Unmasking the Economic Disruption: "COVID-19's Profound Impact on Global Economies"

Introduction

Early in 2020, a little enemy materialized, cloaked in mystery, and quickly surrounded the entire planet, sparing no country from its reach. The new coronavirus known as COVID-19 not only caused an unparalleled public health emergency, but it also caused a financial disruption that reverberated across the world's financial system. This template estimates the overall impact for the developing Asian economies of Bangladesh, Brunei Darussalam, Bhutan, Fiji, Hong Kong, China, Indonesia, India, Kazakhstan, Kyrgyz Republic, Cambodia, Republic of Korea, Sri Lanka, Maldives, Mongolia, Malaysia, Nepal, Pakistan, Philippines, Singapore, Thailand, Taipei, China, and Viet Nam. It is an update to a version published on March 6, 2020. What at first seemed to be a brief disturbance quickly proved to be a revolutionary force, changing sectors and economies.

The complex relationship between economic well-being and public health was highlighted by this phenomena. Businesses faced an existential threat and economic activity ceased as nations rushed to impose lockdowns, travel restrictions, and safety precautions to stop the virus's spread. Employees became accustomed to working remotely, and demand and supply drastically changed for entire industries. To lessen the harm, governments all over the world announced previously unheard-of fiscal stimulus plans and financial interventions, which sparked discussions over the effectiveness of these policies and their long-term effects.

Our investigation on the tremendous effects of COVID-19 on world economies seeks to reveal the complexities and repercussions of this complex disruption. We will peel back the many layers of this economic narrative, from the closing of small enterprises to the tenacity of the internet giants, from the predicaments of vital employees to the advancements in healthcare. We shall go from the pandemic's initial shocks to the ongoing efforts to rebuild and adapt during this tour.

Understanding the Impact

Global Economic Interconnectedness :

The information highlights the differences in the economies of different nations. The COVID-19 epidemic illustrated the interdependence of the world's economies. One region of the world can be affected by disruptions in another. It might be important for economies with larger GDPs to take into account the possible global fallout from their economic difficulties.

Data Collection : -

- Data set contains 207 rows and 24 columns.
- Our dataset for the project has been collected from this source :
- https://data.adb.org/dataset/covid-19-economic-impact-assessment-template

Cleaning & Preprocessing :-

We have applied different models and imputers like KNN imputer

KNN imputation can be a useful technique for handling missing data in the context of our project, which examines how COVID-19 has affected the economies of various nations. This proves how efficiently it works situations where we might have insufficient employment or economic data for particular nations.

	Economy	ADB Country Code	Sector	Country 2018 GDP	Scenario	as % of total GDP	in Mn dollars	Employment (in 000)	as % of sector GDP	as % of sector employment
0	Australia	AUS	Agriculture, Mining and Quarrying	1433904.349	Shorter containment, smaller demand shock	-0.33	4,671.20	18	-2.7	-2.65
1	Australia	AUS	Business, Trade, Personal, and Public Services	1433904.349	Shorter containment, smaller demand shock	-1.41	20,147.01	991	-2.31	-2.29
2	Australia	AUS	Hotel and restaurants and Other Personal Services	1433904.349	Shorter containment, smaller demand shock	-0.35	5,023.10	112	-6.7	-7.24
3	Australia	AUS	Light/Heavy Manufacturing, Utilities, and Cons...	1433904.349	Shorter containment, smaller demand shock	-0.39	5,660.89	54	-2.31	-2.29
4	Australia	AUS	Transport services	1433904.349	Shorter containment, smaller demand shock	-0.3	4,307.48	47	-6.47	-7.22

Understanding The Data

```
# Convert the columns to float data type
df['as % of total GDP'] = df['as % of total GDP'].astype(float)
df[' in Mn dollars '] = df[' in Mn dollars '].astype(float)
df['Employment (in 000)'] = df['Employment (in 000)'].astype(float)
df['as % of sector GDP'] = df['as % of sector GDP'].astype(float)
df['as % of sector employment'] = df['as % of sector employment'].astype(float)
```

Converting into float data type

```
imputer = KNNImputer(n_neighbors=10)

columns_to_impute = ["Country 2018 GDP", "as % of total GDP", " in Mn dollars ", "Employment (in 000)", "as % of sector GDP", "as % of sector employment"]

for column in columns_to_impute:
    data = df[[column]]

    imputed_data = imputer.fit_transform(data)

    df[column] = imputed_data
```

Applying KNN Imputer

```
df.isna().sum()
✓ 0.0s

Economy                    108
ADB Country Code             0
Sector                     496
Country 2018 GDP             0
Scenario                   832
as % of total GDP          524
 in Mn dollars             524
Employment (in 000)        568
as % of sector GDP         524
as % of sector employment  568
dtype: int64
```

Checking Null Values

Sectoral Insights

Vulnerability to Economic Shocks :

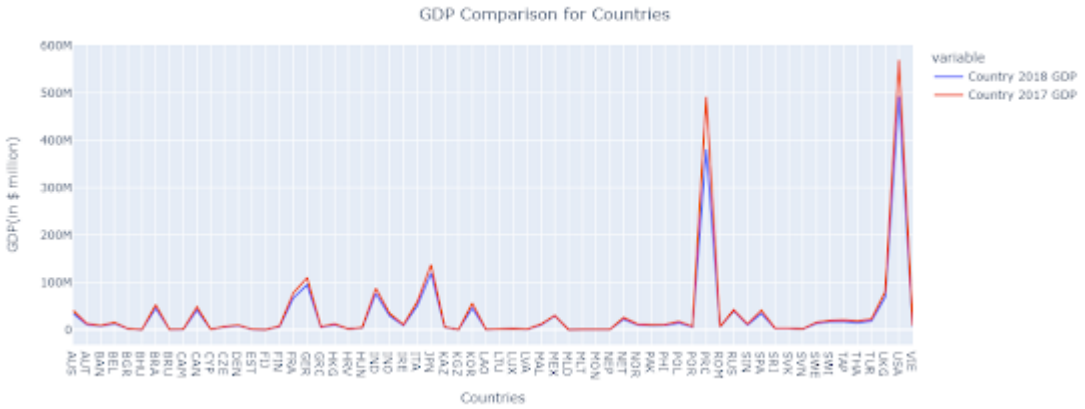
Countries with smaller GDPs, represented by the negative "as % of total GDP" values, may be more vulnerable to economic shocks. When a crisis like the COVID-19 pandemic hits, these countries might face greater challenges in maintaining economic stability, supporting their populations, and investing in healthcare infrastructure.

Sectoral Employment Disparities :

The negative percentages in the "as % of sector employment" column highlight that most countries in the dataset have lower employment in their sectors compared to the average. During the pandemic, certain sectors were severely impacted (e.g., tourism, hospitality), leading to job losses. Countries with a higher proportion of their workforce in these affected sectors may have experienced more significant unemployment challenges.

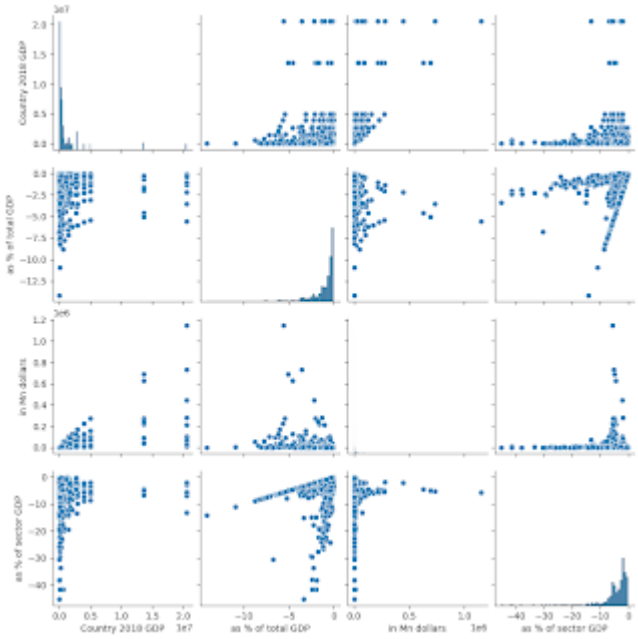
Exploration & Data Visualization : -

We have plotted different graphs such as scatter plot , pair plot for further visual understanding of the situation and to proceed further accurately.

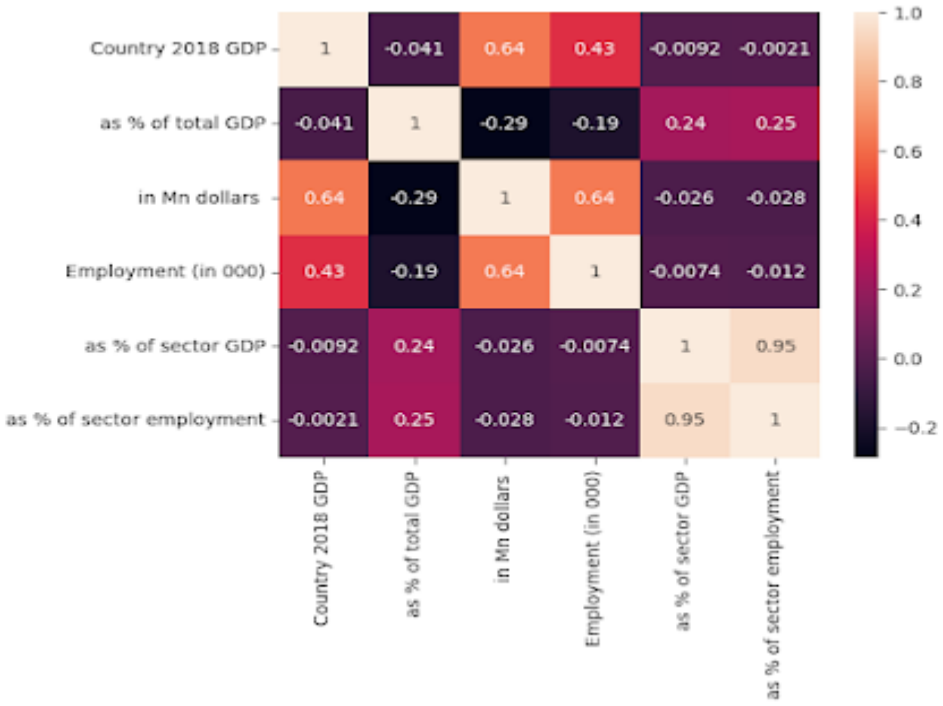


GDP Comparison For Countries

Scatter plot for Economy in Million dollars vs Employment



Pair Plot for different column factors



Heat Map

Resilience and Adaptation

Resilience and Economic Diversification :

According to the data, some nations appear to have diverse economies with employment in certain sectors that is relatively average. Due to their wider economic bases, these economies might have been more resistant to the pandemic's shocks. Diversification can lessen the impact when specific industries suffer setbacks.

Training & Validation Of Model :-

One machine learning algorithm that is used for both regression and classification tasks is the Random Forest Regressor. In the context of our research, which examines how COVID-19 has affected the economies of several nations, a Random Forest Regressor has proved be a helpful tool for developing models that forecast and comprehend economic outcomes.

```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, random_state=42)
✓ 0.0s
```

Training The Model

Random Forest Regressor

```
rf_reg = RandomForestRegressor(n_estimators = 80,max_depth=50,n_jobs=30)
rf_reg.fit(X_train, Y_train)
Y_pred_rf = rf_reg.predict(X_test)
rmse_rf = np.sqrt(mean_squared_error(Y_test, Y_pred_rf))
r2_score_rf = rf_reg.score(X_test, Y_test)

print("Random Forest Regression RMSE:", rmse_rf)
```

✓ 0.3s

```
Random Forest Regression RMSE: 2967398.561268504
```

Applying Random Forest Regressor

Model Deployment : -

- We have deployed our model using Streamlit
- It takes two input values namely overall economic activity from each sector and employment.
- Using the above two user input values it predicts the GDP of the country.

Final Model Deployment

Below given is the URL for our deployed model :-

https://vaibhav7766-covid-impact-on-economy-analysis-app-wqiyzl.streamlit.app/

Conclusion

In conclusion, the data insights highlight the differences in economic conditions between nations and the different difficulties they encounter during a global crisis when considered within the framework of COVID-19. In order to minimize economic disruptions and encourage recovery, the pandemic has brought attention to the significance of resilience, diversification, and focused policy responses. Understanding the economic structure of different countries is crucial for tailoring effective responses to future global challenges.

Our Project is also uploaded for future reference of this topic on Github
Below given is the Github Repository link:-
https://github.com/vaibhav7766/covid_impact_on_economy_analysis