

## Malthus Excel Exercise

### A MALTHUSIAN WORLD

Variable	Meaning / Value
$C_t$	Aggregate consumption of food
$c_t$	Individual consumption of food
$N_t$	Number of people
$L_t$	Acres of land (fixed amount) = 10,000,000,000
$K_t$	Aggregate capital Stock
$Y_t$	Total Output
$N_t$	Total population

**Endowments:** People own the economy's stock of land and its capital. Each person also has one unit of time for which he can supply to the labor market.

#### Preferences

People save a fixed fraction  $s=.20$  of their income.

**The production function is**

$$Y_t = AK_t^{1/12}L_t^{3/12}[(1.001)^t N_t]^{2/3}.$$

#### Capital Stock law of motion

$$K_{t+1} = .95K_t + .2Y_t$$

#### The Population growth function

$$N_{t+1} / N_t = .999 + .00004c_t. \text{ This is the function } G(c).$$

### Q1. Balanced growth Path Results

- a. Solve for the balanced growth path level of  $c$ .
- b. Solve for the Balanced Growth path population at time  $t=0$ ,  $N_0$ .
- c. Solve for the Balanced Growth path aggregate capital stock at date  $t=0$ ,  $K_0$ .

### Q.2 Transitional Dynamics

- a. Suppose that the economy is on its balanced growth path from  $t=0$ , 49. Then at  $t=50$ , there is an epidemic that kills off  $1/3$  of the date  $t=49$  population. (Thus,  $N_{50}=2/3 N_{49}$ .) Calculate the paths for  $N_t$ ,  $c_t$ , and  $K_t$  from  $t=50$  to 250. Produce a time plot graph for the log of each variable. Does the system converge to the balanced growth path solution?
- b. Suppose that the economy is on its balanced growth path from  $t=0$ , 49. Then at  $t=50$ , there is an event that reduces the capital stock by  $1/3$  of the date  $t=49$  level. (Thus,  $K_{50}=2/3 K_{49}$ .) Calculate the paths for  $N_t$ ,  $c_t$ , and  $K_t$  from  $t=50$  to 150. Produce a time plot graph for the log of each variable. Does the system converge to the balanced growth path solution?