

DATATHON - V

GDP AND EXCHANGE RATES

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Abstract—In this report we present the results and the methodology used to visualise the GDP and the relative exchange rates of various countries.

We attempt to present the visualizations using Treemaps, Parallel coordinates plot (PCP) and Scatter matrix plots. We opted out for the Sunburst plot for hierarchical visualizations as treemaps were sufficient for the purpose of this report.

I. INTRODUCTION

The document attempts to visualize the data for various countries based on their GDP and exchange rates and try to find out a generalized trend from the countries with higher exchange rates.

The document is divided into various sections. Initially, in the 'Data' section we brief about the data that was available and the subset of data used for creation of this report. Under 'Methodology' we cover the preprocessing and filtering we applied on the data to make it useful for our purpose. Then we move to the 'Visualisations' in which we present the visual representation of the data along with the inferences drawn from them. Finally we share the 'References' we used for the task.

II. DATA

The UNECE's Country Overview data was used for this report. The data is publically available. The data basically consists of data of 52 countries for a range of 17 years ranging from [2000-2016]. The data consists of multiple attributes. Grouping them together and naming a few would be:

- The population of the nations divided according to the gender and in three age groups (0-14, 15-64, 64+).
- Life expectancy of each of the groups of population.
- Computer using population.
- Women workers in various fields like clerks, plant and machine operators, government etc.
- The GDP of the whole country and various units.
- The GDP from various sections of the society.
- And a few miscellaneous attributes like road accidents and railway line length etc.

For the current report we used the data related to the exchange rate of each country and the total as well as field specific GDP of each country.

We focused on the data for a period of 6 years, from 2005 and 2010. The purpose of this choice was the fact of global recession in 2008. We focus on this period in two sets. Before the recession and after the recession.

III. METHODOLOGY

As already mentioned in the previous section, we used the data for a period of 6 years [2005,2010]. As the data was only for countries we externally added the 'Continent' attribute to each country.

The first task using the subset of the data is that, we extracted the exchange rates of the countries. The data had the exchange rates (XR) with the units as national currency units (NCU) per US dollars. For better understanding of the data we took the inverse of the data and converted the data in US dollars per NCU. Thus the countries with $XR > 1$ are relatively "stronger" in terms of financial securities than the ones with $XR < 1$ taking United States as the reference.

After calculating the exchange rates (XR) we took a mean of the XR separately for the pre-recession period [2005,2007] and post recession period [2008,2010].

Later for the purpose of studying the GDP trends of the countries the data was just normalized according to the range of values that particular value took.

We observe the nations with exchange rates higher than 1 for this purpose as we expect to extract better inferences from them and nations financially stronger would have a stable curves.

IV. VISUALIZATIONS

We visualize the available data in the form of a Treemap. The root for the tree is named as 'World' under which we have the continents as the first level. Under each continent we have the countries we're studying. The data only consisted of 52 countries under 3 continents.

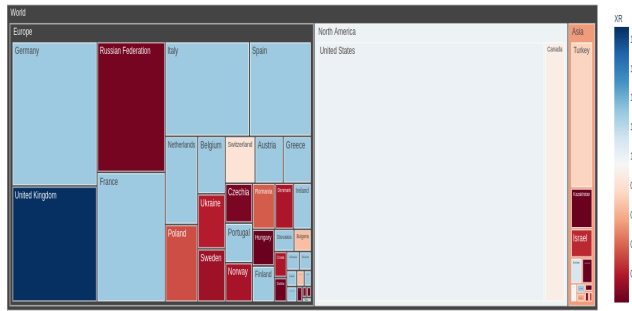


Fig. 1: Before Recession : GDP, XR Treemap

The size attribute for each section of the indicates the total GDP of the country. And the exchange rates have been colored map using a diverging color map.

Fig 1. shows the data for the countries before the 2008 recession. We observe that USA had exceptionally highest gross GDP among all the countries. Among other countries, we observe the European countries, Germany, United Kingdom, Russian Federation and France had the next higher gross GDP. Spain and Italy also had high GDP followed by low GDP European countries. Among all the three continents, Asia seemed to have the lowest gross GDP that too Turkey contributing to it the most along with small contributions from Kazakhstan and Israel.

But observing the color mapping we observe that United Kingdom has the highest exchange rate per US dollars. We see that major European countries with relatively high GDP have a positive exchange rate except Russian Federation which has really low exchange rate. Other smaller countries in Europe have exchange rates lower than 1 with a few exceptions. Moving to Asia we observe that all the countries have low exchange rates.

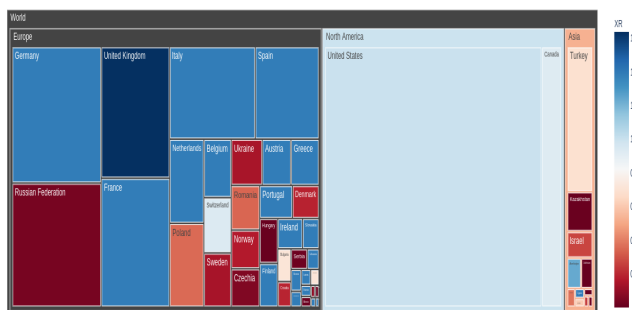


Fig. 2: Post Recession : GDP, XR Treemap

Fig 2. visualizes the GDP and exchange rate data during and post the recession period [2008,2010].

Comparing it with the before recession period the gross GDP did not show much change much. The most observable change was the Russian Federation crossed United Kingdom in terms of gross GDP. We observe a few changes in the GDP of the smaller European nations. The nations such as Portugal seem to have lost a bit of GDP during the recession period where as Ukraine, Switzerland and Ireland move up the GDP level.

Moving up the hierarchy we observe the North American gross GDP to have reduced compared to before recession. From this we and above mentioned observations we believe the North American nations to be affected by the recession the most compared to the European and Asian nations.

We observe a few changes in the exchange rates of the nations as well. In the continent of North America, Canada, we observe that Canada has reduced it's gap with United states and the exchange rate reaching closer to 1. Similarly Switzerland has moved closer to 1 in terms of exchange rates per US dollar.

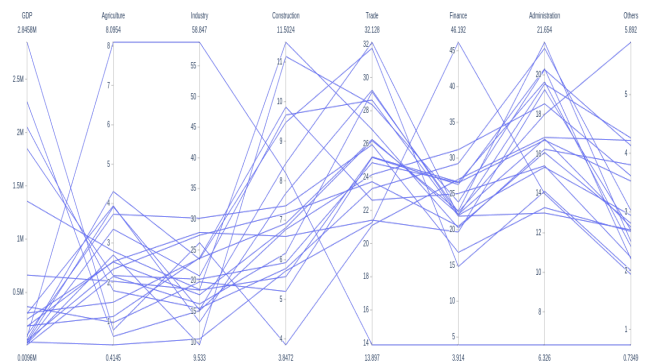


Fig. 3: Parallel Coordinates Plot : GDP

Using Fig 3. and Fig 4. we try to observe the GDP trends for the nations with exchange rates higher than 1.

We get a better understanding of that using Fig 4, where we plot the scatter matrix plot for all pairs of attributes.

Observing Fig 3, and pairing different coordinates together we observe a few dependencies of a few fields of the society who's contributions to the gross GDP move together.

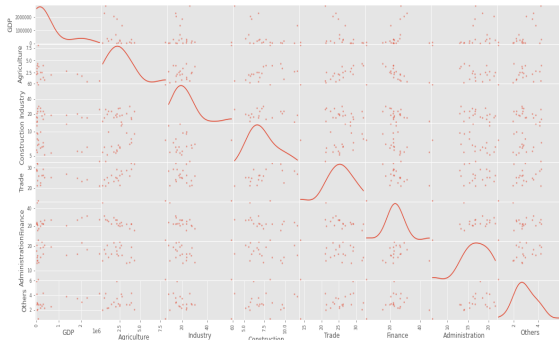


Fig. 4: Scatter Matrix Plot : GDP

The fields we observe which contribute to the GDP are as follows:

- Agriculture
- Industry
- Construction
- Trade
- Finance
- Administration
- other fields clubbed

Moving as per the above list, Agriculture seems to have a positive relation with Construction and Trade, whereas it shows a strong negative relation with the field of Finance. Moving to Industry, although it doesn't show much of inclination towards or away from any other field but there is a slight positive relation between Trade and Industry. Construction shows a positive relation with Trade and is random with other fields contributing to the GDP. Trade, other than the earlier mentioned fields doesn't show any particular relation with the other fields. Finance as earlier mentioned shows a negative relation with Agriculture. Other than that we do observe a bit of positive relation with Administration. The "other" fields more or less show a random relation with the other mentioned fields.

V. IMPLEMENTATION

All the preprocessing mentioned under the methodology section were done using python and pandas library. For the purpose of visualizations we used the plotly python library.

VI. REFERENCES

Plotly : Treemaps <https://plotly.com/python/treemaps/basic-treemap-with-plotlyexpress>

Plotly : Sunburst <https://plotly.com/python/sunburst-charts/using-an-explicit-mapping-for-discrete-colors>

Plotly : Parallel Coordinates Plot
<https://plotly.com/python/parallel-coordinates-plot/>

Plotly : Scatter Matrix
<https://plotly.com/python/splom/styled-scatter-matrix-with-plotly-express>