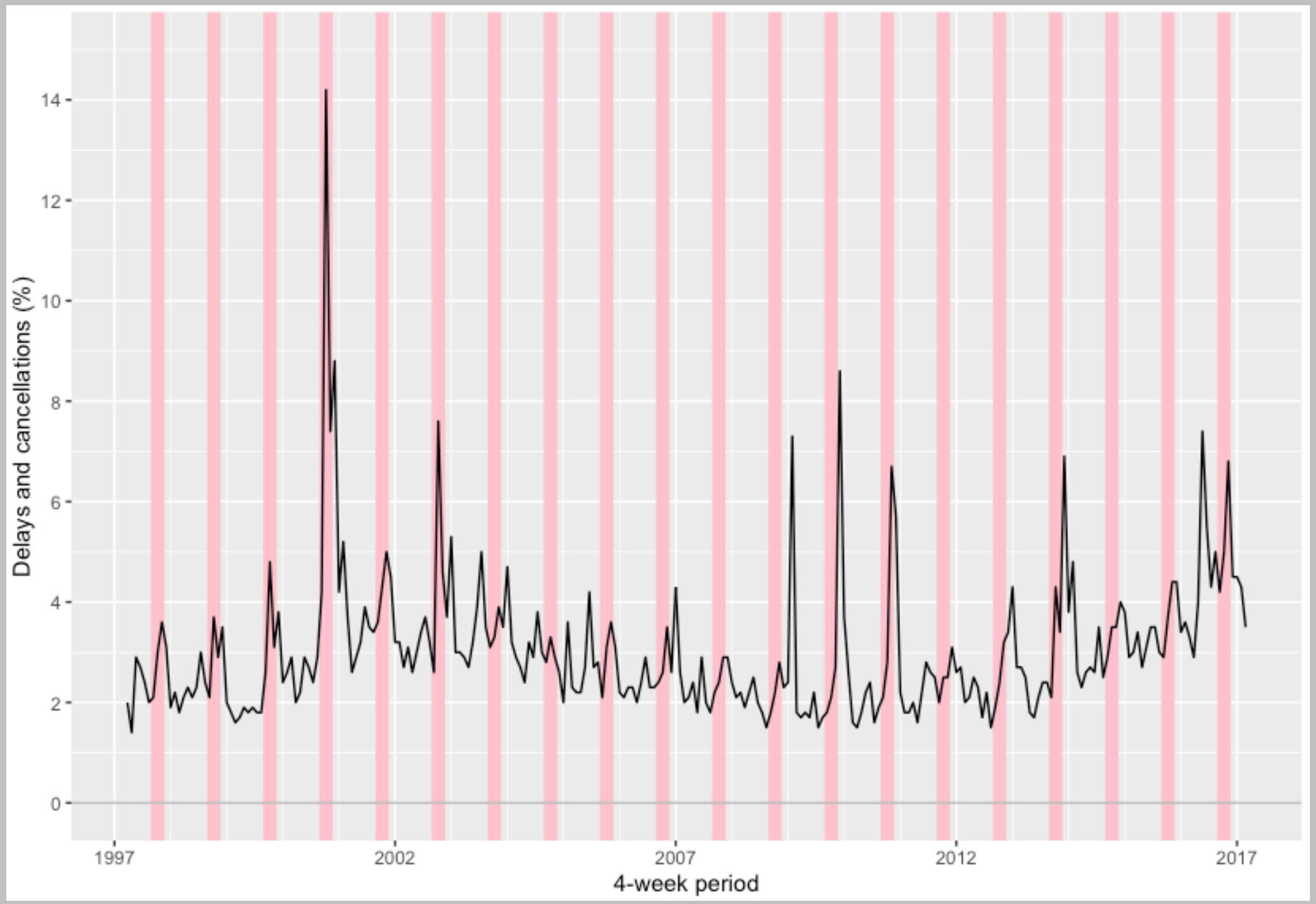
Line Chart



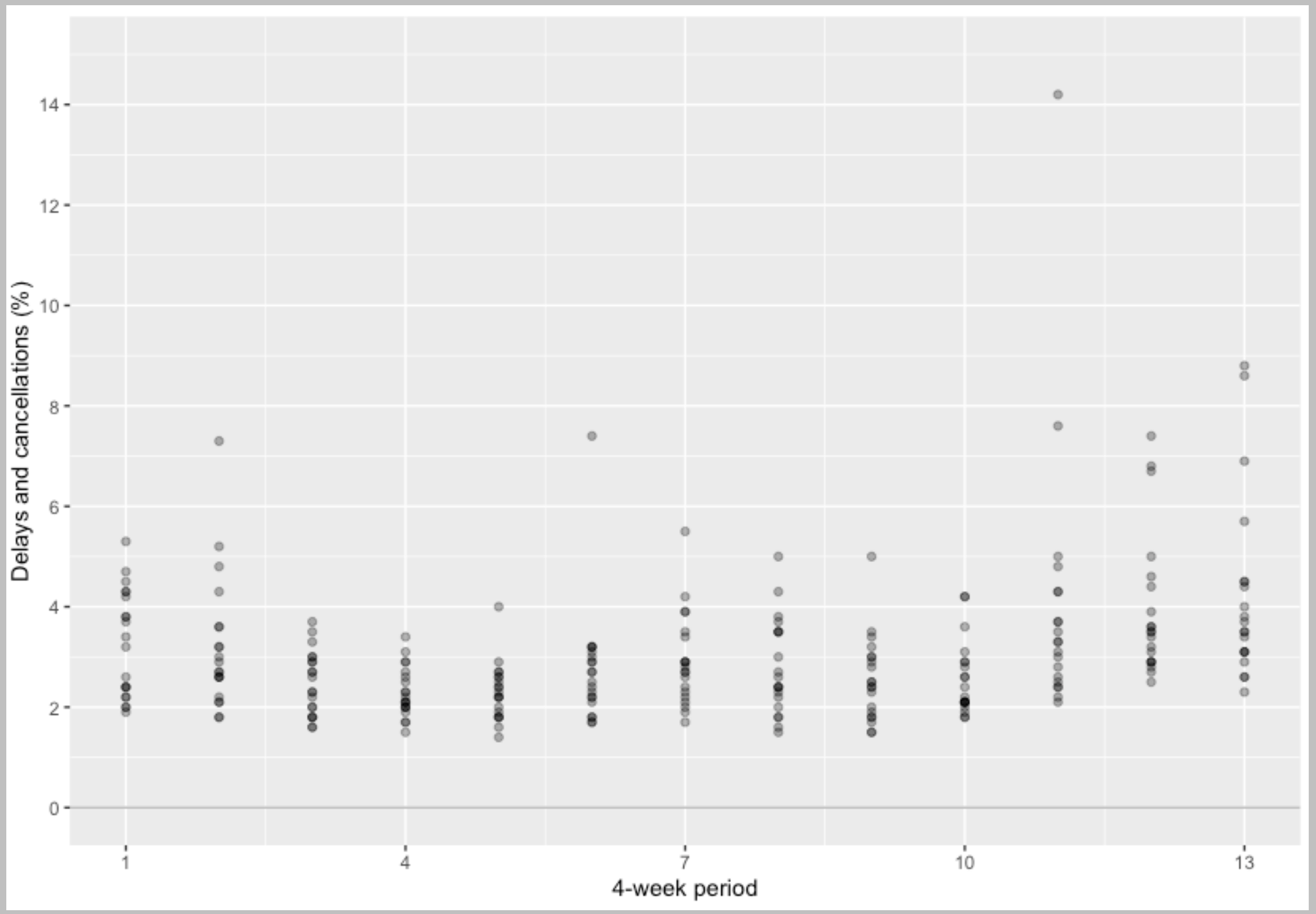
Color target observations



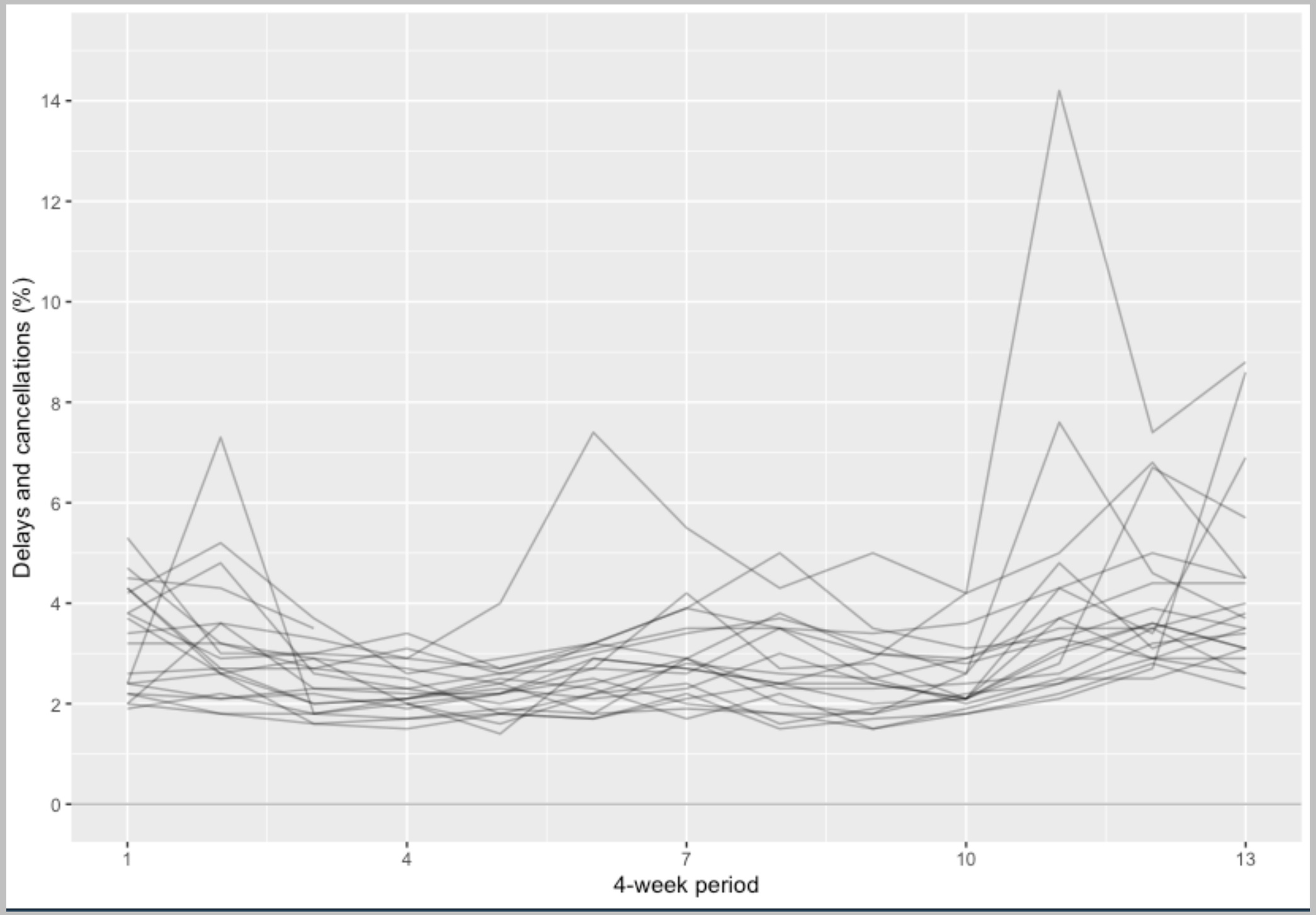
Color target periods



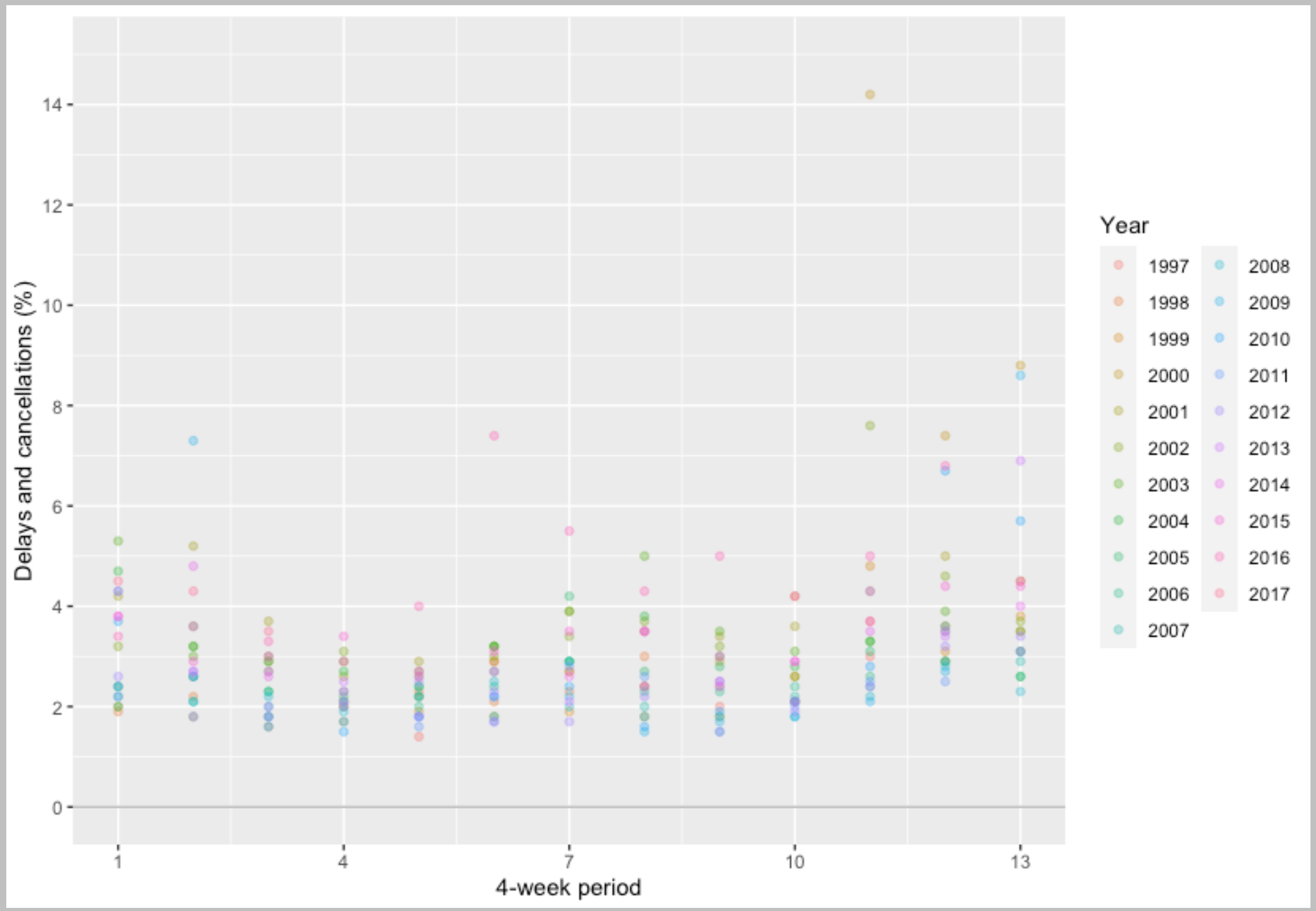
Focus on within-year changes



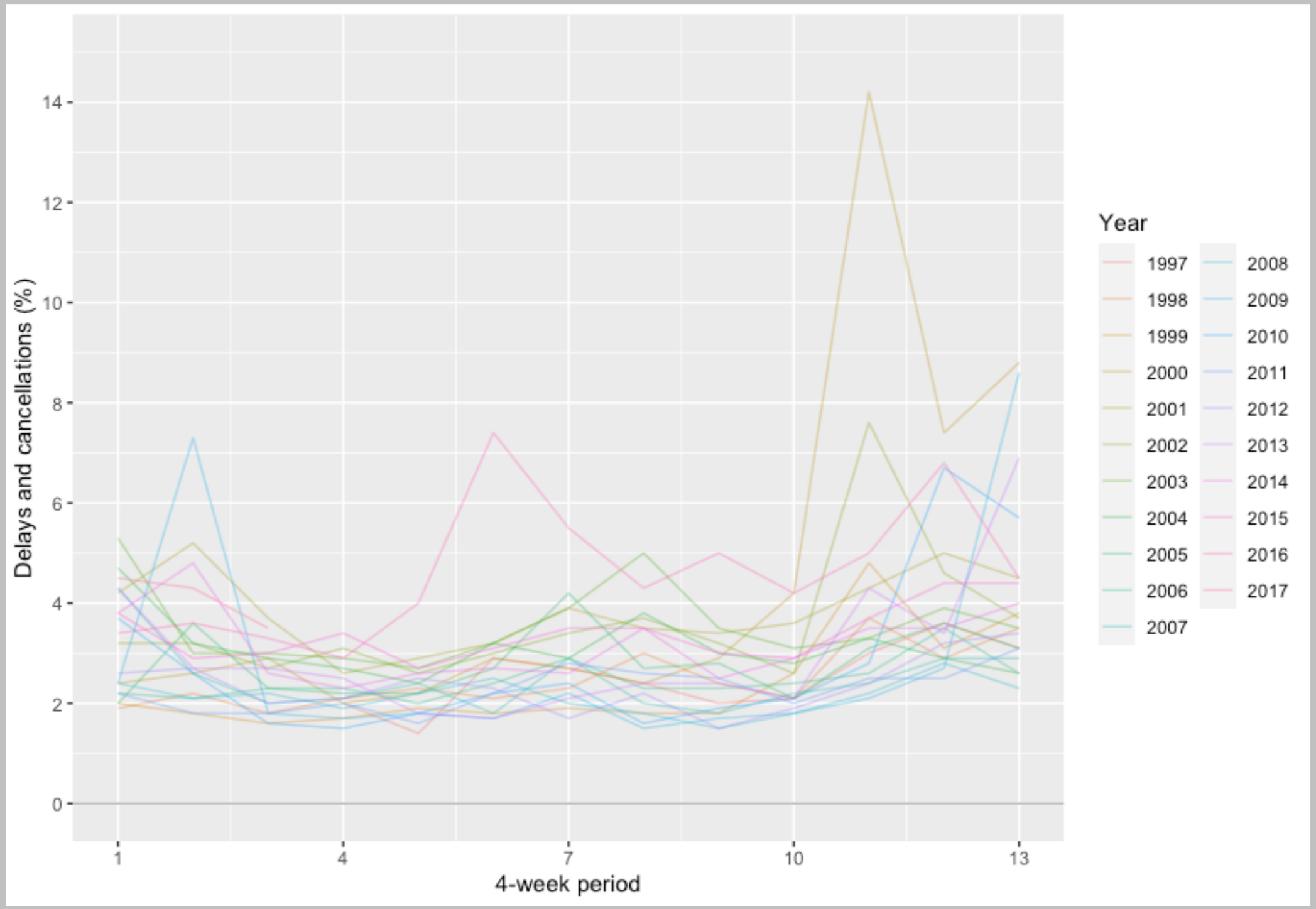
Focus on within-year changes



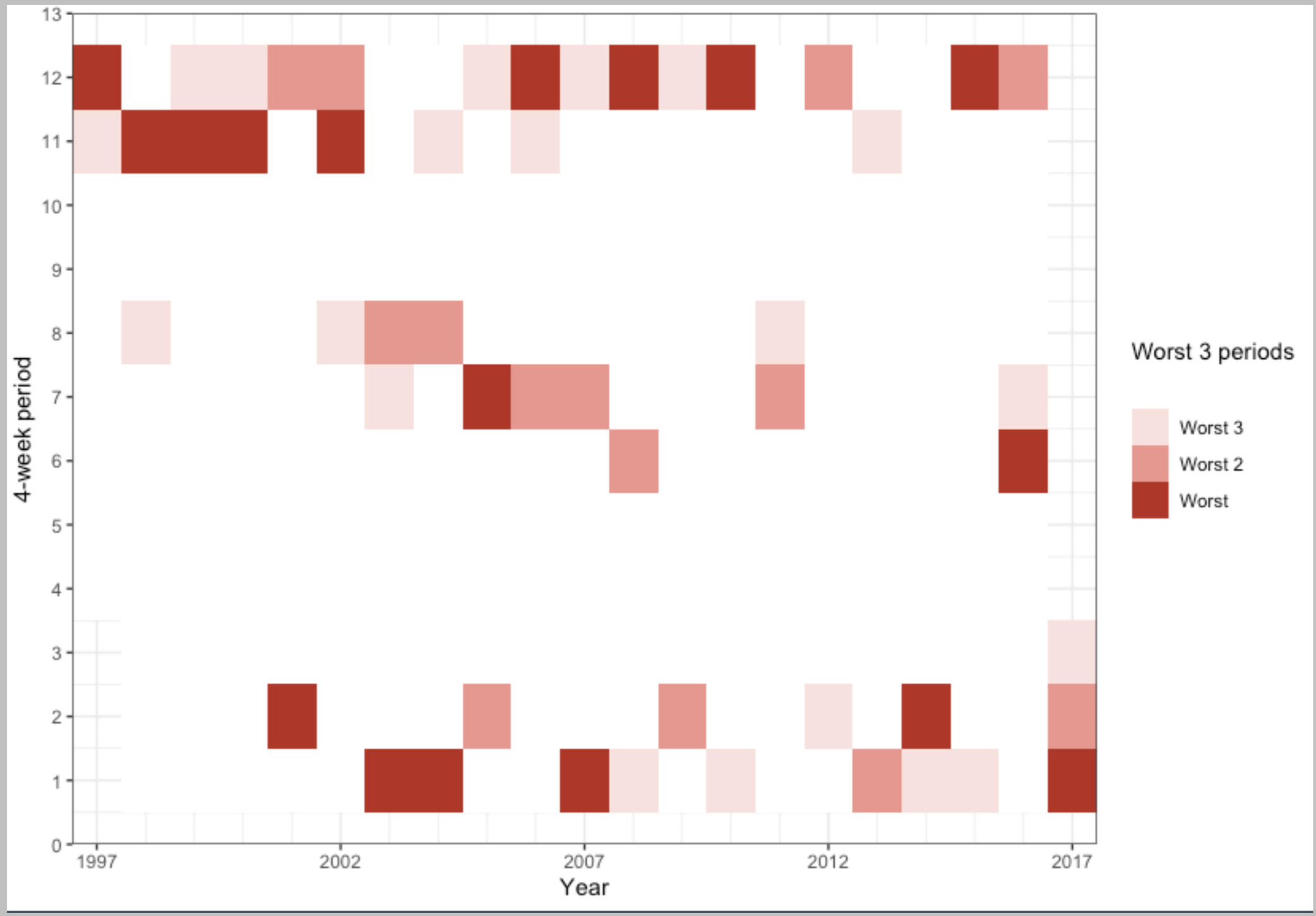
Distinguish different years



Distinguish different years



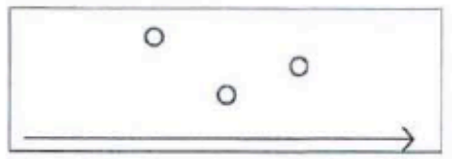
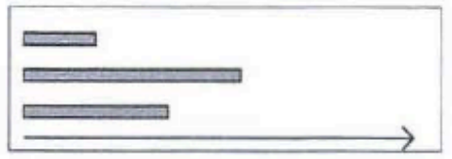
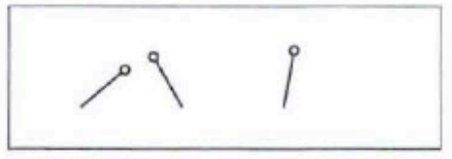
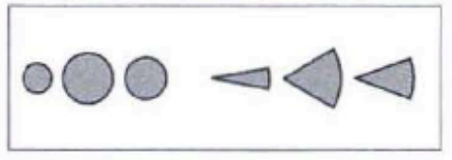
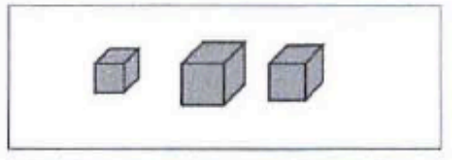
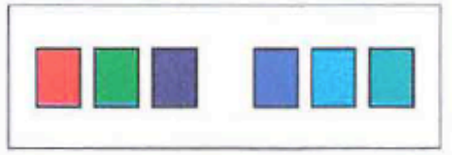
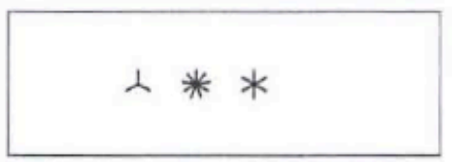
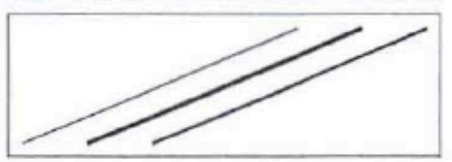
Heatmap: 3-D on 2-D



Visual Encoding

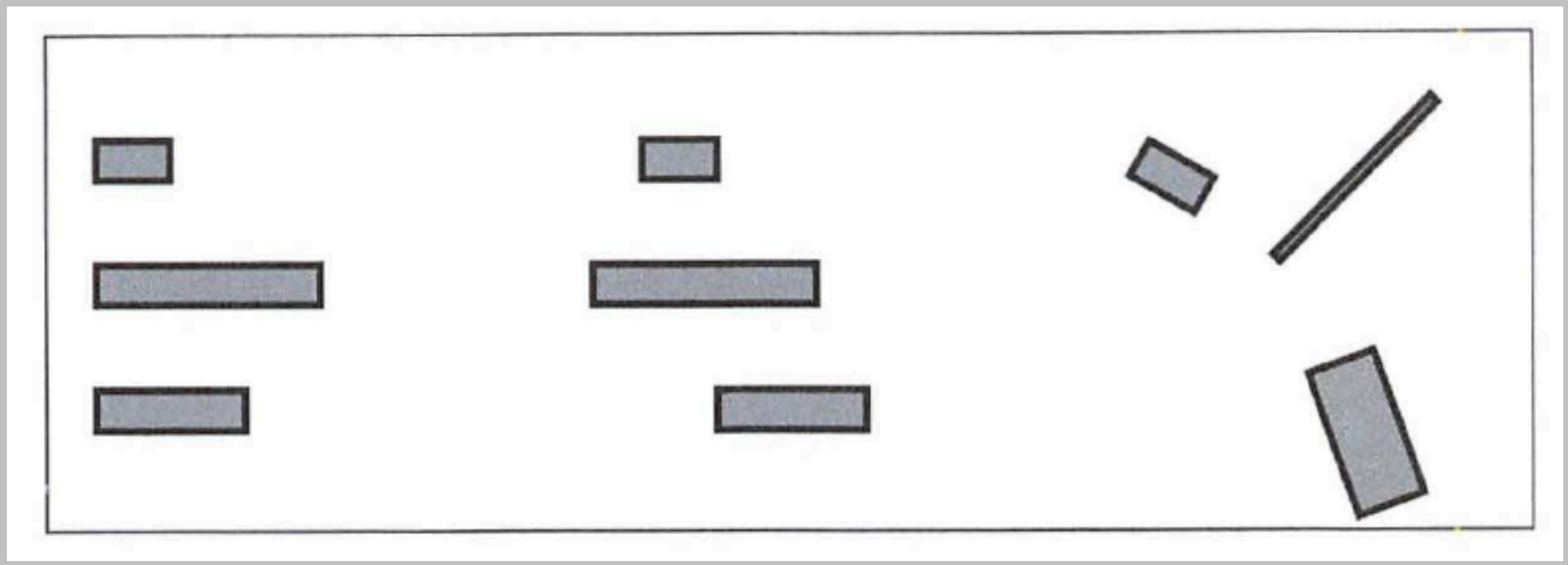
How to Encode

Choosing Visual Parameters

Parameter	Ideal data type	
Position	Quantitative	
Length	Quantitative	
Angle	Quantitative*	
Area	Quantitative*	
Volume	Quantitative*	
Color hue	Nominal or ordinal*	
Color saturation	Ordinal	
Marker shape	Nominal*	
Features	Quantitative*	
Line width	Ordinal*	

Grant (2019: p29)

Keep Everything Else Constant



Grant (2019: p.30)

Understanding Color (1)

- Quantifying colors
  - RGB (red, green, blue) system
    - For each of R, G, and B, specify an integer between 0 and 255
      - ✦ Pure black is (0, 0, 0); pure white is (255, 255, 255)
      - ✦ Use a 2-digit hexadecimal number in R
        - ❖ Pure black is `"#000000"`; pure white is `"#ffffff"`
- Use color in meaningful ways
  - E.g., Warm colors for higher values, cold colors for lower
  - If data have information on colors, probably should use them

Understanding colors (2)

- Avoid ambiguous colors
- Imagine the possibility that your readers cannot distinguish colors
  - Single-color gradation might be safe
    - from light to dark (or from dark to light)

Limitations of the Areas

- It is difficult for readers to translate areas back to data well

- Should avoid to use areas when possible
  - Bubble chart, pie chart, pictogram, etc.

Annotation

- Add some explanation when necessary
  - Don’t add too much!
    - Ink-data ratio should be small (Edward Tufte’s advice)
- Ask yourself:
  - Will your graphic be misunderstood?
  - Essential information:
    - Axis labels, data source, and graph title (when the graph doesn’t have its caption)

User Testing

- Test your graphics before you submit/publish them
  - Show your drafts to someone similar to your intended audience
    - Gather honest, critical opinions
    - Understand how people misunderstand your graphics
    - Find weak points and improve your graphics
- Safe to use standard graphics
  - Tested a lot of times by other people
- Search for innovative ways
  - Need careful testing

Next class

10. Beauty