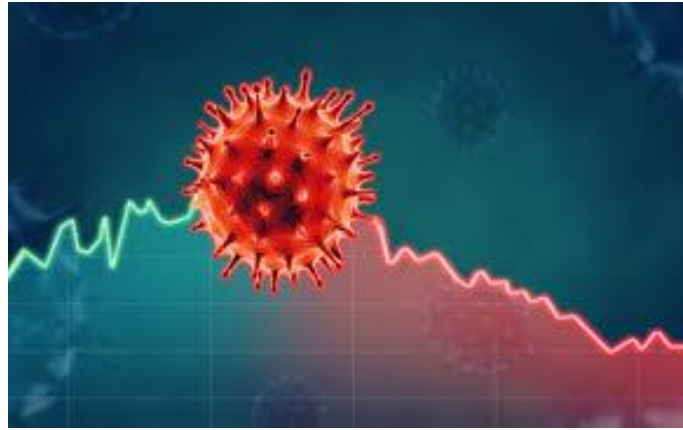


TECHNOCOLABS DATA ANALYSIS INTERNSHIP

PROJECT REPORT

TITLE: Covid-19 Analysis with respect to Economic Exposure Index.



AIM:

The principle focus of our project is to perform data analysis and train a model using the most popular Machine Learning algorithm – Linear Regression in order to analyse the historical data that is present regarding the Economic Exposure Index (EEI) and its indicators.

ABSTRACT:

The novel COVID-19 pandemic has taken a root in nearly every country of the globe, upending the operating exposure. COVID-19 is truly a global health issue and a massive reason that has rapidly affected the Economic exposure of every country which has a substantial impact on a company's market value since it has far-reaching effects and is long term in nature.

While, the pandemic seems likely to remain a fact of life for the foreseeable future it is very important to analyse the trend of Covid-19 and its effect on the EEI which will assist us in understanding and gaining insights regarding the same.

INTRODUCTION:

Economic exposure is a type of foreign exchange exposure caused by the effect of unexpected currency fluctuations on a company's future cash flows, foreign investments and earnings. The degree of the economic exposure is directly proportional to currency volatility. EEI increases as foreign exchange volatility increases and decreases as it falls.

The propounded report of exploration studies after having done the project, aims to evaluate the Economic Exposure Index and train Machine Learning model that will predict the value of the EEI when the respective prospective data is entered concerning the same.

OVERVIEW:

- Data Segmentation and Data Cleaning
- Exploratory Data Analysis using python's data visualisation libraries and Tableau
- Training the model based on the historical data available

DATASET:

The dataset we have considered, has information of a country's economic exposure due to COVID-19 and composite indicator based on **World Bank's** datasets on remittances, food import dependence, primary commodity export independence, tourism independence, government indebtedness and foreign currency reserves.

Original format of the dataset: XLSX

A brief explanation of every column in the dataset is as follows:

- **GHRP** – Global Humanitarian Response Plan for COVID-19 is the Inter-Agency Standing Committee (ISAC) initiative to address the risks and impact of Covid-19 pandemic on the most vulnerable people in countries affected by humanitarian crisis at high risk of facing humanitarian disaster. The GHRP was first launched on 25th March 2020 and was updated first on 7th May 2020.
- **Income classification according to WB (World Bank)** – When it comes to income, the World Bank divides the world's economies into four income groups: high, upper-middle, lower-middle and low. The income classification is based on a measure of national income per person on Gross National Income per capita, calculated using the ATLAS method.
- **Net ODA received (% of GNI)** – Net official development assistance consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies such as DAC- Development Assistance Committee (DAC), by multilateral institutions and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC.
- **Aid Dependence** – refers to the proportion of government spending that is given by foreign donors. Heavy aid dependence can have significant effects on institutions and governance.
- **Remittances and Volume of remittances (in USD) as proportion of total GDP - A** remittance is a transfer of money, often by a foreign worker to an individual in their home country. According to the World Bank, in 2018 overall global remittance grew 10% to US\$689 billion, including US\$528 billion to developing countries. Remittances (money or goods) that migrants send back to families and friends in origin countries, are often the most direct and well-known link between migration and development.
- **Food imports (% total merchandise exports)** – this indicator provides a measure of vulnerability and captures the adequacy of the foreign exchange reserves to pay for food imports, which has implications for national food security depending on production and trade patterns.
- **Food import dependence** – all countries use imports to varying extents to satisfy the quantity and diversity of the food demands of their populations; for poor countries where food imports are a large share on country's total trade, food security is conditioned by capacity to obtain food through imports.
- **Fuel, ores and metals exports (% of total merchandise exports)** – Ores and metals exports (% of merchandise exports) in World was reported at 3.9631%. According to World Bank

collection of development indicators, compiled from officially recognized sources the ores and metals comprise the commodities in SITC section.

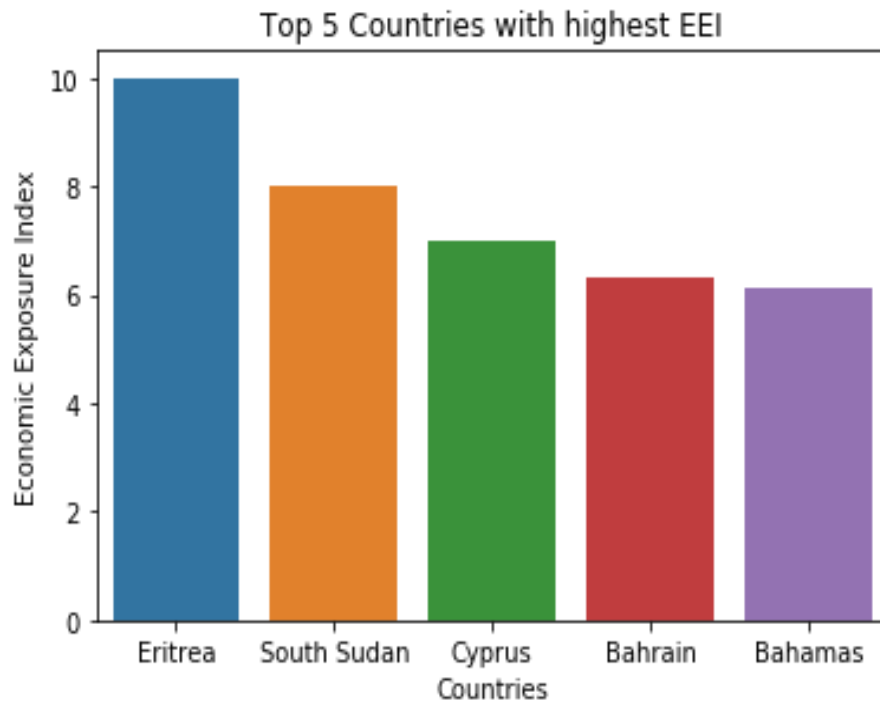
- **Tourism Dependence** – Tourism is an engine for jobs, exports, and investments. The tourism sector is also the largest market-based contributor to finance protected areas.
- **General government gross debt (Percent of GDP)** – General Government debt-to-GDP ratio measures the gross debt of general government as a percentage of GDP. It is a key indicator for the sustainability of government finance.
- **Total reserves in months of imports** – comprises holdings of monetary gold, special drawing rights, reserves of International Monetary fund members held by the IMF, a holding of foreign exchange under the control of monetary authorities.
- **Government indebtedness** – also known as public interest, public debt, national debt and sovereign debt, contrasts to the annual government budget deficit, which is a flow of variable that equals the difference between government receipts and spending in a single year.
- **Foreign currency reserves** – are the foreign currencies held by a country's central bank. They are also called foreign currency reserves or foreign reserves.
- **Foreign direct investment net flows (% GDP)** – are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor.
- **Foreign direct investment (FDI)** – is an investment in the form of a controlling ownership in a business in one country by an entity based in another country. It is thus distinguished from a foreign portfolio investment by a notion of direct control.
- **Covid-19 Economic Exposure index** – the target variable and the country's economic exposure due to COVID 19.
- **Covid-19 Economic Exposure index [ex aid and FDI]** – EEI taking into consideration the effect of the aid and FDI.
- **Covid-19 Economic Exposure index [ex aid, FDI and Food imports]** – EEI taking into consideration of all the three – aid, FDI and imports.

DATA SEGMENTATION AND DATA CLEANING:

- In this project, we have prepared a processed dataset by and collected the clear-cut data available online.
- Using pandas data frame, we have calculated the mean of every column.
- By using the fillna we have filled all the cells with empty values.
- While doing so, we have not included the countries having a zero value in their cells.
- We have manually replaced the zeros in a column with the mean of the column.
- The original format of the file was XLSX. We have converted into CSV format and proceeded.

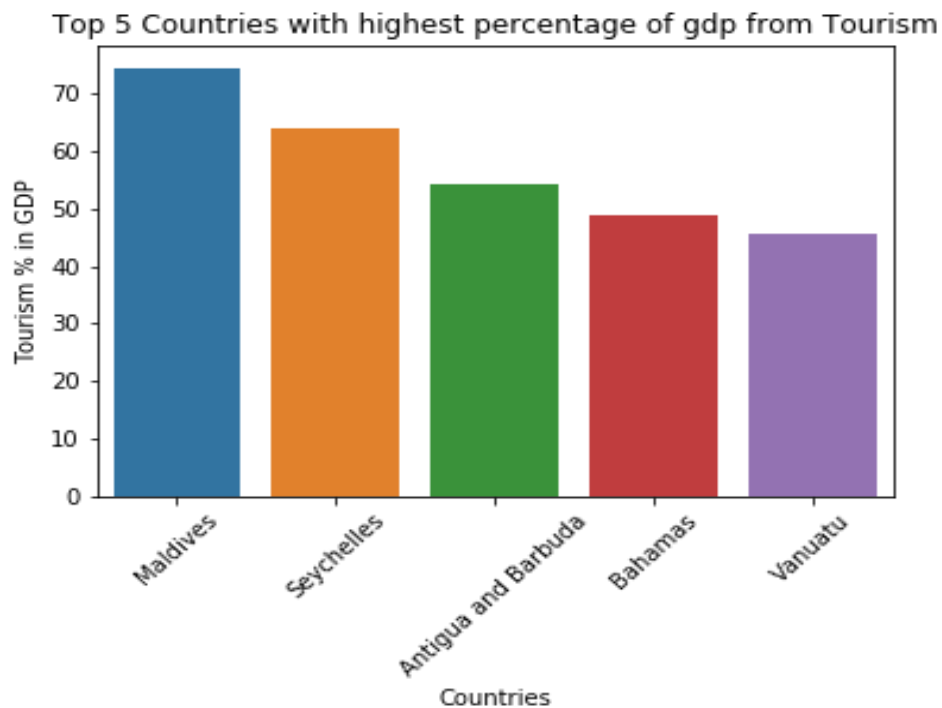
EXPLORATORY DATA ANALYSIS:

➤ PLOT 1



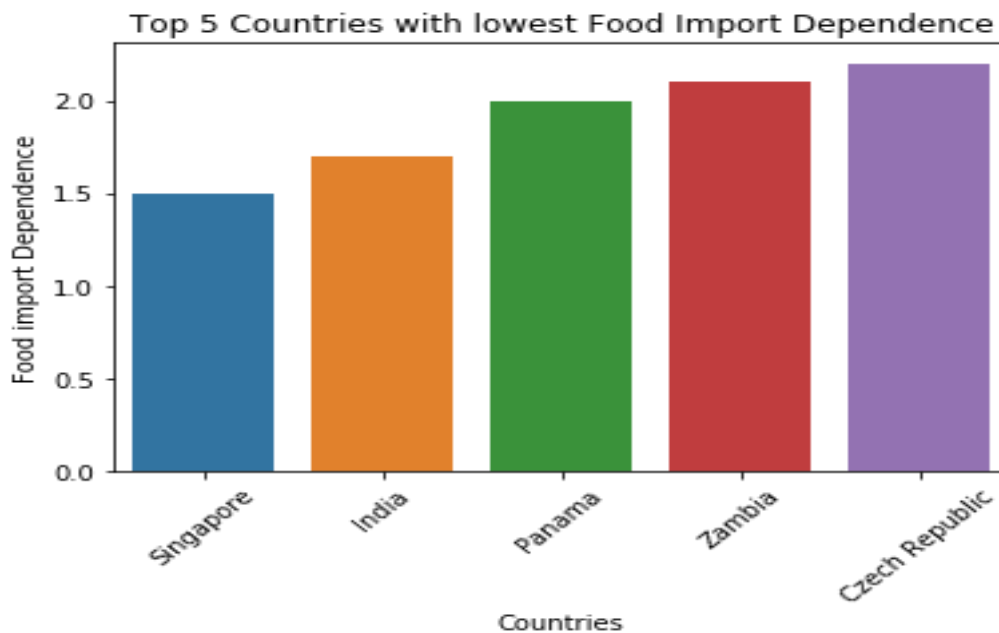
The above plot represents the top 5 countries with highest EEI which is basically the fluctuation in the market value of company or a fluctuation in the economic value of a country caused due certain factors. Companies can hedge against the unexpected currency fluctuations by investing in foreign exchange (FX) trading. The more the economic exposure index the more fluctuations and less flexibility to adapt to changes.

➤ PLOT 2



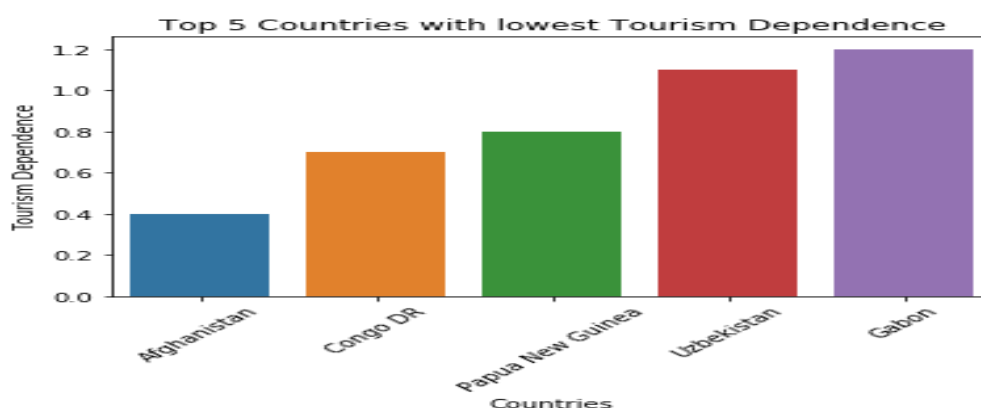
Tourism based countries had a majority of their GDP collected from tourists around the world. As we can observe, from the COVID 19 EEI graph that, Bahamas is one of the among the top five countries having the highest EEI with a tourism GDP. Hence, what we analyse from this graph is that Tourism industry is massively hit by the global pandemic. The other countries which thrive on income made out of tourism don't have the EEI as it is based on a number of factors. There might be possibilities that these tourism-based countries could have adapted to the new normalcy and thus don't have a low EEI.

➤ PLOT 3



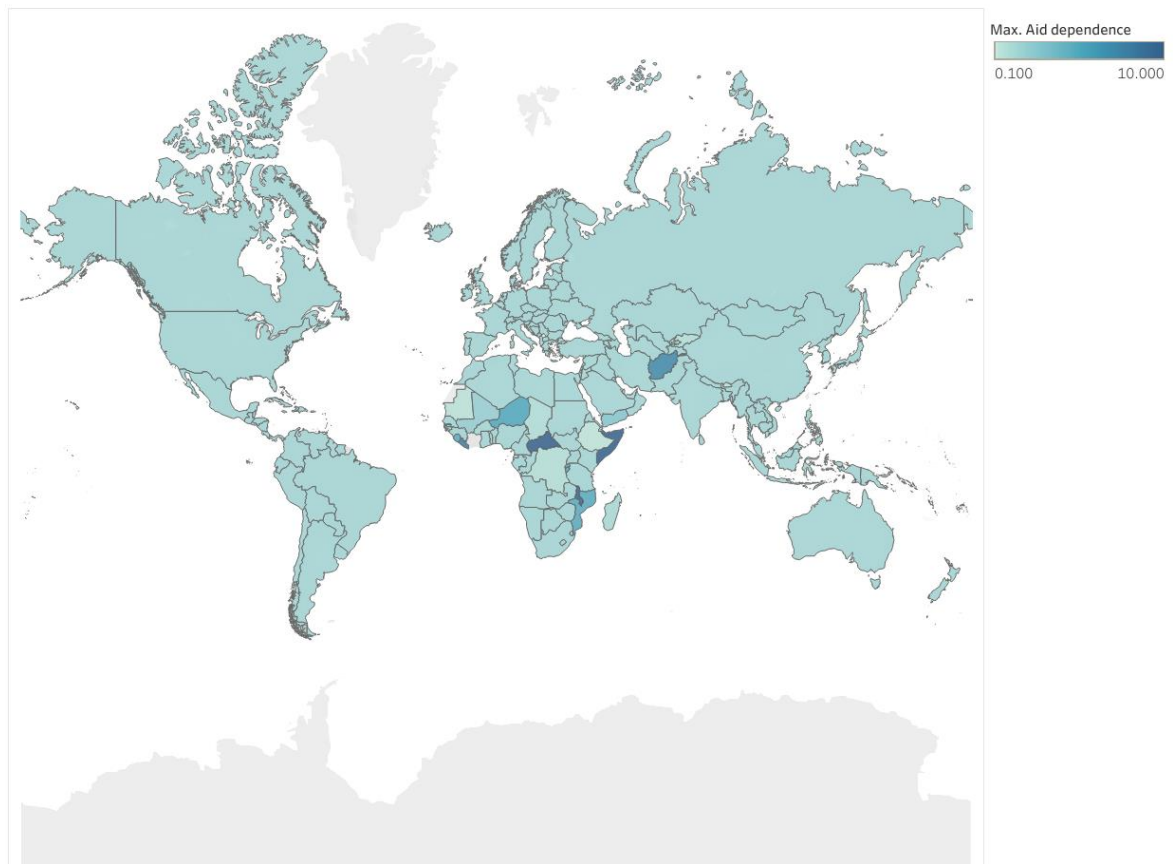
The above plot represents the top 5 countries that are heavily dependent on the Food import. Here, are the top 5 countries which have the lowest food import dependence. Countries having low EEI also have low Covid-19 EEI.

➤ PLOT 4



The above plot shows that countries with lowest tourism dependence. The COVID-19 EEI is not affected in these countries as EEI and Tourism dependence are correlated.

➤ PLOT - 5



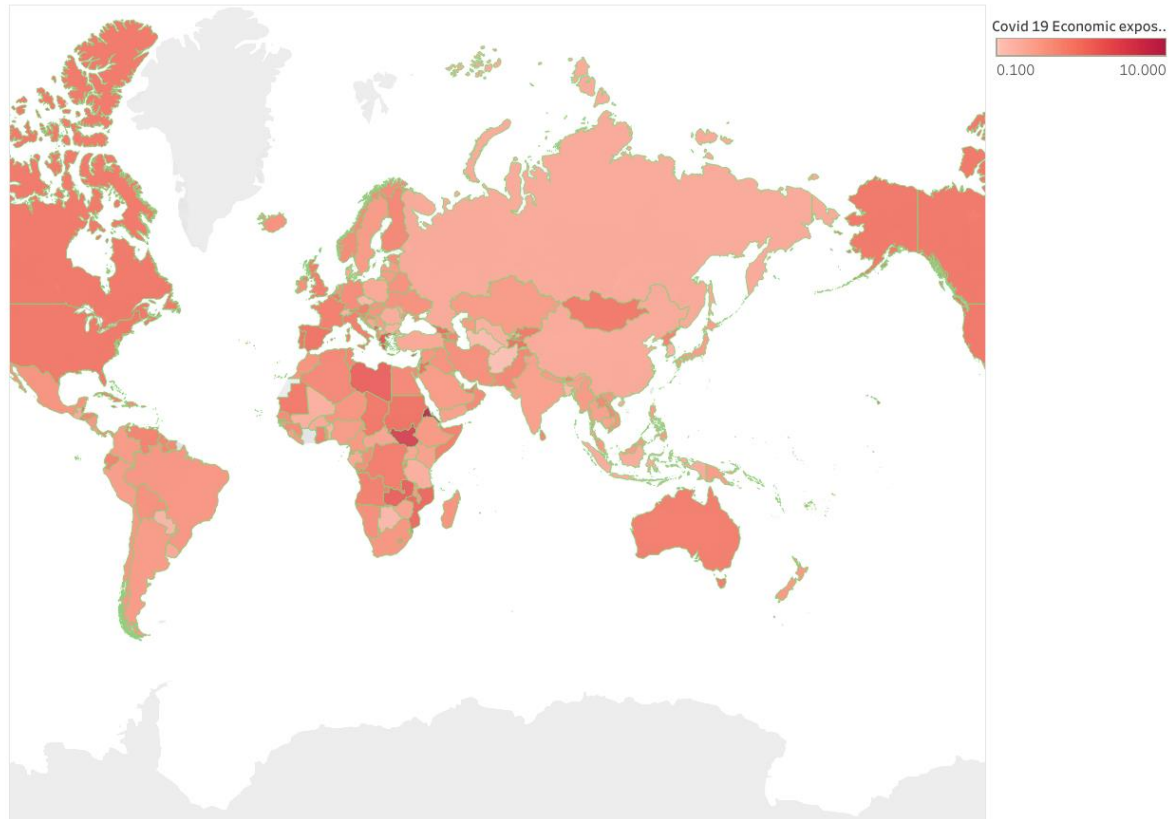
The above interactive plot shows that countries are dependent on the aid globally. Initially, foreign aid negatively impacts the countries' growth and over a period of time, it positively contributes to economic growth.

➤ PLOT 6



The above plot represents the maximum COVID-19 Economic Exposure Index continent wise. European countries have the highest EEI, and there are no countries around the globe that aren't having any economic fluctuations.

➤ PLOT 7



This interactive plot shows how the global pandemic has affected the FDI and Food imports. The COVID-19 has impacted the global food supply. Majority of the world is found resilient to food supply shocks. Mostly food import-dependent nations are vulnerable to food supply shocks. We can conclude that the current pandemic has caused transitory food insecurity across such vulnerable countries. The effects of the pandemic FDI and food import may persist longer as a combined effect of economic exposure index showdown and increase in poverty limiting food supply and import and its access beyond 2020.

Link to the public tableau -

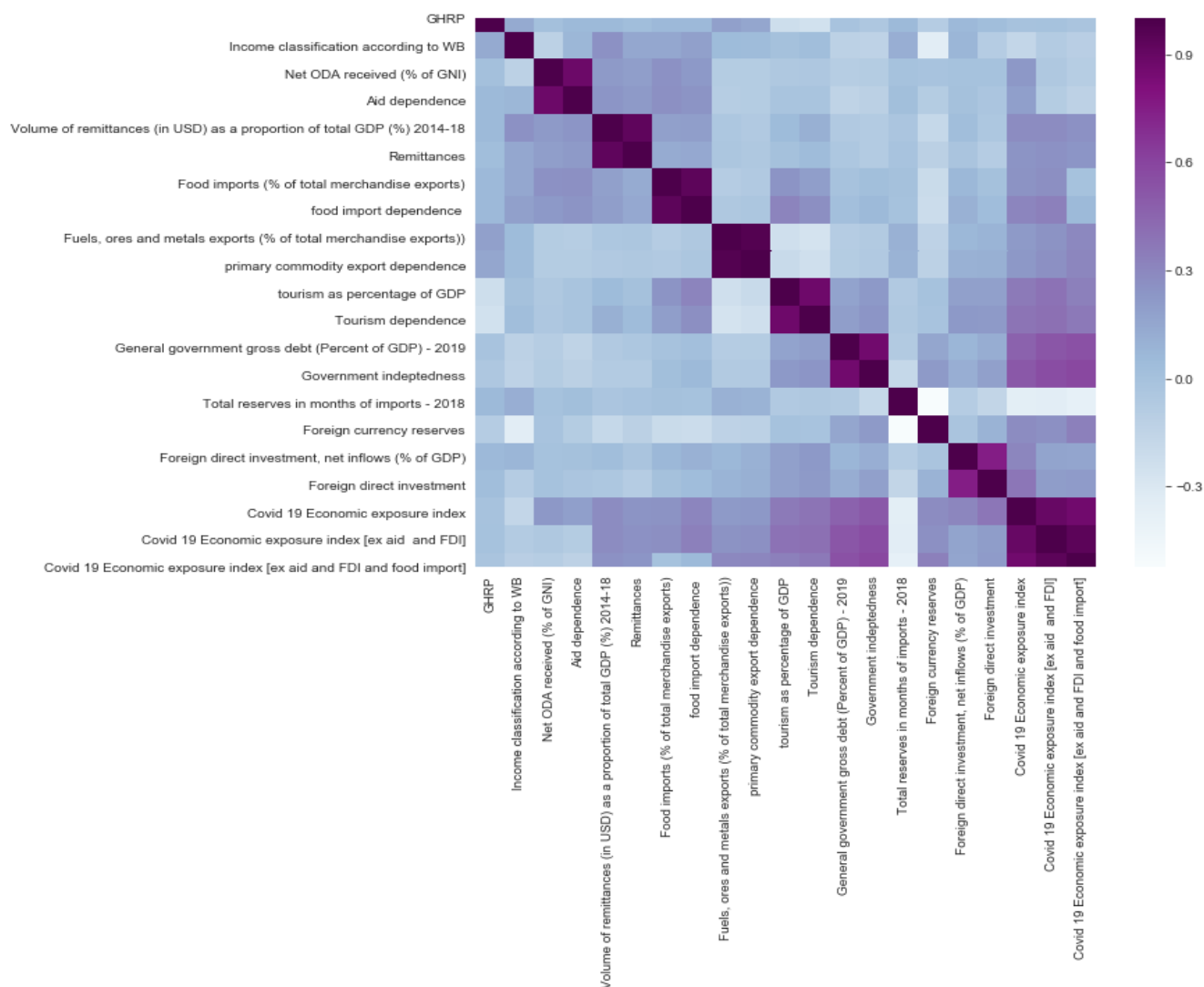
https://public.tableau.com/profile/aarsh.sapra#!/vizhome/Internship_15972438128110/Story1?publish=yes

TRAINING THE MODEL:

Globalization and the rapid integration of markets due the COVID-19 pandemic have a prominent effect on the EEI which aims to reflect the performance of the companies with significant exposure to specific regions or countries, regardless of their domicile.

Our project aims to train 3 models for -

1. COVID-19 EEI
2. COVID-19 EEI [ex aid and FDI]
3. COVID-19 [ex aid, FDI and Food imports]



We have used correlation in order to select the columns to train the model and columns which had a correlation of 0.2 and above were used.

➤ MODEL FOR COVID-19 EEI

The correlated columns considered for this model are as follows:

ODA received (% of GNI)', 'Volume of remittances (in USD) as a proportion of total GDP (%) 2014-18',

'Remittances',

'Food imports (% of total merchandise exports)',

'food import dependence ',

'Fuels, ores and metals exports (% of total merchandise exports))',

'primary commodity export dependence', 'tourism as percentage of GDP',

'Tourism dependence',

'General government gross debt (Percent of GDP) - 2019',

'Government indebtedness', 'Total reserves in months of imports - 2018',

'Foreign currency reserves',

'Foreign direct investment, net inflows (% of GDP)', 'Foreign direct investment'

Accuracy of the model:

```
In [15]: # Model with Columns who have a Correlation of 0.2 and above
y_column_list_1=df_Economic_Exposure_Index['Covid 19 Economic exposure index']
x_column_list_1=df_Economic_Exposure_Index.drop( labels='Covid 19 Economic exposure index',axis=1)
lr.fit(x_column_list_1,y_column_list_1)
lr.score(x_column_list_1,y_column_list_1)
```

Out[15]: 0.7813107705132221

➤ MODEL FOR COVID-19 EEI [EX AID & FDI]

The correlated columns considered for this model are as follows:

'Volume of remittances (in USD) as a proportion of total GDP (%) 2014-18',
'Remittances', 'Food imports (% of total merchandise exports)',
'food import dependence ',
'Fuels, ores and metals exports (% of total merchandise exports))',
'primary commodity export dependence', 'tourism as percentage of GDP',
'Tourism dependence',
'General government gross debt (Percent of GDP) - 2019',
'Government indebtedness', 'Total reserves in months of imports - 2018',
'Foreign currency reserves',
'Foreign direct investment','Covid 19 Economic exposure index [ex aid and FDI]'

Accuracy of the model:

```
In [20]: # Model with Columns who have a Correlation of 0.2 and above
y_column_list_2=df_Economic_aid_FDI['Covid 19 Economic exposure index [ex aid and FDI]']
x_column_list_2=df_Economic_aid_FDI.drop( labels='Covid 19 Economic exposure index [ex aid and FDI]',axis=1)
lr.fit(x_column_list_2, y_column_list_2)
lr.score(x_column_list_2, y_column_list_2)
```

Out[20]: 0.8048207337795678

MODEL FOR COVID-19 [EX AID, FDI & FOOD IMPORTS]

The correlated columns considered for this model are as follows:

'Volume of remittances (in USD) as a proportion of total GDP (%) 2014-18',
'Remittances', 'Food imports (% of total merchandise exports)',
'food import dependence ',
'Fuels, ores and metals exports (% of total merchandise exports))',
'primary commodity export dependence', 'tourism as percentage of GDP',
'Tourism dependence',

'General government gross debt (Percent of GDP) - 2019',

'Government indebtedness', 'Total reserves in months of imports - 2018',

'Foreign currency reserves',

'Foreign direct investment', 'Covid 19 Economic exposure index [ex aid and FDI and food import']

Accuracy of the model is as follows:

```
In [25]: # Model with Columns who have a Correlation of 0.2 and above
y_column_list_3=df_Economic_aid_FDI_Food['Covid 19 Economic exposure index [ex aid and FDI and food import]']
x_column_list_3=df_Economic_aid_FDI_Food.drop( labels='Covid 19 Economic exposure index [ex aid and FDI and food import]',axis=1)
lr.fit(x_column_list_3, y_column_list_3)
lr.score(x_column_list_3, y_column_list_3)

Out[25]: 0.8184622415051798
```

TEAM MEMBERS:

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PRAGNA B RAO

SATYAM ASTHANA