## Economic Forecasting Using Infectious Disease Spread Model

CHEE, Chunggu\* and BAE, Uihwan \*\*

The global and Korean economies have been hit hard by the rapid spread of COVID-19. Under these circumstances, the policy authorities have been making efforts to enhance the precision of economic forecasting, considering uncertainties stemming from COVID-19 developments. This paper establishes an economic forecasting model based on COVID-19 developments by linking a contagious disease spread model and a macroeconomic model, and provides simulation results using this model.

The major characteristics and contributions of this paper are as follows: First, this paper includes an SIR (susceptible, infected, recovered) model in the new Keynesian DSGE model in block form. The SIR model is a representative model used to study and forecast the spread of infectious disease. Specifically, it is structured such that the number of confirmed cases and the degree of quarantine measures generated from the SIR model block affect economic variables within the DSGE model. Second, this paper presents methods to analyze the effects of COVID-19 on small-open economies like Korea. Notably, we structured the model such that small-open economies would be affected by COVID-19 through two channels. One is a channel through which the domestic spread of COVID-19 has a direct negative impact on the domestic economy (direct channel), and the other is a channel through which the global spread of COVID-19 hurts the global economy and thereby affects the Korean economy (indirect channel).

The setting of the model and estimation based on it shows that the number of future confirmed cases and the economic effects will largely depend on the degree of quarantine measures when there is a high number of confirmed cases as now. Moreover, in the case of a small open economy like Korea, it is necessary to carefully consider not only domestic but also global COVID-19 developments.

- \* Senior Economist, Research Department, Bank of Korea (Tel: +82-2-759-4185, e-mail: chunggu.chee@bok.or.kr)
- \*\* Junior Economist, Research Department, Bank of Korea (Tel: +82-2-759-4184, e-mail: jun4680@bok.or.kr)
  - We thank Mr. Kim Yoong, director of the Macroeconomic Modeling Division, and Mr. Lee Jooyong, the team head of the Model Forecasting Team, for their useful comments regarding the writing of this paper.
  - The contents of this paper represent the personal opinions of the authors and do not necessarily reflect the official view of the Bank of Korea. Any report/citation of this paper should specify the names of the authors.

## **I**. Introduction

## **II.** Infectious Disease Spread Model and Previous Research

- **II**. Model Structure
- **IV.** Parameter Setting and Scenario Analysis
- V. Conclusion