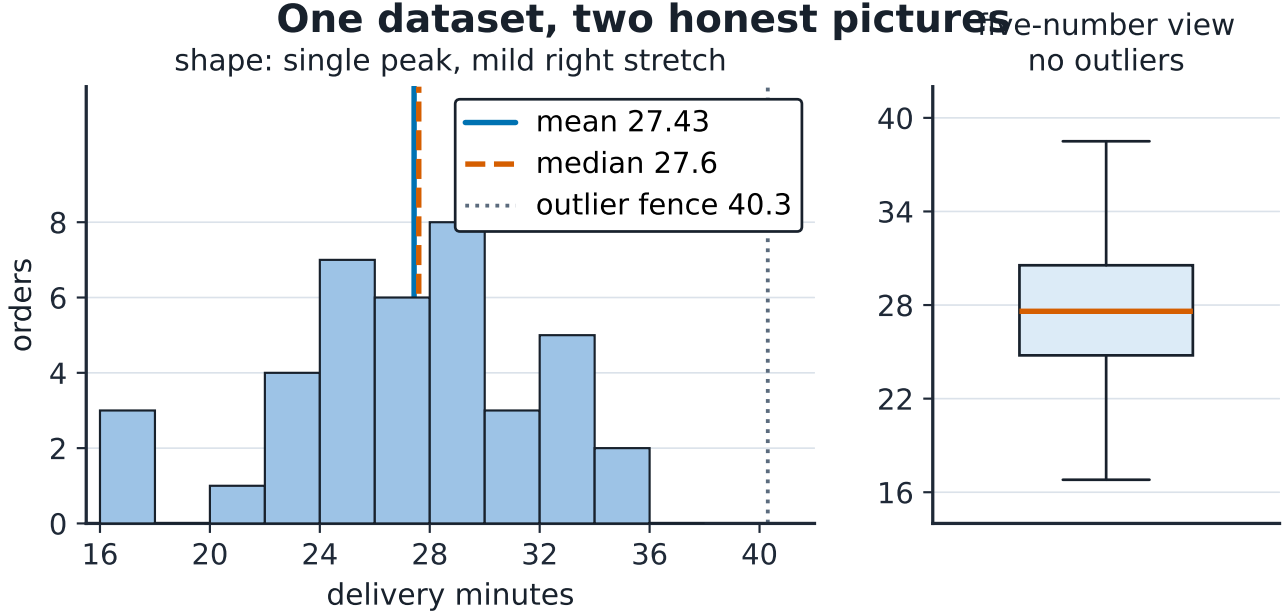
Exercise walk-through

5.4
Sampling distributions and estimation

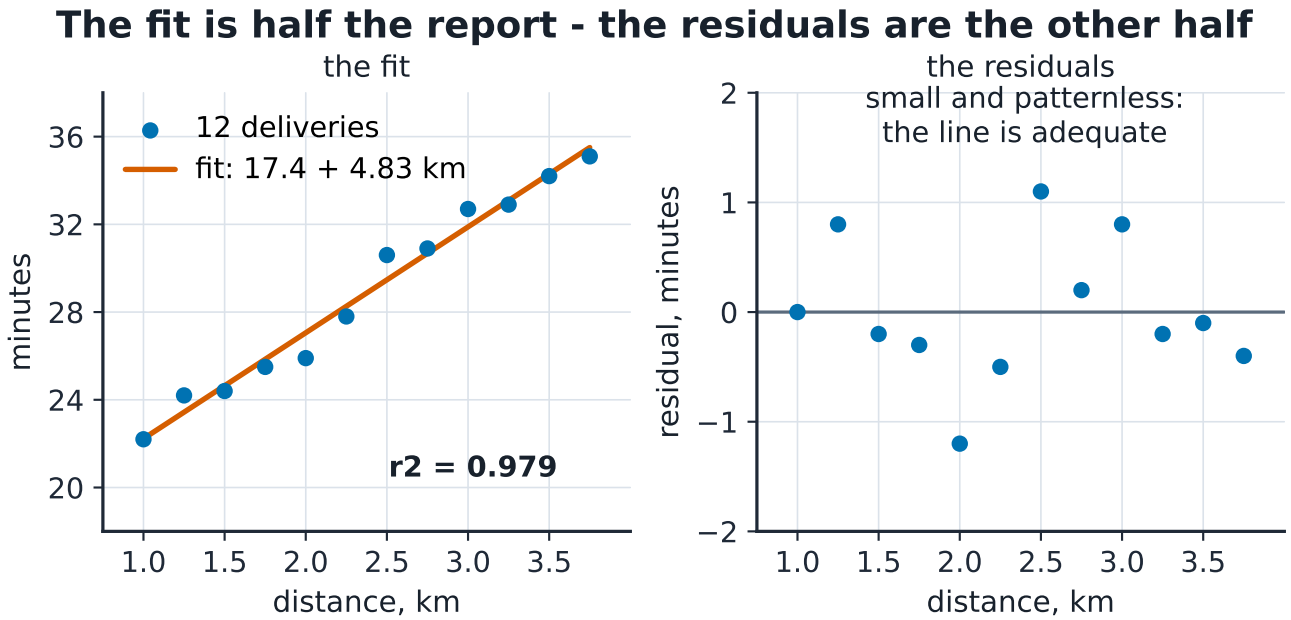
University Business

Descriptive measures and visualisation: the four questions



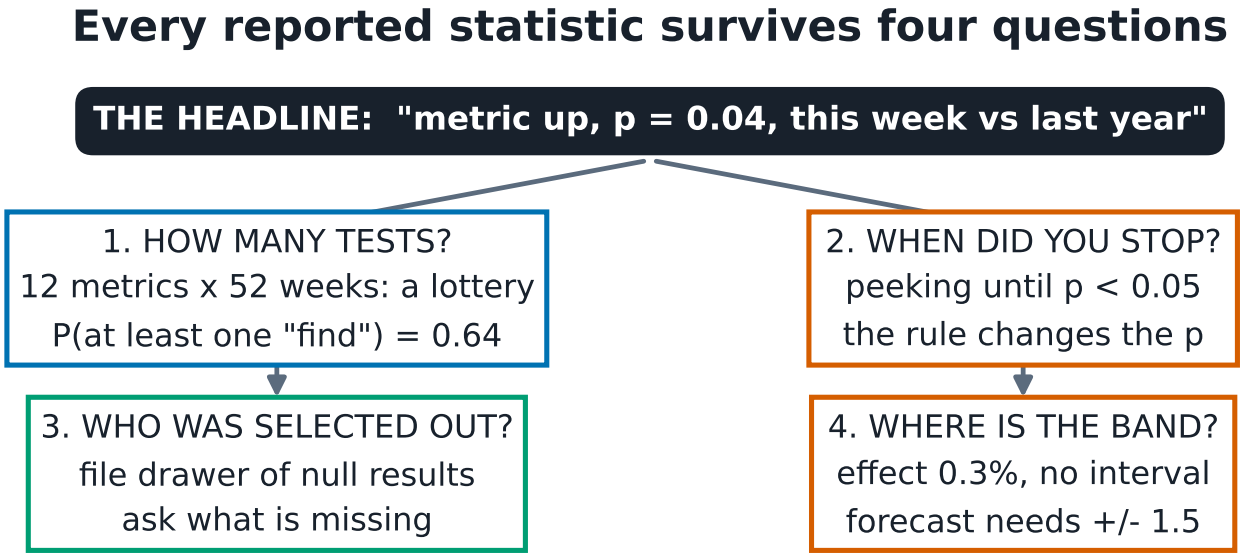
Mean 27.43, **median** 27.6, fence at 40.3: centre, spread and outliers.

Regression: the line and its police



Time = 17.4 + 4.83 km, r2 = 0.979, with patternless residuals.

Limitations: the four gates



verdict: not evidence of change - evidence of a dashboard making headlines

Challenge a headline through four gates: tests, stopping, selection, error.

Exercises 2.1–2.2

2.1 Compute the standard error of the mean. [2]

2.2 Construct the 95% confidence interval (t(24) = 2.064). [3]

Exercises 2.1–2.2

2.1 Compute the standard error of the mean. [2]

2.1

- $SE = 5.0/\sqrt{25}$.
- $= \mathbf{1.0}$.

2.2 Construct the 95% confidence interval (t(24) = 2.064). [3]

2.2

- $26.8 \pm 2.064 \times 1.0$.
- $= 26.8 \pm 2.06$.
- 95% CI = [$\mathbf{24.7}$, $\mathbf{28.9}$].

Exercises 2.3·2.4

2.3 Interpret the interval in ONE correct sentence, and write down the two most common wrong readings. [3]

2.4 The manager wants the mean known to ± 0.5 minutes. With $t \approx 2$ and $s \approx 5$, what n is required? What does your answer say about the price of precision? [3]

Exercises 2.3·2.4

2.3 Interpret the interval in ONE correct sentence, and write down the two most common wrong readings. [3]

2.3

- Correct: bands built this way capture the true mean in 95% of uses – this is one such band.
- Wrong: the true mean has 95% probability of lying in this interval.
- Wrong: 95% of orders fall within these minutes (that is a prediction interval, far wider).

2.4 The manager wants the mean known to ±0.5 minutes. With t ≈ 2 and s ≈ 5, what n is required? What does your answer say about the price of precision? [3]

2.4

- $n \geq (2 \times 5.0/0.5)^2 = 20^2$.
- $= \mathbf{400}$ orders.
- Precision costs $\sqrt{n}$: one decimal more costs sixteen times this sample – and only a random design makes it truthful.

Exercise 2.5

2.5 True or false with one line each: (a) the SE falls in half when n doubles; (b) a 99% interval is narrower than a 95% one; (c) the CLT makes the raw data normal as n grows. [3]

Exercise 2.5

2.5 True or false with one line each: (a) the SE falls in half when n doubles; (b) a 99% interval is narrower than a 95% one; (c) the CLT makes the raw data normal as n grows. [3]

2.5

- (a) False – SE falls by $1/\sqrt{2}$, about 29%; halving needs $4\times$ the data.
- (b) False – more confidence buys a WIDER band.
- (c) False – the means become normal; the data keep their shape.