

< How COVID 19 impacted global economy and lessons from regression results>

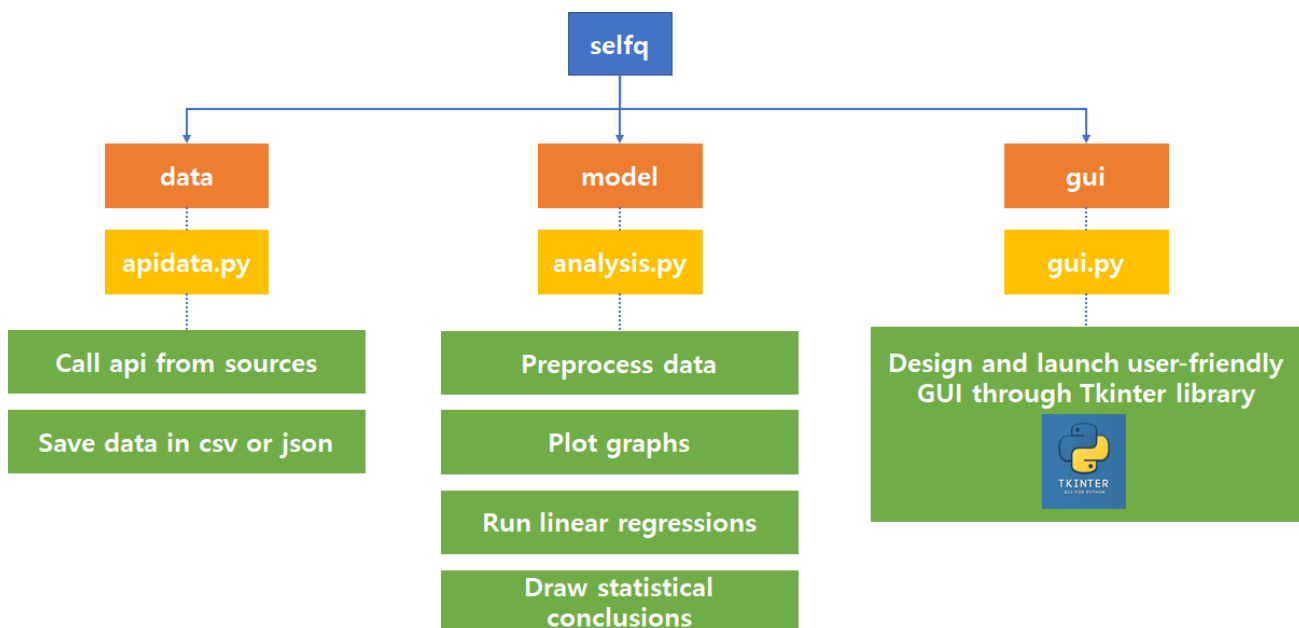
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I . A brief overview of the project

Covid 19 has impacted global economy in a drastic way. In this project, we analyzed the statistical relationships between worldwide Covid-19 data (incl. worldwide new cases and death toll) and price data of major financial products (NASDAQ, S&P500, US Treasury yields, etc.) and commodities (Crude oil, natural gas, gold, wheat, soybean, etc.). We thought this analysis is meaningful, because pandemics like Covid-19 can be repeated in the future. The regression results from our software can help the users extrapolate from the past data. If we can predict the future, we can be prepared for it and make better investment decisions.

II. Overall structure of the software



Above is the structure of our team's software. We collected data through various sources and also called API from some sources. You can find the 'apidata.py' module and raw data under 'data' subpackage. Then through 'analysis.py' module under 'model' subpackage, we preprocessed data, plotted graphs, ran linear regressions, and drew statistical conclusions. Lastly, we designed a user-friendly GUI (Graphical User Interface) through Tkinter library, so the end-user can conveniently

browse graphs and analyses. We put that part of our work under 'gui' subpackage.

Data sources

Data category	Organization	URL
COVID-19	Our World In Data	https://ourworldindata.org/
Energy	Energy Information Administration (EIA)	https://www.eia.gov/
Safe assets (Gold, EUR, etc.)	NASDAQ	https://www.nasdaq.com/
Equity indices (NASDAQ, S&P500, etc.)		
Commodities (Wheat, Corn, etc.)		

III. A description on the code responsibilities for each group member

- **Jihae** was responsible for data collection and construction of 'data' and 'gui' subpackages.
- **Jin Seong** was responsible for data preprocessing and construction of 'model' subpackage.

IV. Short description on how to interact with the application and what it produces.

1. We have uploaded a csv file on Box because of the data size limit on Github.

You can download it here:

<https://uchicago.box.com/s/35smyycuf3sz04h1tt5cce217sxe94ib>

Then place the file under '**data**' subpackage for the app to run properly.

(IMPORTANT : The file should be saved as '**owid-covid-data.csv**')

2. Run the app by the command '**ipython -m selfq**'

3. We have put together a streamlined GUI to guide users through the data and analytics:

(1) Main page

: When you run the app, you will see a screen pop up like this -

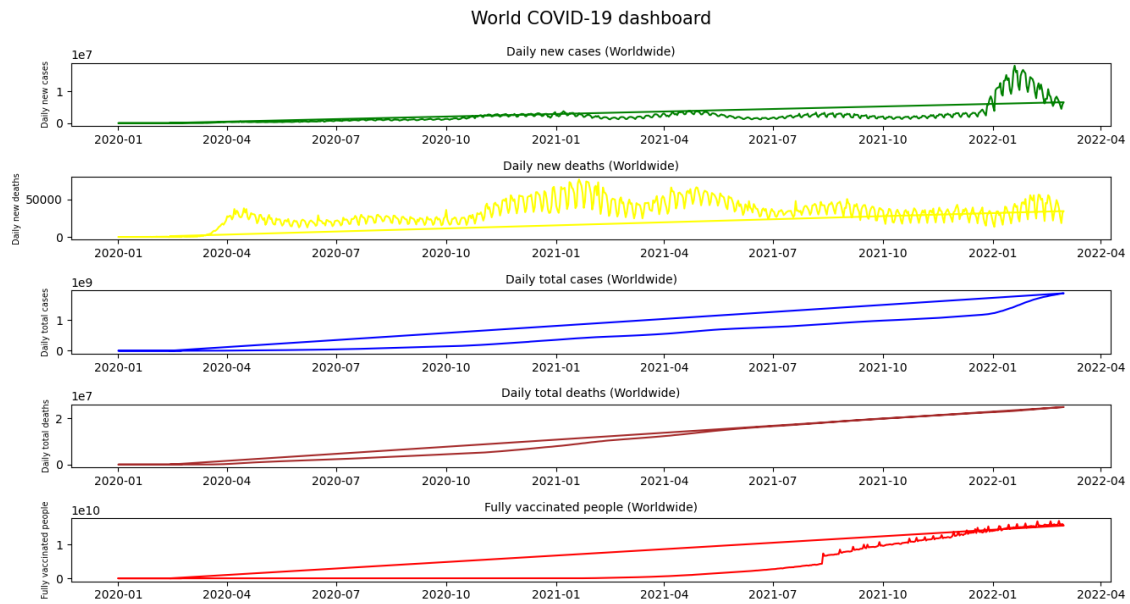
Hi, welcome!
Please select from the menu below :

The menu consists of six buttons stacked vertically, each with a dashed border. The buttons are labeled: "COVID data", "Safe asset data", "Equity indices data", "Energy price data", "Commodities price data", and "Regression Analysis". Below these buttons is a "Quit" button.

Then you can click on any button you are interested in.

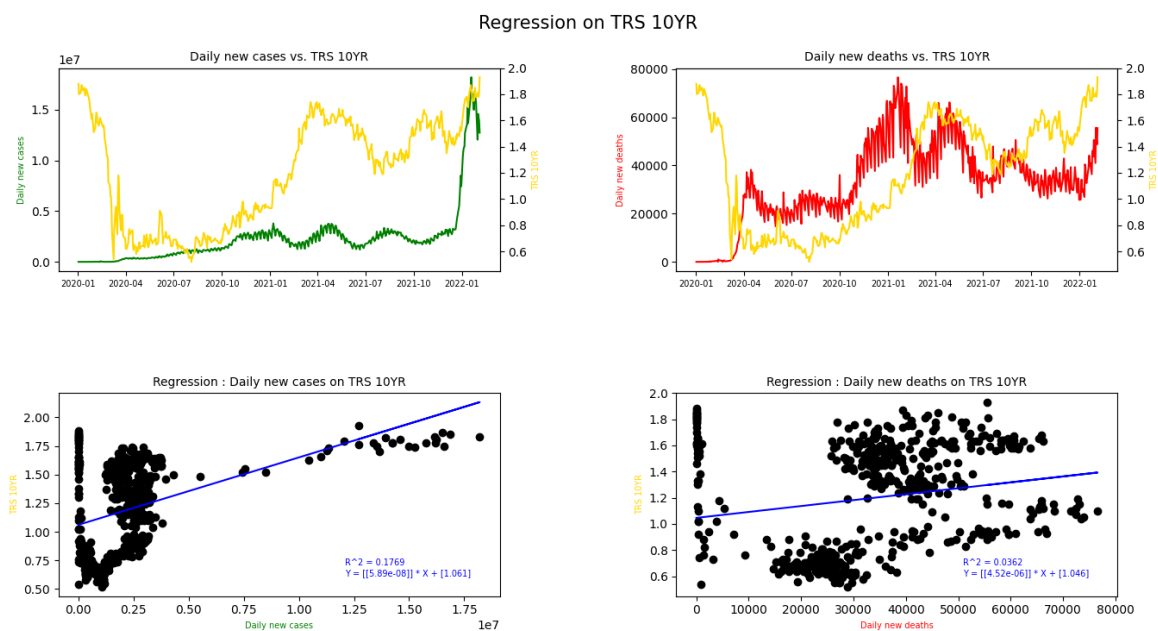
(2) Time series line plots

: In the first 5 menus ('Covid data', 'Safe asset data', 'Equity indices data', 'Energy price data', 'Commodities price data'), you can view time series graphs spanning the whole Covid-19 pandemic starting Jan. 2020.



(3) Data regression analysis

: In the 'Regression Analysis' menu, you can browse through the data analyses we have ran. We analyzed statistical relationships between Covid-19 data ('daily new cases', 'daily new deaths') and price data of major asset categories.



V. What the project tried to accomplish and what it actually accomplished

: We tried to discover statistical relationships between Covid data and prices of major assets.

Through regression analyses, we have found out that movements in asset prices are more sensitive to changes in 'daily new cases' than 'daily new deaths'. Generally, 'daily new cases' has more explanatory power over 'daily new deaths' when predicting the price change of an asset class. Out of the 17 asset classes we observed, 10 had higher R^2 statistics from 'daily new cases', and 7 had higher R^2 statistics from 'daily new deaths'. It is also worth noting that regressions on equity indices and commodities consistently produced much higher R^2 (above 0.3) compared to other asset classes.

We could also observe that most of the assets (except gold spot and JPY/USD) we analyzed had positive relationships with 'daily new cases' and 'daily new deaths', and this might seem counterintuitive. However, one possible explanation for this could be that as long as the market participants have firm beliefs in the fundamentals of the economy, the price can be very resilient or even reflect future potentials for a recovery.

Table1. Summary of R-squared

Type	Regressand (Y)	Regressor (X)	
		Daily new cases	Daily new deaths
Safe assets	Treasury Bond (10yr)	0.1769	0.0362
	Gold spot price	0.222	0.0001
	EUR/USD F/X	0.0098	0.5196
	JPY/USD F/X	0.2037	0.0106
	GBP/USD F/X	0.1167	0.4036
Equity indices	NASDAQ Composite	0.2273	0.3841
	NASDAQ100	0.262	0.3489
	Dow Jones Industrial Average	0.247	0.2495
	S&P500	0.2866	0.2645
Energy prices	WTI crude spot	0.2785	0.108
	BRENT crude spot	0.2762	0.0985
	Natural gas spot	0.1257	0.1033
Commodity prices	WHEAT spot	0.3219	0.2398
	CORN spot	0.2285	0.3534
	SOYBEAN spot	0.2716	0.5804
	COFFEE spot	0.3919	0.0739
	SUGAR spot	0.2082	0.1818

Table2. Summary of the sign of correlations (+, -)

Type	Regressand (Y)	Regressor (X)	
		Daily new cases	Daily new deaths
Safe assets	Treasury Bond (10yr)	(+)	(+)
	Gold spot price	(-)	(-)
	EUR/USD F/X	(+)	(+)
	JPY/USD F/X	(+)	(-)
	GBP/USD F/X	(+)	(+)
Equity indices	NASDAQ Composite	(+)	(+)
	NASDAQ100	(+)	(+)
	Dow Jones Industrial Average	(+)	(+)
	S&P500	(+)	(+)
Energy prices	WTI crude spot	(+)	(+)
	BRENT crude spot	(+)	(+)
	Natural gas spot	(+)	(+)
Commodity prices	WHEAT spot	(+)	(+)
	CORN spot	(+)	(+)
	SOYBEAN spot	(+)	(+)
	COFFEE spot	(+)	(+)
	SUGAR spot	(+)	(+)