MACRO ECONOMY ANALYSIS REPORT

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INDEX – COHNDDS23.1F-007

Introduction

Here I have performed some analysis and some visualizations using the Dataset given. Also I have performed some hypothesis testing using **R language**. For the Linear regression model I have used **Python** to predict next 5 years prediction Export and import ratio.

Step 1: Data Exploration

```
## # A tibble: 6 × 6
##    Year    ST    EI    IH `GDP ($Mn)` `BI ($Mn)`
##   <dbl> <dbl> <dbl> <dbl>       <dbl>      <dbl>
## 1  1983 0.335 0.623  2.06        168.       40.7
## 2  1984 0.33  0.616  2.1         298.       78.6
## 3  1985 0.335 0.647  2.17        102.       32.1
## 4  1986 0.33  0.652  2.21        124.       38.1
## 5  1987 0.334 0.68   2.23        146.       56.1
## 6  1988 0.325 0.682  2.2         158.       56.3
```

Here I have loaded the dataset and here we can see all the columns of that particular dataset.

Step 2: Data Loading and Cleaning

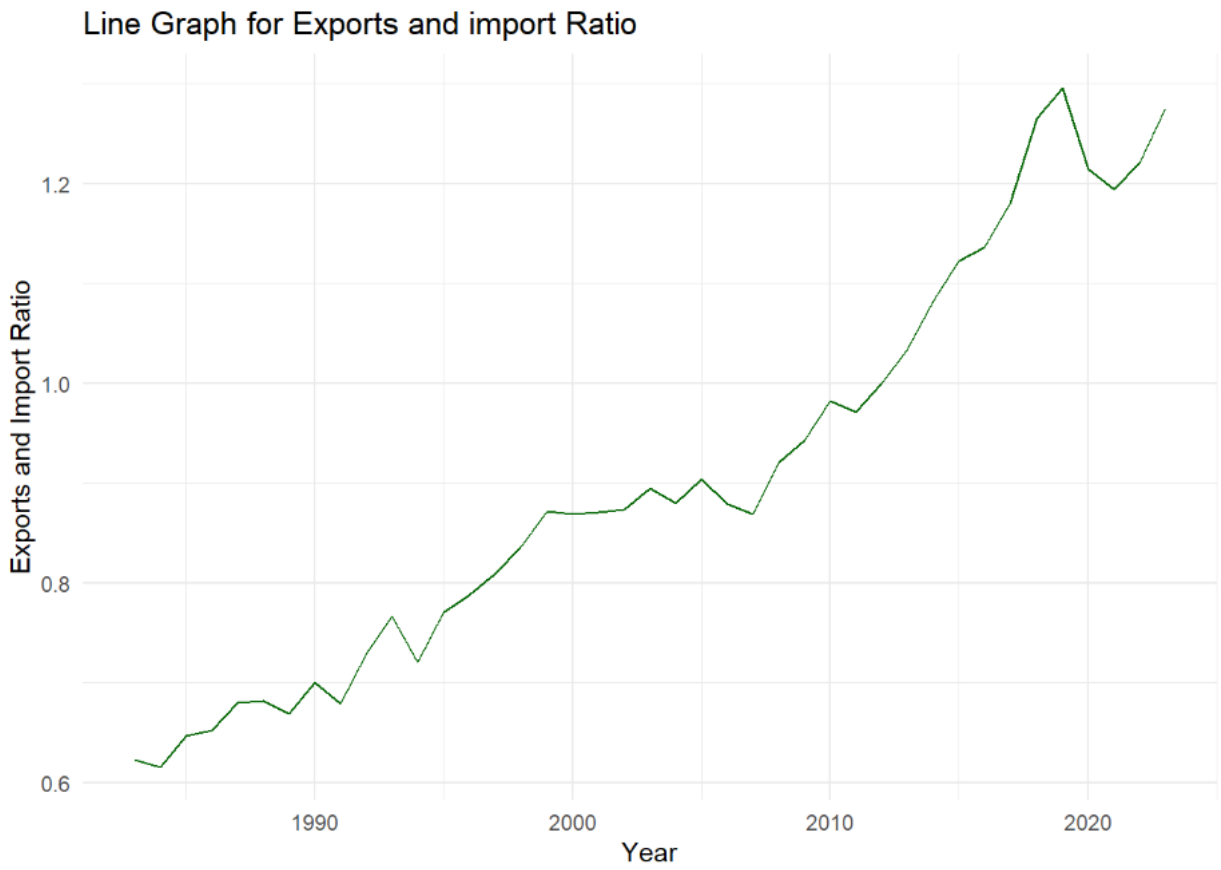
```
##      Year        ST        EI        IH GDP ($Mn)  BI ($Mn)
##         0         0         0         0         0         0
```

Here I have checked the null values in that dataset. But it has no null values.

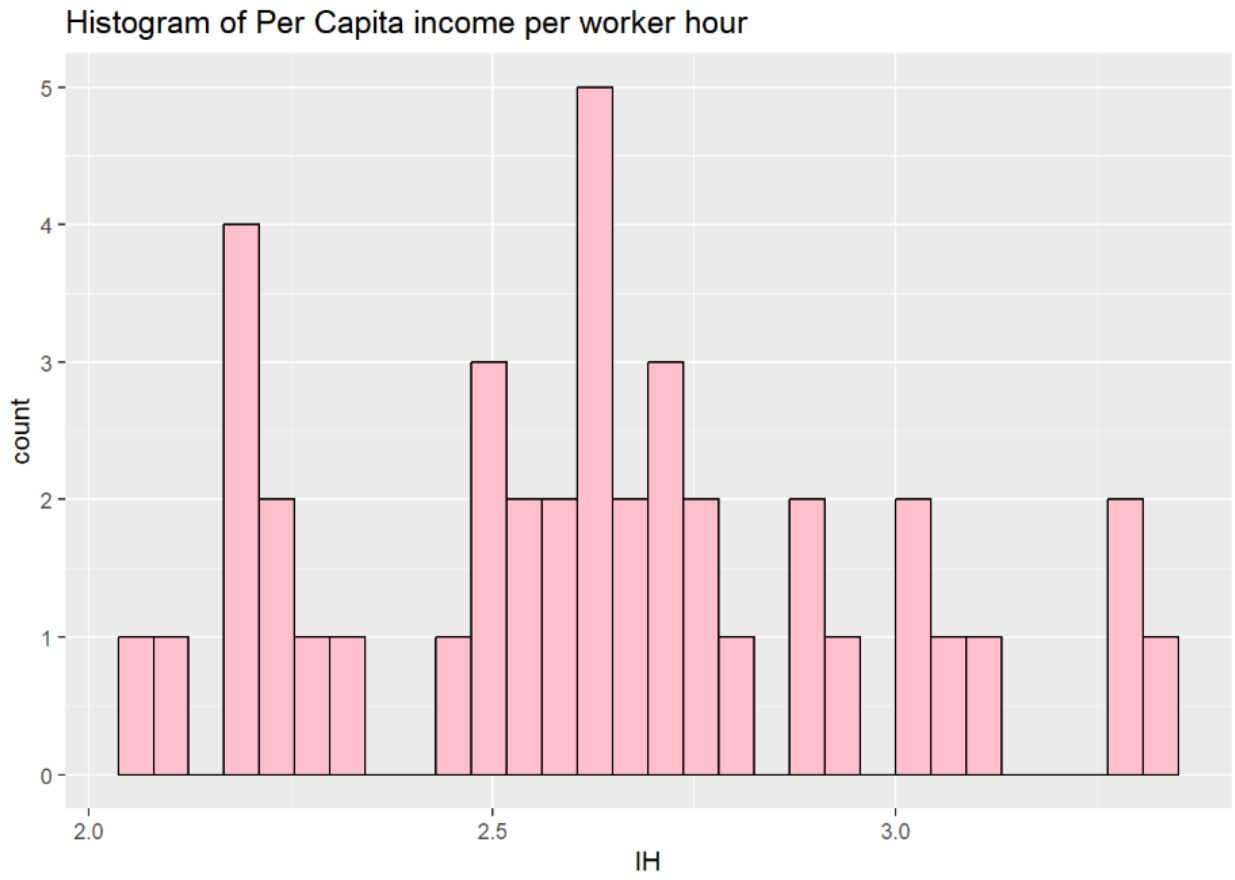
Step 3: Descriptive Statistics and Visualization

```
##       Year            ST              EI              IH       
##  Min.   :1983   Min.   :0.3120   Min.   :0.6160   Min.   :2.060  
##  1st Qu.:1993   1st Qu.:0.3300   1st Qu.:0.7290   1st Qu.:2.470  
##  Median :2003   Median :0.3370   Median :0.8740   Median :2.630  
##  Mean   :2003   Mean   :0.3413   Mean   :0.9053   Mean   :2.631  
##  3rd Qu.:2013   3rd Qu.:0.3540   3rd Qu.:1.0340   3rd Qu.:2.810  
##  Max.   :2023   Max.   :0.3970   Max.   :1.2960   Max.   :3.330  
##    GDP ($Mn)        BI ($Mn)      
##  Min.   :102.3   Min.   :32.12  
##  1st Qu.:148.9   1st Qu.:40.89  
##  Median :192.3   Median :56.26  
##  Mean   :206.7   Mean   :54.33  
##  3rd Qu.:232.0   3rd Qu.:64.08  
##  Max.   :498.2   Max.   :95.44
```

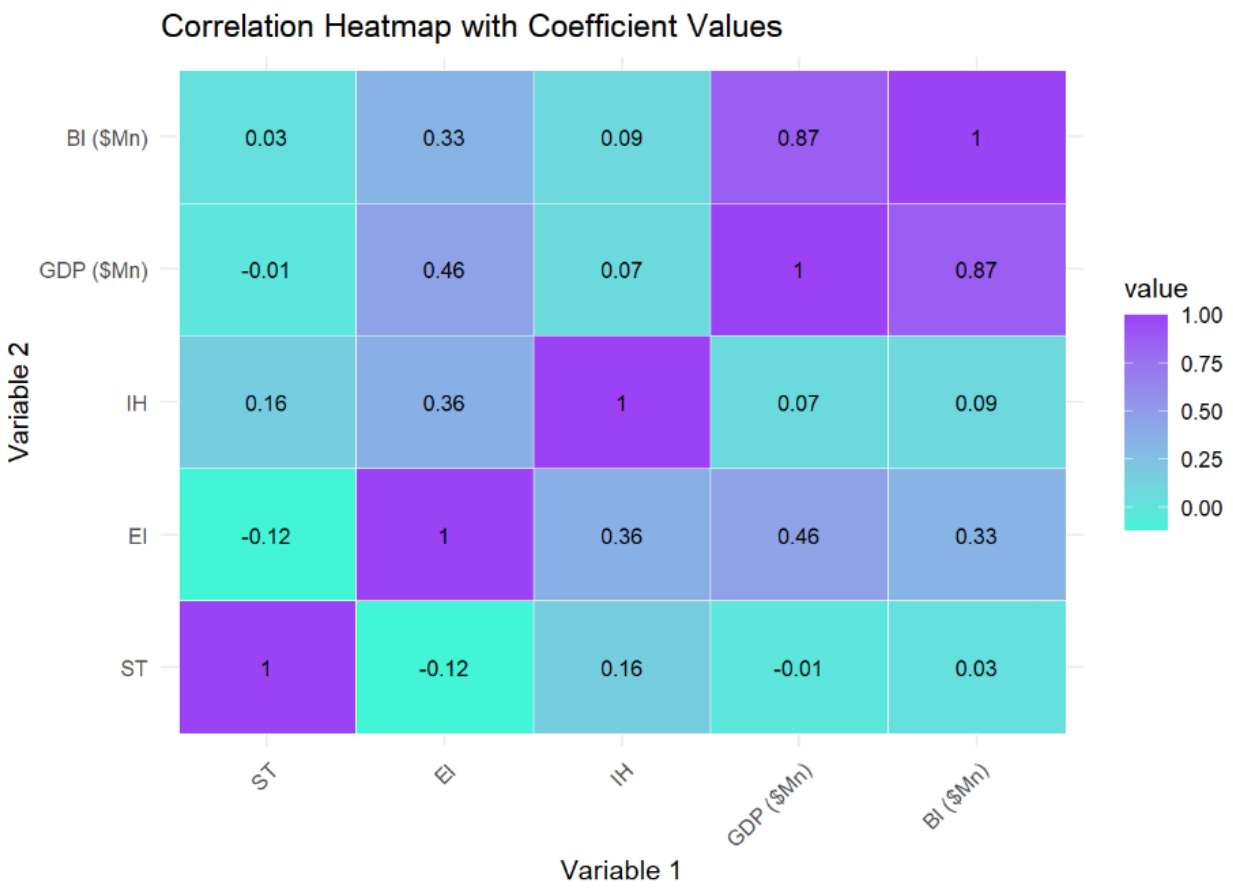
Here I have done descriptive statistic for my dataset such as mean, median, maximum value, minimum value, etc.



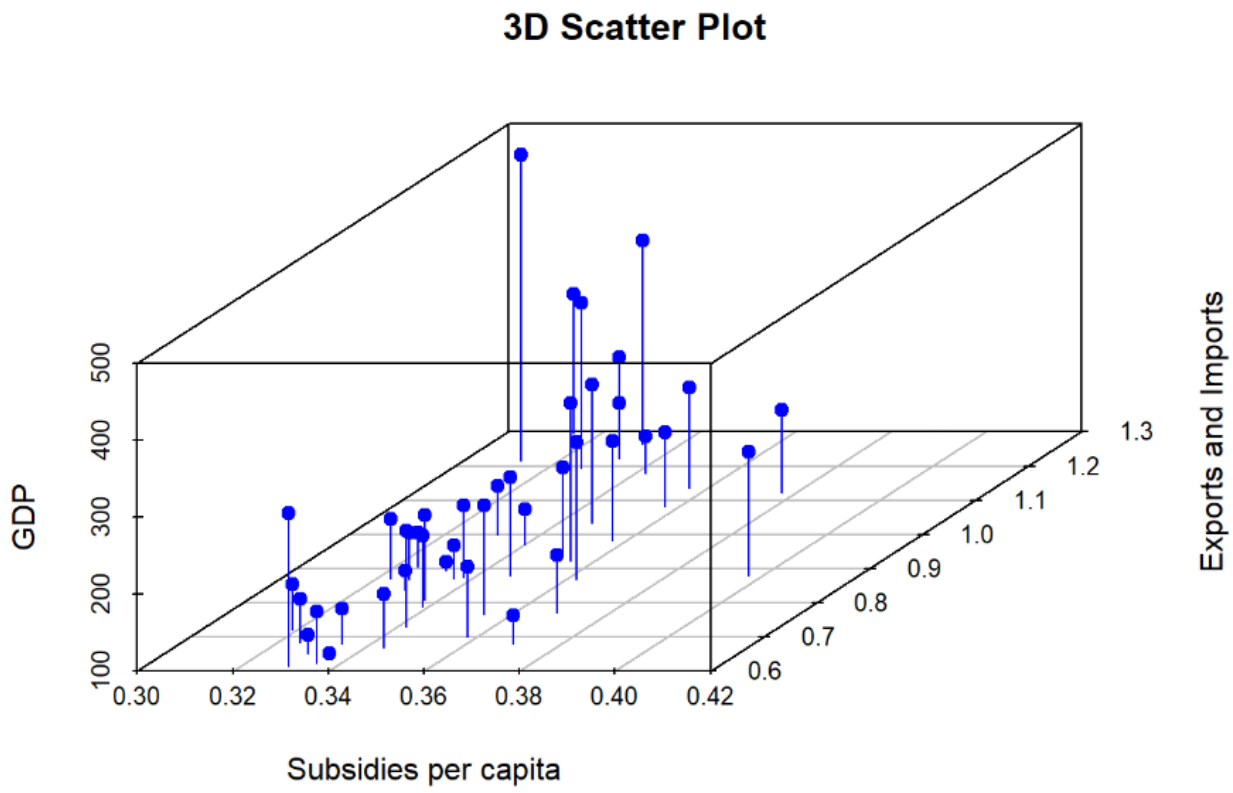
For the above line graph. Here it looks like by the year 2012 the exports and import ratio has reached the value of 1.0 which means imports = exports. After that we can see a continuous growth in the Export and the imports until 2019. After that there is a sudden decrement.



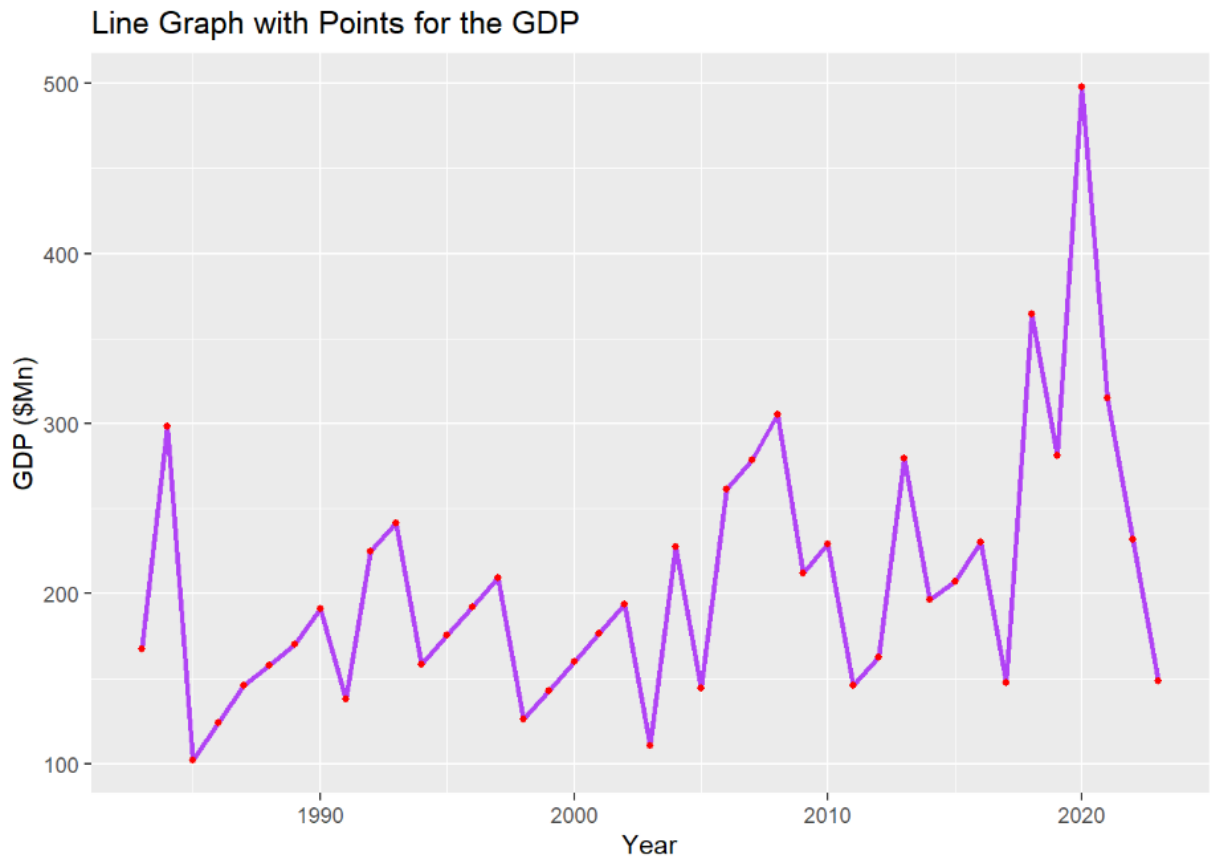
Here the above histogram is about, the distribution of Per Capita income per worker hour. Here the distribution of that variable looks like very much spread. Not symmetrically bell shaped. So we can say that the Per Capita per worker hour is not stable here. That is not good for the economy of the country.



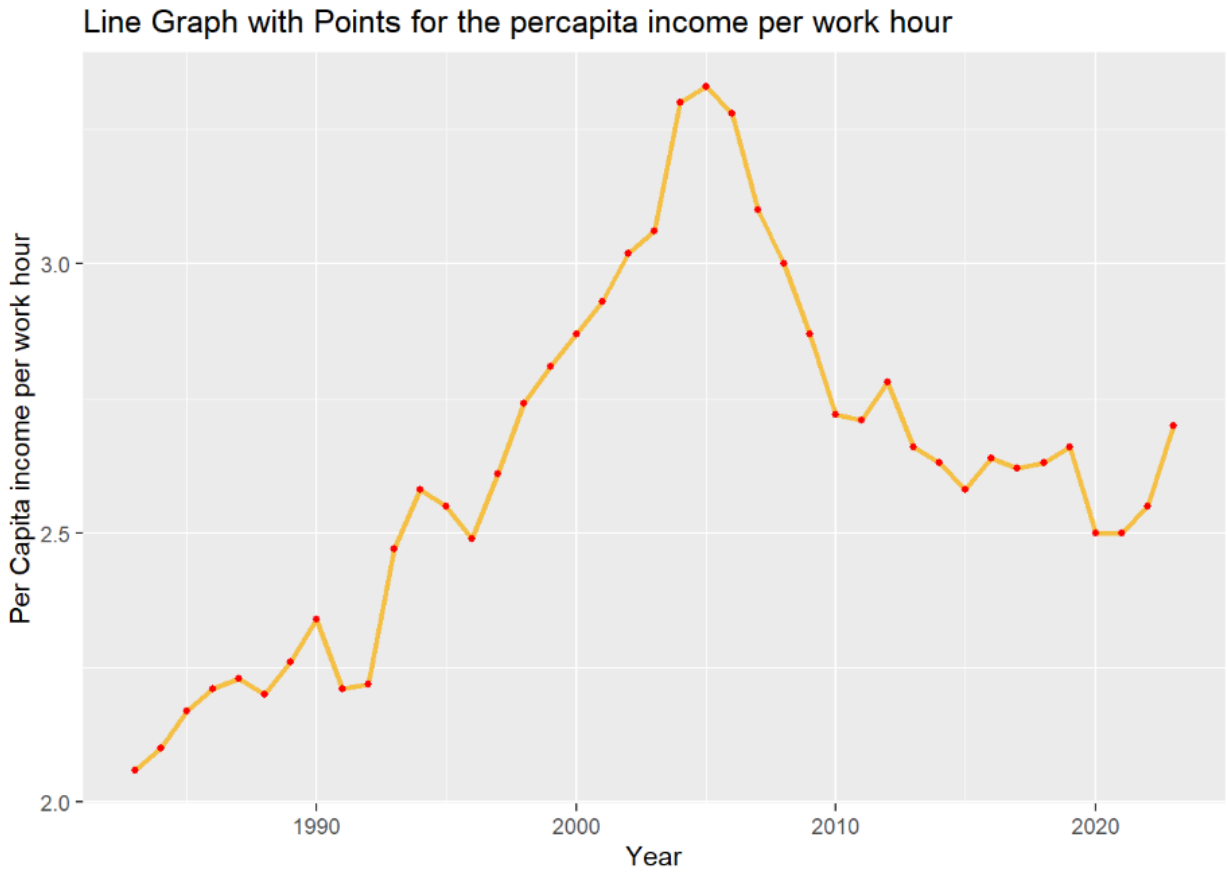
The above plot is a correlation map which shows the relationship between variables by measuring correlation. The darker box tells that there is a high correlation between those variables. In the above Correlation Heatmap, we can see that Export and imports, Business investments are highly correlated. Which means it has a big impact on nations GDP.



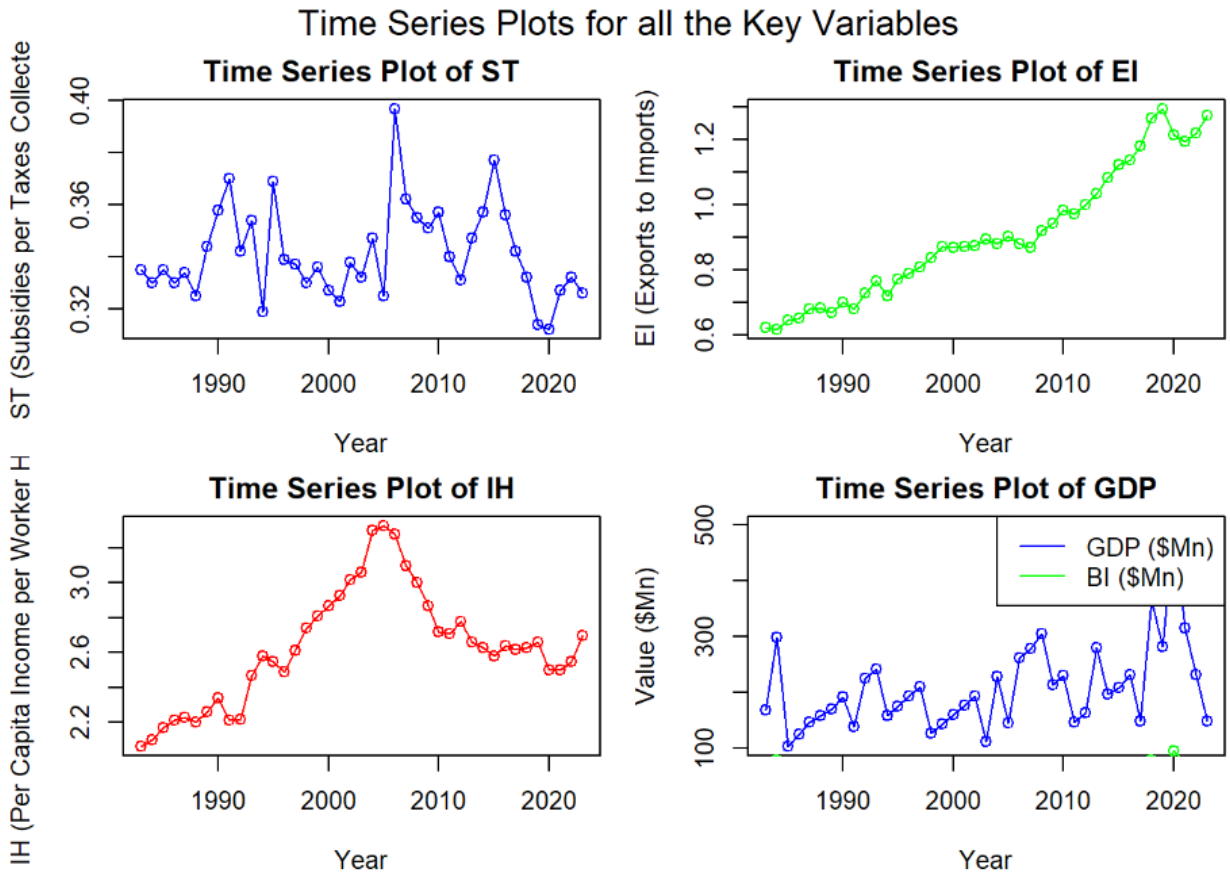
The above 3D graph shows the relationship between GDP , Subsidies per capita, Export and Imports. So Here it clearly shows that GDP is low when the Subsidies per capita and the export and import is low. In other word we can say that the Subsidies are low when the Export and import are low. So we can see a good correlation between these 3 variables. Importantly we can also see that GDP is high when the subsidies and Exports and imports are high.



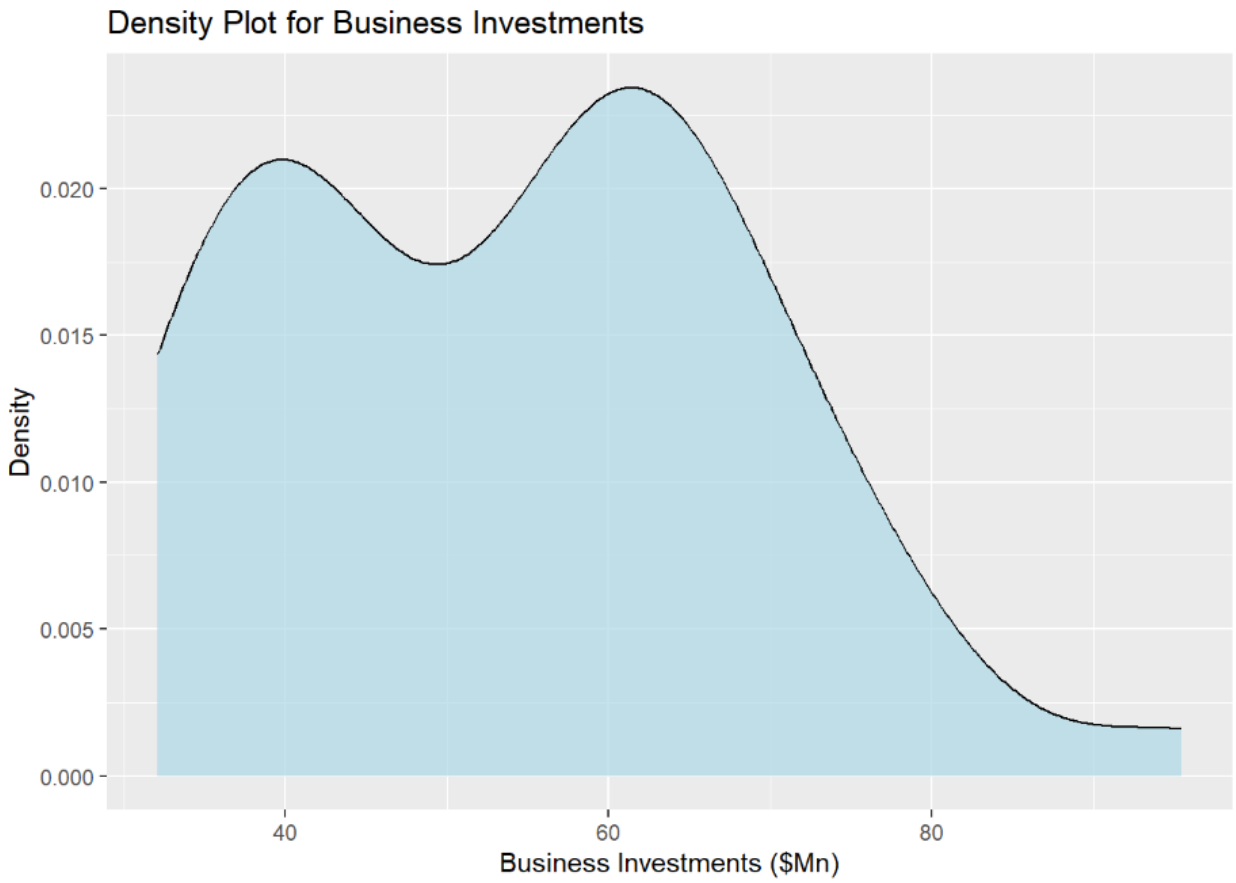
The above plot is a line graph which shows the GDP growth till 2023. In the above graph we can see a sudden huge fall in the GDP. We call can guess the reason for that is because of the economic crisis all over the world due to covid 19.



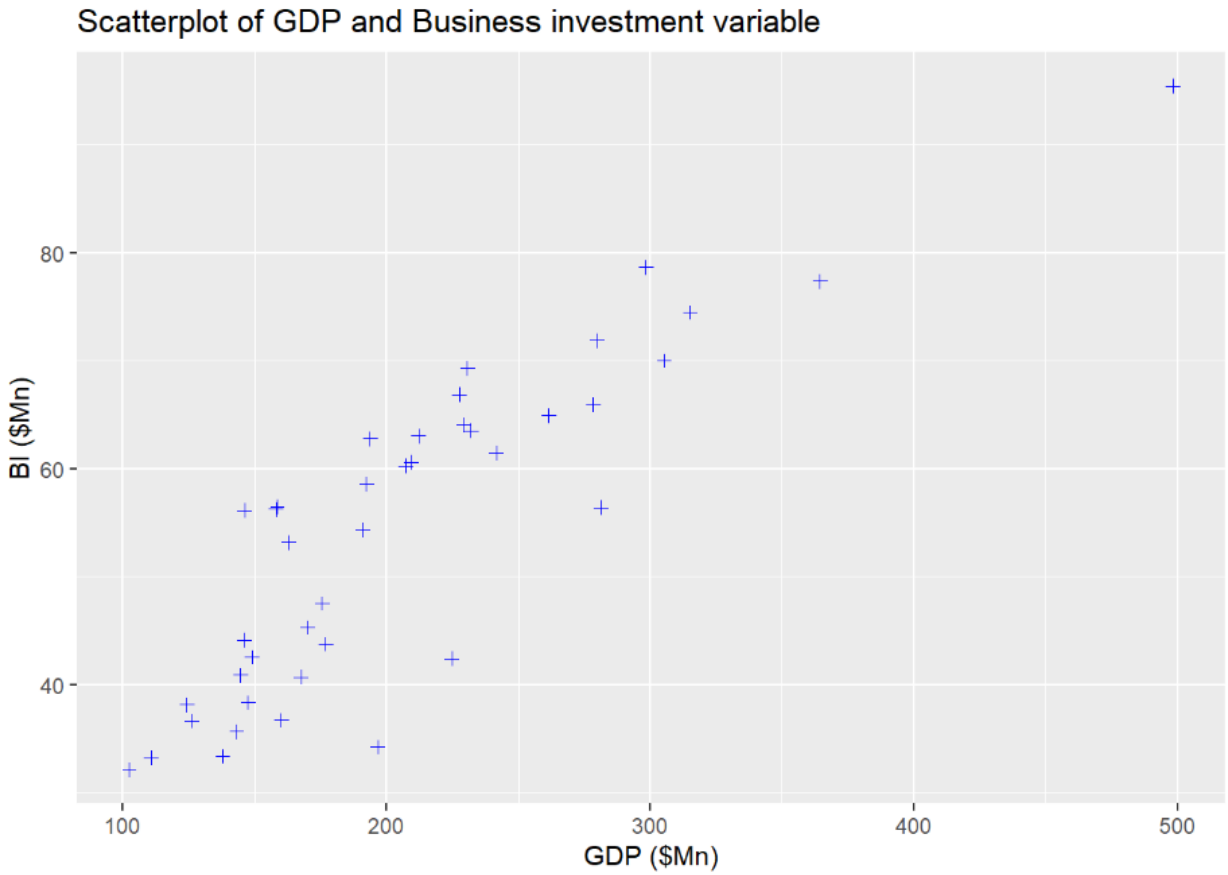
The above plot is a line graph which shows the growth of the per capita income per work hour (ratio) till 2023. In here it is a bit different from the GDP graph. In here we can see a sudden fall by 2005 itself. Which means it affects the countries' Earning Efficiency, cost of living, Income disparity, Labor market conditions and etc. So that ratio has fallen from 3.5 to 2.5 until 2020. Then it has started rising again.



The above image shows 4 timeseries plots for 4 different variables in a single plot. So it contains the growth information of Export and Import. GDP , Per capita per worker.



The above graph is a density plot which shows the distribution of business investments. When we check the distribution of this variable it is not symmetrically bell shaped which means it has a spread distribution. In other words we can say that the distribution of business investment is not good which is not good for the country's economy.



The scatterplot above shows the relationship/ correlation between GDP and Business investments. From the chart, a positive linear correlation is visible (When one variable increases, the other tend to increase as well). In another word we can say that the both variable has a good positive relationship. Also we can say that the business investment has a big impact on the country's GDP.

Step 4: Analysis and Interpretation.

1) **Hypothesis Testing**

hypothesis = is there any relationship between Export and index and the Bisiness Investment.

Null hypothesis(H0) = There is no relationship between Export and index and the Bisiness Investment.

Alternate Hypothesis (H1) = There is a relationship between Export and index and the Bisiness Investment.

```
Call:
lm(formula = EI ~ `BI ($Mn)`, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-0.39780 -0.13617 -0.00116  0.11127  0.42221

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 0.662960   0.113248   5.854 8.26e-07 ***
`BI ($Mn)`  0.004461   0.002010   2.219   0.0323 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1923 on 39 degrees of freedom
Multiple R-squared:  0.1121, Adjusted R-squared:  0.08938
F-statistic: 4.926 on 1 and 39 DF,  p-value: 0.03234
```

So i performed hypothesis testing for this using R. For that I got the p-value of 0.03234. So if it is less that 0.05, we have to reject the null hypothesis and we have to go with the alternative hypothesis. So accordingly, here we can see that the p value is less that 0.05. So that means we can't reject the null hypothesis. So we have to go with the alternative hypothesis. which means There is a relationship between Export and index and the Business Investment.

2) **Regression Analysis**

For the regression analysis, I have done a linear regression model in order to predict the Export and import Ratio based on the Dataset provided. For that I used python language.

```
Year 2024: Predicted Exports and Imports = 0.99
Year 2025: Predicted Exports and Imports = 0.84
Year 2026: Predicted Exports and Imports = 0.85
Year 2027: Predicted Exports and Imports = 1.03
Year 2028: Predicted Exports and Imports = 0.76
```

So here the above image shows the predicted out put ratio for the next 5 years. It It is based on the provided Data.

Step 5: Conclusion and Communication

So for the summary. I found that the Business investment variable and the GDP has high positive correlation which means, The change of one will affect another. In other word we can say that the Business investment and also import and export has a massive impact.

Appendices.

Assignment 1_COHNDDS23.1F-007

Assignment_COHND DS23.1F-007.html