COMPUTABLE GENERAL EQUILIBRIUM MODELS

Miroslav Kotov

Faculty of Mathematics, Physics and Informatics
Comenius University
Bratislava, Slovak Republic
kotov@fmph.uniba.sk

Computable general equilibrium (CGE) models are macroeconomic models based on microeconomic assumptions. Such models describe the equilibrium reached by a number of agents simultaneously operating in the markets. They represent a useful and widely used tool for analyzing the impacts of nonmarginal changes affecting the economy. The first Walras work assumes just two kinds of agents in the economy - households and producers. More recent applied works add also sectors of government and foreign trade. The development of a CGE model can be divided into three steps

S pecifying agents in the model.

M athematical description of the agents. Production sectors are described by the production function, households are described by the utility function. Government sector is usually also described by the utility function. To describe the foreign trade the "Armington" concept is used. This approach is based on the assumption of the domestic and foreign goods being imperfect substitutes.

C haracterization of the behavior of the agents. The firms are assumed to maximize their profit, the households their utility. In addition to these three steps the equilibrium conditions have to be defined . Within the CGE framework the general equilibrium is defined by the following three conditions

N o firm earns nonzero profit

T he market "clears"

T he budget constraint is satisfied . After building its structure the model has to be calibrated. Calibration is a process where the parameters of behavioral functions are computed using the data from a given baseline year. If the model is well-defined and calibrated the calibration run must compute benchmark values of equilibrium prices and quantities. Mathematically, this step requires a simultaneous solution of a system of nonlinear equations.

A successfully calibrated model can be used to forecast changes in the production, consumption, foreign trade etc in an economy caused by exogenous shocks.

The method will be demonstrated on the example of the model of the social impacts of the environmental expenses of the government of Slovakia required by EU approximation.