Covid-19 Analysis with respect to Economic Exposure Index

A Project Work- I Report

Submitted in partial fulfillment of requirement of the

Degree of

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

BY

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MEDI-CAPS UNIVERSITY, INDORE- 453331

Academic Session: 2017-2021

Report Approval

The project work**"Covid-19 Analysis with respect to Economic Exposure Index"** is hereby approved as a creditable study of an engineering/computer application subject carried out and presented in a manner satisfactory to warrant its acceptance as prerequisite for the Degree for which it has been submitted.

It is to be understood that by this approval the undersigned do not endorse or approved any statement made, opinion expressed, or conclusion drawn there in; but approve the "Project Report" only for the purpose for which it has been submitted.

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External Examiner
Name:
Designation
Affiliation

Declaration

We hereby declare that the project entitled **"Covid-19 Analysis with respect to Economic Exposure Index"** submitted in partial fulfillment for the award of the degree of Bachelor of Technology in 'Information Technology' completed under the supervision of **Ms. Shruti Dhanotiya, Associate Professor and department of Information Technology,** Faculty of Engineering, Medi-Caps University Indore is an authentic work.

Further, we declare that the content of this Project work, in full or in parts, have neither been taken from any other source nor have been submitted to any other Institute or University for the award of any degree or diploma.

Date:28/12/2020

Priyanshu Jain	Samyak Jain	Sarthak Ranka
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Certificate

I, **Ms.Shruti Dhanotiya** certify that the project entitled **"Covid-19 Analysis with respect to Economic Exposure Index"** submitted in partial fulfillment for the award of the degree of Bachelor of Technology by **Priyanshu jain ,Samyak jain** and **Sarthak Ranka** is the record carried out by them under my guidance and that the work has not formed the basis of award of any other degree elsewhere.

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It is their help and support, due to which we became able to complete the design and technical report.

Without their support this report would not have been possible.

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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.This report discusses the economic impact of the Coronavirus/COVID-19 crisis across industries, and countries. It also provides estimates of the potential global economic costs of COVID-19, and the GDP growth of different countries.The current draft includes estimates for 190 countries, under different scenarios.At the date of this report, the duration of the lockdown, as well as how the recovery will take place is still unknown. That is why several scenarios are used.

Service-oriented economies will be particularly negatively affected, and have more jobs at risk. Countries like Greece, Portugal, and Spain that are more reliant on tourism (more than 15% of GDP) will be more affected by this crisis. This current crisis is generating spillover effects throughout supply chains. Therefore, countries highly dependent on foreign trade are more negatively affected. The results suggest that on average, each additional month of crisis costs 2.5-3% of global GDP.

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Chapter 1: Introduction

1.1 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

The major cause of this exposure is the unexpected fluctuation in the currency and its effects on the cash flow of the company in the future. Usually, the competitive position of the entire corporation is deeply affected by this. This is one of the most difficult to cope up with because of the fact that there is no way of anticipating this. One needs to have a deep understanding of different concepts so that this risk can be dealt with sufficiently and accordingly.

BACKGROUND

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 compromise 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

1.2 Literature Review

The COVID-19 pandemic has spread with alarming speed, infecting millions and bringing economic activity to a near-standstill as countries imposed tight restrictions on movement to halt the spread of the virus. As the health and human toll grows, the economic damage is already evident and represents the largest economic shock the world has experienced in decades.

The June 2020 ***Global Economic Prospects*** describes both the immediate and near-term outlook for the impact of the pandemic and the long-term damage it has dealt to prospects for growth. The baseline forecast envisions a 5.2 percent contraction in global GDP in 2020, using market exchange rate weights—the deepest global recession in decades, despite the extraordinary efforts of governments to counter the downturn with fiscal and monetary policy support. Over the longer horizon, the deep recessions triggered by the pandemic are expected to leave lasting scars through lower investment, an erosion of human capital through lost work and schooling, and fragmentation of global trade and supply linkages.

The crisis highlights the need for urgent action to cushion the pandemic's health and economic consequences, protect vulnerable populations, and set the stage for a lasting recovery.

1.3 Objective

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 hasrapidly affected the Economic exposure of every country which has a substantial impact on acompany'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.

1.4 Significance / Scope

A well-defined project scope is a necessity to ensure the success of your project. Without it, no matter how efficient, how effective and how hard you work, you won't be able to succeed in your project .The scope of our project should steer in the direction of successfully meeting your project's outcome in a timely manner, within budget and be able to satisfy the end users expectations.

The scope of our COVID Analysis system can cover many needs, including valuing the analysis through economic exposure, measuring the change in system and planning for future levels. The value at the end of each period provides a basis for final reporting .

1.5 Source of data/Problem in existing system+Justification

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.

The problem statement was to analyze the market for a company on basis of economic exposure and give a strategic recommendation based on the data available as to whether acompany should invest in a particular country or not.

The tools that will be brought to use to make the prediction is jupyter notebook and technology is Data Science with Python .The process involves collecting data sets , processing data , operationalize it , building data and presenting them with the help of these models . The steps involved are:-

Extraction of data: Various libraries that can be put into service in order to scrape the data are beautiful soup, request and pandas .The analysis tool that will used in this project is pandas which will provide data frame to store data and concise manner .

The next step would be processing of data or cleaning where in all the duplicate and unnecessary data will be removed from the data set . This Particular step is accomplished using NumPy and pandas .

Further the data will be analysed and will be understood and will be plotted on graphs to obtain the desired model with the help of seaborn and matplotlib which are the libraries involved.

Then the model will be built according to the category under which it falls and SciKit library will be used which is an easy-to-use Python library that is used to build machine learning model.It’s built on NumPy,SciPy and matplotlib.Data will be represented by jupyter notebook

1.7 Organization

The Report is consists of following Chapters :

Chapter 1: Introduction

Chapter 2:System Requirement Analysis

Chapter 3:System Analysis

Chapter 4:Design

Chapter 5:Testing

Chapter 6:Limitations

Chapter 7:Future Scope

Chapter 8Conclusion

Chapter 9: References

CHAPTER 2: SYSTEM REQUIREMENT ANALYSIS

System Requirement Analysis

The purpose of the system requirements analysis process is to transform the stakeholder, user-oriented view of desired services and properties into a technical view of the product that meets the operational needs of the user. This process builds a representation of the system that will meet stakeholder requirements and that, as far as constraints permit, does not imply any specific implementation. It results in measurable system requirements that specify, from the supplier's perspective, what performance and non-performance characteristics it must possess in order to satisfy stakeholders' requirements.

FUNCTIONAL REQUIREMENTS

Defining product requirements is the first stage of any software development project. The owner describes expectations about the software, and the development team specifies skills and tech stack, applied to reach these objectives. Detailed requirements help to improve mutual understanding and setclear benchmarks for the product.A functional requirement is a function of a system with inputs, required for a system to function and outputs that it produces.

Functional requirements usually describe the following aspects of the system's functionality: calculations, performed by the system (inputs, formulas, expected output)data processing and consumption (how much data and of which type are required to start the system and keep it running) use cases for the system: all possible scenarios where a system might be involved used technology: which languages, APIs, database solutions, and other tools are used to implement and maintain a system.The formula for functional requirements is "the system must do" because they describe all actions that a feature should undertake.

NON -FUNCTIONAL REQUIREMENTS

Non functional definition is the criteria that all product's features should fall under. These are attributes that will help you define crucial user expectations and control product quality. The list of non-functional requirements is very specific to the type of the product and industry, but we can boil it down to four main ones.

1. Usability
2. Legal or Regulatory requirements
3. Reliability
4. Performance

Information Gathering

When it comes to getting a clear information gathering concept, the simplest way to define it would be the process of collecting information about something you are interested in.

Machine learning algorithms require huge amounts of data to function. When dealing with millions or even billions of images or records, it's really hard to pinpoint what exactly makes an algorithm perform badly.

So, when compiling your data, it's not enough to gather vast reams of information, feed it to your model and expect good results. The process needs to be much more finely tuned.

In general, it's best to follow a series of iterative stages until you're satisfied with the outcome. The process should run like this:

1. Select your data distributions
2. Split the data into data sets
3. Train the model

2.2 System Feasibility

2.2.1 Technical Feasibility:

This involves questions such as whether the technology needed for the system exists, how difficult it will be to build, and whether the firm has enough experience using that technology. The assessment is based on outline design of system requirements in terms of input, processes, output, fields, programs and procedures. This can be qualified in terms of volume of data, trends, frequency of updating in-order to give an introduction to the technical system. The application is the fact that it has been developed on windows XP platform and a high configuration of 1GB RAM on Intel Pentium Dual core processor. This is technically feasible .The technical feasibility assessment is focused on gaining an understanding of the present technical resources of the organization and their applicability to the expected needs of the proposed system. It is an evaluation of the hardware and software and how it meets the need of the proposed system.

2.2.2 Economical Feasibility:

Establishing the cost-effectiveness of the proposed system i.e. if the benefits do not outweigh the costs then it is not worth going ahead. In the fast paced world today there is a great need of online social networking facilities. Thus the benefits of this project in the current scenario make it economically feasible. The purpose of the economic feasibility assessment is to determine the positive economic benefits to the organization that the proposed system will provide. It includes quantification and identification of all the benefits expected. This assessment typically involves a cost/benefits analysis.

2.3 Platform Specification

2.3.1 Hardware Requirements:

1. Ram Size: 2GB
2. Hard-Disk: 500GB
3. Hardware: I3 Processor or little less.

2.3.2 Software Requirements:

1. Operating System: Linux, Unix, Windows
2. User Interface Design : Html, JQuery, Javascript , CSS
3. Database: MySQL 5.1 or above

CHAPTER 3: SYSTEM ANALYSIS

3.1 Information Flow Representation

3.1.1 ER Diagram/Object Diagram

An Entity–relationship model (ER model) describes the structure of a database with the help of a diagram, which is known as Entity Relationship Diagram (ER Diagram). An ER model is a design or blueprint of a database that can later be implemented as a database. The main components of E-R model are: entity set and relationship set. In terms of DBMS, an entity is a table or attribute of a table in database, so by showing relationship among tables and their attributes, ER diagram shows the complete logical structure of a database. An ER diagram shows the relationship among entity sets. An entity set is a group of similar entities and these entities can have attributes. An ER diagram has three main components:

1. Entity

2. Attribute

3. Relationship

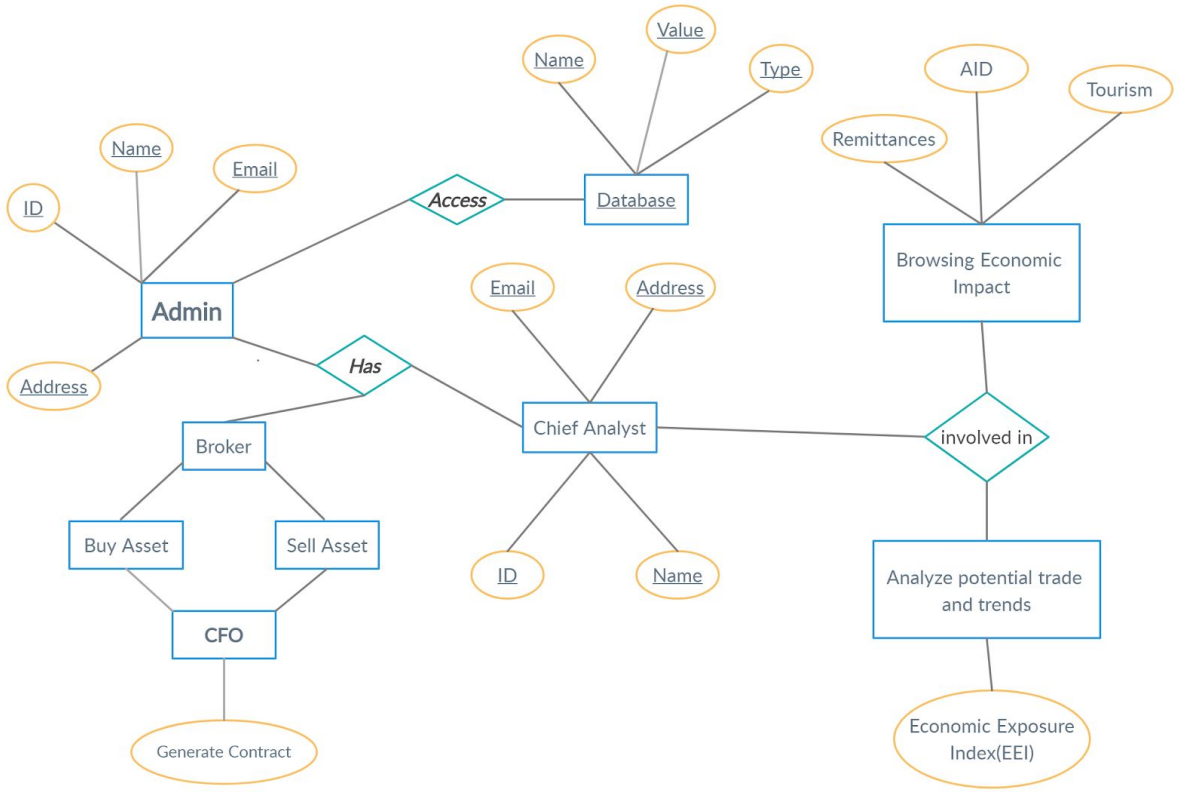


Fig:ER Case Diagram for Covid Analysis through EEI

3.1.2 Activity Diagram

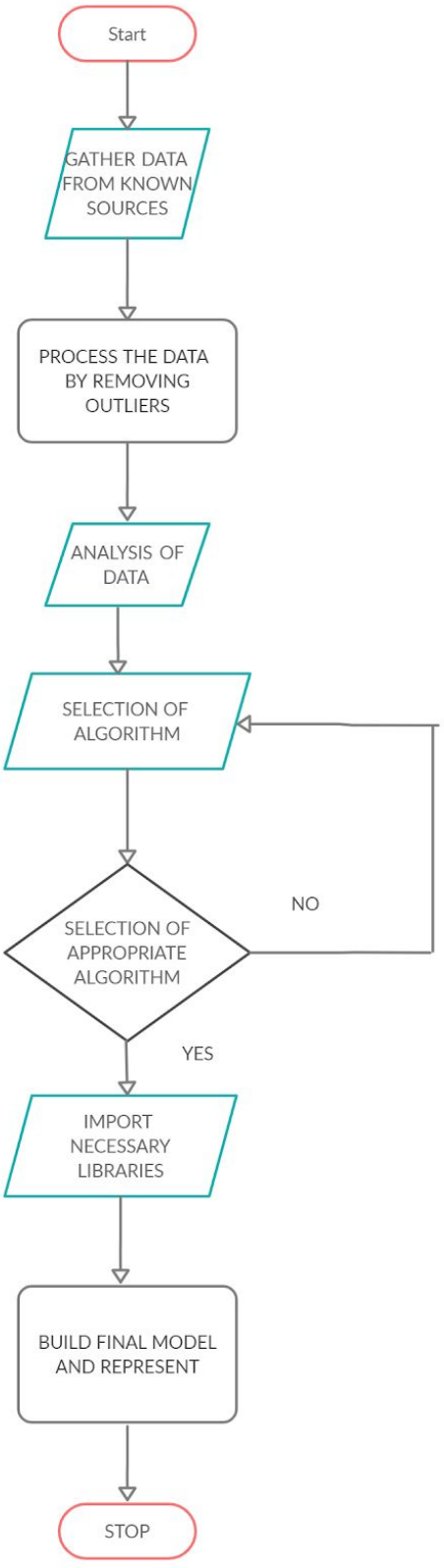


Fig:Flow Diagram for Covid Analysis through EEI

3.1.3Use Case Diagram

That purpose is covered by use cases – a document that describes the interactions between a system and a user (UX). In functional requirements, we describe which date users have to enter to start working within a system, how the system responds to particular user actions, and underline scenarios in which every feature will be used.

The structure of a use case document

- Actors: types of users that interact with a system (for instance, on a blogging platform, these actors can be publishers, readers, and moderators).
- System: a list of features available for user interactions;
- Functionality, necessary to achieve goals: objectives, related to the user experience are usually defined in user requirements. Functional requirements describe which features are necessary for each user group to get the ultimate experience.
- Associations: relationships between several feature of the system and involved actors.

The goal of use cases is to determine scenarios of how users typically interact with the intended functionality of the software.

- If use cases describe user-software interactions in a generalized impartial way, user stories go through the same situations but from the user's point of view. A document with user stories connects possible interactions with user motivations and expectations. After making user stories documents, teams often discover that some use cases weren't necessary at all, because they don't correlate with user needs. It's likely that developers will have to add some new user cases – so be ready to switch back-and-forth between the two documents.

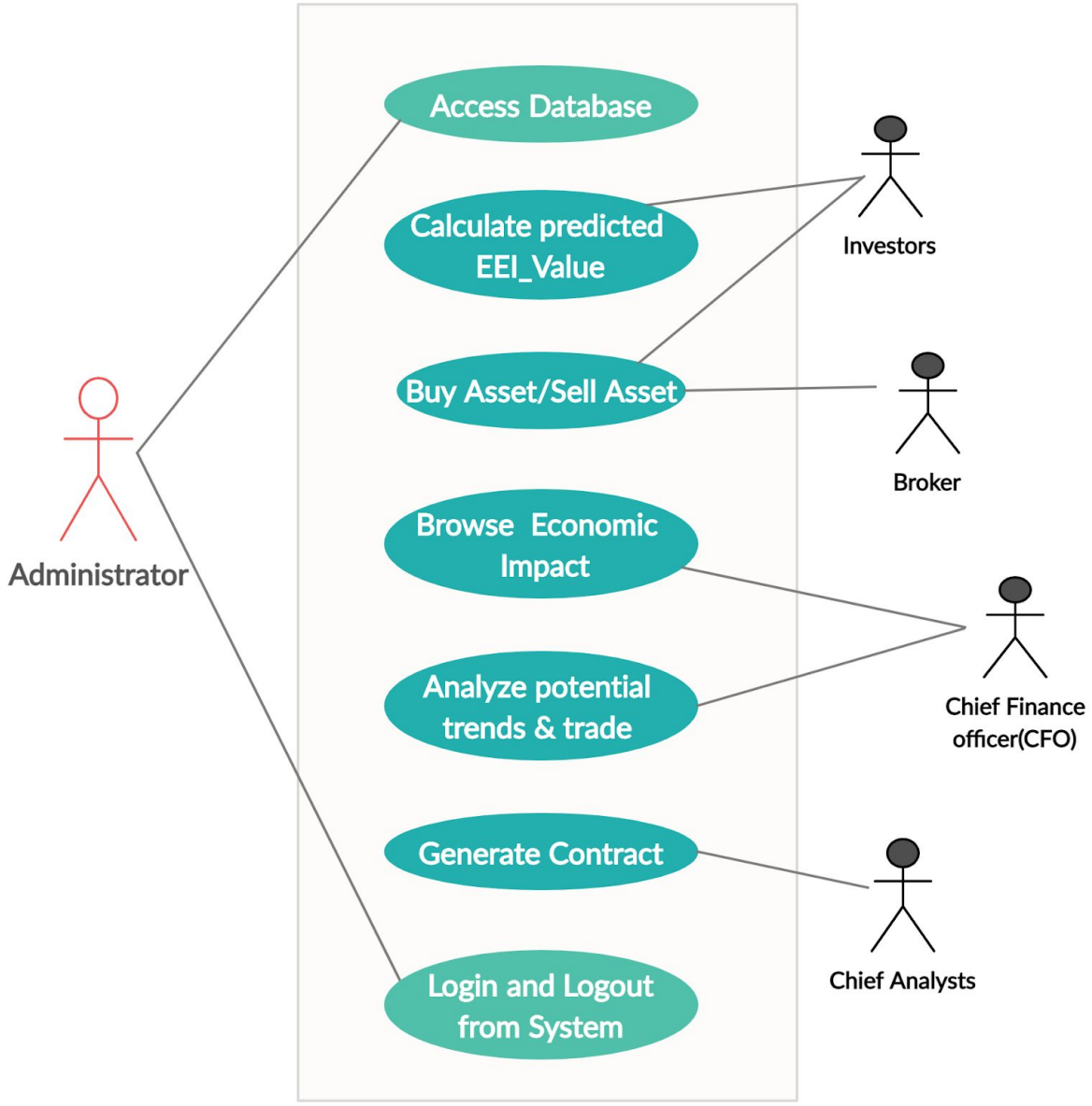


Fig:Use Case Diagram for Covid Analysis through EEI

3.1.4 CLASS Diagram

The **UML** Class diagram is a graphical notation used to construct and visualize object oriented systems. A class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's:

- classes,
- their attributes,
- operations (or methods),
- and the relationships among objects

Purpose:

1. Diagram provides a basic notation for other structure diagram perspectives prescribed by UML
2. Helpful for developers and other team members too
3. Business Analysts can use class diagrams to model systems from a business

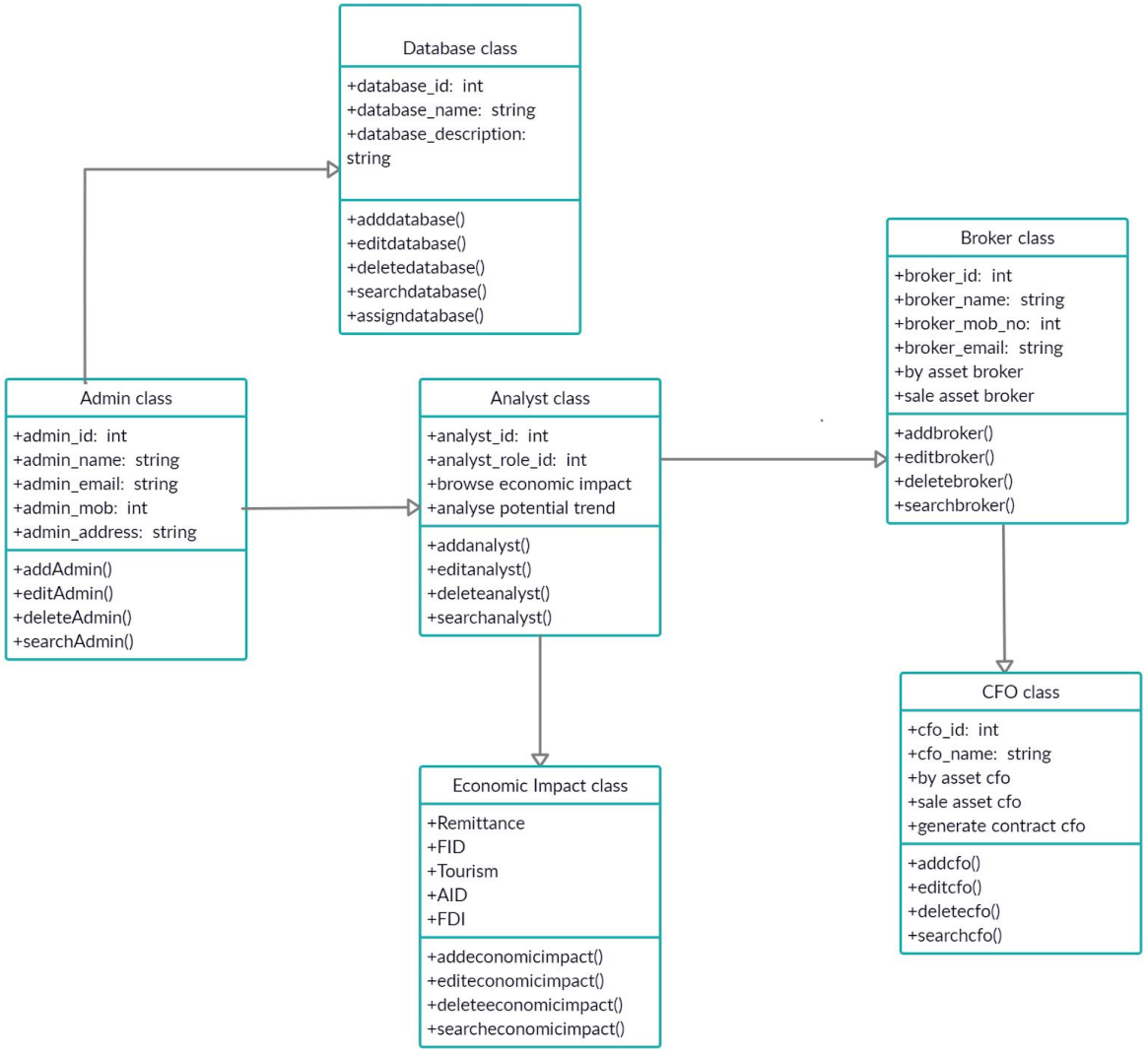


Fig:Class Diagram for Covid Analysis through EEI

CHAPTER 4: DESIGN

Architectural Design

Design and Construction oversight is the heart of an architectural practice. Realizing the built design that meets the goals of the owner and the site is the ultimate achievement of architecture. It is the Architect's responsibility to provide physical dimension and physical spatial definition to the owner's vision. At MLA, the owner's needs and vision come first. The Architect is merely there to translate these ideas into the built environment, using our skills and design expertise. The design process is the beginning of the building process. MLA will help you achieve your design potential, help to facilitate the approval process, and will provide strong construction oversight to verify that the design intent is met and construction documents adhered to. The result is an end product that meets all of the goals and criteria of the owner. Our goal is to help you achieve your project on schedule and on budget.

Procedural Approach & Model Training

1. Strategy: matching the problem with the solution
In the first phase of an ML project realization, company representatives mostly outline strategic goals.
They assume a solution to a problem, define a scope of work, and plan the development.
2. Dataset preparation and preprocessing
Data is the foundation for any machine learning project. The second stage of project implementation
is complex and involves data collection, selection, preprocessing, and transformation. Each of these phases
can be split into several steps.
3.Data Segmentation and Data Cleaning
4.Exploratory Data Analysis using python's data visualisation libraries and Tableau
5.Training the model based on the historical data available
Model training

After a data scientist has preprocessed the collected data and split it into three subsets, he or she can proceed with a model training. This process entails "feeding" the algorithm with training data. An algorithm will process data and output a model that is able to find a target value (attribute) in new data — an answer you want to get with predictive analysis. The purpose of model training is to develop a model.

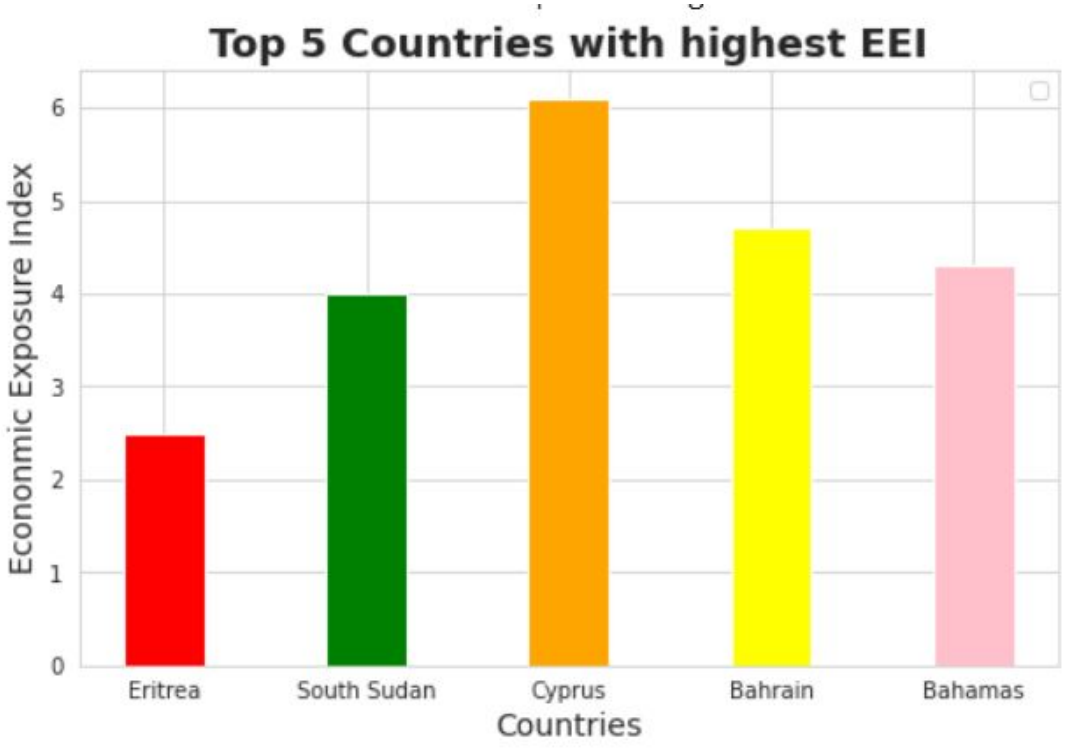
Two model training styles are most common — supervised and unsupervised learning. The choice of each style depends on whether you must forecast specific attributes or group data objects by similarities.

Supervised learning. Supervised learning allows for processing data with target attributes or labeled data. These attributes are mapped in historical data before the training begins. With supervised learning, a data scientist can solve classification and regression problems.

Unsupervised learning. During this training style, an algorithm analyzes unlabeled data. The goal of model training is to find hidden interconnections between data objects and structure objects by similarities or differences. Unsupervised learning aims at solving such problems as clustering, association rule learning, and dimensionality reduction. For instance, it can be applied at the data preprocessing stage to reduce data complexity.

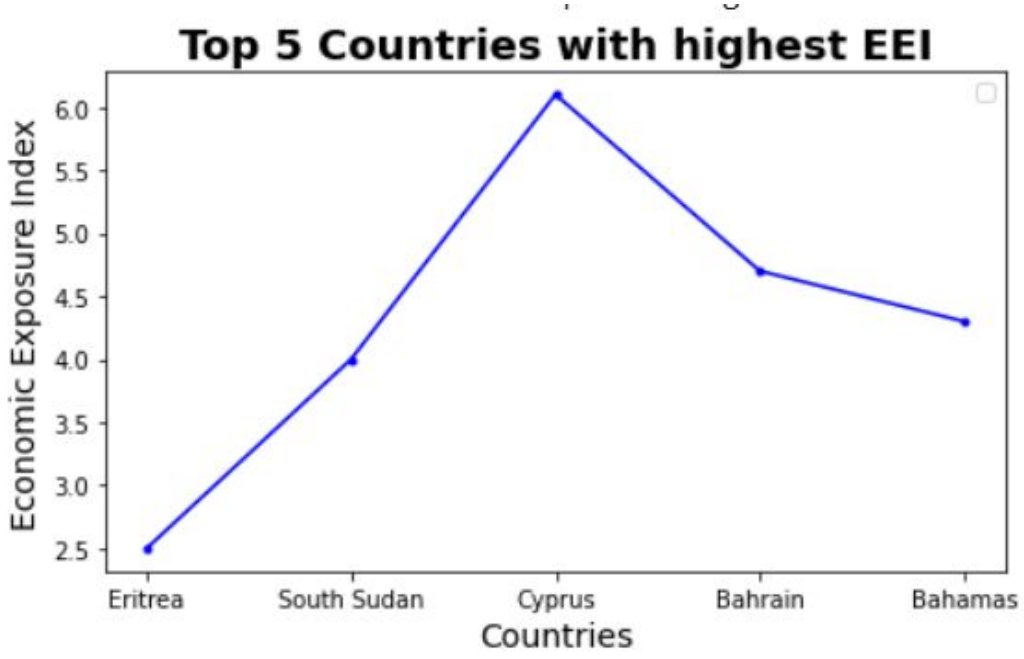
Exploratory Data Analysis

Plot1:

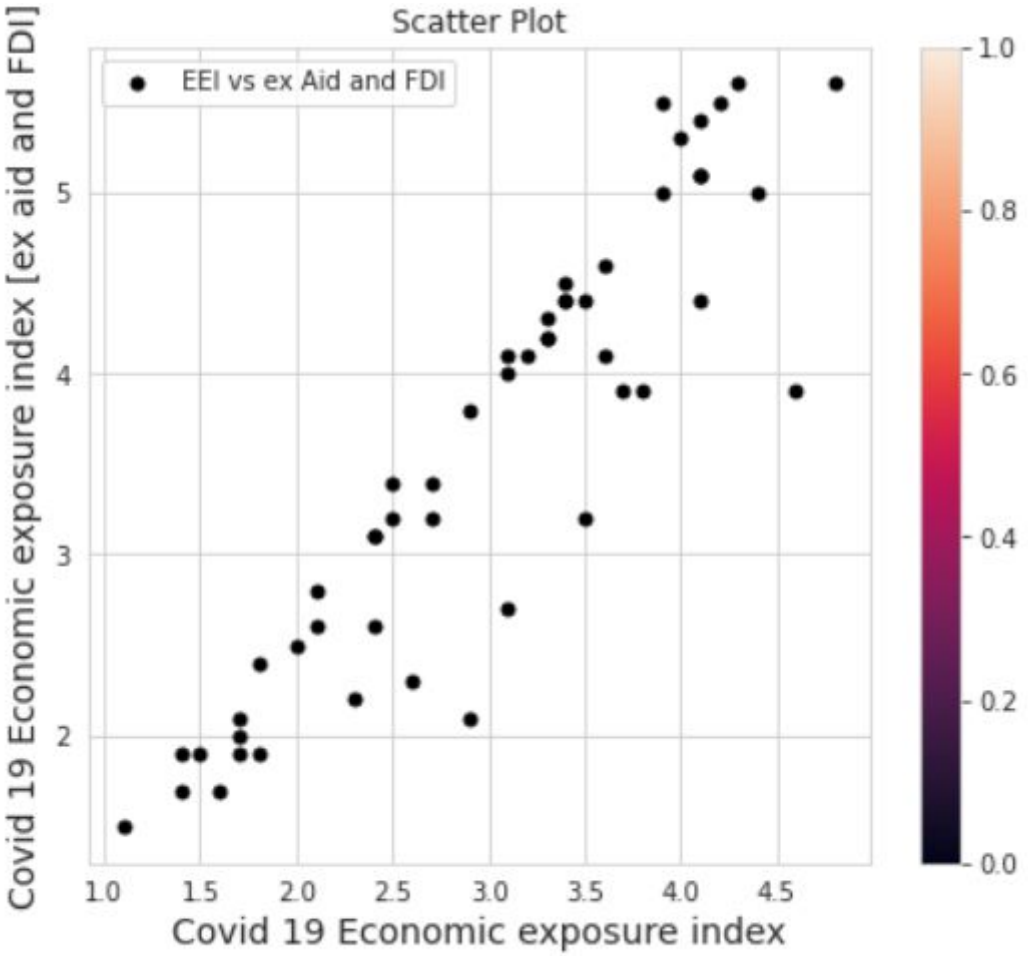


The above plot represents the top 5 countries with highest EEI which is basically the fluctuation in the market value of company or a fluctuation in the economic value of a country caused due certain factors. Companies can hedge against the unexpected currency fluctuations by investing in foreign exchange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

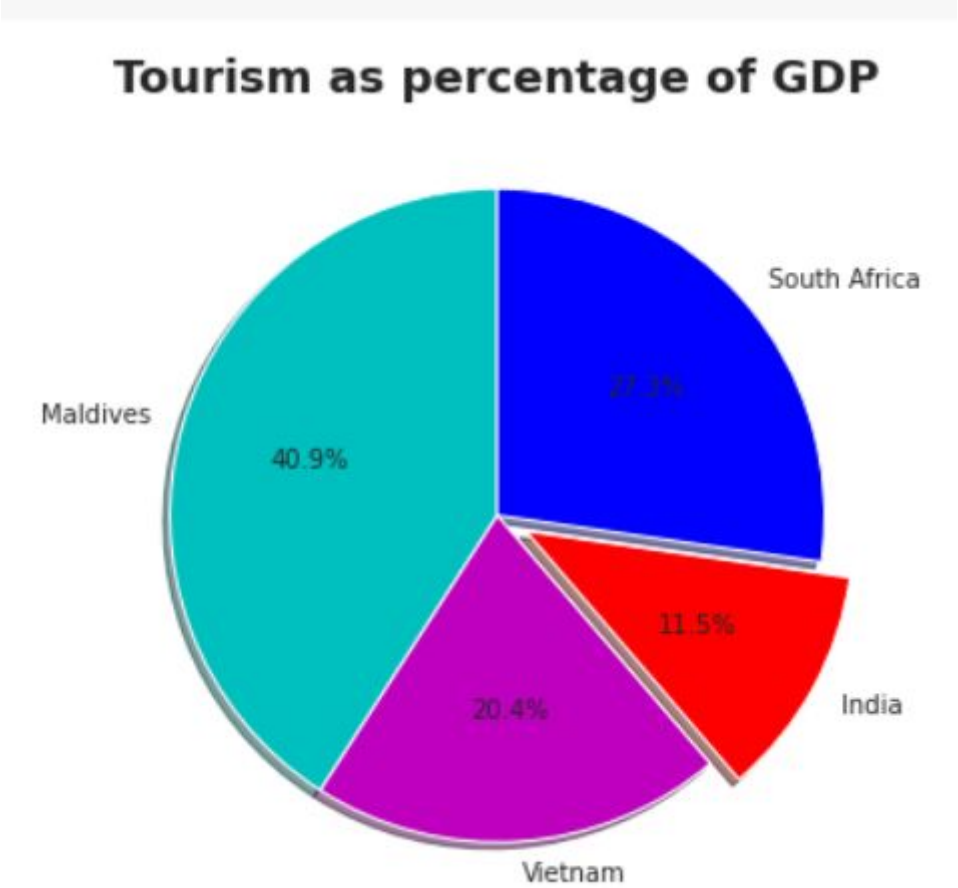
Plot2:


Top 5 Countries with highest EEI
Economic Exposure Index
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
Eritrea
South Sudan
Cyprus
Bahrain
Bahamas
Countries

Plot3:

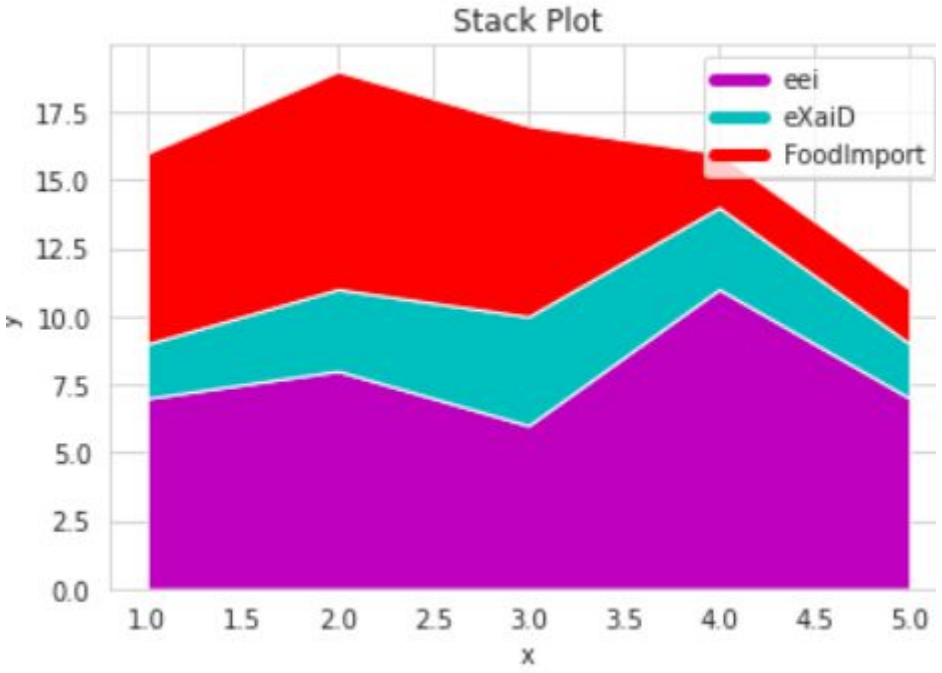

Scatter Plot
EEI vs ex Aid and FDI
Covid 19 Economic exposure index [ex aid and FDI]
Covid 19 Economic exposure index
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
2
3
4
5
0.0
0.2
0.4
0.6
0.8
1.0

Plot4:



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.

Plot5:


Stack Plot
eei
eXaiD
FoodImport
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
y
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
x

Plot6:

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

Plot7:

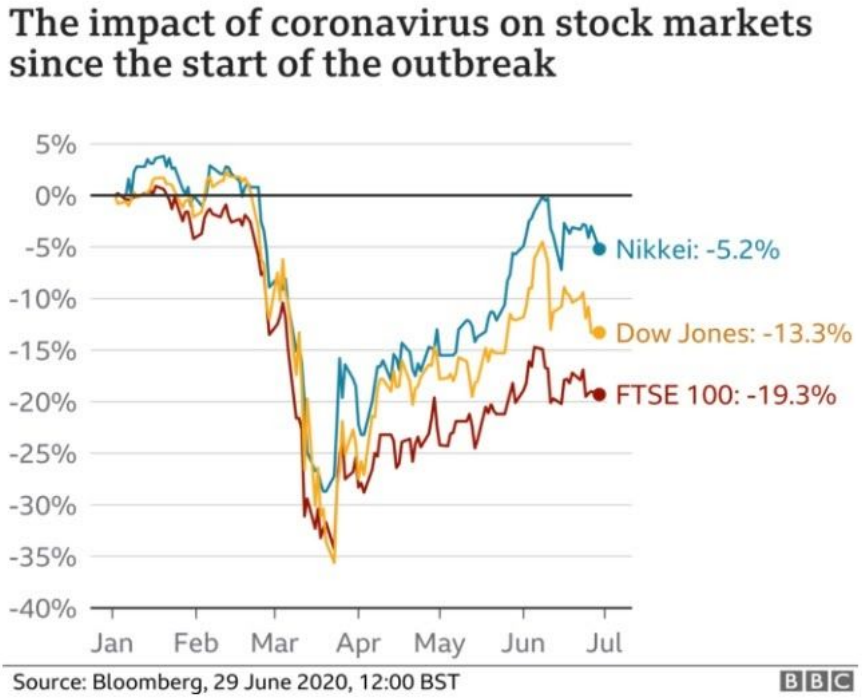
The above interactive plot shows that countries are dependent on the aid globally. Initially, foreign aid negatively impacts the countries' growth and over a period of time, it positively contributes to economic growth.

Plot8:

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

Interface Design

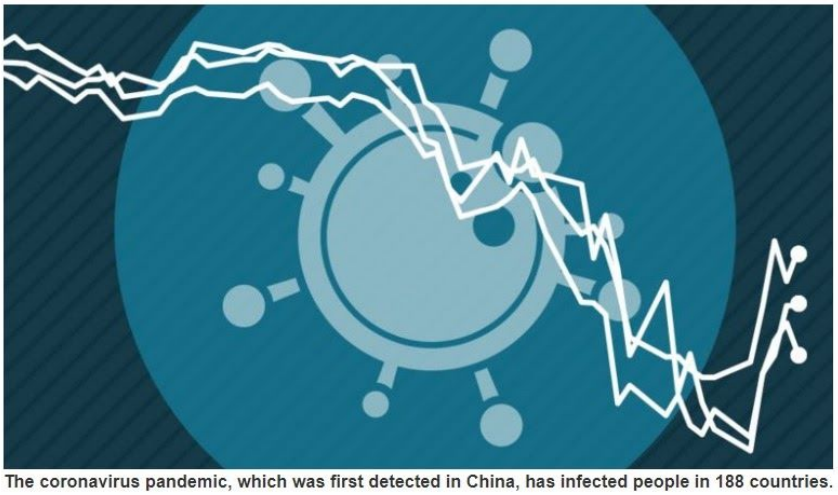
Coronavirus: A Visual guide to the economic impact



In response, central banks in many countries, including the UK, slashed interest rates. That should, in theory, make borrowing cheaper and encourage spending to boost the economy.

Coronavirus: A Visual guide to the economic impact

Coronavirus pandemic



The coronavirus pandemic, which was first detected in China, has infected people in 188 countries.

Covid_EEI	Tourism as GDP	Govt.Indebtness	Highest_EEI	EEI vs eXaiD	eXaiD vs Foodimport

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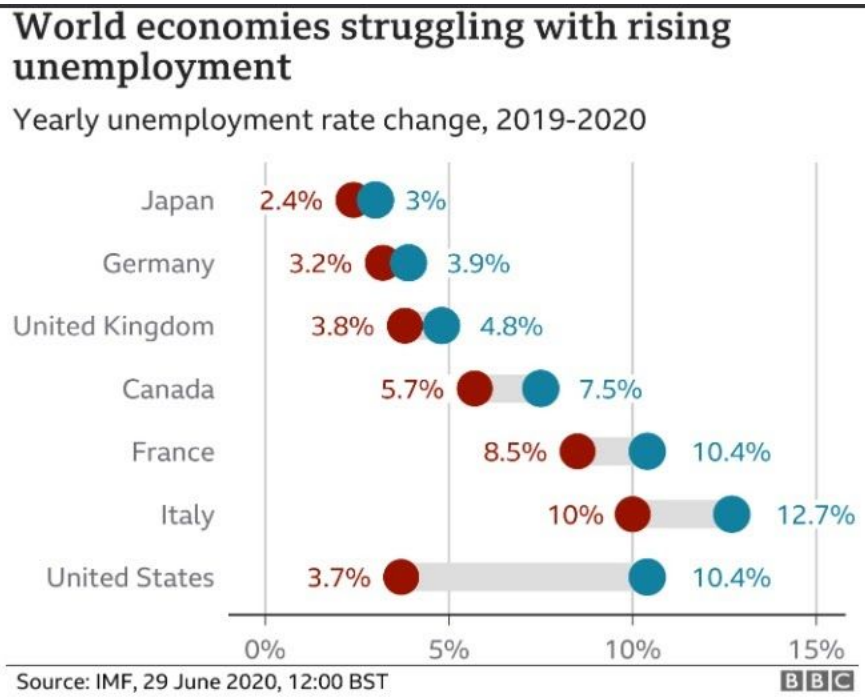


In the United States, the proportion of people out of work has hit 10.4%, according to the International Monetary Fund (IMF), signalling an end to a decade of expansion for one of the world's largest economies.
Millions of workers have also been put on government-supported job retention schemes as parts of the economy, such as tourism or hospitality, came to a standstill under lockdown.

Chapter 5: Testing

5.1 TESTING OBJECTIVE

Test Objective is the overall goal and achievement of the test execution. The objective of the testing is finding as many software defects as possible; ensure that the software under test is bug free before release.

5.2 TESTING SCOPE

This includes finding what features will be tested and can create the test cases necessary to evaluate them. Out of everything that we could possibly test, which features are the right ones to test. This helped in lower extraneous work and help concentrate on the most important elements of the software. Secondly it was decided how to test these identified features and by which technique.

Test Case Scope

The Test Cases will verify the correct functionality of Event Organizer portal.

5.3 TESTING PRINCIPLES

1. Timely start of testing.

2. Module wise testing

3. Testing by developer as well as tester

4. Unit and integrating testing by developer and testing team

5. Preparation of test metrices for defect and effort rates.

5.4 TESTING METHODS USED

System and Integration Testing

All the modules shall be tested after integrating them on the test server

Participants:

Tester will test the test cases and will send the test report to PM, developers.

Methodology:

Tester will write the test cases. Developer will help him by providing the unit test cases.

The goal of this step is to develop the simplest model able to formulate a target value fast and well enough. A data scientist can achieve this goal through model tuning. That's the optimization of model parameters to achieve an algorithm's best performance.

One of the more efficient methods for model evaluation and tuning is cross-validation

Cross-validation. Cross-validation is the most commonly used tuning method. It entails splitting a training dataset into ten equal parts (folds). A given model is trained on only nine folds and then tested on the tenth one (the one previously left out). Training continues until every fold is left aside and used for testing. As a result of model performance measure, a specialist calculates a cross-validated score for each set of hyperparameters. A data scientist trains models with different sets of hyperparameters to define which model has the highest prediction accuracy. The cross-validated score indicates average model performance across ten hold-out folds.

Then a data science specialist tests models with a set of hyperparameter values that received the best cross-validated score. There are various error metrics for machine learning tasks.

The common ensemble methods are stacking, bagging, and boosting.

Stacking. Also known as stacked generalization, this approach suggests developing a meta-model or higher-level learner by combining multiple base models. Stacking is usually

used to combine models of different types, unlike bagging and boosting. The goal of this technique is to reduce generalization error.

Bagging (bootstrap aggregating). This is a sequential model ensembling method. First, a training dataset is split into subsets. Then models are trained on each of these subsets. After this, predictions are combined using mean or majority voting. Bagging helps reduce the variance error and avoid model overfitting.

Boosting. According to this technique, the work is divided into two steps. A data scientist first uses subsets of an original dataset to develop several averagely performing models and then combines them to increase their performance using majority vote. Each model is trained on a subset received from the performance of the previous model and concentrates on misclassified records.

A model that most precisely predicts outcome values in test data can be deployed.

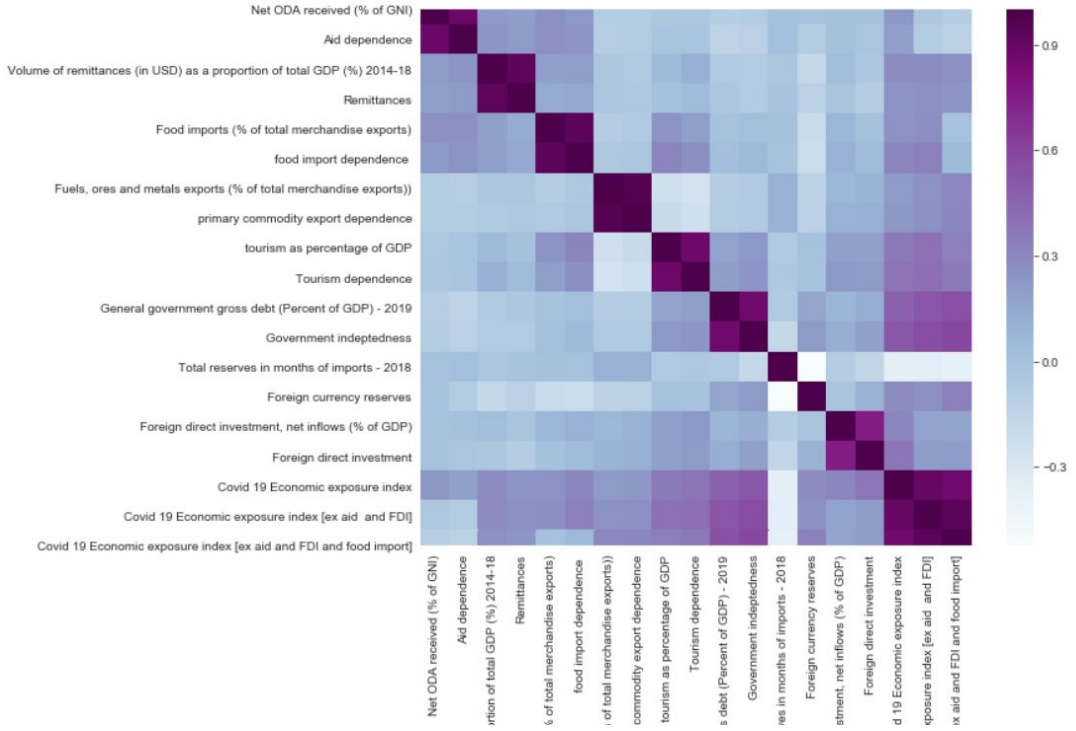
5.5 TEST CASES

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.

We have used 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.

```
In [4]: plt.figure(figsize=(10,8))
        sns.set_style('whitegrid')
        correlations=df.corr()
        sns.heatmap(correlations, cmap='BuPu')

Out[4]: <matplotlib.axes._subplots.AxesSubplot at 0x26717d67908>
```



Our project aims to train 3 models for -

1. COVID-19 EEI

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.

```
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
```

2. COVID-19 EEI [ex aid and 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]

```
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
```

3. COVID-19 [ex aid, FDI and 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',

```
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
```

TEST RESULTS

Upon completion, each test procedure shall be checked off and the tester who executed the test case shall sign each test case. In addition, for each test case the tester should clearly indicate the date, duration, software release number, result (pass/fail) and if fail, associated SR problem reporting number.

CHAPTER 6: LIMITATIONS

Although we have put our best efforts to make the software flexible, easy to operate but limitations cannot be ruled out even by us. Though the software presents a broad range of options to its users some intricate options could not be covered into it; partly because of logistic and partly due to lack of sophistication. Lack of time also compelled me to ignore some part such as storing old result of the candidate etc.

1.Limited Access to Information

Our project may involve some organizations and people in the research, and sometimes you may get problems with access to these organizations. Due to this, we need to redesign and rewrite your study.

2.Time Limits

Needless to say, all the project have their deadlines when they need to complete their studies. Sometimes, time constraints can affect our project negatively. I

3.Conflicts on Biased Views and Personal Issues

Sometimes can have biased views because of their cultural background or personal views. Needless to say, it can affect the research. Apart from this,project with biased views can choose only those results and data that support their main arguments.

CHAPTER 7: Future Scope

The primary goal is to help companies make more informative business decisions by analyzing large volumes of data. Having a deep understanding of the proper methods of handling risks in exchange rate is top priority of foreign exchange investors because it has a great effect on their respective businesses.

Having the working knowledge will definitely help you lessen the impact of the risks involved. Instead, we must take a careful look at market signals across asset classes, recession and recovery patterns, as well as the history of epidemics and shocks, to glean insights into the path ahead.

The use and adoption of this model within governmental processes allows efficiencies in terms of cost, productivity, and innovation. For investors who build and analyse investment programmes, measuring economic exposure should be part of a broader toolkit. There are numerous applications in:

1) Improving The Decision-Making Process
2) Uncovering Fresh Business Insights
3) Boosting Productivity
4) Increasing Sales
5) Improving Financial Efficiency

CHAPTER 8 :Conclusion

The coronavirus disease continues to spread across the world following a trajectory that is difficult to predict. The health, humanitarian and socio-economic policies adopted by countries will determine the speed and strength of the recovery. COVID-19 has affected the global economy in three main ways: by directly affecting production, by creating supply chain and market disruption, and by its financial impact on firms and financial marketsThe COVID-19 pandemic is far more than a health crisis: it is affecting societies and economies at their core. While the impact of the pandemic will vary from country to country, it will most likely increase poverty and inequalities at a global scale, making achievement of SDGs even more urgent.

The outbreak of a novel human coronavirus has become a global health concern causing severe respiratory infections in humans. The virus is rapidly spreading and the number of persons infected across nations is significantly increasing as no specific therapies are available for the disease. Only isolation, containment and prevention of further spread are crucial to arrest the outbreak and to control infectious disease. There is a direct disruption to global supply chains due to the outbreak of coronavirus. Lesser demand for goods and services which are imported and the decrease of tourists around the globe are adverse effects of this disease. Higher public investment along with other fiscal support needs to be promoted and long term low-interest rate is essential to push the global economy.

CHAPTER 9 : References

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