


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  MEIS


- (a) 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?
- (b) Find the least-squares regression line and add it to your plot.
- (c) Interpret the slope of the line in the context of this exercise.
- (d) 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.
- (e) What is the predicted value of sales for a country that has an index of 224 for dwelling permits?
- (f) Canada has an index of 224 for dwelling permits. Find the residual for this country.
- (g) 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

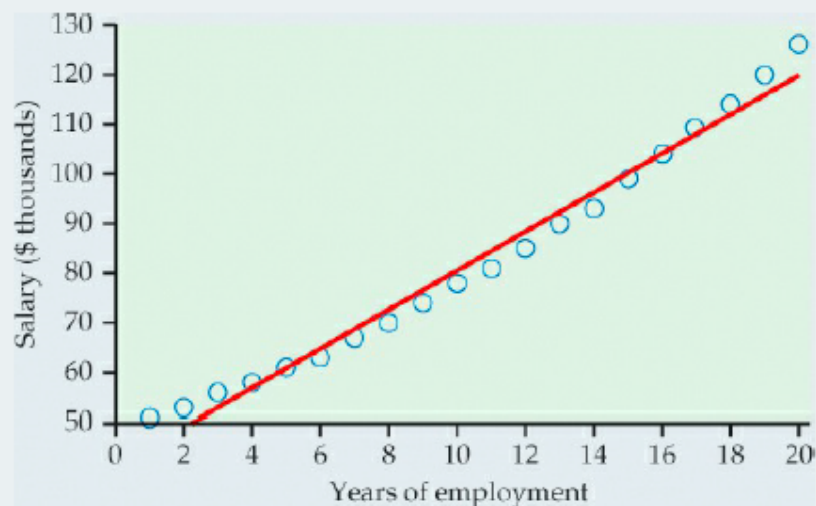



FIGURE 2.34 Plot of salary versus year for an individual who receives approximately a 5% raise each year for 20 years, with the least-squares regression line, [Exercise 2.156](#).

- (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.

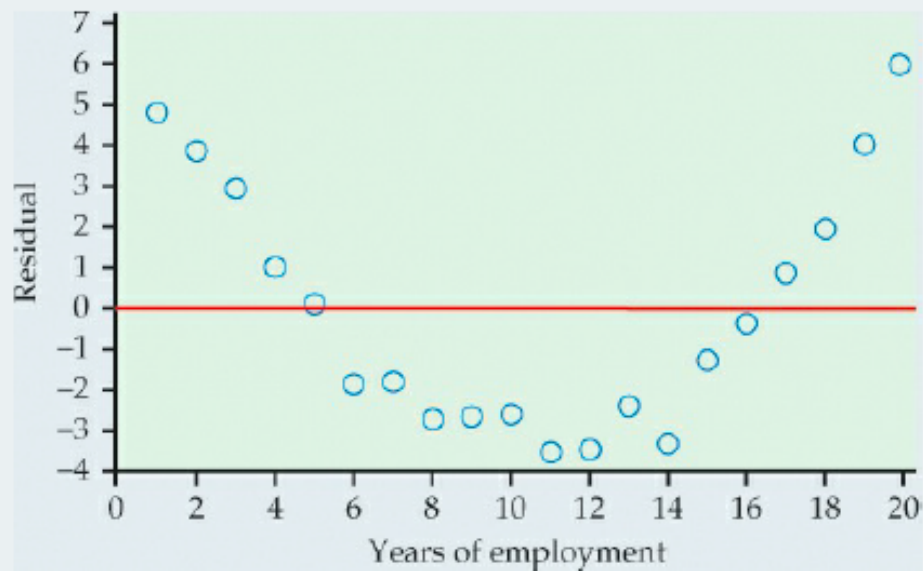


FIGURE 2.35 Plot of residuals versus year for an individual who receives approximately a 5% raise each year for 20 years, Exercise 2.157.

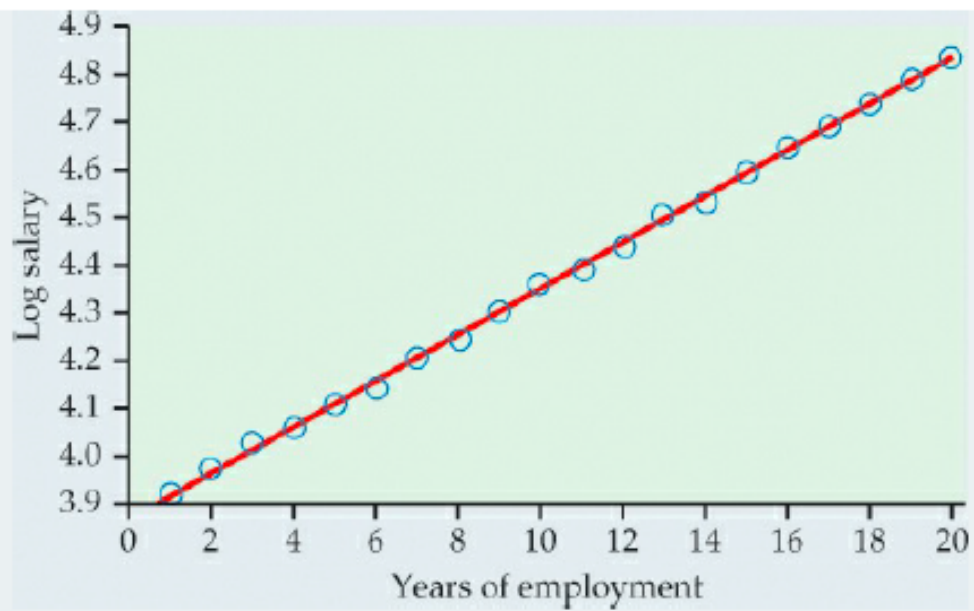


FIGURE 2.36 Plot of log salary versus year for an individual who receives approximately a 5% raise each year for 20 years, with the least-squares regression line, [Exercise 2.158](#).