

Closure in CGE Models

Short Course on CGE Modeling, United Nations ESCAP

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Introduction

- In any economic model we must make a choice as to what is to be determined within the model (the endogenous variables) and what is to be considered external to the model (the exogenous variables).
- A model, numerical or otherwise, is just a way of explaining the endogenous variables in terms of the exogenous.
- Where we choose to draw the line between endogenous and exogenous and exactly which variables we choose to be exogenous depends on a number of factors, including model tractability, and the purpose for which the model simulations are to be used.
- The choice that we make is called the model closure. In this session we discuss some of the issues surrounding closure for CGE models.

- ① Closure Concepts
- ② Microeconomic Closure
- ③ Macroeconomic Closure
 - Closed Economy
 - Closed Economy with Government/Investment
 - Open Economy

Closure Concepts

- Mathematically, ensuring that a model is 'closed' amounts to ensuring that we have enough independent equations to explain the endogenous variables.
- If a model is closed and we want to explain another exogenous variable, we must either add a new equation to the model to explain it, or switch it for a currently endogenous variable.
- Because the choice of a closure defines the direction of causality in a model, our choices can have significant implications for the behavior of the model.
- In static CGE models we are most often concerned with elements of the factor market closure, and with macroeconomic elements relating to investment and government spending.

Factor Market Closure

- Changes in the capital market closure are usually used to represent different adjustment time frames.
- Consider the specific factors and HOS models of production. The key difference between them is that in the former the stock of capital in each industry is exogenous, and the price of capital in each sector is endogenous.
- We can think of this as a closure choice — the specific factors model does not attempt to explain the allocation of capital. By contrast, the HOS model does, and to do so it must introduce two new conditions. These are full employment of capital and capital price arbitrage.
- Which of these closure options we choose will depend on the adjustment time-frame that we want the results to represent, with the specific factors case being thought of as ‘short run’ and the HOS case as ‘long run.’

Steady State Closure

- Another alternative is sometimes called a 'steady-state' closure.
- In this case, the price of capital is assumed to be at a long-run equilibrium rate and the capital stock is at its optimal level given that return.
- Increases in the return to capital caused by a shock to the economic system would induce an increase in investment, thereby driving the marginal product of capital down to its original level.
- Hence, to implement the closure we 'swap' the exogenous/endogenous status of the capital stock and the return to capital. The expansion of the capital stock generates an endowment effect that can be thought of as capturing the dynamic effects of the shock.

- When it comes to the labor market, we have similar closure choices.
- Most common closures are neoclassical — the wage rate is assumed to vary to ensure full employment of labor.
- We can instead fix the wage rate and endogenize the level of employment or the labor stock.
- If we want to allow both the price of labor and the quantity of labor supplied to vary, we are drawing the line for what is inside the model in a different place. We would need to provide another equation to describe the labor supply. This could be accomplished by allowing for the consumption of leisure by the household and adding a time constraint, or by specifying an immigration function.

Macroeconomic Closure

- In CGE models we usually introduce government spending and investment since these are significant sources of final demand.
- Nonetheless, their introduction to the model sits somewhat awkwardly within the static economic framework.
- This is because the models represent a single period, but investment and saving (by the household or the government) represent activities directed to future periods which are not explicitly modeled.
- Similarly, government expenditure presumably reflects, at least in part, investment in public goods, but the optimization process behind spending choices is not explicitly modeled.
- This necessitates that a closure choice be made for key

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