Montgomery Yu Regression Assignment

1. Variables:
   For your Simple Linear Regression Analysis problem,
   a. What is the dependent variable (Y) and what is the independent variable (X)?

   My dependent variable is Food Inflation (measured as a percentage) and my independent variable is the number of COVID-19 vaccine doses administered in Europe as of December 14, 2021 by country.

   b. How are these variables being measured?

   Food inflation is measured as a percentage value, while COVID-19 vaccine doses administered in Europe per 100 people in a given population

2. Expected Relationship:
   What relationships you expect to find between your independent variable and your dependent variable?

   I expect to find that the as independent variable rises, the dependent variable will decrease (negative, linear relationship) – Countries that have higher vaccination rates or generally get more doses of vaccines administered relative to their population will experience less inflation in the price of food.

   Do you think there will be a positive or negative relationship between your variables?

   I expect there will be a negative relationship between these two variables.

Do you expect the relationship to be strong? What is your reasoning?

I expect that the relationship between these variables will be moderately strong to extremely strong (a range of r-values from 0.75 – 0.95), because countries that do not vaccinate against COVID-19 as much will become sick more often, and this will affect supply chains across Europe, agriculture and fishing in particular because more people cannot work physically to do these jobs, and hence the average price of food (basket of goods pertaining to food) will increase because of this.

3. Data Set:
a. What is your data set? How many observations do you have?

There are 33 observations (n=33). The European Union is NOT counted, and Turkey is also NOT counted because the EU is an average of an combination of different countries, most of which are already listed here.

Turkey is an extreme outlier concerning inflation from specific policies OTHER than COVID-19: (See this source for more info on that topic: https://link.springer.com/article/10.1007/s10644-021-09357-1)

Country	Vaccination per 100 People	Food Inflation Rate
Iceland	203.64	1.7
Malta	193.27	4
Portugal	181.63	1.36
Denmark	179.56	2.1
United Kingdom	179.13	2.5
Ireland	174.45	0.9
Spain	173.5	3.3
Belgium	171.76	-0.32
Italy	170.79	1.5

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Austria	186.87	1.6
France	168.01	0.5
Norway	167.41	-3.6
Sweden	165.02	1
Germany	161.39	4.5
Finland	161.12	1.5
Cyprus	157.73	-3.1
Luxembourg	153.34	1.42
Hungary	152.12	1.7
Greece	151.93	3
Netherlands	145.99	1.2
Switzerland	145.85	-1.7
Lithuania	145.17	7.6
Czech Republic	135.77	2
Slovenia	132.87	1.1
Latvia	120.79	5.6
Serbia	117.48	11.4
Poland	117.48	6.4
Estonia	113.09	5.4
Croatia	107.97	5.7
Russia	93.87	10.81
Slovakia	92.72	4.5
Romania	80.72	6.1
Bulgaria	51.09	7.2
EU Average (NOT Included)		2.3

   b. What is the source of your data?

X-values: : Number of COVID-19 vaccine doses administered in Europe per country: https://www.statista.com/statistics/1196071/covid-19-vaccination-rate-in-europe-by-country/

Y-values: Food Inflation rates in Europe (CPI) circa October – November 2021: https://tradingeconomics.com/country-list/food-inflation?continent=europe

c. If you are using raw data, how did you collect your data? How did you measure the variable(s) and /or what specific questions did you ask?

I got the data for Vaccination rates from Statista as reported by all 33 countries circa December 14, 2021; and likewise I got the food inflation rates for various European countries from the website Trading Economics, where inflation rates are posted every week for each country. I only needed to specify that I was looking for food inflation in Europe particularly, NOT the nominal inflation rate or CPI or GDP deflator or other metrics.

Food Inflation Rate Line Fit Plot

$y = -6.3046x + 165.97$
$R^2 = 0.3721$

Vaccination per 100 People

Food Inflation Rate
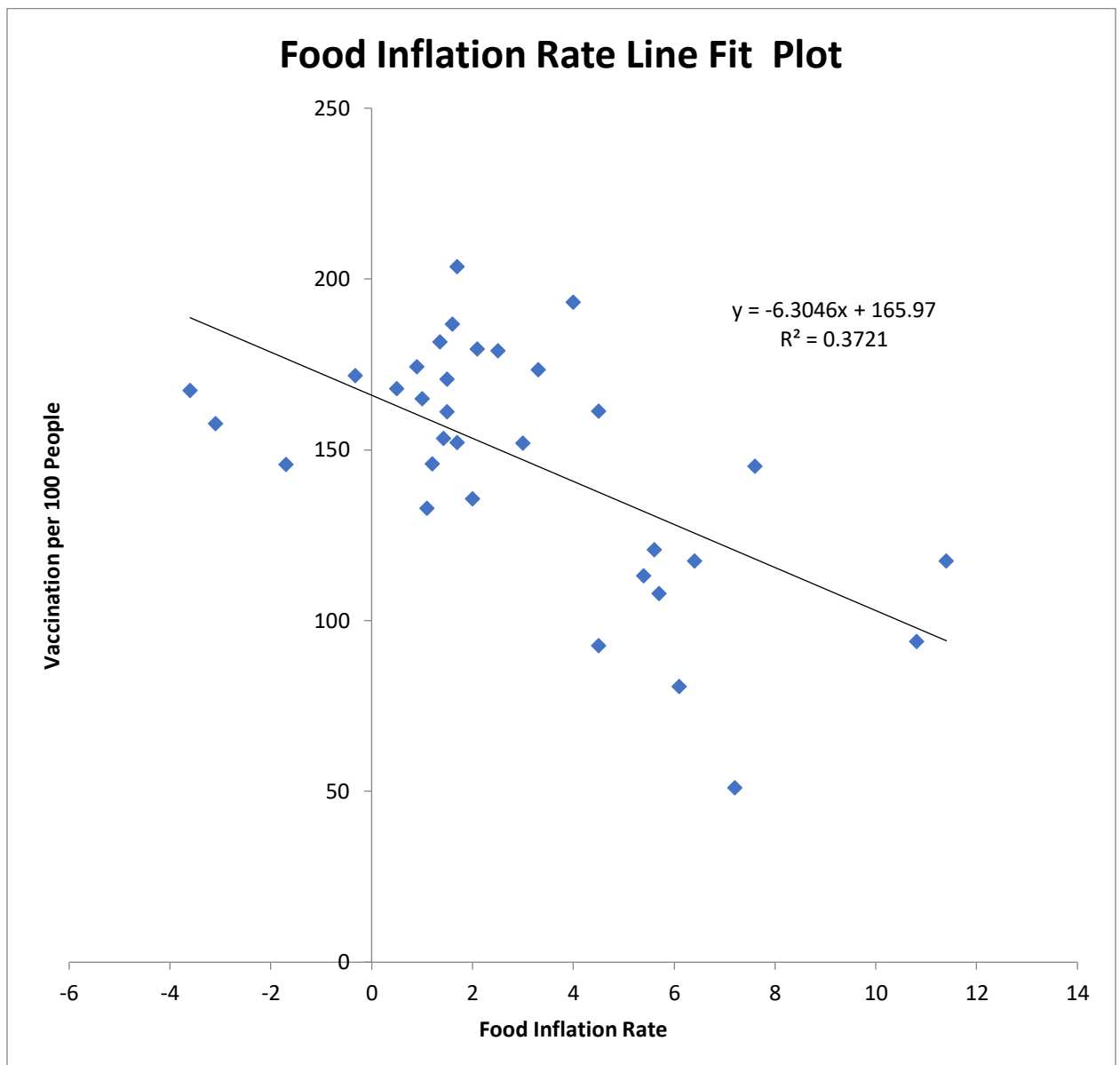
Data set is attached along with this document in the Excel worksheet.

4. Analysis:
Conduct your simple regression analysis using Excel. Using the Summary Output, answer
the following:
a. What is the regression equation that describes the relationship between the 2 variables?

Y = -6.3046x + 165.97

b. In the context of your problem,
(i) What does the slope indicate?

The slope is -6.3046x, which means that for every 1 more dose of COVID-19 vaccine administered, there is a decrease of about 6.3% when it comes to food inflation.

(ii) What does the y-intercept indicate?
The Y-intercept is 165.97, which means that in the absence of a COVID-19 vaccine (no vaccines administered at all), food inflation rate could be approximately 165.97%, although for our purposes this really means that the line crosses the Y-intercept at 165.97 when the X-value is 0 (but this is not the case for any of these countries so it is a moot point)

c. What is the value of the standard error of the estimate? Interpret this value in the context of your problem.

Standard Error is approximately 28.27, which means that on average, the actual observations lie 28.27 units above or below the estimated regression line. The average scatter of Y-values (food inflation) around the regression line is 2.76. It is a stochastic relationship.

d. What are the values of:
(i) the coefficient of correlation (r)

r = -0.6101, which means that inflation and vaccines are negatively/indirectly/inversely correlated

and (ii) the coefficient of determination (r^2).

$R^2 = 0.372$, which means that the correlation is apparently very weak between these two variables

Please see the Excel Output in the Excel Workbook attached.

5. Conclusion:
a. Conclude your analysis with overall observations that you have about your study.

Overall, I was correct in my initial hypothesis that there would be a negative relationship between vaccination rates and inflation in the price of food in at least most of these countries listed. I was correct in that the standard error would indicate a stochastic relationship and that the data points would not vary too much around the predictive regression line.
However, the correlation between these two variables was actually very weak, which means that there are other recent factors that are affecting the price of food in European countries beyond just the vaccination or immunization to COVID-19.

b. Did the analysis confirm to your initial expectations? If not, what surprised you?

As stated above, my hypothesis about a negative relationship was correct (more vaccination generally means lower inflation

rates in the price of food), but what surprised me is that the correlation is very weak between these two factors. I was probably correct to predict a stochastic relationship as well.

Overall, I would say that my hypothesis was more wrong than right because the relationship between the two variables is evidently extremely weak, it is not a particularly direct relationship because this is more fitting for a multiple variable regression than a single variable regression. There must be other factors that affect the price of food beyond vaccines and COVID-19.

c. In light of your analysis, what questions (if any) do you have or what further topics would you like would like to investigate going forward?

What other factors are responsible for this incredible rise in the price of food for many of these countries? Some of these countries jump to near double-digit inflation in a single week. Is it a result of Christmas shopping? Is it a result of supply chain dysfunction NOT related to COVID-19? Are Vaccinations really effective in preventing supply chain dysfunction and therefore inflation?

Sources:

Why Turkey is not included in this data set despite being a significant country in terms of population and agriculture: https://link.springer.com/article/10.1007/s10644-021-09357-1

X-values: Number of COVID-19 vaccine doses administered in Europe per country: https://www.statista.com/statistics/1196071/covid-19-vaccination-rate-in-europe-by-country/

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