SDS315_HW3.rmd

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HW3

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GitHub Link

Problem One

Part A

What creatinine clearance rate should we expect for a 55-year-old? Explain briefly (one or two sentences + equations) how you determined this.

I used the lm function to create a linear regression model that helped analyze the creatinine clearance rate (CCR)by age. Using this model I found the intercept and coeffecient, which can be used to create the line of best fit which has an equation of y = 147.8 - .62x. In this equation x is age and y is the expected CCR. The projected CCR for someone that is 55 years old is about 114 mL/min.

Part B

How does creatinine clearance rate ch ange with age? (This should be a single number whose units are ml/minute per year.) Explain briefly (one or two sentences) how you determined this.

Using the equation I found in part A, the slope is equal to the change of CCR over the age of the patient. This number is our mx of the mx + b which in this case is actually -.62 mL/min per year.

Part C

Whose creatinine clearance rate is healthier (higher) for their age: a 40-year-old with a rate of 135, or a 60-year-old with a rate of 112? Explain briefly (a few sentences + equations) how you determined this.

To find which individual has a healthier creatinine clearance rate we can plug both of their ages into our regression formula to find both of their expected rates, then compare their provided actual rates. Starting with the 40 year old who has an expected rate of 123, but an actual rate of 135. Next the 60 year old is expected to have a 110.6 creatinine clearance rate but actually has an 112 rate. Since the difference between actual and expected for the 40 year old is +12mL/min and for the 60 it is +1.4mL/min we can conclude that the 40 year old is healthier than the 60 year old in terms of creatinine.

Problem Two

Part A

A short introduction, in your own words, on what the “beta” of a stock is measuring and how it is calculated.

For this problem, we used data from six stocks (excluding the S&P 500, which acts as a market reference). We calculated beta, alpha, and R^2 values for each of these six stocks. To undestand the data yo uneed to know what beta and alpha values are.

‘Beta’ for a stock is the percentage change in its return when the overall market changes by 1%. If a stock has a beta of 1, it changes by 1% when the market changes by 1%. A higher beta means the stock changes more than the market, and a lower beta means it changes less. Some stocks even have negative betas, changing in the opposite direction of the market. Negative betas sound like a bad thing but they act like ‘insurance’ during market crashes, benefiting beta stocks when the market crashes.

Beta measures a stock’s systematic risk, reflecting its risk compared to the broader market. This is different from unsystematic risk, which can be spread out. Although the table below doesn’t cover the entire stock market, we use the SPY ticker for the S&P 500 as a stand-in. It helps us understand market conditions due to its size and correlation with the overall market.

Part B

Regress the returns for each of the 6 stocks individually on the return of S&P 500. Make a clean, professional looking table that shows the ticker symbol, intercept, slope, and R2 for each of the 6 regressions.

Ticker	Intercept	Slope	R^2
AAPL	0.0091893	1.0656012	0.0133625
GOOG	0.0002330	0.9967746	0.6483015
JNJ	-0.0000241	0.6771930	0.5019430
MRK	-0.0001540	0.7136141	0.4837010
TGT	0.0015833	0.7076485	0.2478813
WMT	0.0006781	0.5189811	0.2853233

The provided table examines the Alpha (β0), Beta (β1), and R^2 metrics for six individual stocks in relation to the S&P 500 between Jan 2019 and Sept 2020. The values represent the percentage change of each stock corresponding to S&P 500 moves. A higher Beta showsa stock tends to grow more in sync with the S&P 500, while a lower shows a stock tends to fall. The R^2 value shows the extent of predictable variation for a stock on a scale of 0 to 1, where the closer to 0 means more variation in y, and closer to 1 is more systemic variation in y.

Part C

A conclusion that answers two questions: in light of your analysis, which of these six stocks has the lowest systematic risk? And which has the highest systematic risk?

The stock with the lowest systematic risk is Walmart (WMT) due to it having the smallest Beta value. The stock with the highest systematic risk is Apple (AAPL), which funnily enough I now own, because it has the highest Beta value.

Problem Three

Part A

An estimated growth rate and doubling time for Italy

The growth rate of COVID in Italy from February 2020 to April 2020 is about 1.201 and the doubling occurs on day 1.

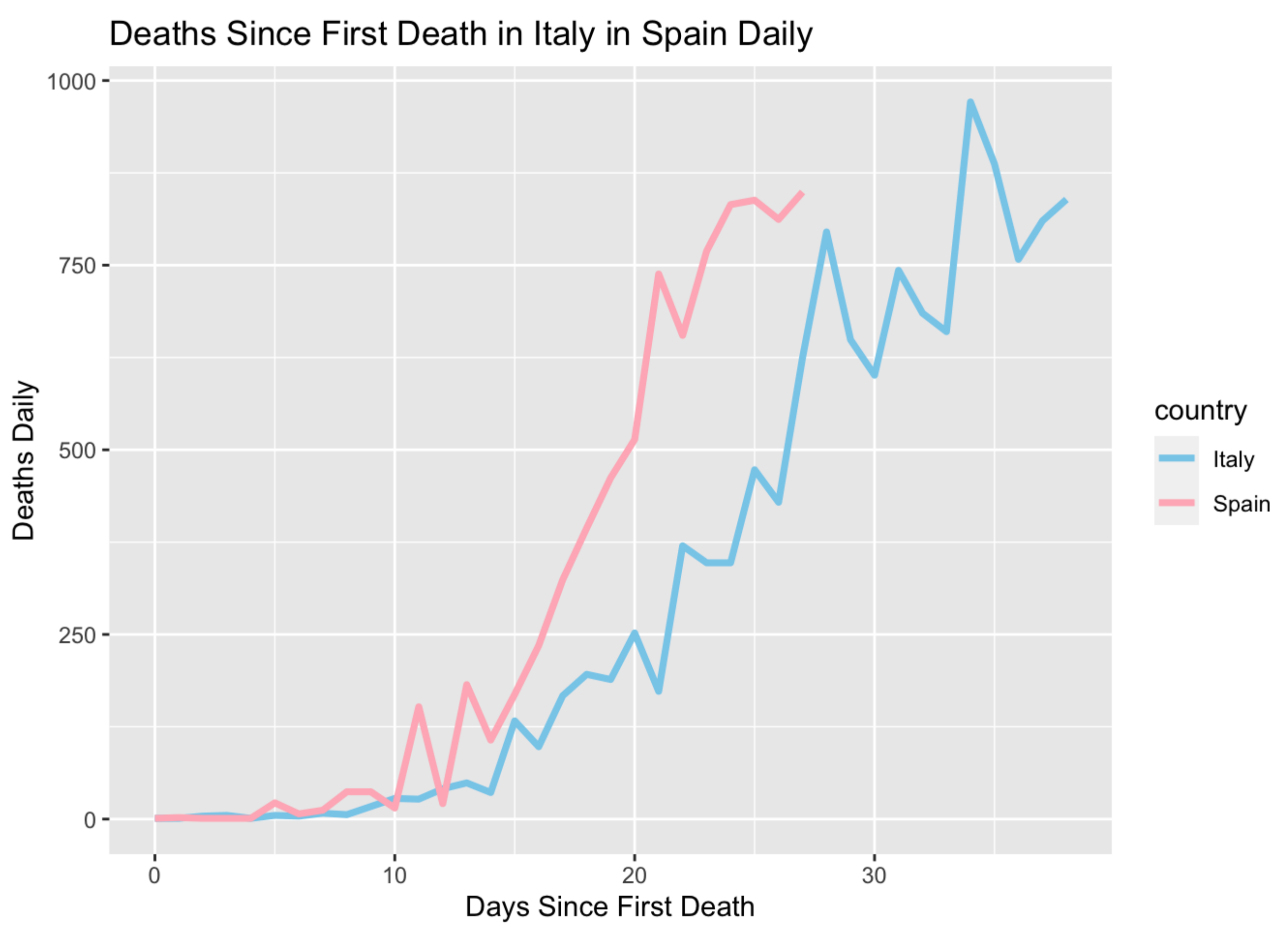
Part B

An estimated growth rate and doubling time for Spain.

The growth rate of COVID in Spain from March 2020 to April 2020 is approximately 1.318 and the doubling occurs on day 1.

Part C

A line graph showing reported daily deaths over time (using days_since_first_death, rather than calendar date, as the relevant time variable) in each country. Your line graph should have two lines, one for each country, distinguished by their color.



The graph above shows the trend of daily deaths as the days increase after the day of the first death due to covid.

Problem Four

Question

The economists’ power-law model is Q = KP^β , where P is price, Q is quantity demanded by consumers at that price, where β is the price elasticity of demand. In light of the data, what is the estimated price elasticity of demand for milk?

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## Warning: 'tidy.numeric' is deprecated.
## See help("Deprecated")
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Term	Estimate
(Intercept)	4.720604
log(price)	-1.618578

Using a power-law regression model to display the change in milk demand with price changes we can find the estimated price elasticity of demand for milk. The data in the table shows that the elasticiity is about -1.62. This means that for every 1% price change in milk there is about a NEGATIVE 1.62% change in demand. So for example if the price of milk goes up by 100%, lets say from 3 dollars to 6 dollars, the demand for milk would go down about 162%. This establishes a negative correlation/relationship between price and demand for milk.