International Macroeconomics and Monetary Policy Project

PROBLEM STATEMENT:

Consumer spending and business cycles is the transmission of consumer spending to growth rates with special focus on Covid pandemic 2020-21. **Country: USA**

PRESENTED BY

Sudhanshu Prasad

Pavitra Bhargava

FINANCE

Introduction

CONSUMER SPENDING

Consumer spending, also known as personal consumption expenditures (PCE), refers to the amount of money spent by individuals and households on goods and services in a given period of time.

In this project we have analyzed the role of consumer spending in GDP the growth of the US economy through data analysis and regression models in python.

Data Source

Federal Reserve Economic Data (FRED) database

Real PCE: Link

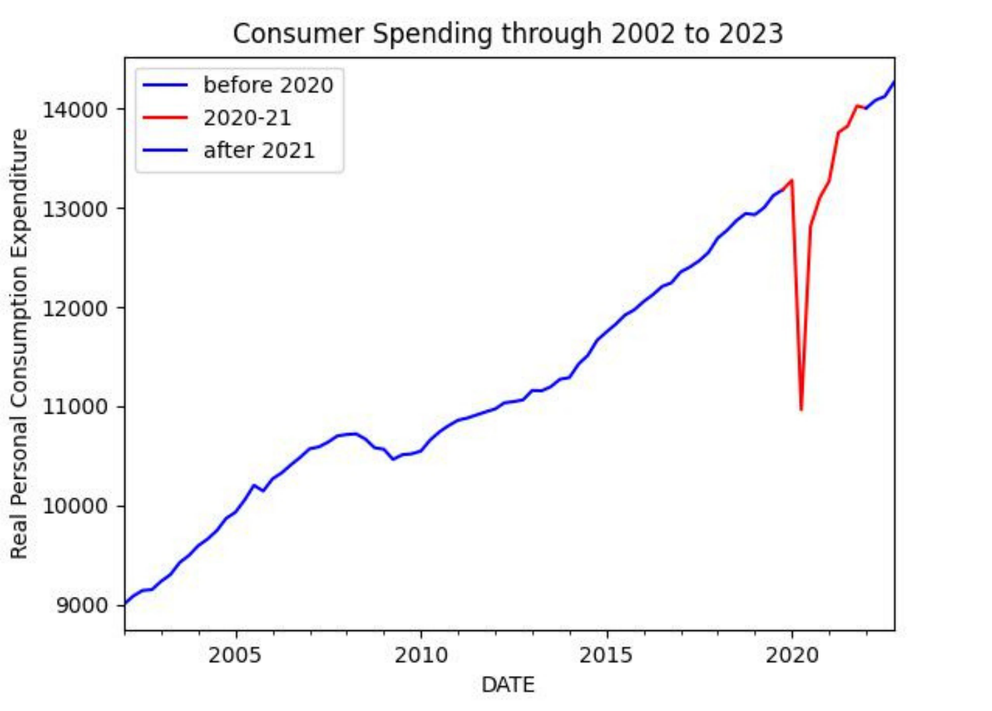
Real GDP: Link

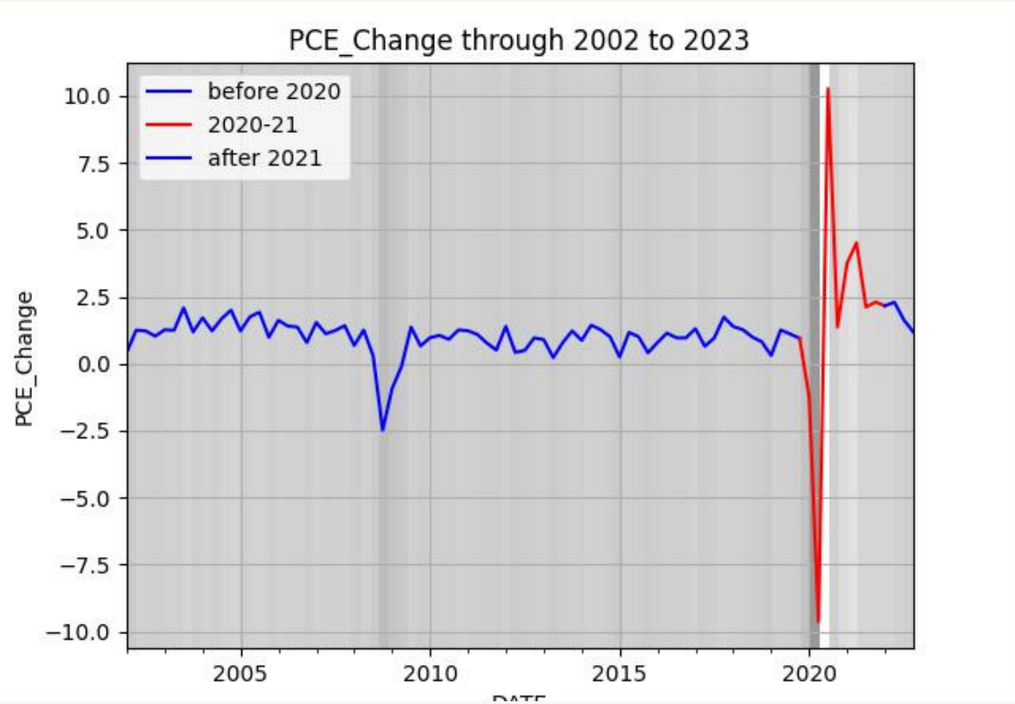
Time Period

2002- 2022

Approach

- Quarter Wise GDP and PCE Analysis
- Global Financial Crisis (2008-09)
- Special Focus on COVID Years (2020-21)

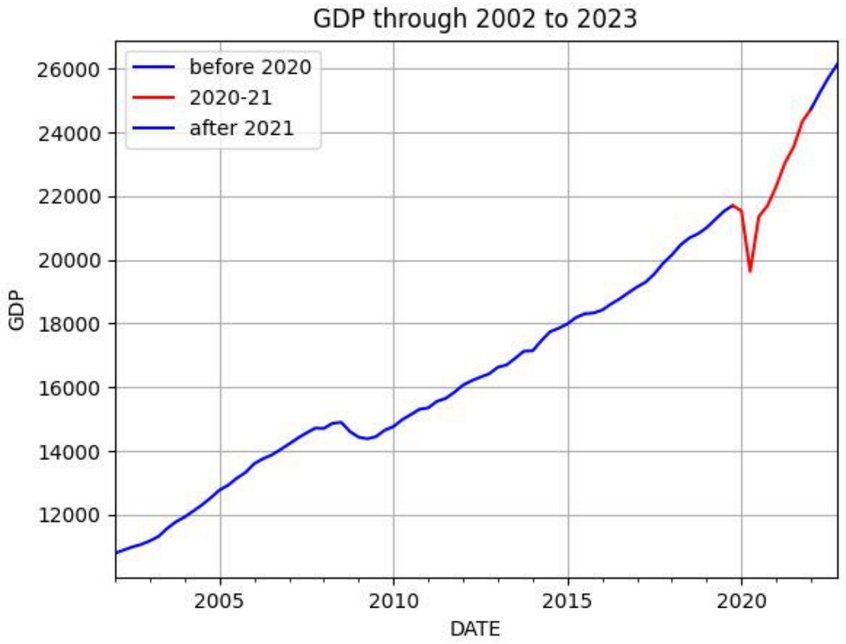


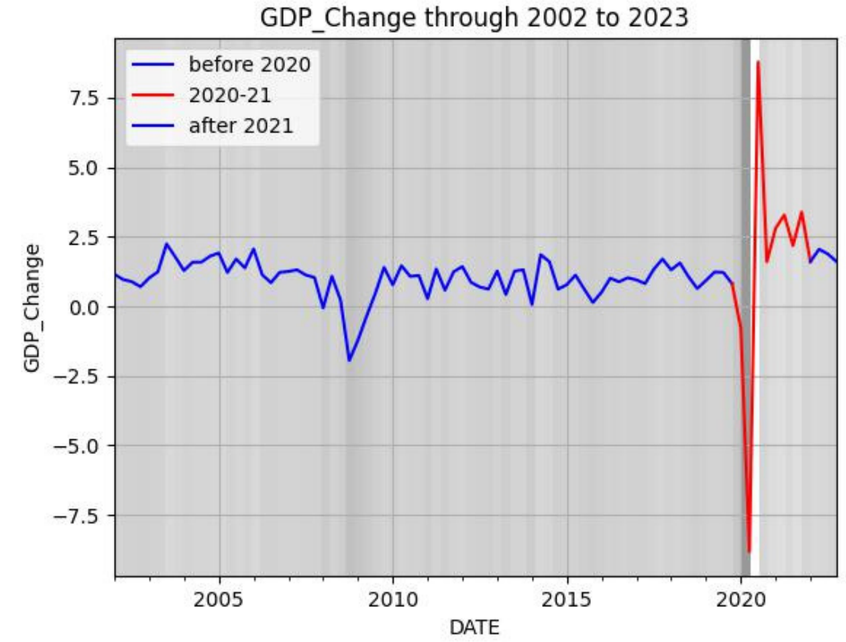


Personal Consumption Expenditures (2002-2023)

💡 Our Inferences from the Graph

- A steady increase in personal consumption expenditures from 2002-2007 was primarily due to robust economic growth, increased employment, and high consumer confidence.
- 2008-2009, the Global Financial Crisis hit, which was the most significant financial crisis since the Great Depression, which resulted in a decline in personal consumption expenditures
- 2010-2019, personal consumption expenditures grew moderately as the US slowly came out of the crisis
- In Q2 2020, personal consumption expenditures showed a sharp decline due to the COVID-19 pandemic due to a decrease in spending on business directly impacted by social distancing measures.
- The expenditures increased in the next quarter due to government stimulus packages and reopening of businesses. The drop was ultimately short-lived with expenditure levels returning to around 2.5% by the end of 2021.



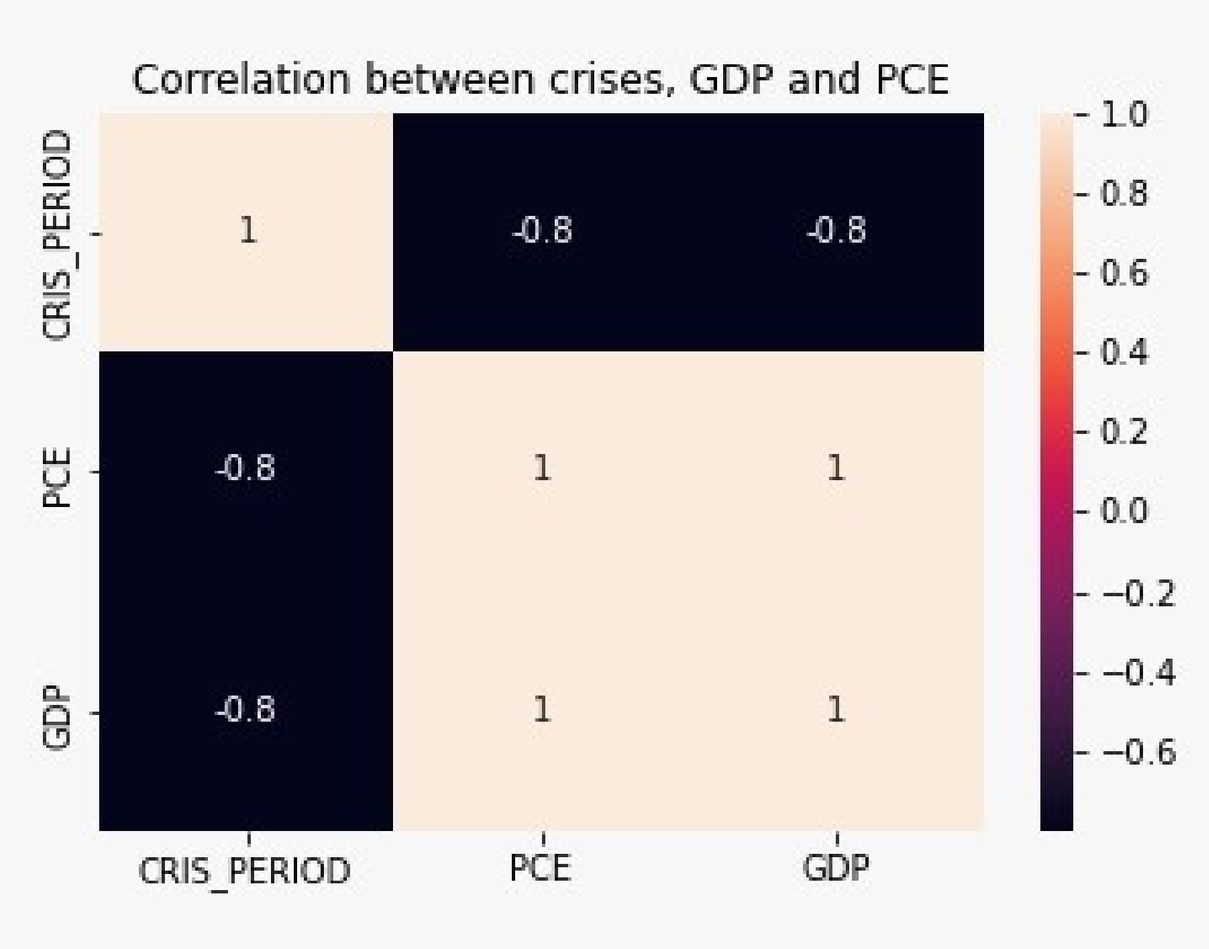


Economic Growth (2002-2023)

💡 Our Inferences from the Graph

- The period from 2002 to 2007 saw a steady growth of the US economy with GDP increasing at an average annual rate of around 2.5%. This growth was primarily driven by the housing market boom, low interest rates, and increased consumer spending.
- in 2008, the US economy was hit by a severe recession, which was triggered by the collapse of the housing market and the mortgage crisis. As a result, the GDP contracted by 2.8% in 2008 and by 2.5% in 2009.
- From 2010 to 2019, the US economy experienced moderate growth, with GDP increasing at an average annual rate of around 2.3%
- The economy contracted sharply in Q2 of 2020, with GDP falling by 8.8%.due to shutdowns of businesses and schools, and other social distancing measures, significantly impacting consumer spending and investment
- By the next quarter, the GDP rebounded by 8.7% due to government dole outs during the pandemic, that increased personal consumption, in turn raising the GDP

Correlation Matrices



GDP AND PCE

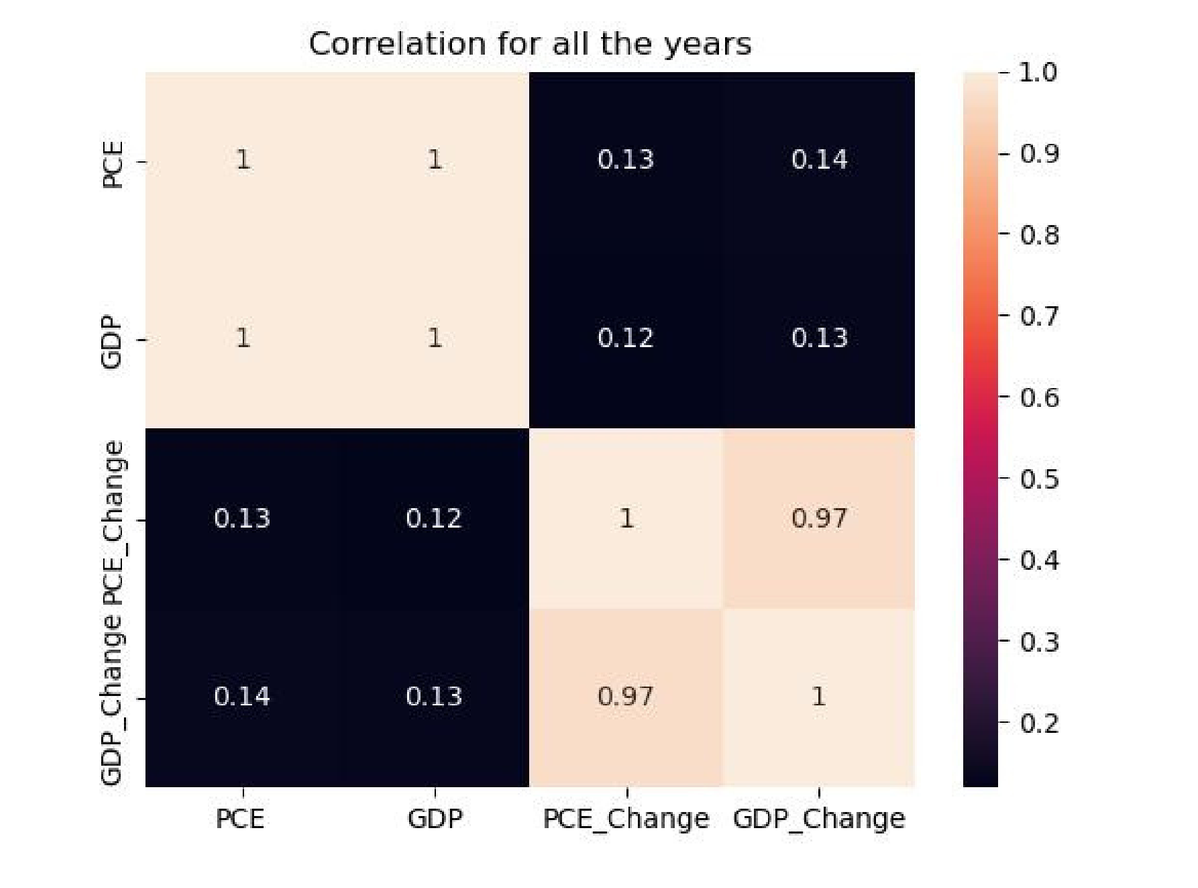
A correlation factor of 1 shows a very strong and positive correlation between real GDP and real PCE indicating that consumer spending is an important driver of economic growth.

Crises and PCE

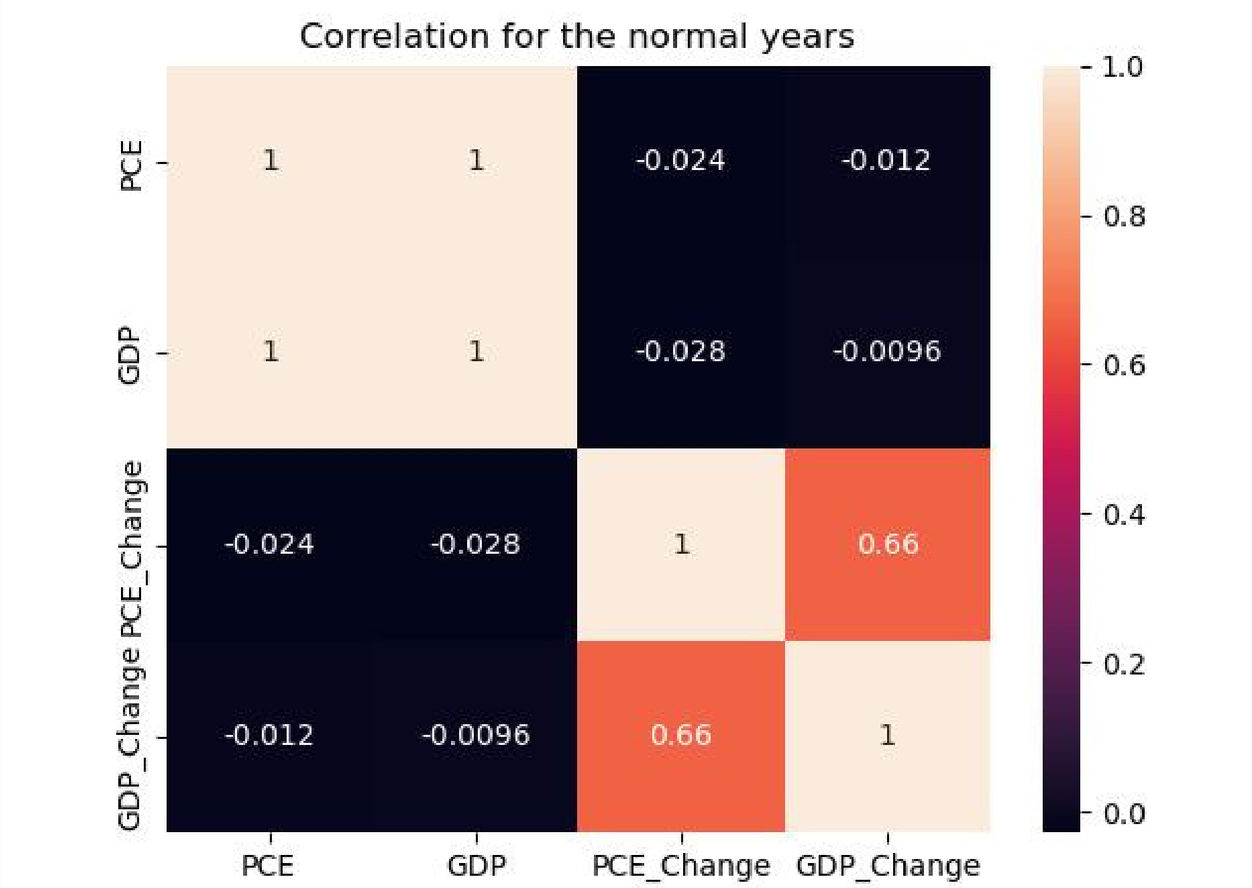
A negative correlation factor of 0.8 between crises and PCE indicates that during the time of crises, there is a decrease in personal consumption which in turn, is followed by a decrease in GDP of the country.

Correlation Matrix for GDP percentage change PCE percentage change

(a) Overall
(from 2002 to 2022)

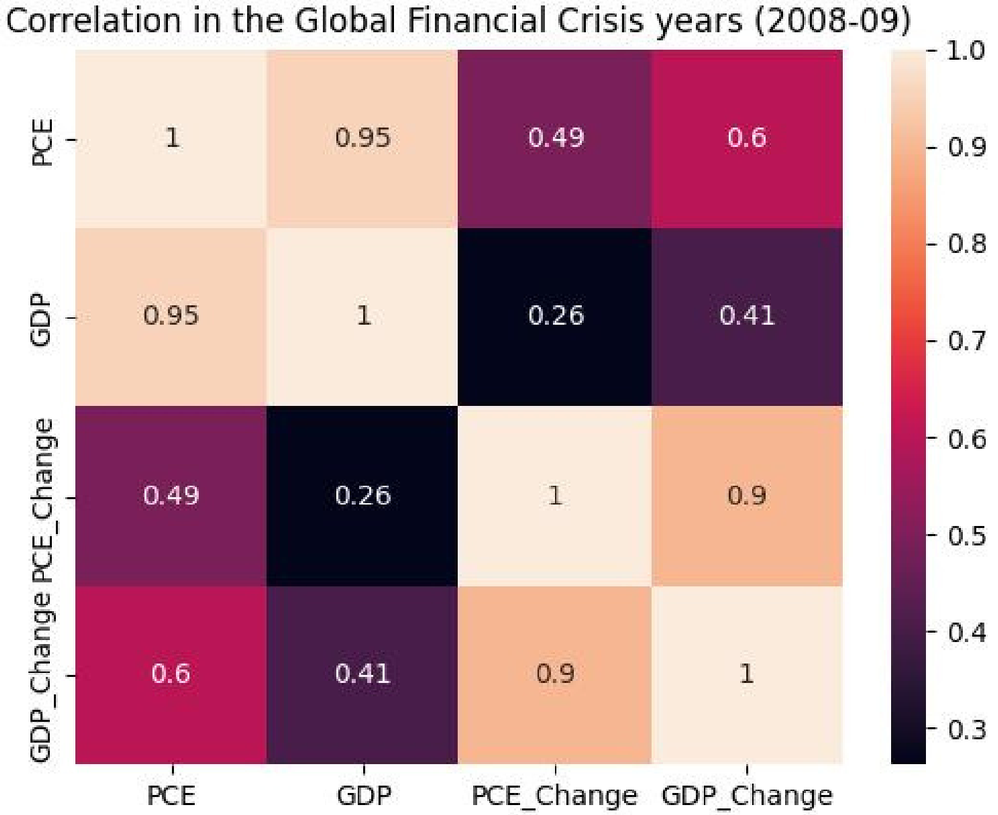


(b) Non-Crises Years
(2002-07, 2010-2019, 2022- 2023)

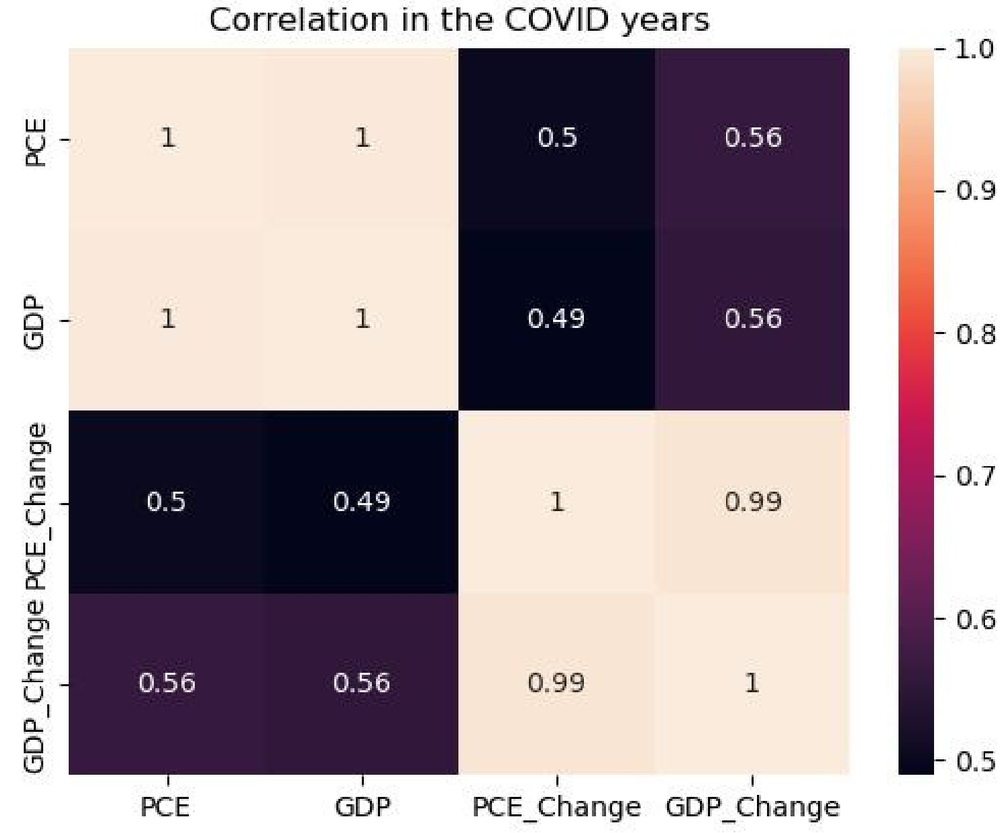


Correlation Matrix for GDP percentage change PCE percentage change

(a) Global Financial Crisis (from 2008-2009)



(b) Covid Pandemic (from 2020-2021)



Augmented Dickey Fuller TEST

The Augmented Dickey-Fuller (ADF) test is commonly used to test for stationarity in time series data.

Stationarity: In time series analysis, a stationary time series is one whose statistical properties, such as mean and variance, remain constant over time.

✓ Paramerters of ADF Test

1. Test Statistic (ADF): This is a negative number that measures how much the series deviates from stationarity. The more negative the test statistic, the stronger the evidence for stationarity.
2. p-value: If the p-value is less than a pre-specified significance level (e.g., 0.05), then we reject the null hypothesis and conclude that the series is stationary.

Our Results from this Test

For All years:
PCE is not stationary
GDP is not stationary
PCE_Change is stationary
GDP_Change is stationary

For COVID years (2020-21)
PCE is not stationary
GDP is not stationary
PCE_Change is stationary
GDP_Change is not stationary

For Global Financial Crisis years (2008-09)
PCE is stationary
GDP is stationary
PCE_Change is not stationary
GDP_Change is not stationary

P-Value

	PCE	GDP	PCE_Change	GDP_Change
Global Financial Crisis (2008-09)	0.998443	0.998765	1.361779e-18	1.125522e-17
Covid (2020-21)	0.000000	0.002236	8.494580e-02	2.089435e-01
Overall	0.653058	0.961525	3.347842e-02	2.911378e-01

Test Statistic

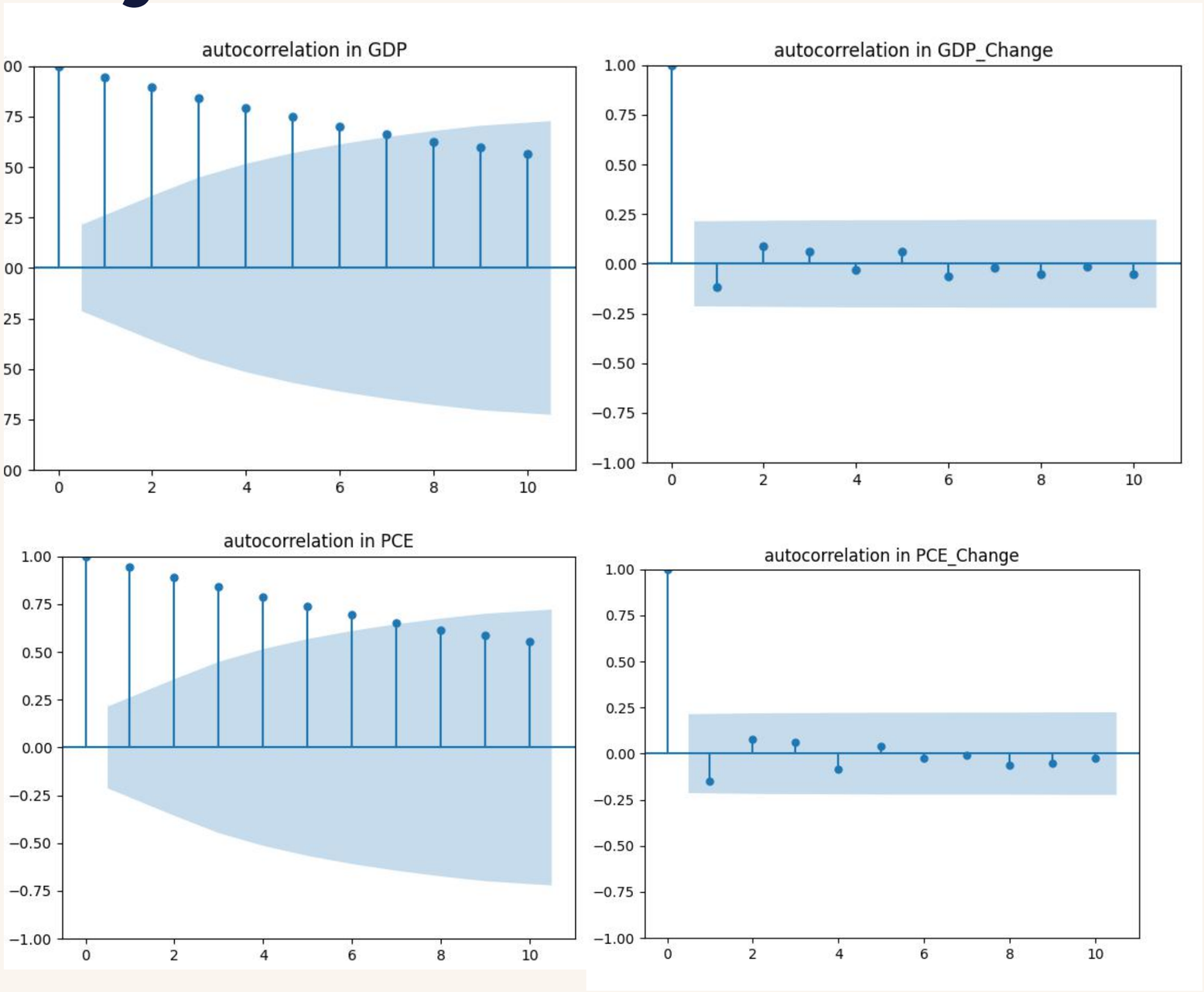
	PCE	GDP	PCE_Change	GDP_Change
Global Financial Crisis (2008-09)	1.849924	2.076544	-10.460663	-10.090497
Covid (2020-21)	-89.229254	-3.873846	-2.640326	-2.192596
Overall	-1.247000	0.037499	-3.015429	-1.989631

Autocorrelation analysis

In the autocorrelation graphs on the right, the correlation coefficients are plotted against lags in the quarterly time series data.

The blue region signifies the confidence interval, while the lines show the correlation coefficient

The correlation coeffcients in the GDP and PCE autocorrelation graph exceed the confidence interval.This shows that there is autocorrelation across 5 recent quarters.



Results after performing Regression Analysis in Python

On Overall Data

$$GDP\_PCH = 0.77 PCE\_PCH - 0.039 CRIS\_PERIOD + 0.266$$

```
reg_model = LinearRegression().fit(X, y)
reg_model.coef_
```

```
array([ 0.77335367, -0.03968569])
```

```
reg_model.intercept_
```

```
0.26633201358973624
```

Results after performing Regression Analysis in Python

On Non-Crises Data

PCE_PCH = 0.63*GDP_PCH + 0.4069*

```
X = non_crises_data[['GDP_PCH']]
y = non_crises_data['PCE_PCH']

reg_model = LinearRegression().fit(X,y)
reg_model.coef_
```

```
array([0.63605114])
```

```
reg_model.intercept_
```

```
0.40696096755737776
```

On COVID Data

PCE_PCH = 1.122*GDP_PCH - 0.06771*

```
X = covid_data[['GDP_PCH']]
y = covid_data['PCE_PCH']

reg_model = LinearRegression().fit(X,y)
reg_model.coef_
```

```
array([1.12203928])
```

```
reg_model.intercept_
```

```
-0.067706239185820 3
```

CONCLUSION

- In our analysis of the relationship between consumer spending and economic growth in the US from 2002 to 2022, it can be concluded that personal consumption expenditures (PCE) have a strong positive correlation with economic growth as measured by GDP growth rate.

- Our analysis highlights the importance of consumer spending in driving economic growth in the US and underscores the contraction of the US economy in the face of external shocks such as the COVID-19 pandemic and Global Financial Crisis.

- The COVID-19 pandemic had a significant impact on the US economy, with a sharp decline in GDP and PCE growth rates in Q2 2020. However, the economy rebounded, with GDP and PCE returning to pre-pandemic levels by Q4 of the year 2021