

The background features a dark gray grid pattern. In the top right and bottom left corners, there are decorative wavy lines in a gradient of purple and magenta, creating a modern, abstract aesthetic.

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**japan covid19
epidemiology**

Datasets

source : <https://covid19.mhlw.go.jp/en/>



dataset1 (for lockdown) :

period : 2020-02-06 - 2020-05-08

columns : new cases , discharged , fetal , hospital

dataset2 (for vaccine) :

period : 2021-04-12 - 2021-07-29

columns : total dose , first dose , second dose

seirq (lockdown) model

seirq model :



s : susceptible

e : exposed

i : infected

r : recovered

q : lockdown , quarantined

$$ds = s - e - i - q$$

$$de = e - i - r$$

$$di = i - r$$

$$dr = i * \text{recoverRate}$$

$$dq = \text{lockdownRate} * s$$

sir model && seir(q) model

datasets period : 2020/02/01 - 2020/06/30 (when first peak)

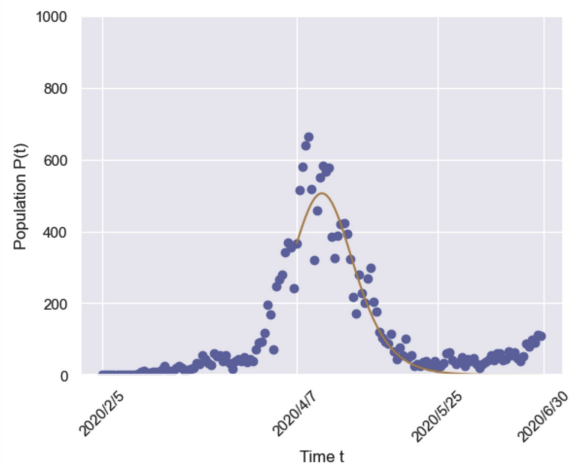
purpose : to check if city lock down works



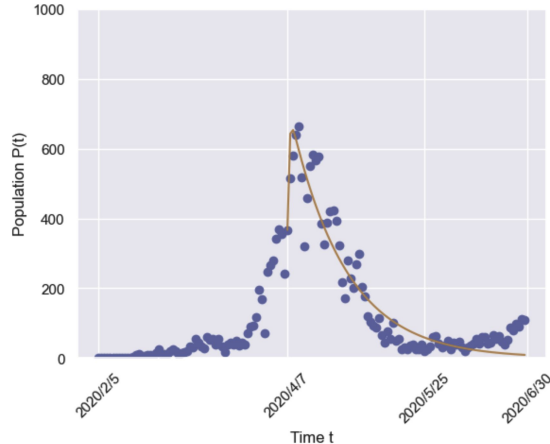
sir : $R^2 = 0.865$

seir : $R^2 = 0.888$

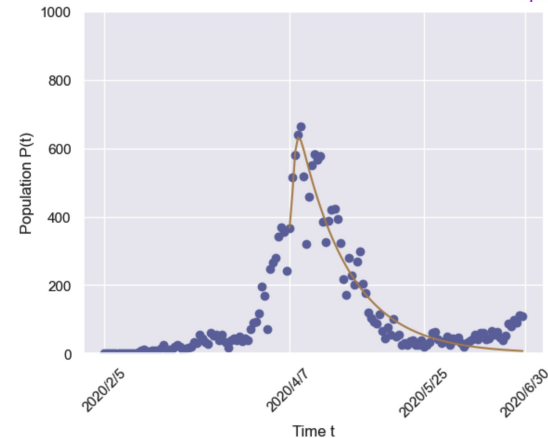
seirq : $R^2 = 0.896$



0.8651590020313282



0.8884050451288074



0.8967575474006497

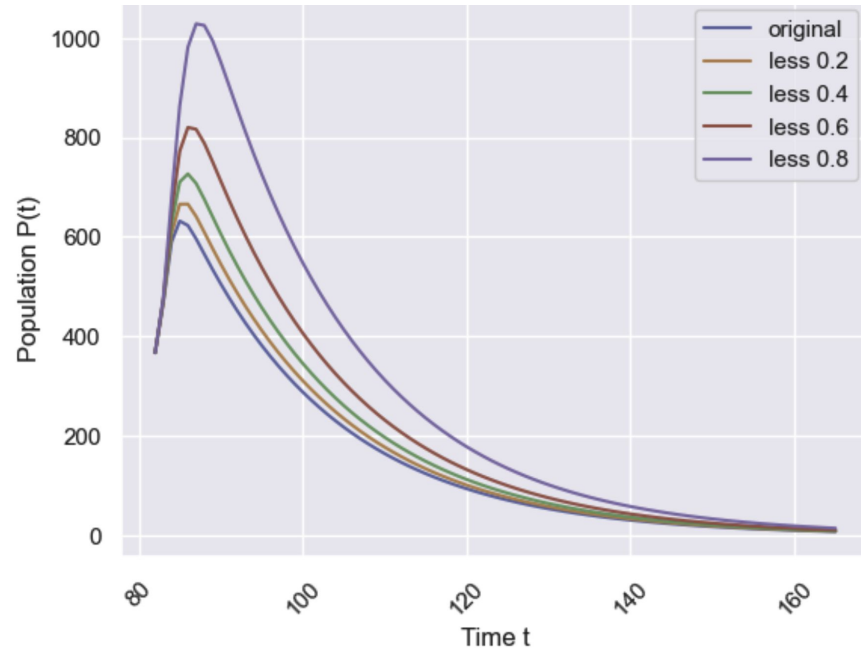
seirq model

original lockdown rate : 1.46377811

method : to reduce by 0.2 each time

conclusion :

by reducing rate , the peak could be higher and cause worse situation, which we can say lockdown is one successful temporary solution



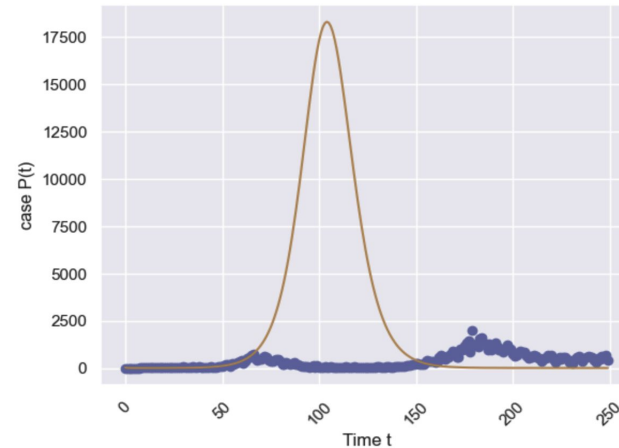
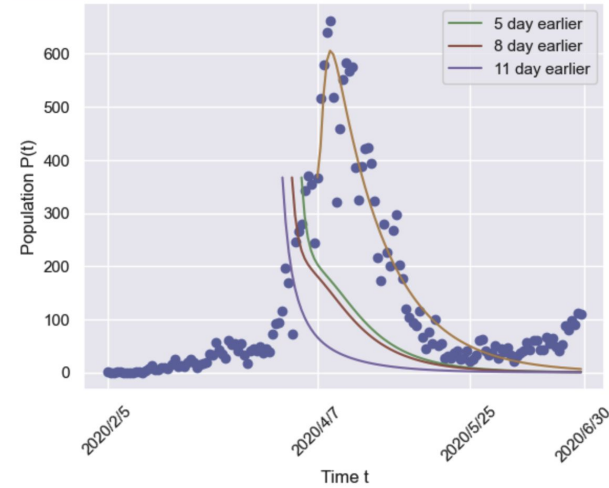
hypothesis

If measurement could be taken earlier

here is possible result in fig 1 to possibly lead to minimum fatal :

rate of susceptible to exposed & rate of susceptible to infected from original data are used to assume how pandemics can change if lockdown was conducted **5,8,11 days** earlier . From graph , it shows **possible alleviation** of pandemic

otherwise in fig 2 shows how pandemics could be **out of control** if lockdown was not conducted



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reproduction rate (R_t)

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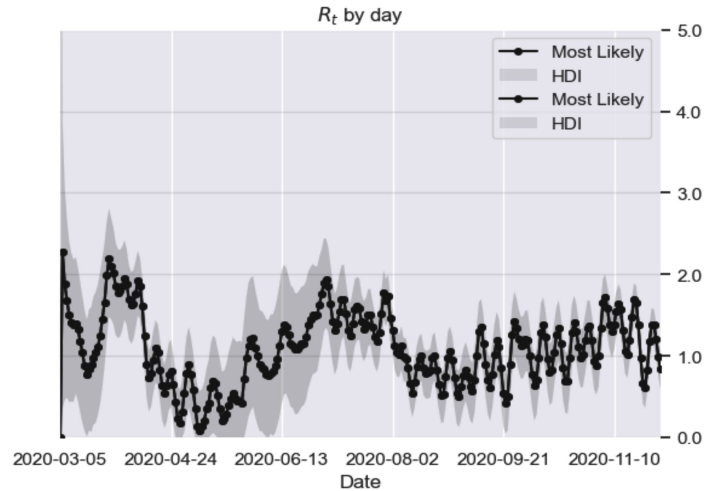
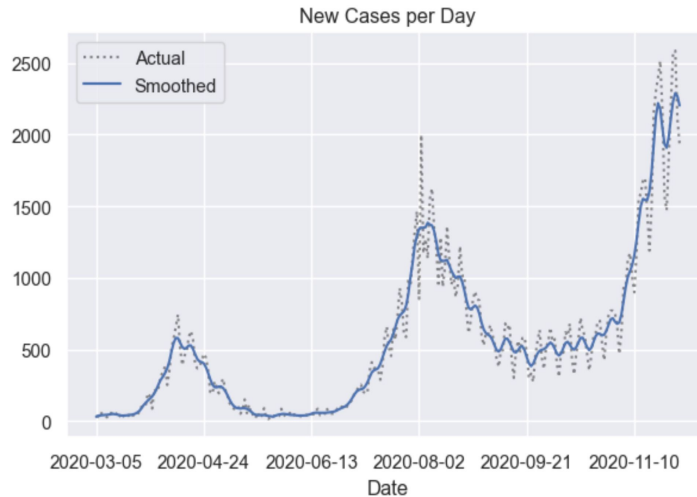
Bettencourt & Ribeiro's Approach :

1. **Gaussian** noise to estimate a time-varying
2. Based on **Bayes'rule** to update R_t on how many new cases were reported each day
3. based on this notebook

<https://github.com/k-sys/covid-19/blob/master/Realtime%20R0.ipynb>

reproduction rate (R_t) analysis

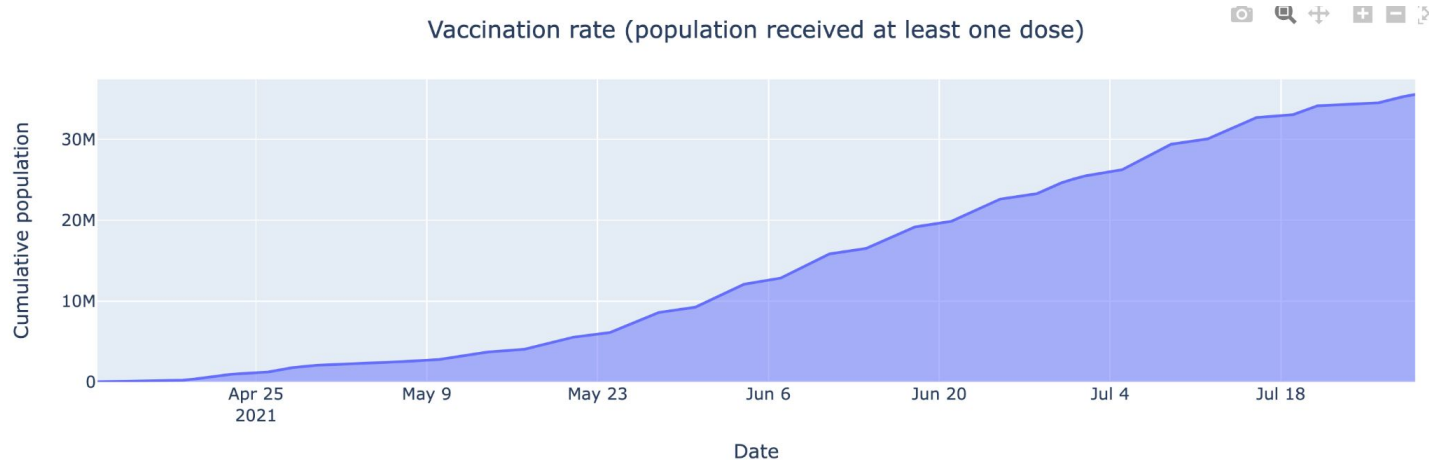
when R_t is above 1, we consider this virus could have severe spread
we can see the time of rise and drop can match



vaccination (2021-4-21 – 2021-06-01)

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here is graph to show people with vaccination with at least one vaccination by real data based on <https://covid19.mhlw.go.jp/en/>



seirv (vaccine) model

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seirq model :



s : susceptible

e : exposed

i : infected

r : recovered

v : vaccine (at least one)

$$ds = s - e - i - v$$

$$de = e - i - r$$

$$di = i - r$$

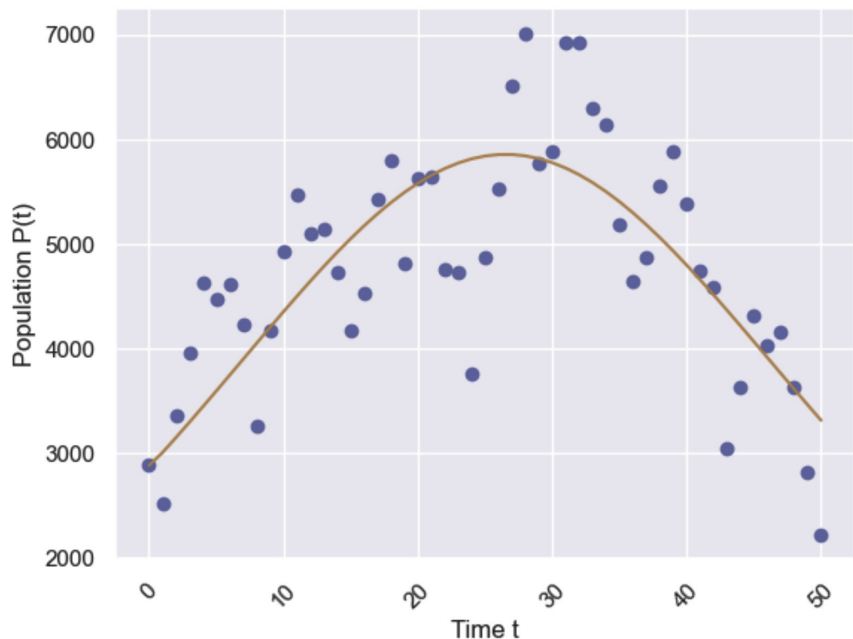
$$dr = i * \text{recoverRate}$$

$$dv = \text{vaccineRate} * s$$

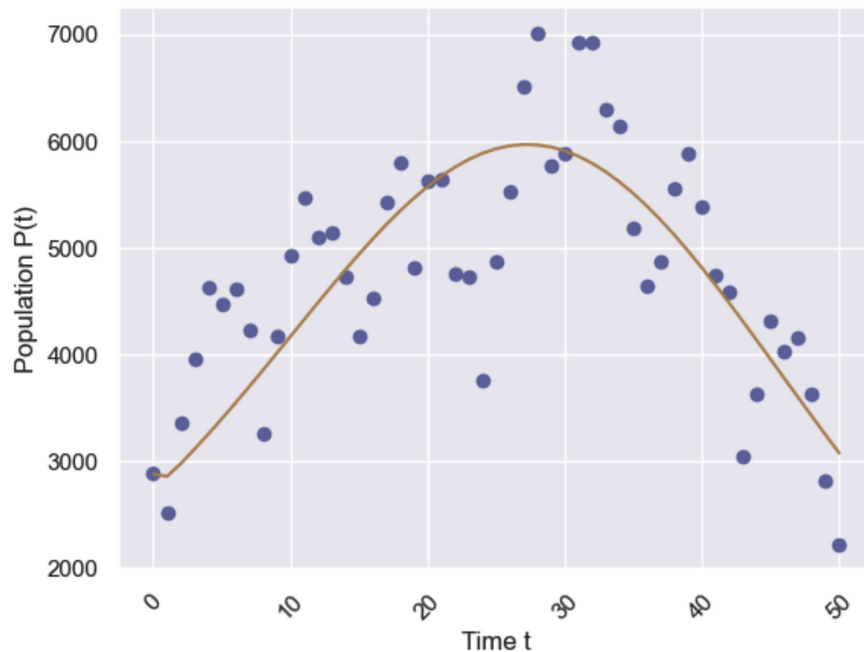
Calibration (2021-4-21 – 2021-06-01)

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seir : $R^2 = 0.576$



seirv : $R^2 = 0.561$



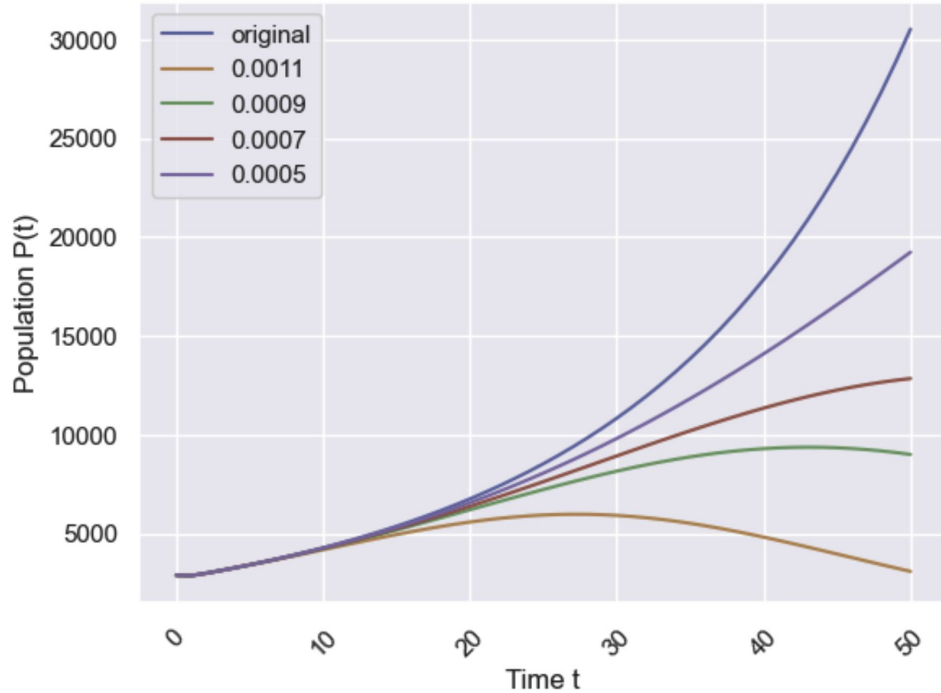
seirv model (hypothesis)

original lockdown rate :
0.001314

method : to reduce by 0.0002
each time

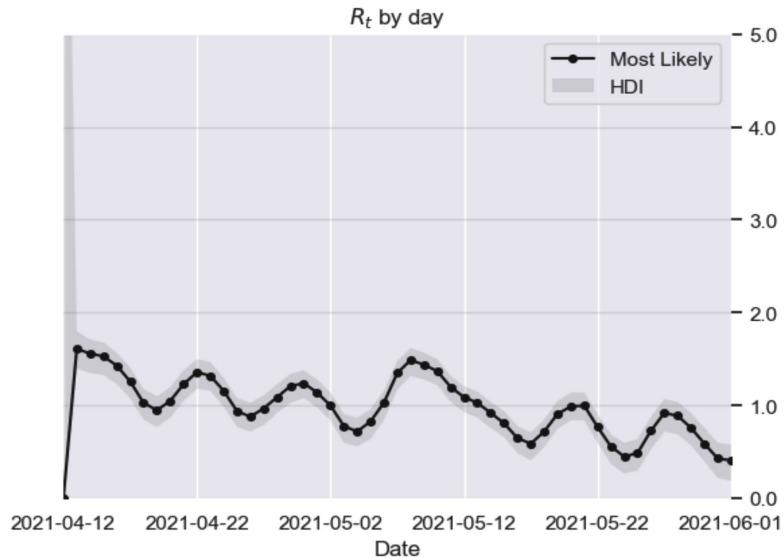
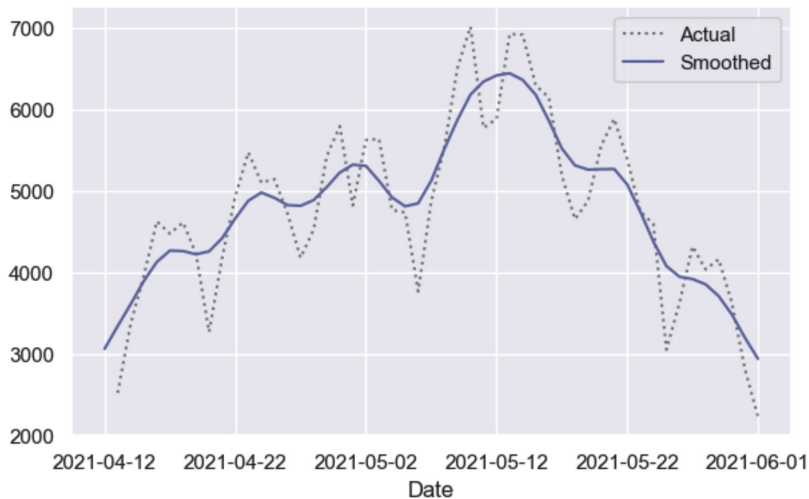
conclusion :

by reducing rate , the new
cases could become higher,
which we can say vaccine is
one factor to restrain the
pandemic



reproduction rate (R_t) analysis

when R_t is above 1, we consider this virus could have severe spread



The background features a dark, almost black, grid pattern. Overlaid on this grid are several wavy, glowing purple lines that create a sense of movement and depth. These lines are more prominent in the corners, with a large, bright purple area in the top right and another in the bottom left.

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**Thank you for
attention**