

Subject: Marketing Analysis and Design Management (COM145)

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Project Name:

MAKARAH

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Headings				
ID	2-social		7-knowledge	
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Summary—GDP is the Gross Domestic Product of a country and is used internationally to know and compare economic growth. We chose 7 variables (Research and Development, Market Capitalization, Exports, Taxes, CO2 Emission, Population) which we processed in Python to determine which socioeconomic variables have the greatest impact on the GDP of each country?

Index of Terms— *GDP per capita, Linear Regression.*

I. INTRODUCTION

Research & Development

A country's investment in research and development is a key aspect for a country to progress. This investment involves the acquisition of knowledge and skills, which well used and applied, can grow the national economy.

Market capitalization

Capitalization (simple or compound) is the process by which a certain amount of capital increases in value.

It is calculated as follows:

$$C_n = C_0 \cdot (1 + i)^n$$

C0: Initial capital or capital in year 0.

Cn: Capital in year "n".

i: Interest rate of the operation.

n: Number of years.

Exports

Exports are the sale, barter or donation of goods and services from residents of a country to non-residents; it is a transfer of property between inhabitants of different countries.

GDP per capita

GDP per capita, per capita income or per capita rent is an economic indicator that measures the relationship between the level of income of a country and its population. To do this, the Productor Gross Domestic (GDP) of said territory is divided by the number of inhabitants.

Linear Regression

Linear regression techniques allow you to create a linear model. This model describes the relationship between a dependent variable and (also known as the response) as a function of one or more independent Variables X_i (called predictors). The general equation corresponding to a linear regression model is:

$$Y = \beta_0 + \sum \beta_i X_i + \epsilon_i$$

where β represents the estimates of linear parameters to be calculated and ϵ represents the error terms.

II. RESEARCH QUESTION

Which socioeconomic variables have the greatest impact on the GDP of each country?

Independent:

- CO2 emissions by country
- Exports made by country
- Taxes collected by country
- Expenditure (as a percentage of GDP) on Research and Development by country
- Value of public enterprises (share price by number of shares) by country

Dependent: GDP per country

III. DEVELOPMENT

The first thing that was done was to look for the sources of information to obtain the necessary data for the project. After conducting research of different sources and evaluating which would be the best we decided for the data of the World Bank, from there we obtained the information of each of the 7 variables of all the countries.

We then put all the data together in a spreadsheet and upload it to the Jupiter Notebook. Once we had the spreadsheet, we created a data frame for each variable to later join the data frames into one.

Since many of our rows had null values, we had to get rid of them.

Before processing the data we converted them to the same units, in this case we converted

everything to per capita and in US dollars. Except for the population and the emission of CO2 (since this already came per capita).

We then evaluated each of our independent variables with our dependent variable (GDP) to know the relationship of these.

Finally, after seeing the relationship of our independent variables with our dependent variable, we put all our data into a linear regression model.

Social Implications

It is very important to know if the country's economy is growing or not, that is, if it produced more or less than the previous year. The change in GDP over time is one of the most important indicators of economic growth.

A growth in GDP means that there is more money to build buildings, houses or buy machinery and that more goods and services will be produced. This is beneficial for everyone because there will be more employment and more opportunities to do business.

Conversely, if the GDP decreases the country's output and economic activity will decrease; under these conditions, it is likely that there will be unemployment and that this will affect many families.

By knowing the variables that have the greatest correlation with the increase or decrease in GDP, the countries (their rulers and the citizens) can focus their resources and efforts more intelligently to have a higher GDP growth.

IV. RESULTS

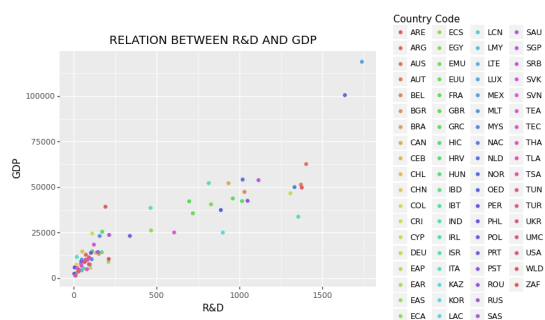


Figure 1: R&D and GDP ratio

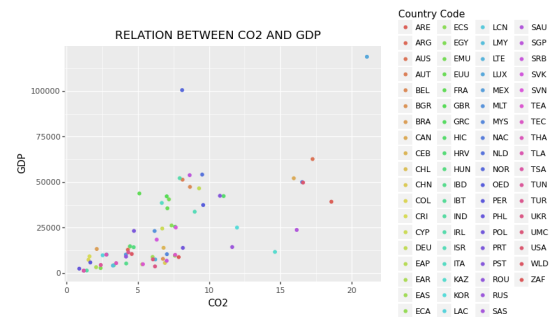


Figure 2: CO2 emission and GDP ratio

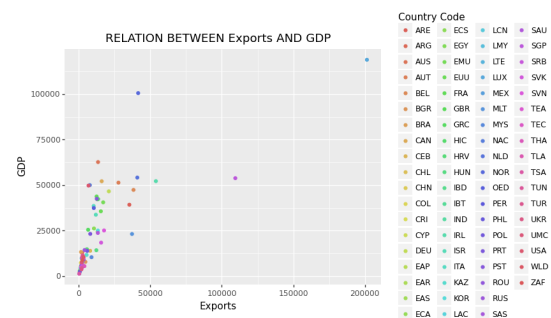


Figure 3: Exports and GDP ratio

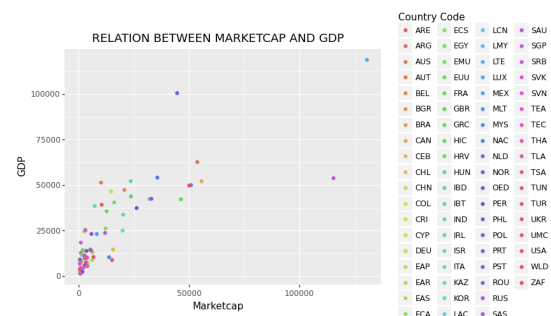


Figure 4: Capitalization and GDP ratio

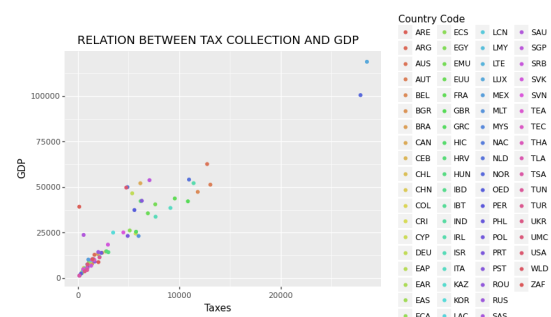


Figure 5: Taxes and GDP ratio

Model Results
Coefficients:

Research & Development: 1.26677200e+01

Exports: 6.65679063e-03
Capitalization: 1.28116971e-01
Taxes: 2.34192587e+00
CO2 emission: 6.52482095e+02

Constant: 1585
R2 Score: 0.846744247532464

Expenditure on Research and Development: For every day Dollar per capita that increases Spending on Research and Development, GDP will increase by 1.26677200e+01 dollars per capita.

Exports: For one dollar per capita that increase exports, GDP will increase by 6.65679063e-03 dollars per capita.

Capitalization: For one dollar per capita that increases the Capitalization, the GDP will increase by 1.28116971e-01 dollars per capita.

Tax Collection: For one dollar per capita that increases tax collection, GDP will increase by 2.34192587e+00 dollars per capita.

CO2 emissions: For one ton of CO2 per capita that increases CO2 emissions, GDP will increase by 6.52482095e+02 dollars per capita.

Intersection: If all our independent variables are zero, the average value of GDP would be 1585 USD per capita.

R2 score (coefficient of determination) regression score function. The best possible score is 1.0 and may be negative (because the model may be arbitrarily worse). A constant model that always reads the expected value of and, without considering input characteristics, would get an R2 score of 0.0.

V. CONCLUSIONS

As we can see, the independent variable that has the most relationship with our dependent variable (GDP) are the CO2 emissions. If CO2 emissions increase by 1 ton of CO2 per capita, GDP will increase by approx. 652 US dollars per capita.

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