

STAT100 Elementary Statistics and Probability Summer II 2014

Quiz 1, Wednesday, July 16, 2014

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Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. You are allowed to calculator for basic calculation in this quiz. You have 15 minutes to take this 10 point quiz.

The following data records year (x) and price (y)

Year x	2010	2011	2012	2013	2014
Price y	36	34	37	38	40

1. (3 points) Find the mean, variance and standard deviation of the price data y .

$$\text{Mean } \bar{y} = \frac{36+34+37+38+40}{5} = \textcircled{37}$$

$$\begin{aligned} \text{Variance } S_y^2 &= \frac{1}{4} \left((36-37)^2 + (34-37)^2 + (37-37)^2 + (38-37)^2 + (40-37)^2 \right) \\ &= \frac{1}{4} (1+9+0+1+9) = \textcircled{5} \end{aligned}$$

$$\text{Standard deviation } S_y = \textcircled{\sqrt{5}}$$

2. (3 points) Find the interquartile range of the price data y .

Hint: The interquartile range is defined by $Q_3 - Q_1$.

First, order price data y : 34, 36, 37, 38, 40

$$Q_3 : 5 \times 75\% = 3.75 \uparrow 4 \Rightarrow Q_3 = 38$$

$$Q_1 : 5 \times 25\% = 1.25 \uparrow 2 \Rightarrow Q_1 = 36$$

$$\text{Interquartile range } Q_3 - Q_1 = \textcircled{2}$$

3. (4 points) Find the correlation coefficient between time and price. Do they have a strong linear relation? Explain why.

x_i	y_i	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - \bar{x})^2$	$(y_i - \bar{y})^2$	$(x_i - \bar{x})(y_i - \bar{y})$
2010	36	-2	-1	4	1	2
2011	34	-1	-3	1	9	3
2012	37	0	0	0	0	0
2013	38	1	1	1	1	1
2014	40	2	3	4	9	6
$\bar{x} = 2012, \bar{y} = 37$		0	0	10	20	12
				S_{xx}	S_{yy}	S_{xy}

$$\begin{aligned} r &= \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} \\ &= \frac{12}{\sqrt{10 \cdot 20}} \\ &= \frac{3\sqrt{2}}{5} \approx \textcircled{0.85} \end{aligned}$$

As $|r|$ is close to 1, x and y have a strong linear relation.