Solow Growth Model, Part 2

Agenda

• Working with the Solow Growth Model:
  ➢ What happens if
    • n-dot changes?
    • δ changes?
    • v changes?
    • A changes?

Solow Growth Model

• What happens if n-dot changes?
  ➢ Baby boom generation enters labor force
  ➢ Baby boom generation retires
  ➢ China’s 1-child policy
  ➢ Comparing 2 countries with different n-dot’s
    • Assume identical production and saving functions

The Solow Growth Model

• What happens to Y/N and y-dot after the increase in n-dot?
  ➢ Y/N is lower
  ➢ y-dot < n-dotB during the transition period
  ➢ y-dot = n-dot in the steady states
    • y-dotB > y-dotA

Increase n-dot

• Working with the Solow Growth Model:
  ➢ What happens if
    • n-dot changes?
    • δ changes?
    • v changes?
    • A changes?
**Increase n-dot**

\[ y\text{-dot}_A = n\text{-dot}_A \]

- At A
- Transition Period
- At B

**Solow Growth Model**

- What are the differences in y-dot and Y/N between countries A and B?
  - \( y\text{-dot}_A > y\text{-dot}_B \)
  - \( (Y/N)_A < (Y/N)_B \)

**Decrease n-dot**

- \( \frac{Y}{N} \)
- \( (Y/N)_A \)
- \( (K/N)_A \)
- \( K/N \)

**Solow Growth Model**

- What happens if \( \delta \) changes?
  - The composition of the capital stock shifts toward shorter-lived equipment.
  - A new technology does not change productivity but increases the durability of equipment.

**Different Countries, n-dot’s**

- \( \frac{Y}{N} \)
- \( (Y/N)_A \)
- \( (Y/N)_B \)
- \( (K/N)_A \)
- \( (K/N)_B \)

**Increase \( \delta \)**

- \( \frac{Y}{N} \)
- \( (Y/N)_A \)
- \( (K/N)_A \)
- \( K/N \)
Solow Growth Model

• What happens to \(Y/N\) and \(y\)-dot after the increase in \(\delta\)?
  - \(Y/N\) is lower
  - \(y\)-dot < \(n\)-dot during the transition period
  - \(y\)-dot = \(n\)-dot in the steady states
  - \(y\)-dot_{A} = y\)-dot_{A}\n
• \(y\)-dot_{B} = \(y\)-dot_{A} \n
Increase \(\delta\)

Solow Growth Model

• What happens if \(v\) changes?
  - A change in the private saving rate
  - A change in the public saving rate
    • Higher \(T\) and/or lower \(G\)
  - A change in net foreign borrowing

Decrease \(\delta\)

Increase \(v\)
Solow Growth Model

- What happens to \( Y/N \) and \( y\cdot\dot{dot} \) after the increase in \( v \)?
  - \( Y/N \) is higher
  - \( y\cdot\dot{dot} > n\cdot\dot{dot} \) during the transition period
  - \( y\cdot\dot{dot} = n\cdot\dot{dot} \) in the steady states
    - \( y\cdot\dot{dot}_t = y\cdot\dot{dot}_s \)

- \( y\cdot\dot{dot}_B = y\cdot\dot{dot}_A \)

Increase v

<table>
<thead>
<tr>
<th>( Y/N )</th>
<th>( (Y/N)_A )</th>
<th>At A</th>
<th>Transition Period</th>
<th>At B</th>
<th>Time</th>
</tr>
</thead>
</table>

Solow Growth Model

- The effect of savings on growth
  - In the steady state
    - \( y\cdot\dot{dot} = k\cdot\dot{dot} = n\cdot\dot{dot} \)
    - \( n\cdot\dot{dot} \) is the only factor that matters.
    - Economies with higher \( v \) do not grow faster in the long-run, i.e., the long-run growth rate does NOT depend on the saving rate.

- So why increase \( v \) (which reduces consumption)?
  - During the transition period
    - \( y\cdot\dot{dot} > n\cdot\dot{dot} \)
    - So \( Y/N \) increases
    - \( (Y/N)_B > (Y/N)_A \)

Decrease v

<table>
<thead>
<tr>
<th>( Y/N )</th>
<th>( (Y/N)_A )</th>
<th>( (K/N)_A )</th>
<th>( (S/N)_A )</th>
<th>At A</th>
<th>Transition Period</th>
<th>At B</th>
<th>K/N</th>
</tr>
</thead>
</table>

• Economies with higher \( v \) do not grow faster in the long-run, i.e., the long-run growth rate does NOT depend on the saving rate.
Solow Growth Model

• What happens if A increases?

Increase A

Y/N

\((Y/N)_A\)

\((S/N)_A\)

\((K/N)_A\)

K/N

Solow Growth Model

• What happens to Y/N and y-dot after the increase in A?
  ➢ Y/N is higher
  ➢ y-dot > n-dot during the transition period
  ➢ y-dot = n-dot in the steady states
    • y-dot_A = y-dot_A

Solow Growth Model

• How much of the increase in Y/N is due to:
  ➢ The increase in A?
  ➢ The increase in K/N?

• Increases in A increase Y/N
  ➢ Directly and
  ➢ Indirectly by increasing S/N, lb/N and K/N.
Increase A

(Y/N)\textsubscript{A}  
(S/N)\textsubscript{A}  
(K/N)\textsubscript{A}  
K/N  
Y/N  
Ib/N  
S/N  
A