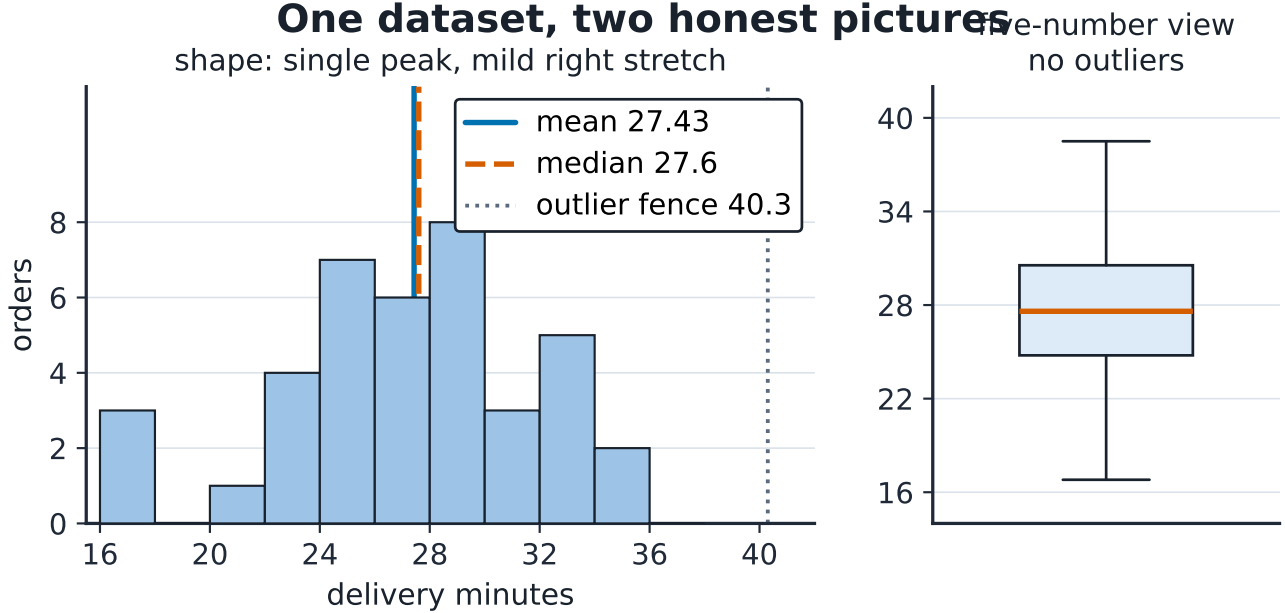
Exercise walk-through

5.3
Probability and distributions

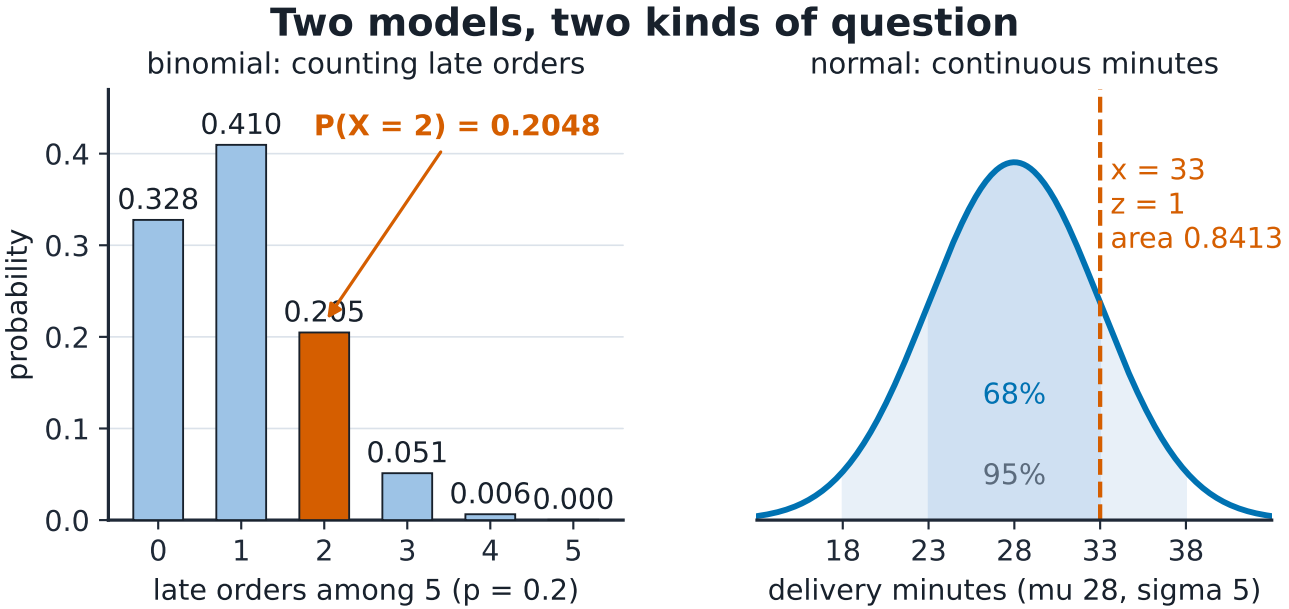
University Business

Descriptive measures and visualisation: the four questions



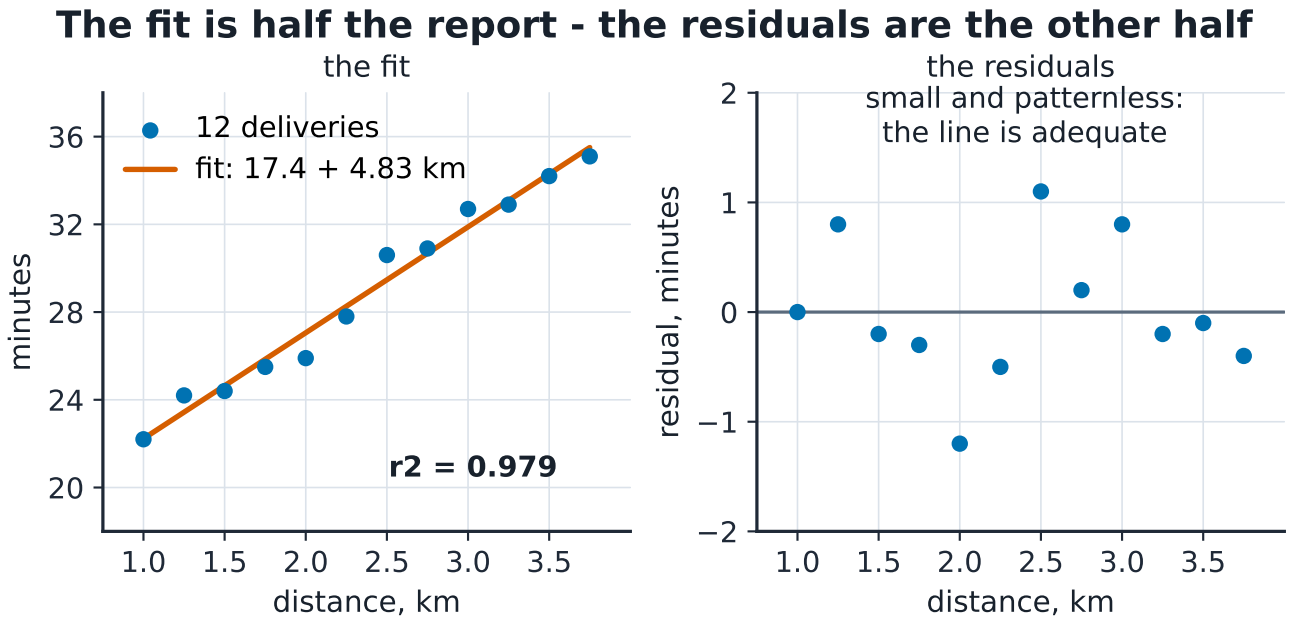
Mean 27.43, **median** 27.6, fence at 40.3: centre, spread and outliers.

Probability: match the model



Binomial counts beside the normal curve with its 68/95 bands.

Regression: the line and its police



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

Exercises 2.1·2.2

2.1 P(rain) = 0.3, P(rush hour) = 0.4, both together 0.12. Compute P(rain or rush), and state whether the two are independent. [3]

2.2 An order is late with probability 0.15. For the next 6 orders, compute P(exactly 1 late) and P(none late). [4]

Exercises 2.1·2.2

2.1 P(rain) = 0.3, P(rush hour) = 0.4, both together 0.12. Compute P(rain or rush), and state whether the two are independent. [3]

2.1

- $P(\cup) = 0.3 + 0.4 - 0.12 = 0.58$.
- Independence check: $P(\text{rain}) \times P(\text{rush}) = 0.12$.
- Equal to the joint → independent.

2.2 An order is late with probability 0.15. For the next 6 orders, compute P(exactly 1 late) and P(none late). [4]

2.2

- $P(1) = \binom{6}{1}(0.15)(0.85^5) = 6 \times 0.15 \times 0.4437$.
- $= \mathbf{0.399}$.
- $P(0) = 0.85^6$.
- $= \mathbf{0.377}$.

Exercises 2.3·2.4

2.3 Delivery minutes follow N(26, 4). Compute P(an order exceeds 32) and P(it finishes within ±6 minutes of the mean). [4]

2.4 In two lines: why is the binomial the wrong model for "P(this specific order is late)" and what IS the right framing? [2]

Exercises 2.3·2.4

2.3 Delivery minutes follow N(26, 4). Compute P(an order exceeds 32) and P(it finishes within ±6 minutes of the mean). [4]

2.3

- $z = (32 - 26)/4 = 1.5$; tail $= 1 - 0.9332 =$ **0.0668**.
- Within ±6: $z = \pm 1.5 \rightarrow 0.9332 - 0.0668 =$ **0.8664**.

2.4 In two lines: why is the binomial the wrong model for "P(this specific order is late)" and what IS the right framing? [2]

2.4

- The binomial counts successes among MANY trials.
- A single order is one Bernoulli trial: "late" is an event with probability 0.15 – the binomial appears only when counting across orders.

Exercise 2.5

2.5 Match each question to its model with one reason each: (a) at least 3 of 25 orders complain; (b) a single order's total weight in grams; (c) which of 4 riders gets the north route. [3]

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2.5

- (a) Binomial(25, complaint rate) – counting successes.
- (b) Normal – continuous, roughly symmetric measurement (weights pile around a mean).
- (c) Equally likely outcomes – direct counting, 1 in 4.