Investigating COVID-19 outbreak convergence through a SIR model

December 27 2021

Credit: CC0 Public Domain

Over a period of time, does COVID-19 cause an explosion of infections, or is it a convergence? If the infection is converging, what kind of convergence will occur? Two researchers specializing in economics investigated the above two hypotheses using openly available data in

Japan.

Like the economic waves of boom and bust, the number of infections expand and contract repeatedly, but the number of COVID-19 cases naturally decreased by about -3% by March 2021 in Japan, the latest data used for the study. The growth rate of the number of infected people throughout the prefectures in Japan with the highest numbers of infected people increased initially and decreased subsequently. Focusing on the growth rate of the number of infected people over time, the growth rate was observed to be high in the early stages of infection when the cumulative number of infected people is small and decreases gradually as the cumulative number of infected people increases. By reviewing and re-examining behavior based on appropriate information, we may control infections and achieve faster convergence. We have no choice but to live with COVID-19, but it is possible to do so through risk management.

Professor Hiroaki Masuhara of Shinshu University's Faculty of Economics and Law with Prof Kei Hosoya of Kogakuin University's Faculty of Economics used a mathematical model of infectious diseases to show that the convergence phenomenon is universal and provided evidence with openly available data from Japan. Initially, researchers from countries outside of Asia found the results of the study hard to believe because the COVID-19 situation in Japan was relatively mild compared to countries outside of Asia.

Professor Masuhara states he felt relief when he saw the signs of convergence and was able to confirm them with mathematical models and data. The team first noticed the signs of convergence around September 2020, when they were looking at the data for June and August 2020. This convergence of infections hypothesis is similar to the convergence hypothesis of economic growth theory and could be demonstrated in mathematical models and could be confirmed with long-

term data.

The researchers will continue to analyze the impact of COVID-19 on the region through data. The increase in COVID-19 infections has led to behavioral restraint in Japan and lockdowns in other countries. This affects not only public health but the local economy. Specifically, the behavioral restraint will lead to a decrease in sales in the restaurant and hotel industries, and also affects production. The researchers aim to clarify the measures to be taken in response to COVID-19 to minimize the impact on the economy backed by data.

More information: Hiroaki Masuhara et al, Convergent movement of COVID-19 outbreak in Japan based on SIR model, *Economic Analysis and Policy* (2021). DOI: 10.1016/j.eap.2021.10.016

Provided by Shinshu University