Estimating an SEIR Model with Testing and Contact Tracing

Zheng (Michael) Song (The Chinese University of Hong Kong)
joint work with Rongzhu Ke and Fabrizio Zilibotti

Abstract

We generalize the SEIR model by introducing testing, contact tracing, and quarantine. The contact-tracing technology can reduce the basic reproduction number (R0). Using structural econometrics techniques, we estimate the model for three European countries, Germany, Italy and Switzerland, and two Asian countries, Japan and Korea. We explicitly distinguish, both in the theory and in the empirical analysis, between infections that are confirmed through testing and infections that remain undetected. The size of the gap between actual and reported infected reflects not only the virulence of the epidemic but also the extent to which tests are available and contacts with infected people are traced. Our estimation indicates that Japan, Korea and Switzerland have pursued more aggressive contact-tracing policy, while Italy has relied more on a strict lockdown policy and less on testing and tracing. We perform counterfactual experiments using the estimated model. We quantitatively show that testing is an effective substitute for draconian lockdown, especially, when the number of total infections is small.