

## Exercises in Statistics

### Correlation and Linear Regression

- 1) A real estate firm wants to estimate the selling price of property in a residential area, based on the evaluation. The data are from previous sales :
- |            |     |     |     |     |     |     |     |     |     |          |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|
| Evaluation | 360 | 130 | 240 | 450 | 300 | 350 | 550 | 150 | 350 | (\$1000) |
| Sold for   | 280 | 100 | 250 | 320 | 330 | 380 | 430 | 120 | 310 | (\$1000) |
- For how much is a property evaluated at \$400,000 expected to sell ? [145000, 96400, 106400, 18324.41]
- 2) Predict the price of a second hand compact car model from the mileage. The following data were collected at different dealers :
- |       |    |     |    |     |    |    |    |    |    |     |           |
|-------|----|-----|----|-----|----|----|----|----|----|-----|-----------|
| Miles | 50 | 120 | 80 | 180 | 40 | 70 | 20 | 80 | 60 | 150 | (1000 km) |
| Price | 10 | 5   | 8  | 3   | 12 | 10 | 15 | 4  | 6  | 3   | (1000 \$) |
- How much would you expect to pay for a car with 1000,000 km ? [22850, 150.4, -1570, 42.53]
- 3) A contractor firm is investigating the relation, if any, between the estimated cost and the real cost of construction projects, based on the following data :
- |                |   |   |   |   |    |    |    |    |       |
|----------------|---|---|---|---|----|----|----|----|-------|
| Estimated Cost | 2 | 3 | 4 | 6 | 9  | 12 | 14 | 18 | (M\$) |
| Real Cost      | 4 | 5 | 5 | 8 | 12 | 10 | 10 | 22 | (M\$) |
- Estimate the real cost for a contract whose estimated is a) 10 M\$, b) 30 M\$. [232, 236, 209, 47.72]
- 4) The amplitude of oscillation of a TV-antenna tower was measured for different peak wind velocities :
- |           |    |    |    |     |    |    |    |     |          |
|-----------|----|----|----|-----|----|----|----|-----|----------|
| Velocity  | 30 | 50 | 80 | 120 | 90 | 60 | 70 | 100 | (km / h) |
| Amplitude | 10 | 30 | 50 | 80  | 80 | 40 | 60 | 90  | (cm)     |
- Estimate the amplitude for a peak velocity of a) 100 km / h . b) 200 km / h . [5800, 5400, 5200, 737.93]
- 5) Are crime rate and the salaries of police officers related ? Here are the data from eight cities :
- |            |     |     |     |     |     |     |     |     |                              |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|------------------------------|
| City       | A   | B   | C   | D   | E   | F   | G   | H   |                              |
| Crime Rate | 675 | 700 | 350 | 475 | 400 | 775 | 325 | 300 | (per 10 <sup>5</sup> inhab.) |
| Salary     | 35  | 55  | 29  | 45  | 40  | 52  | 34  | 30  | (1000 \$)                    |
- Estimate the police salary in city with a crime rate of 500 per 10<sup>5</sup> inhabitants . [250000, 676, 10000, 276]
- 6) Are study time and Final Exam Grade related ? Here is a survey of 12 students :
- |            |    |    |    |    |    |    |    |    |    |    |    |    |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|
| Student    | A  | B  | C  | D  | E  | F  | G  | H  | I  | J  | K  | L  |
| Study Time | 8  | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 26 | 28 | 29 | 30 |
| FE Grade   | 55 | 60 | 65 | 95 | 60 | 45 | 75 | 65 | 85 | 90 | 70 | 75 |
- Estimate the Final Grade for a student studying 25 hours . [600, 2400, 525, 1940.63]
- 7) Is Annual Income of graduates at age 25 related to schooling ?
- |           |    |    |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|----|
| Schooling | 11 | 12 | 13 | 13 | 14 | 15 | 16 | 17 | 17 | 19 |
| Income    | 5  | 15 | 25 | 40 | 30 | 45 | 50 | 50 | 70 | 60 |
- Estimate income for 17 years of schooling . [58.1, 3690, 422, 624.87]
- 8) The compressive strength  $S$  of concrete depends, other parameters being constant, on the ratio by weight of cement to water  $x = c / w$ . In a certain domain of  $c / w$ , this relationship is well approximated by a straight line. Find this linear relation from these lab results :
- |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|
| $x$ | 2.5 | 2.8 | 3.2 | 3.5 | 3.9 | 4.3 | 5.0 |
| $S$ | 80  | 90  | 140 | 150 | 180 | 200 | 280 |
- Estimate the compressive strength for a cement to water ration of 4.0 . [4.56, 28200, 355, 562.94]

Note: [SSX, SSY, SXY, SSE]