COVID-19 IMPACT ANALYSIS ON GLOBAL ECONOMY

→ Team – 643 ←

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Technology Track :- **Applied Data Science**

CHAPTER-1

INTRODUCTION

1.1 OVERVIEW

The Covid-19 pandemic has caused unprecedented disruptions to the global economy, with far-reaching consequences for businesses, governments, and societies. Understanding the multifaceted impacts of the pandemic on the global economy is crucial for informed decision-making and policy planning. This study presents an in-depth analysis of the Covid-19 impact on the global economy, focusing on key economic indicators such as GDP, HDI, and Stringency index. We utilize a comprehensive dataset comprising of historical economic data from pre-pandemic to post-pandemic periods, along with relevant socio-economic variables. We employ statistical analysis, econometric models, and data visualization techniques to examine the magnitude, duration, and distribution of the Covid-19 impact across different countries, regions. We also explore the role of various factors, such as government policies, healthcare measures, and global supply chains, in shaping the economic impact of the pandemic. Our analysis provides valuable insights into the dynamic and evolving nature of the Covid-19 impact on the global economy. These findings can inform policymakers, businesses, and stakeholders in developing strategies to mitigate the economic effects of the pandemic, support recovery, and build resilience for the future. This study contributes to the understanding of the unprecedented challenges posed by the pandemic to the global economy and highlights the need for robust policy responses and adaptive strategies in the post-pandemic era.

1.2 PURPOSE

The purpose of a "Covid-19 Impact Analysis on Global Economy" project is to assess and understand the effects of the COVID-19 pandemic on the world economy. The project aims to analyze the various dimensions and sectors of the global economy that have been significantly impacted by the pandemic, including but not limited to:

1. Macroeconomic indicators: The project would evaluate the impact of COVID-19 on key macroeconomic factors such as GDP growth, inflation, employment rates, and fiscal and monetary policies implemented by governments and central banks in response to the crisis.

2. Industry-specific impacts: Different sectors of the economy have been affected to varying degrees. The project would examine the effects on industries such as travel and tourism, hospitality, retail, manufacturing, transportation, and entertainment, among others. It would analyze changes in consumer behaviour, supply chain disruptions, and the financial health of businesses in these sectors.

3. International trade and investment: The pandemic has caused significant disruptions to global trade and investment flows. The project would assess the impact on international trade volumes, supply chains, and foreign direct investment. It would also analyze the measures taken by countries to protect domestic industries and the potential long-term implications for globalization.

4. Government policies and stimulus measures: Governments worldwide have implemented various policies and stimulus measures to mitigate the economic impact of the pandemic. The project would evaluate the effectiveness of these measures, such as fiscal stimulus packages, monetary policy adjustments, and targeted support for affected industries.

5. Socioeconomic implications: The pandemic has had uneven social and economic effects, exacerbating existing inequalities. The project would examine the differential impact on vulnerable populations, income disparities, changes in poverty and unemployment rates, and the effectiveness of social safety nets in mitigating the consequences.

The overall objective of a "Covid-19 Impact Analysis on Global Economy" project is to provide a comprehensive understanding of the pandemic's economic repercussions, inform policymakers, and support businesses and organizations in making informed decisions to navigate the challenging economic landscape. It can also contribute to identifying lessons learned and potential strategies for future pandemics or similar crises.

CHAPTER-2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

The Covid-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has had an unprecedented global impact on various aspects of human life, including the global economy. The pandemic has resulted in widespread illness, loss of life, and significant disruptions to economies around the world. The economic impact of the pandemic has been multifaceted, affecting various sectors, industries, and regions differently, and has led to significant challenges for governments, businesses, and individuals alike.

The motivation for conducting a "Covid-19 Impact Analysis on Global Economy" stems from the need to understand and quantify the economic consequences of the pandemic. It is crucial to assess the scale and magnitude of the economic impact of Covid-19 to inform policy decisions, allocate resources effectively, and plan for recovery and resilience.

2.2 PROPOSED SOLUTION

The proposed method for "Covid-19 Impact Analysis on Global Economy" involves collecting relevant economic and Covid-19 data, preprocessing and cleaning the data, conducting descriptive and statistical analysis to examine the relationship between Covid-19 variables and economic indicators, applying machine learning algorithms for predictive modeling, conducting scenario and sensitivity analyses, and providing policy implications and recommendations based on the findings. The specific techniques and models used will depend on the research objectives and available data.

CHAPTER-3

THEORITICAL ANALYSIS

3.1 IMPLEMENTED METHODS / FUNCTIONS

Regression Analysis: Regression analysis is a statistical method used to analyze the relationship between dependent and independent variables. It can be used to model and predict the impact of various factors, such as Covid-19 cases, vaccination rates, government policies, and other economic indicators on the global economy.

Time Series Analysis: Time series analysis is a method used to analyze and model data that changes over time. It can be used to study and forecast time-varying economic variables, such as GDP, employment, and stock prices, in response to the evolving Covid-19 pandemic.

Data Visualization: Data visualization techniques, such as bar charts, line charts, heatmaps, and geographic maps, can be used to visually represent economic data and provide insights into the impact of Covid-19 on the global economy. Visualization can help identify patterns, trends, and anomalies in the data, and communicate findings effectively.

Data sorting: The code uses pandas library to sort the aggregated data by the "Total Cases" column in descending order, which involves arranging the data based on a specific column's values. Sorting is a common data manipulation technique used in machine learning pipelines to order data in a specific way for analysis or visualization.

3.2 HARDWARE / SOFTWARE DESIGNING

We have used JUPYTER notebook for our project. Jupyter Notebook is an open-source web application that allows users to create and share documents that contain live code, equations, visualizations, and narrative text. It is a popular tool used by data scientists, researchers, and developers to work with and share code in a collaborative and interactive manner.

CHAPTER-4

EXPERIMENTAL INVESTIGATIONS

Experimental investigations on the "Covid-19 Impact Analysis on Global Economy" have been crucial in understanding the far-reaching consequences of the pandemic. Researchers and experts from various fields have conducted studies to examine the economic effects of COVID-19 at both macro and micro levels. These investigations aim to analyze the disruptions caused by the pandemic and explore potential recovery strategies.

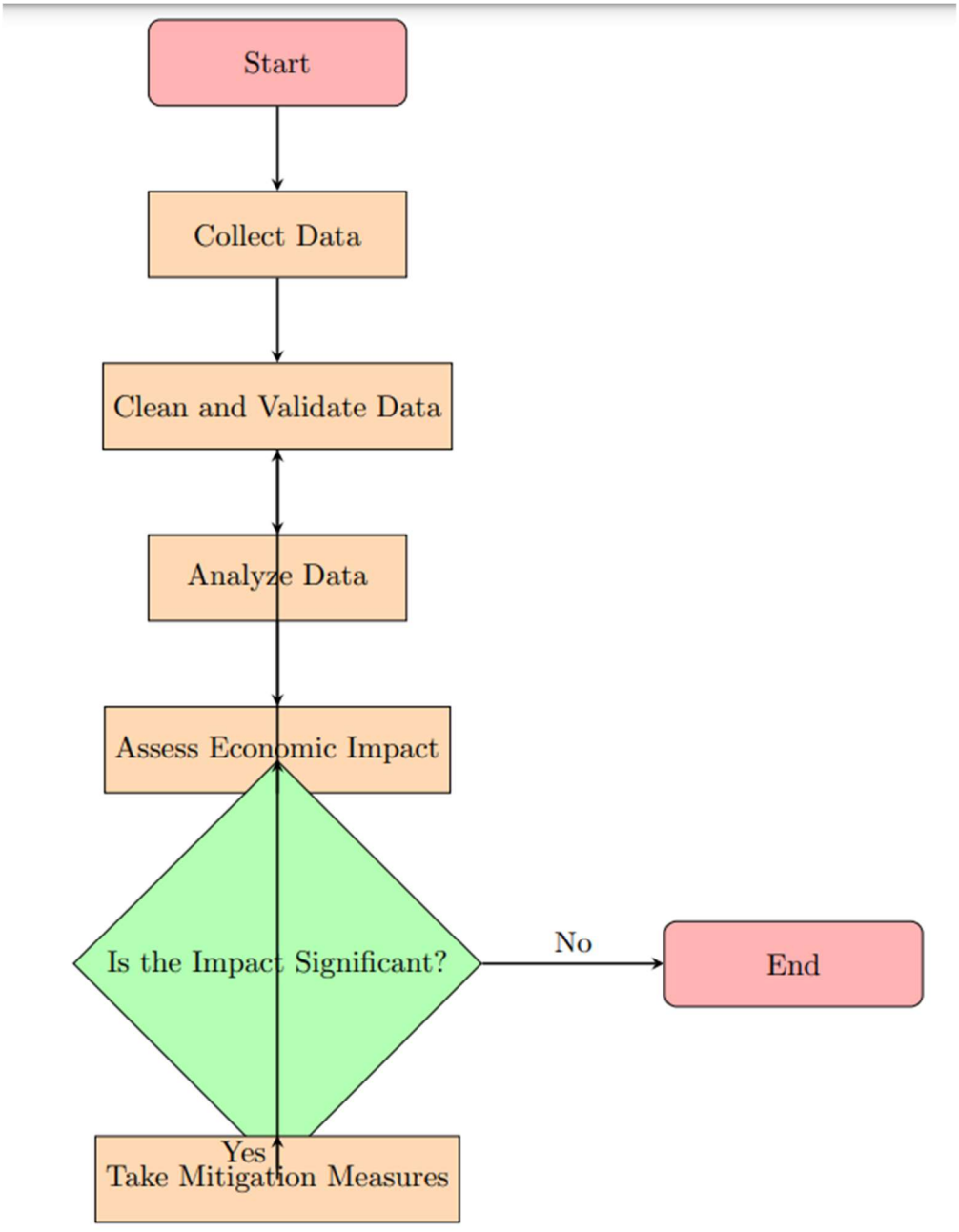
One aspect of experimental investigations has been the analysis of the immediate impact on key economic indicators such as GDP growth, employment rates, and international trade. Researchers have examined how lockdown measures, supply chain disruptions, and reduced consumer spending have led to a sharp decline in economic activity. These studies have provided insights into the magnitude of the economic contraction and its implications for different sectors and regions.

Furthermore, experimental investigations have explored the differential impact on various industries, including travel and tourism, hospitality, retail, and manufacturing. By examining real-world data and conducting simulations, researchers have assessed the severity of the downturn in specific sectors and identified the challenges they face in recovery. These investigations have also shed light on the long-term structural changes that may arise as a result of the pandemic, such as accelerated digital transformation and changes in consumer behaviour.

Moreover, experimental studies have investigated the effectiveness of policy responses implemented by governments and international organizations to mitigate the economic impact of COVID-19. Researchers have analyzed the outcomes of fiscal stimulus packages, monetary policy interventions, and targeted support for businesses and individuals. These investigations have assessed the efficacy of different policy measures and provided recommendations for optimizing future responses to similar crises.

CHAPTER-5

FLOWCHART



CHAPTER-6

RESULTS

```
import pandas as pd
import plotly.express as px
import plotly.graph_objects as go

data = pd.read_csv("/content/transformed_data.csv")
data2 = pd.read_csv("/content/raw_data.csv")
print(data)
```

```
      CODE      COUNTRY        DATE    HDI        TC        TD       STI  \
0      AFG  Afghanistan  2019-12-31  0.498  0.000000  0.000000  0.000000
1      AFG  Afghanistan  2020-01-01  0.498  0.000000  0.000000  0.000000
2      AFG  Afghanistan  2020-01-02  0.498  0.000000  0.000000  0.000000
3      AFG  Afghanistan  2020-01-03  0.498  0.000000  0.000000  0.000000
4      AFG  Afghanistan  2020-01-04  0.498  0.000000  0.000000  0.000000
...    ...          ...         ...    ...       ...       ...       ...
50413  ZWE     Zimbabwe  2020-10-15  0.535  8.994048  5.442418  4.341855
50414  ZWE     Zimbabwe  2020-10-16  0.535  8.996528  5.442418  4.341855
50415  ZWE     Zimbabwe  2020-10-17  0.535  8.999496  5.442418  4.341855
50416  ZWE     Zimbabwe  2020-10-18  0.535  9.000853  5.442418  4.341855
50417  ZWE     Zimbabwe  2020-10-19  0.535  9.005405  5.442418  4.341855

             POP    GDPCAP
0      17.477233  7.497754
1      17.477233  7.497754
2      17.477233  7.497754
3      17.477233  7.497754
4      17.477233  7.497754
...          ...       ...
50413  16.514381  7.549491
50414  16.514381  7.549491
50415  16.514381  7.549491
50416  16.514381  7.549491
50417  16.514381  7.549491

[50418 rows x 9 columns]
```

Figure 1 : Reading the data

→The data we are using contains the data on covid-19 cases and their impact on GDP from December 31, 2019, to October 10, 2020.

```
print(data.head())
```

```
   CODE      COUNTRY        DATE    HDI   TC   TD  STI        POP    GDPCAP
0   AFG  Afghanistan  2019-12-31  0.498  0.0  0.0  0.0  17.477233  7.497754
1   AFG  Afghanistan  2020-01-01  0.498  0.0  0.0  0.0  17.477233  7.497754
2   AFG  Afghanistan  2020-01-02  0.498  0.0  0.0  0.0  17.477233  7.497754
3   AFG  Afghanistan  2020-01-03  0.498  0.0  0.0  0.0  17.477233  7.497754
4   AFG  Afghanistan  2020-01-04  0.498  0.0  0.0  0.0  17.477233  7.497754
```

Figure 2 : Reading the transformed data

→Here we are reading the transformed dataset and displaying the first 5 rows of the dataset using head() function.

```
print(data2.head())
```

```
  iso_code     location        date  total_cases  total_deaths  \
0      AFG  Afghanistan  2019-12-31          0.0           0.0
1      AFG  Afghanistan  2020-01-01          0.0           0.0
2      AFG  Afghanistan  2020-01-02          0.0           0.0
3      AFG  Afghanistan  2020-01-03          0.0           0.0
4      AFG  Afghanistan  2020-01-04          0.0           0.0

   stringency_index  population  gdp_per_capita  human_development_index  \
0               0.0    38928341        1803.987                    0.498
1               0.0    38928341        1803.987                    0.498
2               0.0    38928341        1803.987                    0.498
3               0.0    38928341        1803.987                    0.498
4               0.0    38928341        1803.987                    0.498

  Unnamed: 9 Unnamed: 10 Unnamed: 11  Unnamed: 12  Unnamed: 13
0      #NUM!       #NUM!       #NUM!    17.477233  7.497754494
1      #NUM!       #NUM!       #NUM!    17.477233  7.497754494
2      #NUM!       #NUM!       #NUM!    17.477233  7.497754494
3      #NUM!       #NUM!       #NUM!    17.477233  7.497754494
4      #NUM!       #NUM!       #NUM!    17.477233  7.497754494
```

Figure 3 : Reading the raw data

→The dataset that we are using here contains two data files. One file contains raw data, and the other file contains transformed one. But we have to use both datasets for this task, as both of them contain equally important information in different columns.

```
data["COUNTRY"].value_counts()
```

```
Afghanistan        294
Indonesia          294
Macedonia          294
Luxembourg         294
Lithuania          294
                  ...
Tajikistan         172
Comoros            171
Lesotho            158
Hong Kong           51
Solomon Islands      4
Name: COUNTRY, Length: 210, dtype: int64
```

Figure 4 : No. of samples of each country in dataset

→So, we don't have an equal number of samples of each country in the dataset. Let's have a look at the mode value.

```
data["COUNTRY"].value_counts().mode()

0    294
Name: COUNTRY, dtype: int64
```

Figure 5 : Mode value for samples of each country

→So, the mode value for the samples of each country in the dataset is 294.

```
# Aggregating the data

code = data["CODE"].unique().tolist()
country = data["COUNTRY"].unique().tolist()
hdi = []
tc = []
td = []
sti = []
population = data["POP"].unique().tolist()
gdp = []

for i in country:
    hdi.append((data.loc[data["COUNTRY"] == i, "HDI"]).sum()/294)
    tc.append((data2.loc[data2["location"] == i, "total_cases"]).sum())
    td.append((data2.loc[data2["location"] == i, "total_deaths"]).sum())
    sti.append((data.loc[data["COUNTRY"] == i, "STI"]).sum()/294)
    population.append((data2.loc[data2["location"] == i, "population"]).sum()/294)

aggregated_data = pd.DataFrame(list(zip(code, country, hdi, tc, td, sti, population)),
                               columns = ["Country Code", "Country", "HDI",
                                          "Total Cases", "Total Deaths",
                                          "Stringency Index", "Population"])
print(aggregated_data.head())
```

```
  Country Code      Country       HDI  Total Cases  Total Deaths  \
0          AFG  Afghanistan  0.498000    5126433.0      165875.0
1          ALB      Albania  0.600765    1071951.0       31056.0
2          DZA      Algeria  0.754000    4893999.0      206429.0
3          AND      Andorra  0.659551     223576.0        9850.0
4          AGO       Angola  0.418952     304005.0       11820.0

   Stringency Index  Population
0          3.049673   17.477233
1          3.005624   14.872537
2          3.195168   17.596309
3          2.677654   11.254996
4          2.965560   17.307957
```

Figure 6 : Aggregating the data

→By using the mode value, we created a new dataset by combining the necessary columns from both the datasets. We used the mode value for dividing the sum of all the samples related to the human development index, GDP per capita, and the population.

→Here, We have not included the GDP per capita column yet. We didn't find the correct figures for GDP per capita in the dataset. So it will be better to manually collect the data about the GDP per capita of the countries.

```
# Sorting Data According to Total Cases

data = aggregated_data.sort_values(by=["Total Cases"], ascending=False)
print(data.head())
```

```
    Country Code        Country      HDI  Total Cases  Total Deaths  \
200          USA  United States  0.92400  746014098.0    26477574.0
27           BRA         Brazil  0.75900  425704517.0    14340567.0
90           IND          India  0.64000  407771615.0     7247327.0
157          RUS         Russia  0.81600  132888951.0     2131571.0
150          PER           Peru  0.59949   74882695.0     3020038.0

     Stringency Index  Population
200          3.350949   19.617637
27           3.136028   19.174732
90           3.610552   21.045353
157          3.380088   18.798668
150          3.430126   17.311165
```

Figure 7 : Sorting data according to total cases

→Here, we are sorting the data according to total number of cases for selecting the top 10 countries with highest number of cases.

```
# Top 10 Countries with Highest Covid Cases

data = data.head(10)
print(data)
```

```
    Country Code        Country       HDI  Total Cases  Total Deaths  \
200          USA  United States  0.924000  746014098.0    26477574.0
27           BRA         Brazil  0.759000  425704517.0    14340567.0
90           IND          India  0.640000  407771615.0     7247327.0
157          RUS         Russia  0.816000  132888951.0     2131571.0
150          PER           Peru  0.599490   74882695.0     3020038.0
125          MEX         Mexico  0.774000   74347548.0     7295850.0
178          ESP          Spain  0.887969   73717676.0     5510624.0
175          ZAF   South Africa  0.608653   63027659.0     1357682.0
42           COL       Colombia  0.581847   60543682.0     1936134.0
199          GBR  United Kingdom  0.922000   59475032.0     7249573.0

     Stringency Index  Population
200          3.350949   19.617637
27           3.136028   19.174732
90           3.610552   21.045353
157          3.380088   18.798668
150          3.430126   17.311165
125          3.019289   18.674802
178          3.393922   17.660427
175          3.364333   17.898266
42           3.357923   17.745037
199          3.353883   18.033340
```

Figure 8 : Top 10 countries with highest cases

→As we have so many countries in our dataset, it will be difficult to add GDP for every country manually. So, let's select a subsample from this dataset. To create a subsample from this dataset, We will be selecting the top 10 countries with the highest number of covid-19 cases. It will be a perfect sample to study the economic impacts of covid-19.

```
data["GDP Before Covid"] = [65279.53, 8897.49, 2100.75,
                            11497.65, 7027.61, 9946.03,
                            29564.74, 6001.40, 6424.98, 42354.41]
data["GDP During Covid"] = [63543.58, 6796.84, 1900.71,
                            10126.72, 6126.87, 8346.70,
                            27057.16, 5090.72, 5332.77, 40284.64]
print(data)
```

```
    Country Code         Country       HDI  Total Cases  Total Deaths  \
200          USA   United States  0.924000  746014098.0    26477574.0
27           BRA          Brazil  0.759000  425704517.0    14340567.0
90           IND           India  0.640000  407771615.0     7247327.0
157          RUS          Russia  0.816000  132888951.0     2131571.0
150          PER            Peru  0.599490   74882695.0     3020038.0
125          MEX          Mexico  0.774000   74347548.0     7295850.0
178          ESP           Spain  0.887969   73717676.0     5510624.0
175          ZAF    South Africa  0.608653   63027659.0     1357682.0
42           COL        Colombia  0.581847   60543682.0     1936134.0
199          GBR  United Kingdom  0.922000   59475032.0     7249573.0

     Stringency Index  Population  GDP Before Covid  GDP During Covid
200          3.350949   19.617637          65279.53          63543.58
27           3.136028   19.174732           8897.49           6796.84
90           3.610552   21.045353           2100.75           1900.71
157          3.380088   18.798668          11497.65          10126.72
150          3.430126   17.311165           7027.61           6126.87
125          3.019289   18.674802           9946.03           8346.70
178          3.393922   17.660427          29564.74          27057.16
175          3.364333   17.898266           6001.40           5090.72
42           3.357923   17.745037           6424.98           5332.77
199          3.353883   18.033340          42354.41          40284.64
```

Figure 9 : Inserting GDP columns

→Now we are adding two more columns (GDP per capita before Covid-19, GDP per capita during Covid-19) to this dataset.

```
[ ]  figure = px.bar(data, y='Total Cases', x='Country',
                     title="Countries with Highest Covid Cases")
     figure.show()
```

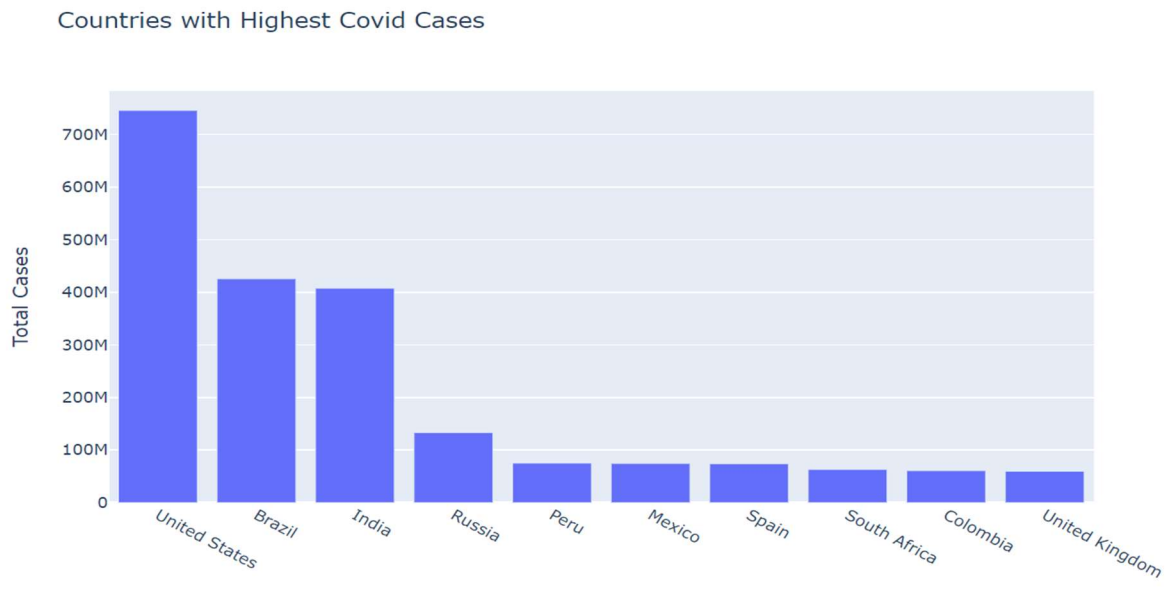


Figure 10 : Countries with highest covid cases

→We can see that the USA is comparatively having a very high number of covid-19 cases as compared to Brazil and India in the second and third positions.

```
figure = px.bar(data, y='Total Deaths', x='Country',
                title="Countries with Highest Deaths")
figure.show()
```

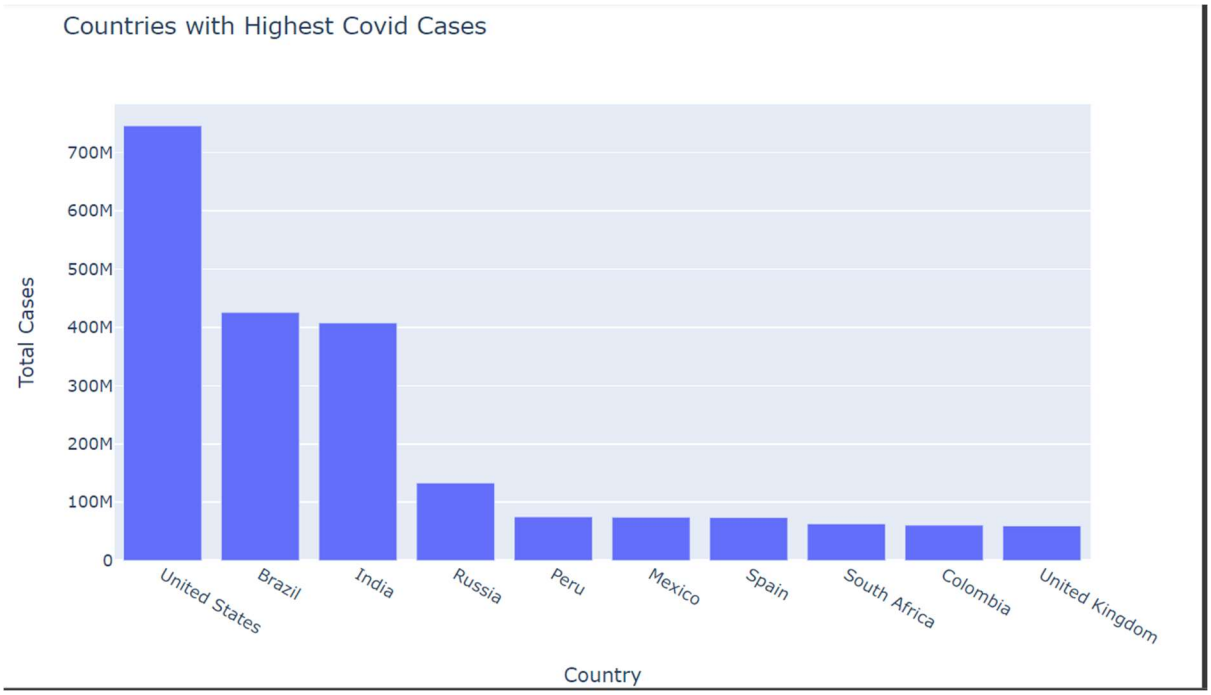


Figure 11 : Countries with highest deaths

→Just like the total number of covid-19 cases, the USA is leading in the deaths, with Brazil and India in the second and third positions. One thing to notice here is that the death rate in India, Russia, and South Africa is comparatively low according to the total number of cases.

```
[ ]  fig = go.Figure()
     fig.add_trace(go.Bar(
         x=data["Country"],
         y=data["Total Cases"],
         name='Total Cases',
         marker_color='indianred'
     ))
     fig.add_trace(go.Bar(
         x=data["Country"],
         y=data["Total Deaths"],
         name='Total Deaths',
         marker_color='lightsalmon'
     ))
     fig.update_layout(barmode='group', xaxis_tickangle=-45)
     fig.show()
```

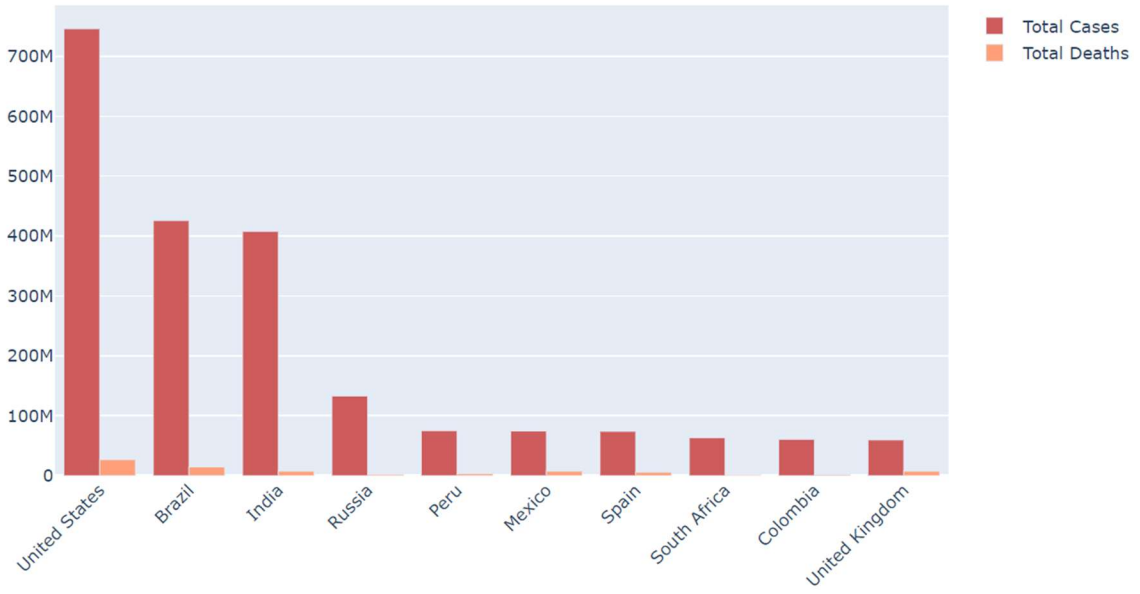


Figure 12 : Comparing cases and deaths

→Comparing the total number of cases and total deaths in all these countries.

```
# Percentage of Total Cases and Deaths
cases = data["Total Cases"].sum()
deceased = data["Total Deaths"].sum()

labels = ["Total Cases", "Total Deaths"]
values = [cases, deceased]

fig = px.pie(data, values=values, names=labels,
             title='Percentage of Total Cases and Deaths', hole=0.5)
fig.show()
```

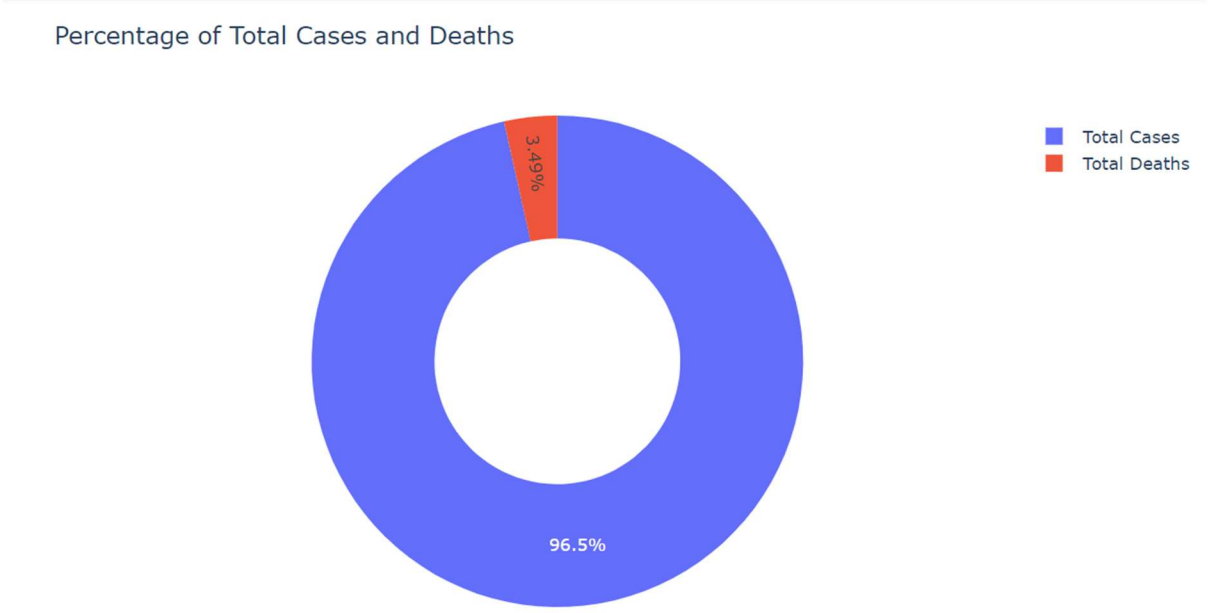


Figure 13 : Percentage of total cases & deaths

→Now let's have a look at the percentage of total deaths and total cases among all the countries with the highest number of covid-19 cases. Here we got 96.5% covid cases and 3.49% deaths.

```
[ ]  death_rate = (data["Total Deaths"].sum() / data["Total Cases"].sum()) * 100
     print("Death Rate = ", death_rate)

     Death Rate =  3.6144212045653767
```

Figure 14 : Death rate

→Here is how we have calculated the death rate of Covid-19 cases. And we got death rate as 3.614421

```
fig = px.bar(data, x='Country', y='Total Cases',
             hover_data=['Population', 'Total Deaths'],
             color='Stringency Index', height=400,
             title= "Stringency Index during Covid-19")
fig.show()
```

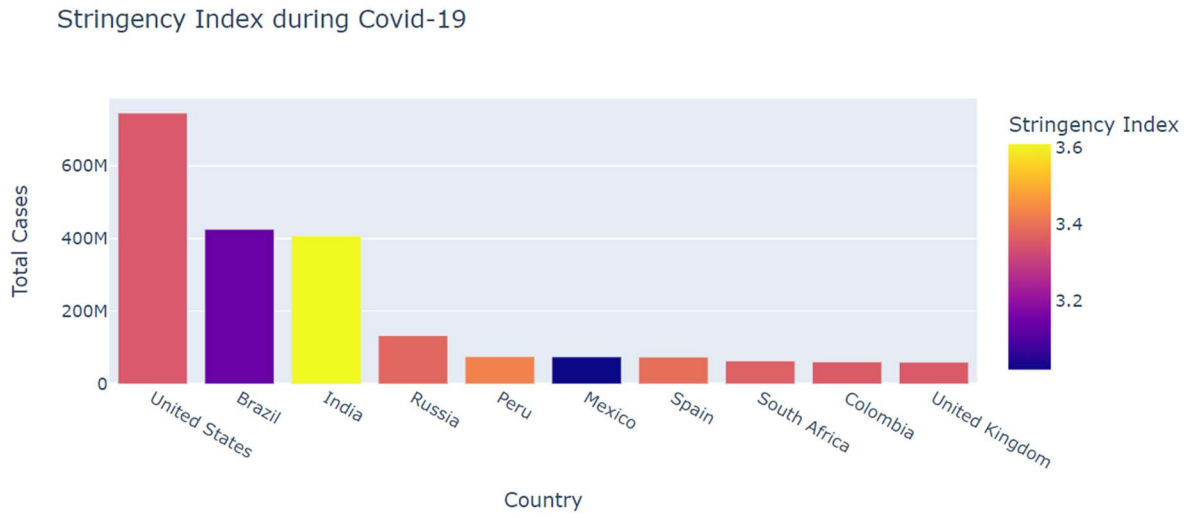


Figure 15 : Stringency Index during Covid-19

→Stringency Index is a composite measure of response indicators, including school closures, workplace closures, and travel bans. It shows how strictly countries are following these measures to control the spread of covid-19.

→Here we can see that India is performing well in the stringency index during the outbreak of covid-19.

→The GDP per capita is the primary factor for analyzing the economic slowdowns caused due to the outbreak of covid-19.

```
fig = px.bar(data, x='Country', y='Total Cases',
             hover_data=['Population', 'Total Deaths'],
             color='GDP Before Covid', height=400,
             title="GDP Per Capita Before Covid-19")
fig.show()
```

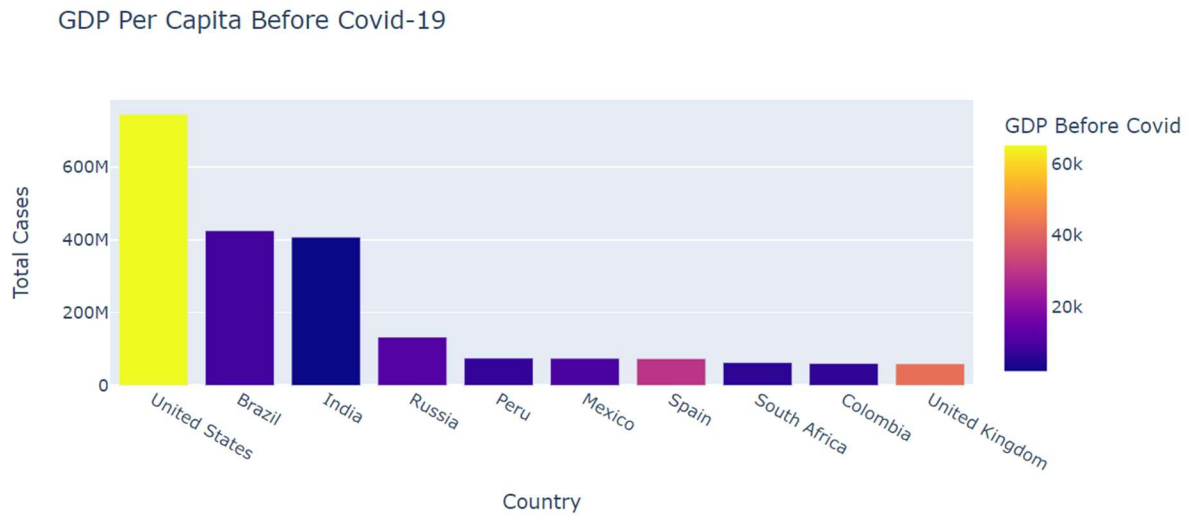


Figure 16 : GDP before covid

→Here, you can see that United States is having more GDP per capita.

```
[ ]  fig = px.bar(data, x='Country', y='Total Cases',
                  hover_data=['Population', 'Total Deaths'],
                  color='GDP During Covid', height=400,
                  title="GDP Per Capita During Covid-19")
     fig.show()
```

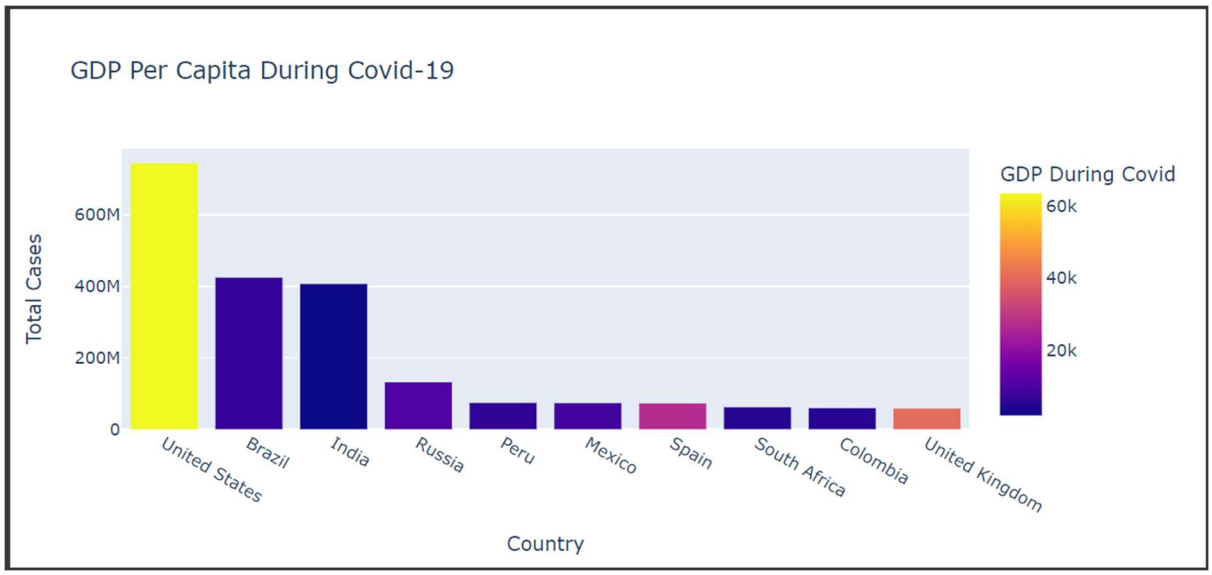


Figure 17 : GDP during covid

→Here, you can still see that United States is having highest GDP but there is a drop in GDP in every country.

```
fig = go.Figure()
fig.add_trace(go.Bar(
    x=data["Country"],
    y=data["GDP Before Covid"],
    name='GDP Per Capita Before Covid-19',
    marker_color='indianred'
))
fig.add_trace(go.Bar(
    x=data["Country"],
    y=data["GDP During Covid"],
    name='GDP Per Capita During Covid-19',
    marker_color='lightsalmon'
))
fig.update_layout(barmode='group', xaxis_tickangle=-45)
fig.show()
```

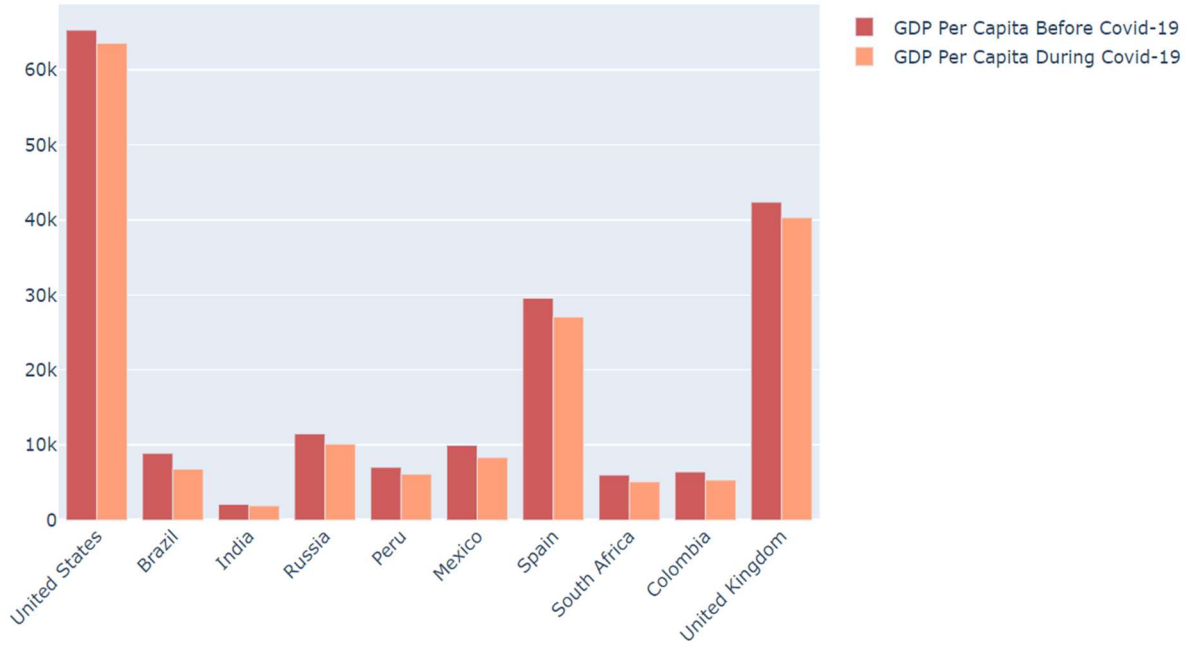


Figure 18 : Comparing GDP

→Now we are comparing the GDP per capita before covid-19 and during covid-19 to have a look at the impact of covid-19 on the GDP per capita. Here you can see a drop in GDP per capita in all the countries with the highest number of covid-19 cases.

```
fig = px.bar(data, x='Country', y='Total Cases',
             hover_data=['Population', 'Total Deaths'],
             color='HDI', height=400,
             title="Human Development Index during Covid-19")
fig.show()
```

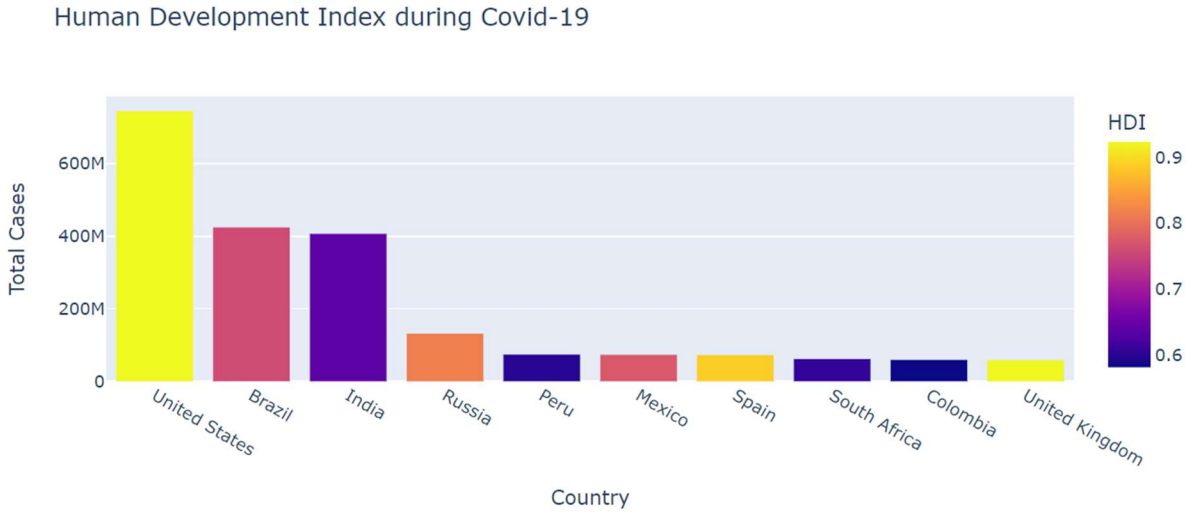


Figure 19 : HDI during covid

→One other important economic factor is Human Development Index. It is a statistic composite index of life expectancy, education, and per capita indicators. Let's have a look at how many countries were spending their budget on the human development.

CHAPTER-7

ADVANTAGES & DISADVANTAGES

The analysis of the impact of Covid-19 on the global economy provides valuable insights for policymakers and businesses, aiding in evidence-based decision making, policy formulation, risk assessment, and comparative analysis. However, limitations such as data constraints, complex causality, uncertainties, contextual factors, and time constraints should be considered. These limitations may affect the accuracy, generalizability, and timeliness of the analysis. It is crucial to address these challenges to ensure the validity and reliability of findings and to provide a comprehensive understanding of the complex relationship between the pandemic and the global economy.

CHAPTER-8

APPLICATIONS

The "Covid-19 Impact Analysis on Global Economy" has diverse applications across multiple domains. It informs policy making by providing insights for designing effective interventions and supporting economic recovery. Businesses can adapt their strategies based on the analysis, while risk assessment and planning benefit from identifying vulnerabilities and enhancing resilience. Investment decisions can be informed by assessing risks and opportunities arising from the pandemic. The analysis also aids in international cooperation and aid distribution, supports academic research, and contributes to understanding the economic consequences of the crisis. These applications demonstrate the practical utility of conducting "Covid-19 Impact Analysis on Global Economy" in guiding decision-making, mitigating risks, and advancing knowledge in response to the pandemic.

CHAPTER-9

CONCLUSION

In conclusion, the Covid-19 pandemic has had a profound impact on the global economy, with far-reaching consequences across various sectors, industries, and regions. The economic impacts of the pandemic have been multifaceted, resulting in widespread job losses, business closures, disruptions in supply chains, decreased consumer spending, financial market volatility, and uneven distribution of impacts among vulnerable populations, small and medium-sized enterprises (SMEs), and developing economies. A comprehensive "Covid-19 Impact Analysis on Global Economy" can provide valuable insights into the magnitude, drivers, and consequences of the economic impacts of the pandemic. Through the use of machine learning methods, such as regression analysis, time series analysis, machine learning algorithms, natural language processing (NLP), and data visualization techniques, researchers and analysts can gain deeper understanding of the complex interactions and dynamics involved in the economic effects of the pandemic.

We also studied the spread of covid-19 among the countries and its impact on the global economy. We saw that the outbreak of covid-19 resulted in the highest number of covid-19 cases and deaths in the United States. One major reason behind this is the stringency index of the United States. It is comparatively low according to the population. We also analyzed how the GDP per capita of every country was affected during the outbreak of covid-19. As the world continues to navigate the ongoing effects of the pandemic and plan for recovery, conducting rigorous and data-driven "Covid-19 Impact Analysis on Global Economy" can provide valuable insights to support evidence-based decision-making and help mitigate the economic impacts of this unprecedented global crisis.

CHAPTER-10

FUTURE SCOPE

Certainly! Future work on "Covid-19 Impact Analysis on Global Economy" can focus on several areas. First, conducting long-term analysis to assess the sustained effects of the pandemic on the global economy, including recovery trajectory and potential long-term consequences. Second, further analyzing the differential impacts on different sectors, regions, and population groups to better understand challenges and effectiveness of policy interventions. Third, investigating social and distributional impacts on vulnerable populations, low-income communities, minority groups, and women to inform equitable policy responses. Fourth, evaluating the effectiveness of policy measures implemented in response to the pandemic to identify best practices and lessons learned. Fifth, conducting scenario analysis to explore potential future developments and their impacts on the global economy to inform decision-making under uncertainty. Sixth, examining the global economic implications of Covid-19 from an international perspective to understand broader implications for global economic relations. Seventh, investigating strategies for sustainable and resilient recovery from the pandemic to ensure a more sustainable, inclusive, and resilient global economy in the post-pandemic era. By addressing these areas in future work, we can deepen our understanding of the economic impacts of Covid-19 and inform evidence-based policy responses and recovery strategies.

CHAPTER-11

BIBILOGRAPHY

[1] Vitenu-Sackey, Prince Asare (2020), "The Impact of Covid-19 Pandemic on the Global Economy: Emphasis on Poverty Alleviation and Economic Growth", Mendeley Data, V1, doi: 10.17632/b2wvnbnpj9.1

[2] "Using generalized logistics regression to forecast population infected by COVID-19", Villalobos Arias, Mario Alberto .

[3] Madurai Elavarasan R, Shafiullah GM, Raju K, Mudgal V, Arif MT, Jamal T, Subramanian S, Sriraja Balaguru VS, Reddy KS, Subramaniam U. COVID-19: Impact analysis and recommendations for power sector operation. Appl Energy. 2020 Dec 1;279:115739. doi: 10.1016/j.apenergy.2020.115739. Epub 2020 Aug 31. PMID: 32904736; PMCID: PMC7458120.

[4] Bell, J.; Chan, H.; Chan, M.; Moon, S. COVID-19 and Construction: Impact Analysis on Construction Performance during Two Infection Waves in Victoria, Australia. Sustainability 2022, 14, 2580. https://doi.org/10.3390/su14052580

[5] R. Wang, G. Hu, C. Jiang, H. Lu and Y. Zhang, "Data Analytics for the COVID-19 Epidemic," 2020 IEEE 44th Annual Computers, Software, and Applications Conference (COMPSAC), Madrid, Spain, 2020,pp.1261-1266,doi:10.1109/COMPSA C48688.2020.00-83.

[6] Zoabi, Y., Deri-Rozov, S. & Shomron, N. Machine learning-based prediction of COVID-19 diagnosis based on symptoms. npj Digit. Med. 4, 3 (2021). https://doi.org/10.1038/s41746-020-00372 -6

[7] Tuli, S., Tuli, S., Tuli, R., & Gill, S. S. (2020). Predicting the growth and trend of COVID-19 pandemic using machine learning and cloud computing. Internet of Things,11,100222.https://doi.org/10.1016/j .iot.2020.100222

APPENDIX

→Source Code :-

```
import pandas as pd

import plotly.express as px

import plotly.graph_objects as go


data = pd.read_csv("/content/transformed_data.csv")

data2 = pd.read_csv("/content/raw_data.csv")

print(data)

print(data.head())

print(data2.head())

data["COUNTRY"].value_counts()

data["COUNTRY"].value_counts().mode()

# Aggregating the data


code = data["CODE"].unique().tolist()

country = data["COUNTRY"].unique().tolist()

hdi = []

tc = []
```

```
td = []
sti = []
population = data["POP"].unique().tolist()
gdp = []

for i in country:
    hdi.append((data.loc[data["COUNTRY"] == i, "HDI"]).sum()/294)
    tc.append((data2.loc[data2["location"] == i, "total_cases"]).sum())
    td.append((data2.loc[data2["location"] == i, "total_deaths"]).sum())
    sti.append((data.loc[data["COUNTRY"] == i, "STI"]).sum()/294)
    population.append((data2.loc[data2["location"] == i, "population"]).sum()/294)

aggregated_data = pd.DataFrame(list(zip(code, country, hdi, tc, td, sti, population))
,
                               columns = ["Country Code", "Country", "HDI",
                                          "Total Cases", "Total Deaths",
                                          "Stringency Index", "Population"])
print(aggregated_data.head())
# Sorting Data According to Total Cases
```

```
data = aggregated_data.sort_values(by=["Total Cases"], ascending=False)
print(data.head())
# Top 10 Countries with Highest Covid Cases


data = data.head(10)
print(data)
data["GDP Before Covid"] = [65279.53, 8897.49, 2100.75,
                            11497.65, 7027.61, 9946.03,
                            29564.74, 6001.40, 6424.98, 42354.41]
data["GDP During Covid"] = [63543.58, 6796.84, 1900.71,
                            10126.72, 6126.87, 8346.70,
                            27057.16, 5090.72, 5332.77, 40284.64]
print(data)
figure = px.bar(data, y='Total Cases', x='Country',
                title="Countries with Highest Covid Cases")
figure.show()
figure = px.bar(data, y='Total Deaths', x='Country',
                title="Countries with Highest Deaths")
figure.show()
```

```
fig = go.Figure()
fig.add_trace(go.Bar(
    x=data["Country"],
    y=data["Total Cases"],
    name='Total Cases',
    marker_color='indianred'
))
fig.add_trace(go.Bar(
    x=data["Country"],
    y=data["Total Deaths"],
    name='Total Deaths',
    marker_color='lightsalmon'
))
fig.update_layout(barmode='group', xaxis_tickangle=-45)
fig.show()
# Percentage of Total Cases and Deaths
cases = data["Total Cases"].sum()
deceased = data["Total Deaths"].sum()
labels = ["Total Cases", "Total Deaths"]
```

```
values = [cases, deceased]


fig = px.pie(data, values=values, names=labels,
        title='Percentage of Total Cases and Deaths', hole=0.5)
fig.show()
death_rate = (data["Total Deaths"].sum() / data["Total Cases"].sum()) * 100
print("Death Rate = ", death_rate)
fig = px.bar(data, x='Country', y='Total Cases',
        hover_data=['Population', 'Total Deaths'],
        color='Stringency Index', height=400,
        title= "Stringency Index during Covid-19")
fig.show()
fig = px.bar(data, x='Country', y='Total Cases',
        hover_data=['Population', 'Total Deaths'],
        color='GDP Before Covid', height=400,
        title="GDP Per Capita Before Covid-19")
fig.show()
fig = px.bar(data, x='Country', y='Total Cases',
        hover_data=['Population', 'Total Deaths'],
```

```
            color='GDP During Covid', height=400,
            title="GDP Per Capita During Covid-19")
fig.show()
fig = go.Figure()
fig.add_trace(go.Bar(
    x=data["Country"],
    y=data["GDP Before Covid"],
    name='GDP Per Capita Before Covid-19',
    marker_color='indianred'
))
fig.add_trace(go.Bar(
    x=data["Country"],
    y=data["GDP During Covid"],
    name='GDP Per Capita During Covid-19',
    marker_color='lightsalmon'
))
fig.update_layout(barmode='group', xaxis_tickangle=-45)
fig.show()
fig = px.bar(data, x='Country', y='Total Cases',
```

```
        hover_data=['Population', 'Total Deaths'],
        color='HDI', height=400,
        title="Human Development Index during Covid-19")
fig.show()
```

→Dataset Description :-

The data we are using contains the data on covid-19 cases and their impact on GDP from December 31, 2019, to October 10, 2020. The dataset we are using to analyze the impacts of covid-19 is downloaded from Kaggle. It contains data about:

1. Name of all the countries
2. Date of the record
3. Human development index of all the countries
4. Daily covid-19 cases
5. Daily deaths due to covid-19
6. Stringency index of the countries
7. The population of the countries
8. GDP per capita of the countries

https://www.kaggle.com/datasets/shashwatwork/impact-of-covid19-pandemic-on-the-global-economy