

# Problem Set #3

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## Elaboration

In this problem set, I use quarterly state and country level data from FRED (FEDERAL RESERVE BANK OF ST. LOUIS) to answer the question, How Covid-19 pandemic effects South Carolina's economy. In this regard, I am using macroeconomic indicators including South Carolina real GDP, unemployment rate and Country level Consumer Price Index for the U.S. from 2015 to 2021. In the first step, I will discuss how data changes after 2020.01.12, the date of first positive covid-19 case in USA. Then, I will elaborate the correlation between the indicators to show how they are correlated. In this step, I will also use 3D plot for visualizing the correlation of all indices.

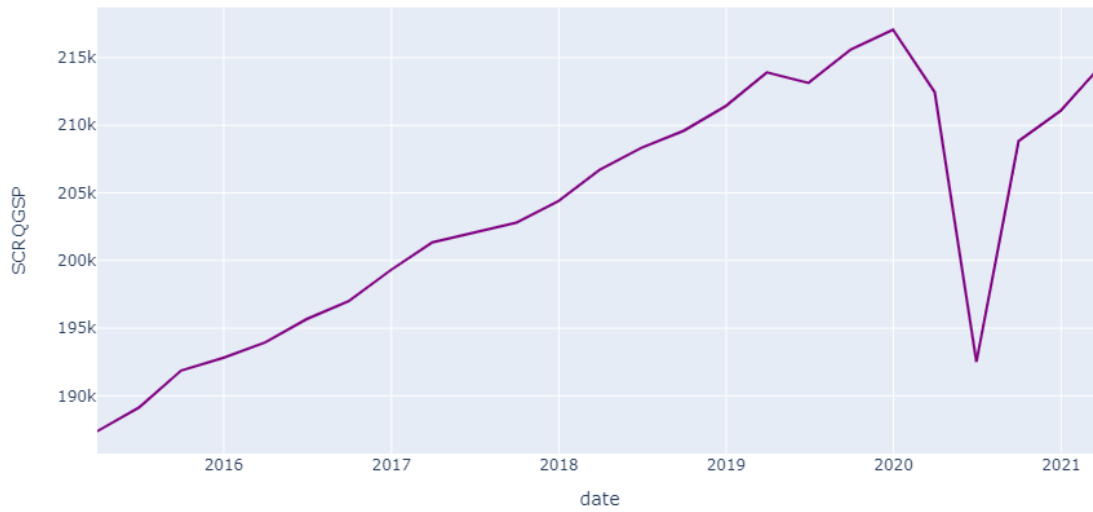
Figure 1 shows how South Carolina Real GDP has changed after 2020.06.12 at which first case in the U.S. tested positive. This may be caused by following reasons:

1. Lock down: In Some industries, like tourism, Entertainments and the like they need to be operated in-person or it took time for those companies to adapt to the new unexpected situation.
2. Problem in supply chain of primary goods and services because of Covid-19 related challenges in other countries.
3. Delay in government relief packages due to time consuming debates over the amount of aid in the U.S. Senate

Roughly after August 2020, The Real GDP trends switched from decreasing to increasing and almost reached to the level before the pandemic. For this increasing and promising change, we can consider the following reasons :

1. Election: After Presidential and the U.S. Senate election, in which Democrats won both, the process of relief package allocation has accelerated.
2. Commence of vaccination
3. Small businesses adjusted their products and services based on new consumer new expectations. For example some bars and restaurants started to add pick up and free delivery of their products to their

SC Real GDP(2015-2021)



(a)

SC Real GDP



(b)

Figure 1: SC Real GDP from 2015 to 2021

costumers.

Figure 2 shows the unemployment rate in South Carolina how reacted to the Covid-19 pandemic. The rate of unemployment increased by about 6 percent which was an unprecedented shift in its trend from 2015 to 2020. This surprising change can be explained by following causes:

- 1 Individuals prefer to leave their job, especially ones who have health problem.
2. Companies choose conservative policy and hold their recruitment plans
3. As mentioned before, some industries like tourism and entertainments that need to be operated in in-person form

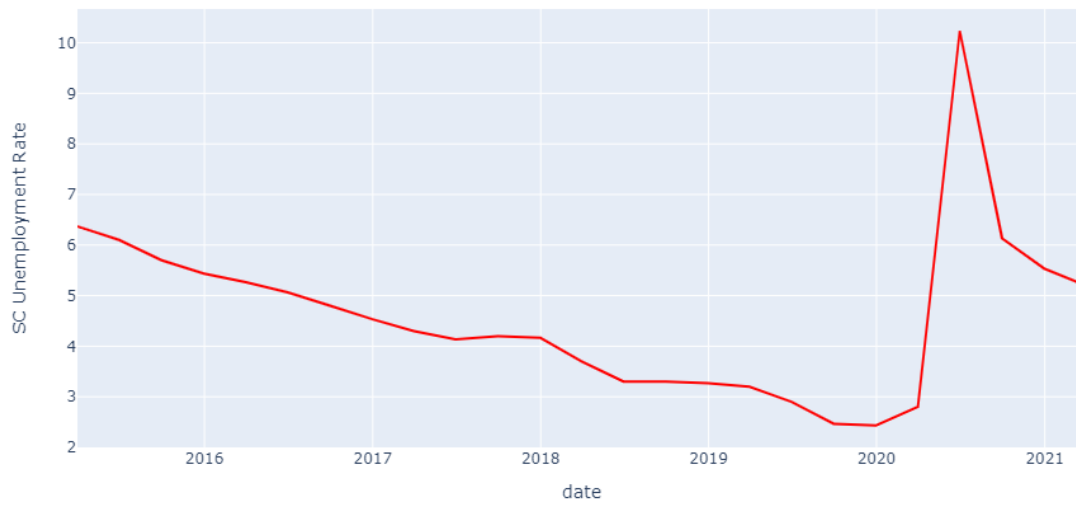
After Vaccination, unemployment rate shifts to decreasing trend but it is not as fast as GDP growth. It may be due to the fact that some small businesses could not handle the situation and file bankruptcy. It is important to note here that GDP declines as the unemployment increases which has a strong correlation with unemployment. I will show this fact in the following figures.

Figure 3 shows the negative strong correlations between unemployment rate and GDP. Figures 3-b and 3-c indicates that the volatility of GDP occurred in the opposite direction which implies negative correlation between the variables. It is important to see the causal effect of each of the aforementioned reasons.

In addition to the unemployment rate, I am visualizing the correlation between Consumer Price Index (CPI) to see how they interact during the pandemic. Figure 4 shows price level has increased more after pandemic in comparison to the previous year and figure 5 implies weak positive correlation between GDP and USA Consumer Price Index but for accurate analysis, we should consider appropriate methods to reach decisive conclusions about the effect of pandemic and each of the above reasons.

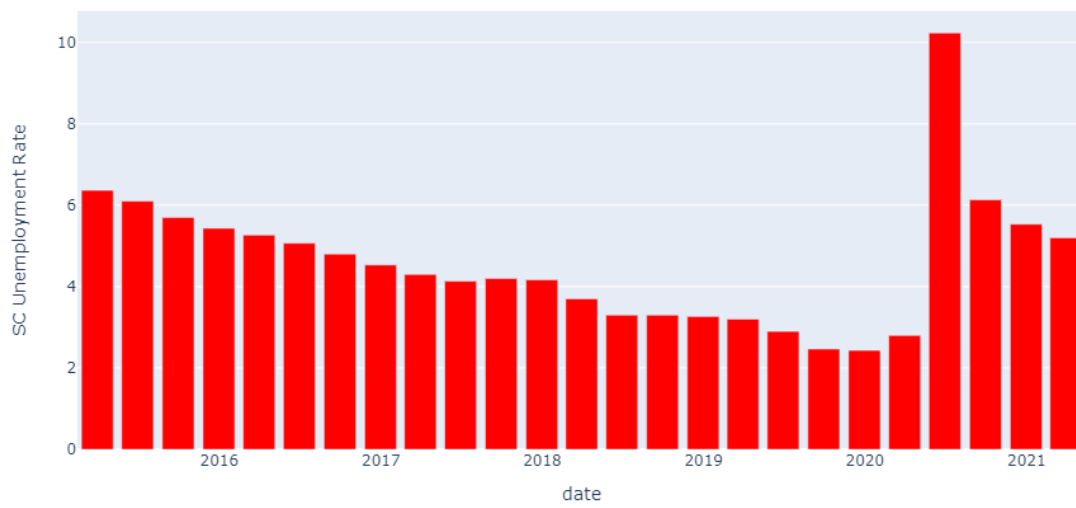
Figure 6 shows the correlation between GPD, CPI and Unemployment rate.

SC Unemployment Rate (2015-2021)



(a)

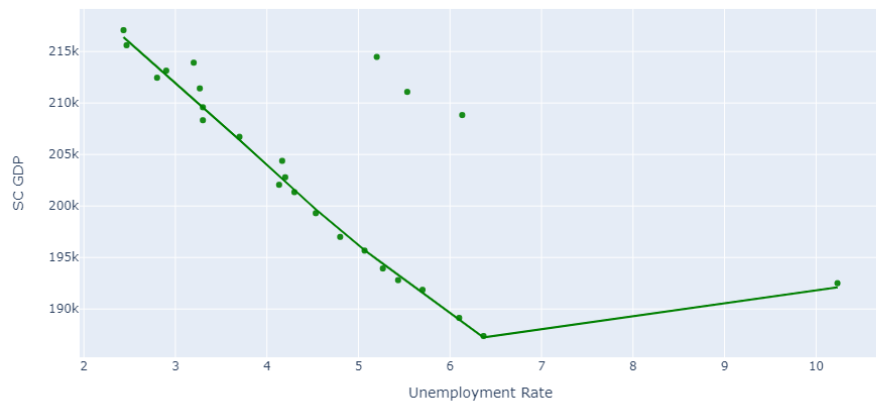
SC Unemployment Rate (2015-2021)



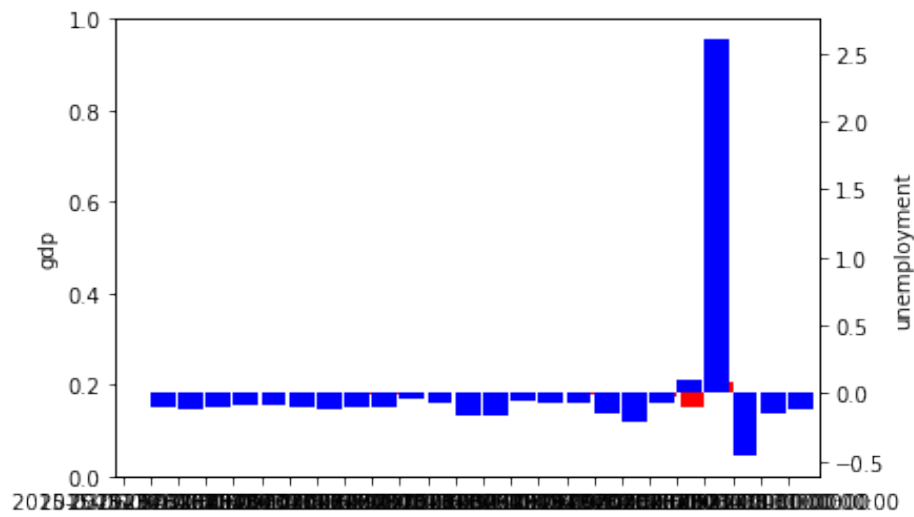
(b)

Figure 2: SC Unemployment Rate from 2015 to 2021

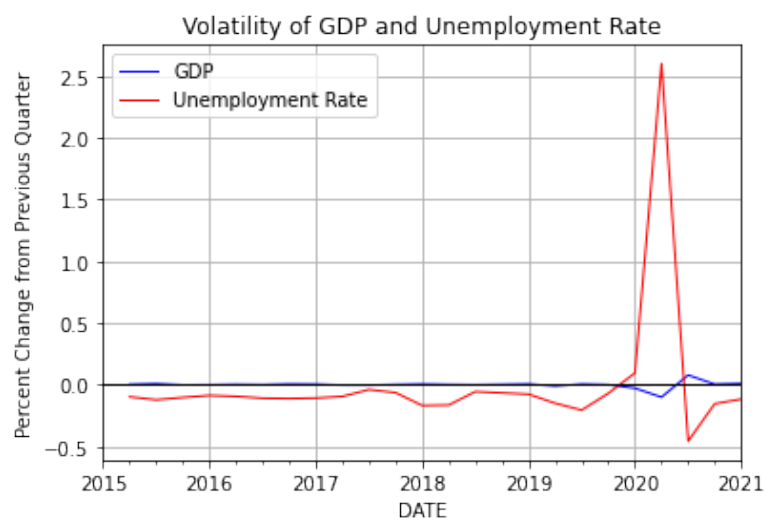
Unemployment Rate and GDP Correlation



(a) Unemployment Rate and GDP Correlation

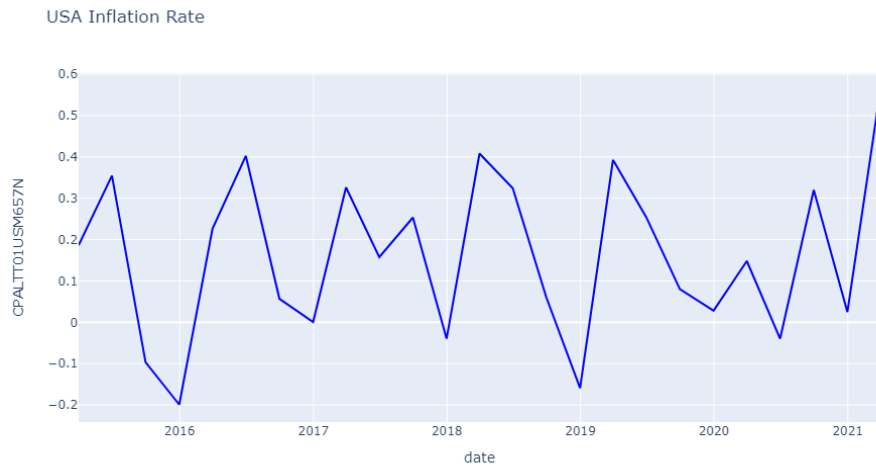


(b) Volatility of GDP and Unemployment Rate

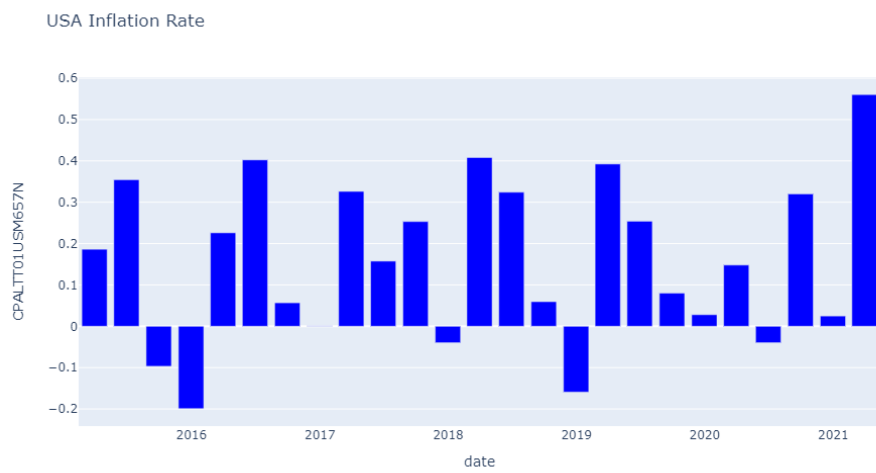


(c) Volatility of GDP and Unemployment Rate

Figure 3: Unemployment rate and GDP volatility and correlation



(a)



(b)

Figure 4: USA Consumer Price Index

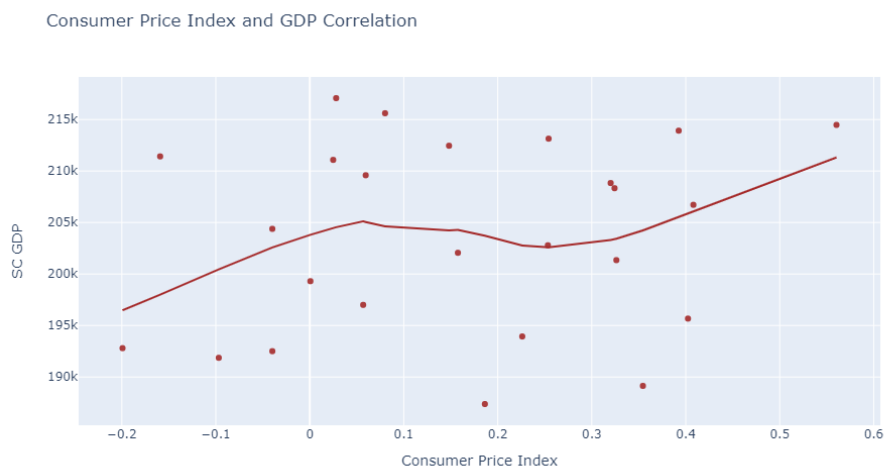


Figure 5: Correlation of GDP and USA Consumer Price Index

### Unemployment Rate and GDP and inflation rate Correlation

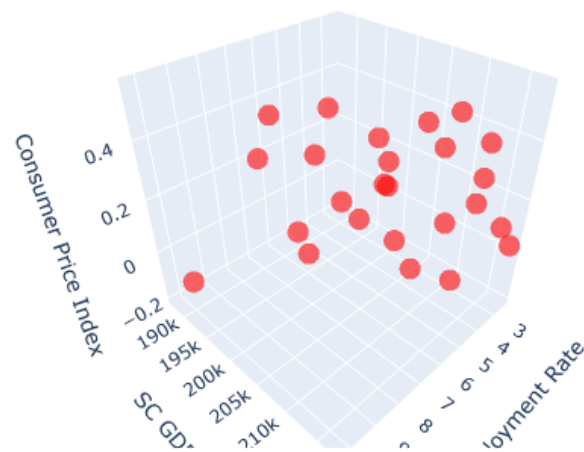


Figure 6: Correlation of GDP and USA Consumer Price Index and Unemployment rate