

Report for GDP Prediction

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Objective:

Our project is aimed to predict GDP growth rate monthly from 2020-01 to 2020-06 under Covid_19 pandemic affect. We are able to find GDP growth rate on quarterly basis from 2011-Q1 to 2020-Q1 for US and China, and 2011-Q1 to 2019-Q4 for Germany, Japan, Mexico, Turkey. Following are the steps how we achieve our goal:

Unaffected GDP:

First, we need to change quarterly data to monthly data simply by divided by 3. Since Covid_19 happened in early 2020, we could use data before 2020 to predict the GDP unaffected by Covid_19 by simply linear regression model. And the result for that is quite acceptable, R2 for the model (for all countries) are greater than 98%.

Affected GDP:

Influence factor:

Since 2020-Q1 GDP for China and USA are published, and it is affected by COVID_19, so we could use that to estimate the influence of COVID_19. We use influence factor to quantify this impact:

Influence Factor:

$$factor(i) = \frac{GDP(affected) - GDP(unaaffected)}{GDP(unaaffected)} \times 100\%$$

Since we have 3 months data for compute factor, we take average for compute

Country Influence Factor:

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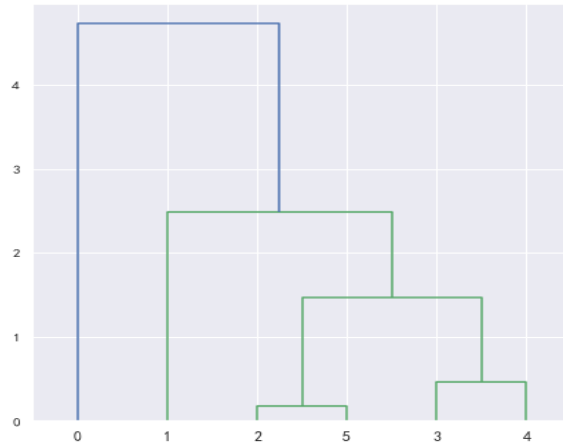
$$factor = \frac{factor(1) + factor(2) + factor(3)}{3}$$

And compute factor for China and USA.

Similarity matrix:

Now we get both factor from China and US, We could use these factor to predict GDP for the rest of the countries according to their cluster based on Covid_19 data, here is the result:

0	USA
1	Germany
2	Japan
5	Mexico
3	China
4	Turkey



We assume the similarity within the same cluster is 1, and China and US have the most dissimilarity, similarity + dissimilarity = 1. And the distance between the nearby cluster is

0.33, so we get the following similarity matrix:

	<i>US</i>	<i>China</i>
<i>US</i>	1	0
<i>Germany</i>	0.7	0.3
<i>Japan</i>	0.3	0.7
<i>Mexico</i>	0.3	0.7
<i>China</i>	0	1
<i>Turkey</i>	0	1

And by multiply similarity with US and China influence factor, we can predict the future GDP by :

$$\text{Impact coefficient} = \text{Factor}[US\ CN] \times \text{Similarity Vector}$$

$$GDP(\text{affected}) = \text{Impact coefficient} \times GDP(\text{unaffected})$$

Note: $GDP(\text{unaffected})$ is obtained by step 1 linear regression

Result:

We make prediction till 2022_01

