## Highlights

•The dynamic growth rate is estimated by regression model and the development of epidemic situation is characterized by change point test.

•Bootstrap algorithm is used to overcome the impact of non-normal distribution of the regression errors, confidence intervals of the growth rate are constructed.

• The epidemic development of COVID-19 in Japan, Italy, and America are studied by our proposed model.

•Three important results are summarized from our modeling results.

•The development of epidemic situation in different areas is different, and different prevention and control measures need to be taken.