# World Economics Visualization Report

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**Abstract**

***In this paper, a visualization is created using world economic factors which enables the decision-makers to visualize multi-dimensional data and identify new growth patterns.It gives a detailed explanation on how the data pre-processed, visualization task and encoding techniques are incorporated in the visualization. The visualization helps in performing a comparative analysis between the countries in understanding there growth trends and classifying them as developing or developed countries.***

## 1. Introduction

Data Visualisation is a presentation of data in a pictorial or graphical format. The fundamental information that affects a business or an investment's value are economic factors, and it is necessary to consider these factors before determining the current and expected future value to upcoming firms or investment portfolio in a country. A creative dashboard is created to help users understand the complex relation between the data with the help of an industry level tool known as Tableau. With tableau's interactive visualisation, we can take the concepts a step further and drill down into more details, interactively by filtering the data and categorising it into various bands.

## 2. Data Pre-processing and description

We have used three different datasets - World Health Expenditure [Hda] (includes health expenditure), world GDP 2016 (contains the GDP, inflation rate, population etc.) [Eda] and World Military Expenditure dataset [Mda] (consists of last ten years of military spending). For better visualisation, values like GDP, population, military expenditures have been scaled down for easy understanding. At various instances, null/missing values have also occurred so instead of performing any calculation we have ignored those rows if the size of the country on the map is significantly small else manually we have replaced values by searching them on the web. Once all three datasets are ready, with the help of inner join we merged them by keeping the Country name as the primary key. The new dataset contains 154 data points and 16 features. Each data point represents a country, and other features include its corresponding values.

## 3. Visual Tasks

A choropleth map, treemap, packed bubbles and bar charts are used to visualise. Both map and packed bubbles show a quantitative attribute encoded as colour over regions. The world map consists of shapes of each part determined by geometry. Different types of actions associated with our visualisation are:

1. *Discover* - The discover [Mun14] goal refers to finding new knowledge also known as exploring unknown artefacts. The existence of new correlations between features can be checked which can ultimately help in deriving new hypothesis for our model, or it can also test the current hypothesis that it holds true or false.
2. *LookUp* - Users are already aware of what they are looking and in this users can navigate easily through world demographic sheet. As the user selects on the country, all the other screens will be displaying related data to that country for better lookups.
3. *Compare* - Comparisons between the countries can be made using filters. Multiple countries can be selected, and all features can be easily compared to the user.
4. *Summarise* - By looking at the vis, users can easily summarise the information dataset contains. So instead of referring to the dataset, again and again, the user can easily do this by seeing this visualisation.

## 4. Visual Encoding

1. *Position*: It is one of the most basic encoding channels [Gri10] and indicates the position of countries in the map, using longitude and latitude.
2. *Mark*: All circles, rectangle and square indicate the mark used in drawing packed bubbles and treemap.
3. *Size*: As the value of a feature increases the size of the square/rectangle/circle increase and decreases respectively.
4. *Color*: Variety of colour schemes are used in the dashboard depending upon the categories present in data. Like the Percent Debt on GDP with the red values present the highest debt of a country and green with low debt.
5. *Brightness*: Brightness of polygons increases and decreases with high and low values present in the data. A step-down approach is implemented which divides the colour brightness as mentioned values. We have given the stepped value as 10.

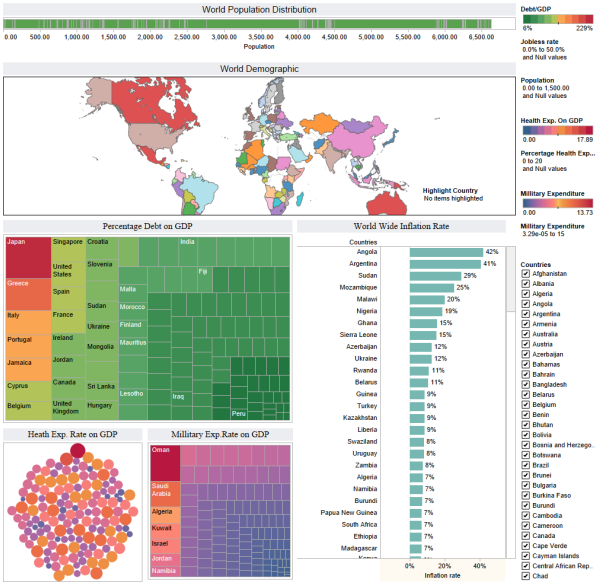


**Figure 1:** *Global Economic Factor Visualization containing all six sheets*

6. *Motion*: It defines the variable change concerning other visual elements. The selection of a particular country in a map also changes the values in other parts of the dashboard; they also display the values related to the selection.

## 5. Interaction

All the sheets in the dashboard are joined in such a way that the selection of a country in one sheet will alter the data in all other sheets. Instead of presenting the whole data the focus will be change to the selected country value. Similarly, the are multiple filters available to narrow down the search even further like filtering data based on population, GDP, health expenditure etc. Various filters can also be used simultaneously, and the data will populate in the sheets accordingly. A highlighter option is also available on the World demographic sheet which does not change visualisation but highlighter our selection, it is best suited for finding the position/standing of the country in a such a big cluster of data. Lastly, using the country filter, a comparative analysis can also be performed. It is constructed using a multi-checkbox functionality which can hold multiple country values and visualisation will dynamically depending upon the values.

## 6. Novelty of Approach

Instead of going with the standard approach of comparing GDP with the previous years, the author has come up with a novel method of plotting the factors that affect GDP and amount of money being spend in Healthcare and military sectors. Healthcare is one of the most critical and necessary industry, and the percent of GDP government is ready to contribute in this sector determines the quality of life of people. Also, military expenses can't be categorised as waste as they are essential in safeguarding the country and its people. By analysing the countries economic condition and the on the military, we can estimate the buying power of a country. More the percentage share in these sectors, more foreign investment and research will be attracted. And by seeing visualisation, we can also estimate countries performance and the current living conditions. For instance, a county with the low unemployment rate, high GDP, High health will be categorised as 1st world country compared to other with the high unemployment rate, high inflation rate. Using this approach, we can study the economic conditions of each country or even perform a comparative analysis between nations.

## 7. Accessing Visualization

- A video describing the functionality of visualization has been upload on YouTube and can be accessed by clicking here or copy the URL: `https://youtu.be/EBq-00kqPw4`
- The visualization can be accessed from Tableau public using the URL - Yes do

## 8. Conclusion

The summary statistics like inflation rate, population, health expenditure etc. are derived from the dataset and visualised. It provides the broad picture of the overall world economics and can help analysts to acquire meaningful insights and take business decisions. From this analysis, we can draw inference about the current economic conditions in a country and determine many features as the standard of living, the viability of there investments and many other depending on users requirements.

## References

[Eda] World economic dataset 2016. URL: `https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?page`. 1

[Gri10] GRINSTEIN GEORGES D. M.: Interactive data visualization foundations techniques and applications. *CRC press* (2010). 1

[Hda] Health expenditure dataset 2016. URL: `https://data.worldbank.org/indicator/SH.XPD.TOTL.ZS`. 1

[Mda] Military expenditure dataset 2016. URL: `https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?page`. 1

[Mun14] MUNZNER T.: Visualization analysis and design. *CRC press* (2014). 1