The Simple Keynesian Theory of Income Determination

The Simple Keynesian Theory

• Some Basic Definitions
  – Endogenous variables
    • Output
    • Consumer Spending
  – To become endogenous variables
    • Investment spending
    • Net exports
    • Interest rates
    • Inflation

The Simple Keynesian Theory

• Some Basic Definitions (continued)
  – Exogenous variables
    • Policy instruments
      – Money supply
      – Government spending
      – Tax rates

The Simple Keynesian Theory

• Some Basic Definitions (continued)
  – Exogenous variables (continued)
    • Demand shocks
      – Unpredictable changes in
        • Consumer spending
        • Investment spending
        • Net exports
      † Foreign economic activity
      – Abrupt changes in technology
      – Changes in regulations
      – Wars
      – Political crises

The Simple Keynesian Theory

• Some Basic Definitions (continued)
  – Exogenous variables (continued)
    • Supply shocks
      – Large changes in oil prices
      – Large changes in raw material prices
        • Agricultural
        • Industrial

The Simple Keynesian Theory

• Parameters

The Simple Keynesian Theory

• Determining Equilibrium Income
  – By definition
    \[ E = C + I + G + NX \]
  – Now assume
    • C, G and NX are always equal to planned
    • Only I can differ from planned
    \[ I = I(p) + I(u) \]
  • Therefore
    \[ E(p) = C + I(p) + G + NX \]
The Simple Keynesian Theory

• Determining Equilibrium Income (con’t)
  – The Consumption Function
    • Autonomous consumption
    • Induced consumption
    • General linear form

\[ C = a + c \ ( Y - T ) \]

– Figure 3-1

Figure 3-1
A Simple Hypothesis Regarding Consumption Behavior

The Simple Keynesian Theory

• Determining Equilibrium Income (con’t)
  – The Savings Function
    • Autonomous saving
    – Figure 3-3
    • Induced saving
    – marginal propensity to save
    • General linear form

\[ S = ( Y - T ) - C \\
= ( Y - T ) - a - c \ ( Y - T ) \\
= -a + ( 1 - c ) \ ( Y - T ) = -a + s \ ( Y - T ) \]

– Figure 3-3
Consumption, Saving, and Disposable Income, 1929–96

The Simple Keynesian Theory

• Determining Equilibrium Income (con’t)
  – Consumption & Savings (Figure 3-2)

\[ ( Y - T ) = C + S \\
= a + c \ ( Y - T ) -a + s \ ( Y - T ) \\
= ( c + s ) \ ( Y - T ) \\
( c + s ) = ( Y - T ) / ( Y - T ) \\
= 1 \\
so \ c + s = 1 ; \ c = 1 - s ; \ s = 1 - c \]

– Figure 3-2
The Relation Between Induced Consumption, Induced Saving, and the Consumption Function
The Simple Keynesian Theory

- Determining Equilibrium Income (con’t)
  - Equilibrium
    - Equilibrium is a situation in which there is no pressure for change
  - Total Planned Expenditures
    \[ E(p) = C + I(p) + G + NX = a + c(Y - T) + I(p) + G + NX = a + cY - cT + I(p) + G + NX \]

- Figure 3-4

The Simple Keynesian Theory

- Determining Equilibrium Income (con’t)
  - Equilibrium (continued)
    - Autonomous Planned Spending
      \[ A(p) = a - cT + I(p) + G + NX \]
    - Total Planned Expenditures
      \[ E(p) = A(p) + cY \]

The Simple Keynesian Theory

- Determining Equilibrium Income (con’t)
  - Disequilibrium Dynamics (continued)
    - Example
      - Figure 3-5
    - Does I(u) need to be reversed?

- Figure 3-5
  How Equilibrium Income is Determined
The Simple Keynesian Theory

• Determining Equilibrium Income (con’t)
  – Equilibrium (continued)
    • Autonomous planned spending equals induced saving in equilibrium

\[ Y = E(p) \]
\[ Y - cY = E(p) - cY \]
\[ (1 - c)Y = A(p) \]

– remember
\[ s = 1 - c \]

The Simple Keynesian Theory

• The Multiplier Effect
  – An example

– Calculating the Multiplier
  • How much does income change?

\[ Y(1) = \frac{A(p)(1)}{s} \]
\[ Y(0) = \frac{A(p)(0)}{s} \]

Change in \( Y \) = Change in \( A(p) / s \)

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• The Multiplier (continued)
  
  \[ k = \frac{\text{Change in } Y}{\text{Change in } A(p)} \]

• from

\[ \text{Change in } Y = \text{Change in } A(p) / s \]

\[ k = \frac{\text{Change in } A(p)}{s} / \text{Change in } A(p) \]

\[ k = 1 / s \]

• Relationship between leakages and the multiplier?

> Figure 3-6

The Simple Keynesian Theory

• Fiscal Policy
  – Fiscal Policy Definitions

• Changes in government spending
• Changes in autonomous tax revenues
• Changes in tax rates

– Now
\[ A(p) = a - cT + I(p) + G + NX \]
The Simple Keynesian Theory

• Government Spending Multiplier
  – If 
  \[ \text{Change in } Y = \text{Change in } A(p) / s \]
  – then 
  \[ \text{Change in } A(p) = \text{Change in } G \]
  \[ \text{Change in } Y = \text{Change in } G / s \]
  \[ k = \text{Change in } G / s / \text{Change in } G = 1 / s \]

The Simple Keynesian Theory

• Government Spending Multiplier (con’t)
  – The Government Budget Deficit
  \[ (G - T) = S - I - NX \]
  \[ \text{Change in } G - \text{Change in } T = \]
  \[ \text{Change in } S - \text{Change in } I - \text{Change in } NX \]
  • but
  \[ \text{Changes in } T, I, \text{ and } NX = 0 \]
  • therefore,

The Simple Keynesian Theory

• The Tax Multiplier
  – Autonomous Taxes
  \[ \text{Change in } A(p) = -c \text{ (Change in } T) \]

The Simple Keynesian Theory

• The Tax Multiplier (continued)
  – Autonomous Tax Multiplier
  \[ k(T) = \frac{\text{Change in } Y}{\text{Change in } T} \]
  • Remember
  \[ \text{Change in } Y = \text{Change in } A(p) / s \]
  \[ = [-c \text{ (Change in } T)] / s \]
  • therefore
  \[ k(T) = -c \text{ (Change in } T) / s \text{ (Change in } T) \]
  \[ = -c / s \]

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• Balanced Budget Multiplier
  \[ k(G) = 1 / s \text{ & } k(T) = -c / s \]
  therefore,
  \[ k(G) + k(T) = [1 / s] + [-c / s] \]
  \[ = [1 - c] / s \]
  \[ = s / s \]
  \[ = 1 \]

» Figure 3-7
The Simple Keynesian Theory

• The Tax Multiplier (continued)
  – Effect of Income Taxes (continued)
    • Induced consumption
      \[ C = a + c ( Y - T ) \]
      \[ = a + c ( Y - T(a) - tY ) \]
      \[ = a + c ( 1 - t ) Y \]

The Simple Keynesian Theory

• The Tax Multiplier (continued)
  – Effect of Income Taxes (continued)
    • Induced saving
      \[ S = ( Y - T ) - C \]
      \[ = Y - T(a) - tY - a + c ( 1 - t ) Y \]
      \[ = -a + ( 1 - c ) ( 1 - t ) Y \]
      \[ = -a + s ( 1 - t ) Y \]

The Simple Keynesian Theory

• The Tax Multiplier (continued)
  – Effect of Income Taxes (continued)
    • Induced income tax revenues
      \[ T = T(a) + tY \]
The Simple Keynesian Theory

• The Tax Multiplier (continued)
  – Equilibrium Income with Income Taxes

\[ Y = E(p) \]

\[ Y - c (1 - t) Y = E(p) - c (1 - t) Y \]

\[ [1 - c (1 - t)] Y = A(p) \]

\[ Y(e) = A(p) / [1 - c (1 - t)] \]

\[ = A(p) / [s (1 - t) + t] \]

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• The Tax Multiplier (continued)
  – Income Taxes and the Multiplier

\[ \text{Change in } Y = \text{Change in } A(p) / [s (1 - t) + t] \]

\[ \text{so} \]

\[ k = 1 / [s (1 - t) + t] \]

\[ \text{or} \]

\[ = 1/\text{marginal leakage rate} \]

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• The Tax Multiplier (continued)
  – Income Taxes, the Multiplier and Stabilization Policy

• Income taxes reduce the size of the multiplier
  – A smaller multiplier means business cycles are dampened
  – Income taxes are an automatic stabilizer.

• \( Y(e) \) changes when tax rates change
  – \( Y(e) \) increases when tax rates are reduced
  – \( Y(e) \) decreases when tax rates are increased

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• The Tax Multiplier (continued)
  – Income Taxes and the Gov’t Budget Deficit

\[ G - T = G - T(a) - tY \]

• Induced taxes makes the deficit cyclical
  – actual deficit
  – structural deficit

The Simple Keynesian Theory

• The International Trade Multiplier
  – Autonomous net exports

• exports
  – autonomous imports

– Induced net exports

• imports
  – General linear form

\[ NX = NX(a) - nxY \]

The Simple Keynesian Theory

• The International Trade Multiplier
  – The multiplier now becomes

\[ k = 1 / [s (1 - t) + t + nx] \]

– The multiplier becomes smaller the larger is the economy’s elasticity to import.
The Simple Keynesian Theory

- Summarizing the Multiplier
  \[ k = \frac{1}{\text{marginal leakage rate}} \]

<table>
<thead>
<tr>
<th>Types of leakages</th>
<th>Marginal leakage rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saving only</td>
<td>s</td>
</tr>
<tr>
<td>Saving and income tax</td>
<td>s (1 - t) + t</td>
</tr>
<tr>
<td>Saving, income tax, and imports</td>
<td>s (1 - t) + t + nx</td>
</tr>
</tbody>
</table>

- Implications for business cycles
- Implications for stabilization policy