Non-dimensional SIR model

To simplify the model, we will remove the units of the variables from ODE.

Set $(S, I, R) = N \times (x, y, z)$ and $(T, \beta, \gamma) = (\tau t, \tau^{-1}\rho, \tau^{-1}\sigma)$.

This results in the ODE

$$\frac{dx}{dt} = -\rho x y$$
$$\frac{dy}{dt} = \rho x y - \sigma y$$
$$\frac{dz}{dt} = \sigma y$$

Where N is the total population and τ is a coefficient ([min], is an integer to simplify).

The range of variables and parameters:

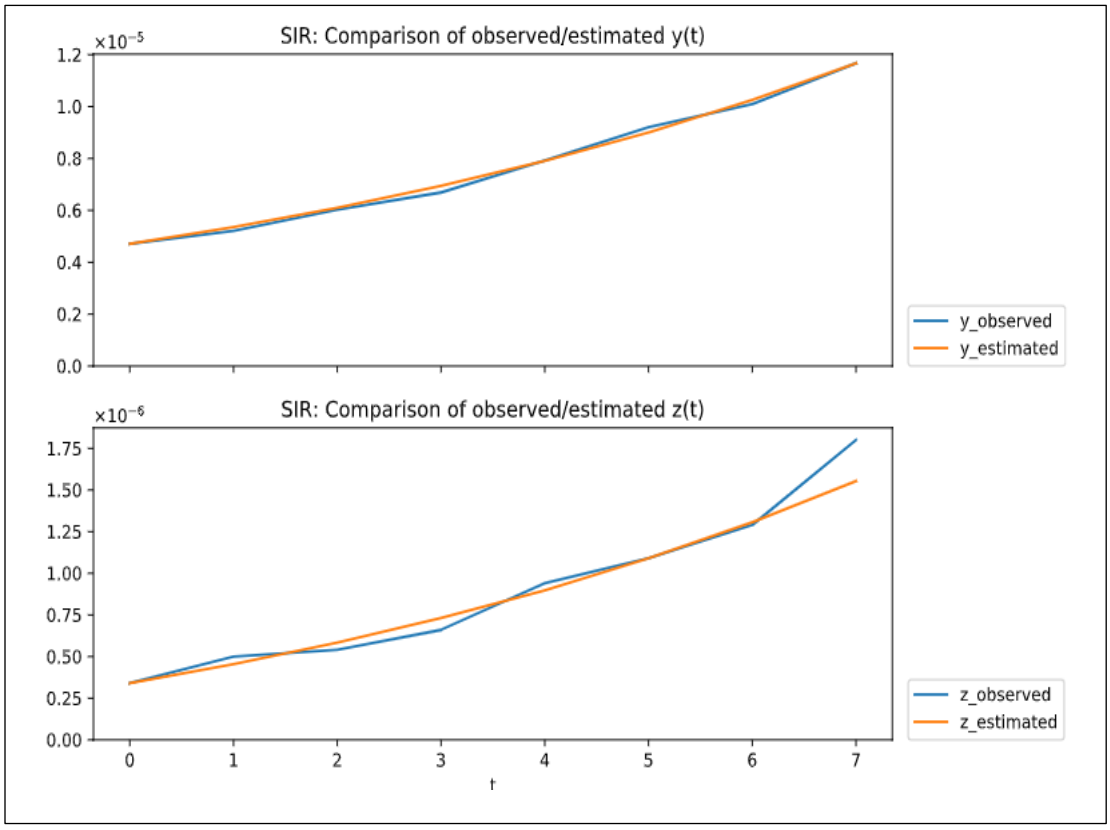
$$0 < (x, y, z, \rho, \sigma) < 1$$
$$1 \leq \tau \leq 1440$$

Basic reproduction number, Non-dimentional parameter, is defined as

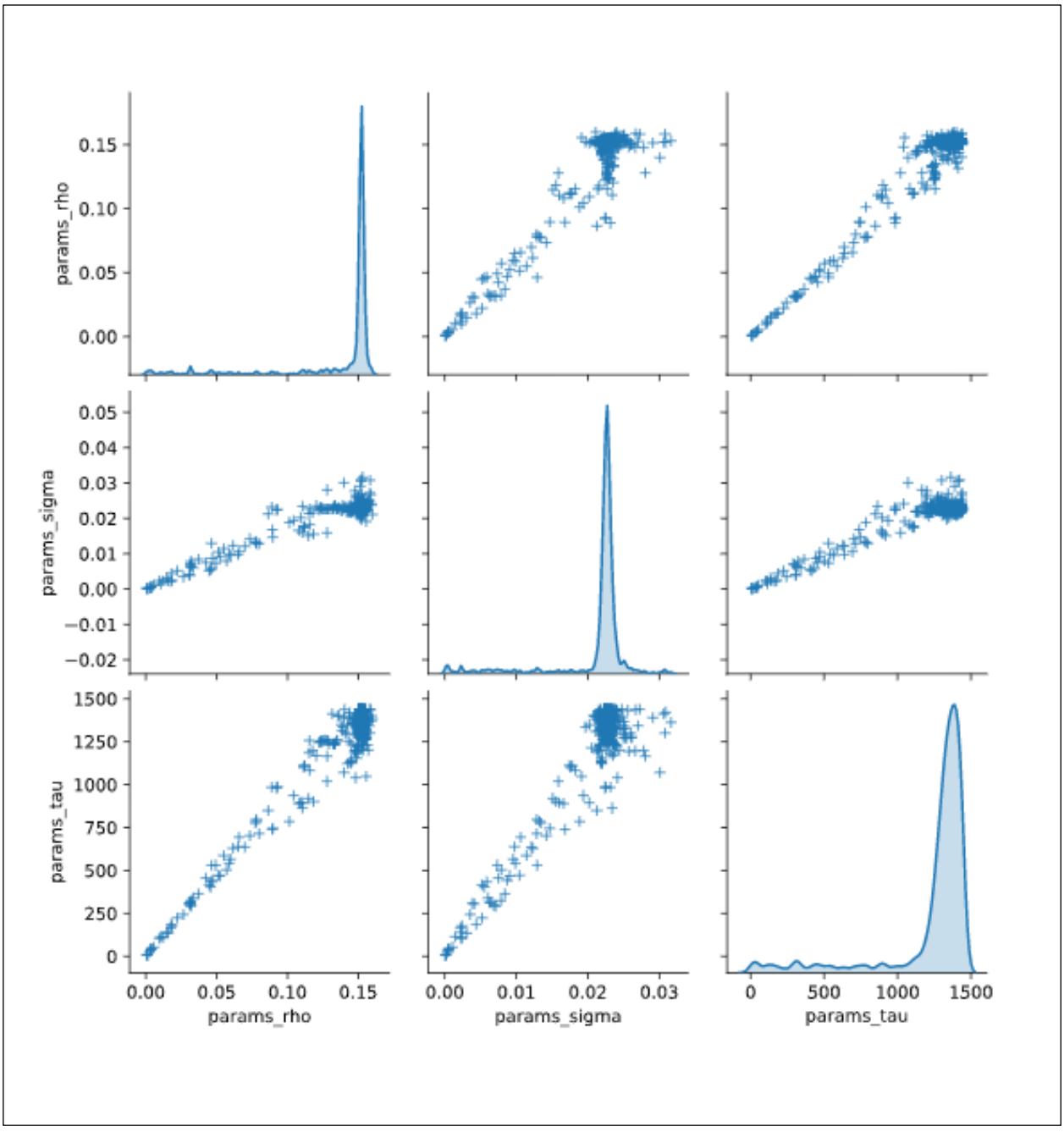
$$R_0 = \rho\sigma^{-1} = \beta\gamma^{-1}$$

Here X, Y, Z were calculated based on ODE. X = Suspected, Y = Confirmed, Z = Recovered + Deaths. To understand why Z = Recovered + Deaths

- S: Susceptible (=All - Confirmed)
- I: Infected (=Confirmed - Recovered - Deaths)
- R: Recovered or fatal (=Recovered + Deaths)



Here I tried to understand the collinearity. Once I was satisfied that there is good relationship. I continued with the model building.



After Model building it is seen that we had reached the highest point for confirmed case by 1st week of July.