Business Cycles & Output in the Short-Run

Agenda

• Introduction to Business Cycles.
• Keynesian Cross Model.

Business Cycle Terminology

• Components of a Business Cycle
  ➢ Peak
  ➢ Recession
  ➢ Trough
  ➢ Recovery and expansion

Business Cycle Terminology

• Features of a Business Cycle
  ➢ Pervasive nature.
  ➢ Recurrent but not periodic.
  ➢ Expansions longer than recessions.
  ➢ Differ in length.

Length of Business Cycle Expansions

<table>
<thead>
<tr>
<th>Business Expansion Beginning in:</th>
<th>37</th>
<th>45</th>
<th>39</th>
<th>24</th>
<th>106</th>
<th>56</th>
<th>12</th>
<th>92</th>
<th>120</th>
<th>38</th>
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<tbody>
<tr>
<td>Number of Months</td>
<td>0</td>
<td>25</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>125</td>
<td>150</td>
<td>175</td>
<td>200</td>
<td>225</td>
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</table>

Length of Business Cycle Contractions

<table>
<thead>
<tr>
<th>Business Contraction Beginning in:</th>
<th>8</th>
<th>11</th>
<th>16</th>
<th>8</th>
<th>16</th>
<th>11</th>
<th>6</th>
<th>16</th>
<th>8</th>
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<tbody>
<tr>
<td>Number of Months</td>
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<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
</tr>
</tbody>
</table>
Business Cycle Terminology

• Peak
  ➢ The maximum level that business activity reaches.
    • Can only be determined after the fact.
    • Generally associated with an output ratio > 0%.

• Boom
  ➢ An extended economic expansion where the output ratio is high (well above 0%) and rising.

Business Cycle Terminology

• Recessions (Hard landings)
  ➢ Popular definition:
    • 2 or more consecutive quarters of declining GDP.
  ➢ Official definition:
    • A period of significant decline in total output, income, employment, and trade,
      usually lasting from 6 months to a year, and
      marked by widespread contractions in many sectors of the economy.

Business Cycle Terminology

• Growth recessions (soft landings)
  ➢ A recurring period of slow growth in total output, income, employment, and trade,
    usually lasting a year or more
    • May occur without a recession, in which case the economy continues to grow, but at a pace significantly below its long-run growth.
    • May precede or be preceded by a recession.
  ➢ Actual growth will be less than potential growth
    • Unemployment rate will rise

Business Cycle Terminology

• Troughs
  ➢ The minimum level that economic activity reaches.
    • Can only be determined after the fact.
    • Generally associated with an output ratio < 0%.

Keynesian Cross Model

• Keynesian Cross (or Multiplier) Model
  ➢ Determining Equilibrium Income
  ➢ The Consumption Function
Keynesian Cross Model

- Determining Equilibrium Income, Ye
  - Actual Expenditures, E
    - \( Y = E = C + I + G + (X - M) \)

Determining Equilibrium Y

- Actual Expenditures, E
  - Actual E is identically equal to actual Y
  - Economy is ALWAYS on the \( Y = E \) line
  - Easiest to think of this line as actual production

Determining Equilibrium Y

- Planned Expenditures, Ep
  - By definition, \( E = C + I + G + (X - M) \)
  - By assumption
    - \( C = C_p \)
    - \( G = G_p \)
    - \( X = X_p \)
    - \( M = M_p \)
    - \( I = I_p + I_u \)
      - where \( I_u \) is unplanned inventory investment
        - can be either positive or negative

Determining Equilibrium Y

- Planned Expenditures, Ep
  - Explaining Ep
    - \( E_p = C_p + I_p + G_p + (X_p - M_p) \)

Exogenous Spending
Determining Equilibrium $Y$

- The (Planned) Consumption Function
  - The relationship between $C$ and $(Y - T)$
  - $C = C_0 + mpc(Y - T)$

  - where $C_0$ represents all of the non-income influences on consumption (autonomous consumption)
    - Interest rates (-)
    - Consumer confidence (+)
    - Wealth (+)
    - Expected future income (+)

- The (Planned) Consumption Function
  - The relationship between $C$ and $(Y - T)$
  - $C = C_0 + mpc(Y - T)$

  - where $mpc$ is the marginal propensity to consume
    - The proportion of an increase in $(Y - T)$ that is spent
    - Equal to $\frac{\Delta C}{\Delta (Y-T)}$
    - $0 < mpc < 1$

Determining Equilibrium $Y$

- The (Planned) Consumption Function
  - The relationship between $C$ and $(Y - T)$
  - $C = C_0 + mpc(Y - T)$

  - where $C_0$ is autonomous consumption, and
  - where $mpc(Y-T)$ is induced consumption

The Consumption Function

- $C = C_0 + mpc(Y - T)$

- $\Delta C = mpc \cdot \Delta (Y - T)$

- Autonomous planned expenditures

Determining Equilibrium $Y$

- The Planned Expenditure Function, $Ep$
  - $Ep = Cp + Ip + Gp + (Xp - Mp)$ and
  - $Cp = C0 + mpc(Y - T)$

  - $Ep = C0 + mpc(Y - T) + Ip + Gp + (Xp - Mp)$
  - $Ep = C0 + mpcY - mpcT + Ip + Gp + (Xp - Mp)$

  - If we let $Ap = C0 - mpcT + Ip + Gp + (Xp - Mp)$
    - Autonomous planned expenditures

  - then $Ep = Ap + mpcY$
Planned Expenditure Function

\[ Ep = Ap + mpcY \]

Determining Equilibrium Y

- Equilibrium is a situation where there is no pressure for any change, i.e.,
  - Where plans are fully realized, \( E = Ep \)
  - Therefore, \( Y = Ye \) at that \( Y \) where \( E = Ep \)

If \( Y = 2600 \)

- \( If\ Cp = 100 + 0.9 \times (2600 - 100) = 2350 \)
- \( Ip = 200 \)
- \( Gp = 150 \)
- \( Xp = 150 \)
- \( -Mp = 250 \)
- \( Then\ Ep = 2600 \)

- So \( Ep = Y = E \Rightarrow Iu = 0 \)
Determining Equilibrium Y

- Algebraically,
  \[ Y = C + I + G + (X - M) \]
  \[ \text{And } C = C_0 + mpc(Y - T) \]
  \[ Y = C_0 + mpcY - mpcT + I + G + (X - M) \]
  \[ \text{Let } Ap = C_0 - mpcT + I + G + (X - M) \]
  \[ Y = Ap + mpcY \]
  \[ Y = \frac{Ap}{1 - mpc} \]

Determining Equilibrium Y

- Ye, an endogenous variable, depends on:
  - Ap, the sum of several exogenous variables, and
  - mpc, a parameter

Determining Equilibrium Y

- If
  \[ Ap = 1,000 \] and \[ mpc = 0.9 \],
  - then
    \[ Y = \frac{Ap}{1 - mpc} \]
    \[ = \frac{1,000}{0.1} \]
    \[ = 10,000 \]

Determining Equilibrium Y

- So the economy is in equilibrium.
  - Is this a “good” thing?
    - Is Ye >, =, or < Yn?

Determining Equilibrium Y

- Disequilibria Dynamics
  - What happens if the economy is not at equilibrium?
    - Y > Ye or
    - Y < Ye?
  - Think of Y = E as production and Ep as spending.
Disequilibria Dynamics

- Suppose $Y = 3000$
  - If $C_p = 100 + 0.9 \times (3000 - 100) = 2710$
  - $I_p = 200$
  - $G_p = 150$
  - $X_p = 150$
  - $-M_p = -250$
  - Then $E_p = 2960$
- So $E_p < Y$ $\Rightarrow$ $I_u = 40$
  - How would businesses respond to this disequilibrium?

- Suppose $Y = 2000$
  - If $C_p = 100 + 0.9 \times (2000 - 100) = 1810$
  - $I_p = 200$
  - $G_p = 150$
  - $X_p = 150$
  - $-M_p = -250$
  - Then $E_p = 2060$
- So $E_p > Y$ $\Rightarrow$ $I_u = -60$
  - How would businesses respond to this disequilibrium?

Determining Equilibrium $Y$

- Disequilibria Dynamics:
  - If $E > E_p$, then $I_u > 0$ and $Y$ will fall to $Y_e$
  - If $E < E_p$, then $I_u < 0$ and $Y$ will rise to $Y_e$
  - The adjustment process is very rapid
    - 6 months to a year