


Lab Assignment 2


Due Sep. 7 11:59 pm

2.144 Dwelling permits and sales for 23 countries. The Organisation for Economic Co-operation and Development collects data on main economic indicators (MEIs) for many countries. Each variable is recorded as an index with the year 2000 serving as a base year. This means that the variable for each year is reported as a ratio of the value for the year divided by the value for 2000. Use of indices in this way makes it easier to compare values for different countries. [Table 2.3](#) gives the values of three MEIs for 23 countries.³¹ 


- Make a scatterplot with sales as the response variable and permits issued for new dwellings as the explanatory variable. Describe the relationship. Are there any outliers or influential observations?
- Find the least-squares regression line and add it to your plot.
- Interpret the slope of the line in the context of this exercise.
- Interpret the intercept of the line in the context of this exercise. Explain whether or not this interpretation is useful in explaining the relationship between these two variables.
- What is the predicted value of sales for a country that has an index of 224 for dwelling permits?
- Canada has an index of 224 for dwelling permits. Find the residual for this country.
- What percent of the variation in sales is explained by dwelling permits?

TABLE 2.3 Dwelling Permits, Sales, and Production for 21 Countries

| Country | Dwelling permits | Sales | Production |
|----------------|------------------|-------|------------|
| Australia | 116 | 137 | 109 |
| Belgium | 125 | 105 | 112 |
| Canada | 224 | 122 | 101 |
| Czech Republic | 178 | 134 | 162 |
| Denmark | 121 | 126 | 109 |
| Finland | 105 | 136 | 125 |
| France | 145 | 121 | 104 |
| Germany | 54 | 100 | 119 |
| Greece | 117 | 136 | 102 |
| Hungary | 109 | 140 | 155 |
| Ireland | 92 | 123 | 144 |
| Japan | 86 | 99 | 109 |
| Korea | 158 | 110 | 156 |
| Luxembourg | 145 | 161 | 118 |
| Netherlands | 160 | 107 | 109 |
| New Zealand | 127 | 139 | 112 |
| Norway | 125 | 136 | 94 |
| Poland | 163 | 139 | 159 |
| Portugal | 53 | 112 | 105 |
| Spain | 122 | 123 | 108 |
| Sweden | 180 | 142 | 116 |


2.145 Dwelling permits and production. Refer to the previous exercise.  MEIS

- Make a scatterplot with production as the response variable and permits issued for new dwellings as the explanatory variable. Describe the relationship. Are there any outliers or influential observations?
- Find the least-squares regression line and add it to your plot.
- Interpret the slope of the line in the context of this exercise.
- Interpret the intercept of the line in the context of this exercise. Explain whether or not this interpretation is useful in explaining the relationship between these two variables.
- What is the predicted value of production for a country that has an index of 224 for dwelling permits?
- Canada has an index of 224 for dwelling permits. Find the residual for this country.
- What percent of the variation in production is explained by dwelling permits? How does this value compare with the value that you found in the previous exercise for the percent of variation in sales that is explained by building permits?

2.153 Fields of study for college students. The following table gives the number of students (in thousands) graduating from college with degrees in several fields of study for seven countries:³⁷  FOS

| Field of study | Canada | France | Germany | Italy | Japan | U.K. | U.S. |
|-----------------------------------|--------|--------|---------|-------|-------|------|------|
| Social sciences, business, law | 64 | 153 | 66 | 125 | 250 | 152 | 878 |
| Science, mathematics, engineering | 35 | 111 | 66 | 80 | 136 | 128 | 355 |
| Arts and humanities | 27 | 74 | 33 | 42 | 123 | 105 | 397 |
| Education | 20 | 45 | 18 | 16 | 39 | 14 | 167 |
| Other | 30 | 289 | 35 | 58 | 97 | 76 | 272 |

- Calculate the marginal totals and add them to the table.
- Find the marginal distribution of country and give a graphical display of the distribution.
- Do the same for the marginal distribution of field of study.

2.154 Fields of study by country for college students. In the previous exercise you examined data on fields of study for graduating college students from seven countries.  FOS

- Find the seven conditional distributions giving the distribution of graduates in the different fields of study for each country.
- Display the conditional distributions graphically.

2.156 Salaries and raises. For this exercise, we consider a hypothetical employee who starts working in Year 1 with a salary of \$50,000. Each year her salary increases by approximately 5%. By Year 20, she is earning \$126,000. The following table gives her salary for each year (in thousands of dollars):



RAISES

| Year | Salary |
|------|--------|
| 1 | 50 |
| 2 | 53 |
| 3 | 56 |
| 4 | 58 |
| 5 | 61 |
| 6 | 63 |
| 7 | 67 |
| 8 | 70 |
| 9 | 74 |
| 10 | 78 |
| 11 | 81 |
| 12 | 85 |
| 13 | 90 |
| 14 | 93 |
| 15 | 99 |
| 16 | 104 |
| 17 | 109 |
| 18 | 114 |
| 19 | 120 |
| 20 | 126 |

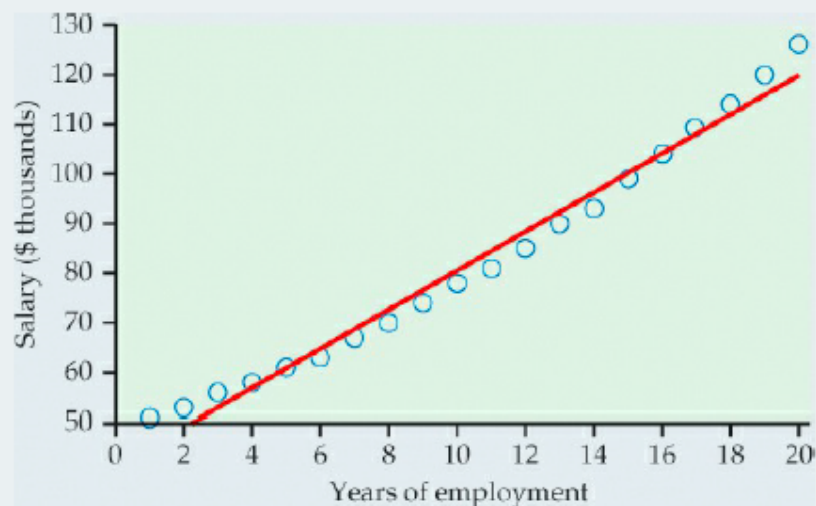



FIGURE 2.34 Plot of salary versus year for an individual who receives approximately a 5% raise each year for 20 years, with the least-squares regression line, [Exercise 2.156](#).

- (a) Figure 2.34 is a scatterplot of salary versus year, with the least-squares regression line. Describe the relationship between salary and year for this person.
- (b) The value of r^2 for these data is 0.9832. What percent of the variation in salary is explained by year? Would you say that this is an indication of a strong linear relationship? Explain your answer.

2.158 Try logs. Refer to the previous two exercises. Figure 2.36 is a scatterplot with the least-squares regression line for log salary versus year. For this model, $r^2 = 0.9995$.  RAISES

- (a) Compare this plot with Figure 2.34. Write a short summary of the similarities and the differences.
- (b) Figure 2.37 is a plot of the residuals for the model using year to predict log salary. Compare this plot with Figure 2.35 and summarize your findings.

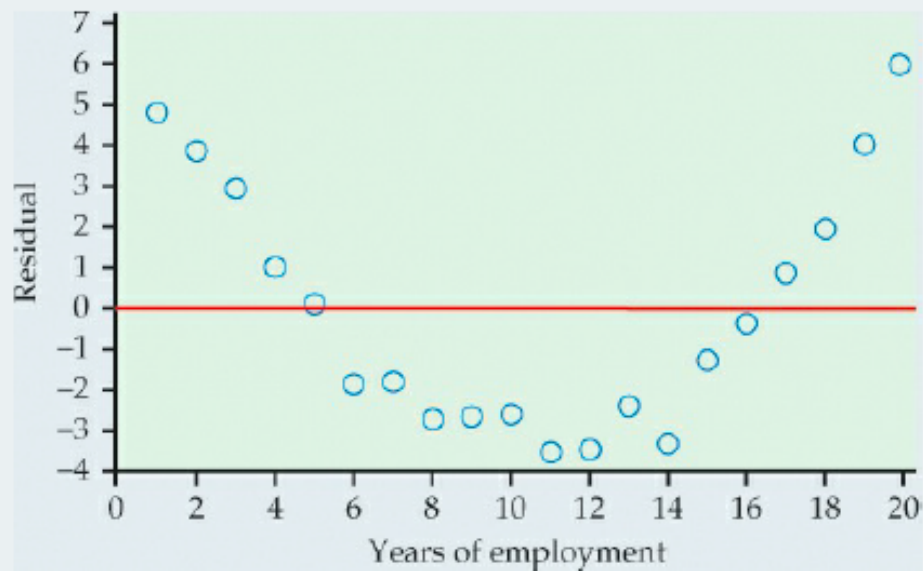


FIGURE 2.35 Plot of residuals versus year for an individual who receives approximately a 5% raise each year for 20 years, Exercise 2.157.

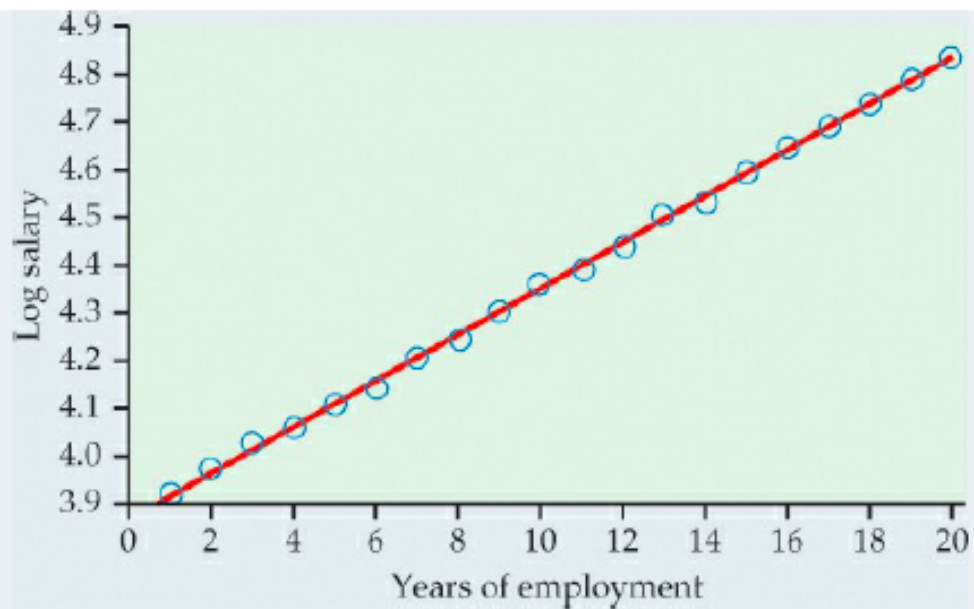


FIGURE 2.36 Plot of log salary versus year for an individual who receives approximately a 5% raise each year for 20 years, with the least-squares regression line, [Exercise 2.158](#).

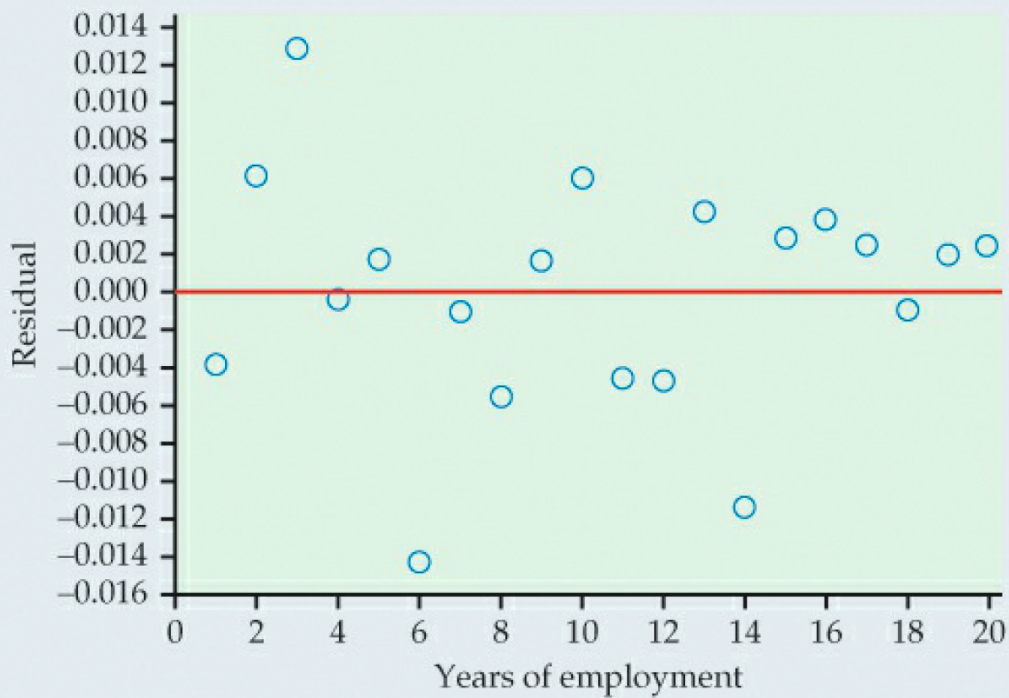


FIGURE 2.37 Plot of residuals, based on log salary, versus year for an individual who receives approximately a 5% raise each year for 20 years, [Exercise 2.158](#).