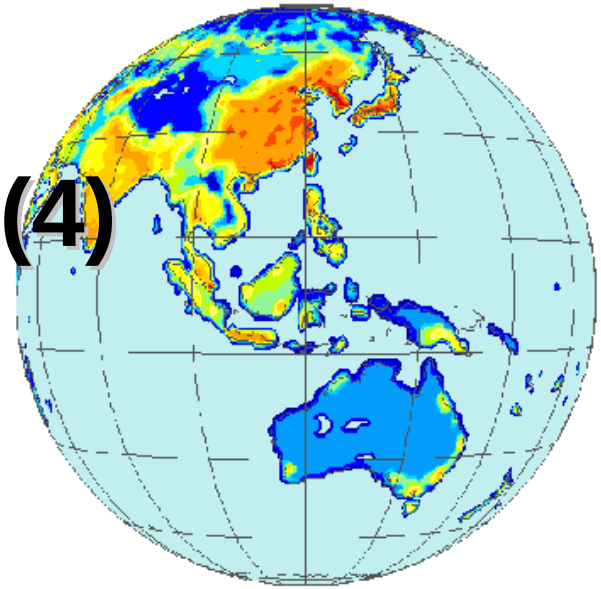
CGE model development (4)

Detailed CGE <2>

Recursive dynamics



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Capital stock

1. Capital stock process

$$CAP_{t+1} = CAP_t * (1-\delta) + I_t$$

2. According to capital stock process, technology will be improved.

   T: technology in stock, A: technology in investment

$$T_{t+1} = \frac{T_t * CAP_t * (1-\delta) + A_t * I_t}{CAP_t * (1-\delta) + I_t} = \frac{T_t * CAP_t * (1-\delta) + A_t * I_t}{CAP_{t+1}}$$

3. Relationship between capital stock and capital income

   In CGE, capital income (INC_CAP) is input.

   In iteration process, capital stock (CAP) is treated.

   2 concepts of capital is linked through coefficient: COEF_CAP as follows;

$$COEF\_CAP = \frac{INC\_CAP_{t=2000}}{CAP_{t=2000}}$$

$$INC\_CAP_t = COEF\_CAP * CAP_t$$

Capital stock

4. Optimal relationship between capital and investment is assumed

g: GDP growth rate, k: capital growth rate,

l: labor growth rate (including labor productivity)

Stock process:

$$CAP_{t+1} = CAP_t * (1-\delta) + I_t$$

$$CAP_{t+1} = CAP_t * (1+k_t)$$

$$\Rightarrow CAP_t = \frac{I_t}{(\delta + k_t)}$$

Economic growth:

$$GDP_t = \alpha_0 CAP_t^{\alpha_K} L_t^{\alpha_L}$$

$$GDP_{t+1} = \alpha_0 CAP_{t+1}^{\alpha_K} L_{t+1}^{\alpha_L}$$

$$GDP_t * (1+g_t) = \alpha_0 \left\{CAP_t * (1+k_t)\right\}^{\alpha_K} \left\{L_t * (1+l_t)\right\}^{\alpha_L}$$

$$1+g_t = (1+k_t)^{\alpha_K} (1+l_t)^{\alpha_L}$$

$$\Rightarrow k_t = \left\{\frac{1+g_t}{(1+l_t)^{\alpha_L}}\right\}^{\frac{1}{\alpha_K}} - 1$$

$$CAP_t = \frac{I_t}{\delta + \left\{\frac{1+g_t}{(1+l_t)^{\alpha_L}}\right\}^{\frac{1}{\alpha_K}} - 1}$$

Investment

- Total investment is calculated from expected GDP growth rate in the next period, present capital stock, and technology change.
- Total investment is distributed into each sectors based on the following logit function taken into account profit from capital.

$$I_{j,t+1} = I_{TOT,t+1} * \frac{\left(PK_{j,t} / PK_{j,t=1}\right)^{\alpha} * I_{j,t=1}}{\sum_j \left(\left(PK_{j,t} / PK_{j,t=1}\right)^{\alpha} * I_{j,t=1}\right)}$$