Outline

• Overview/Recap
• Definitions
• Multipliers
• What about taxes, transfers?
• Imports, Exports
Overview

• We want to build up a general model where supply and demand determine output, and (over time) price level.

• To begin with, we simplify by:
  - Holding the price level constant (so demand completely determines output)
  - Ignore the financial side of the economy
## Recap: the Keynesian Model

<table>
<thead>
<tr>
<th>Eq.No.</th>
<th>Equation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$Y = AD$</td>
<td>Output equals aggregate demand, an equilibrium condition</td>
</tr>
<tr>
<td>2</td>
<td>$AD = C + I + G + X$</td>
<td>Definition of aggregate demand</td>
</tr>
<tr>
<td>3</td>
<td>$C = a_o + bY_d$</td>
<td>Consumption function, $b$ is the mpc</td>
</tr>
<tr>
<td>4</td>
<td>$Y_d \equiv Y - T$</td>
<td>Definition of disposable income</td>
</tr>
<tr>
<td>5</td>
<td>$T = TA_0 + tY$</td>
<td>Tax function; $TA_0$ is lump sum taxes, $t$ is marginal tax rate.</td>
</tr>
<tr>
<td>6</td>
<td>$I = IN_0$</td>
<td>Investment function, exogenous</td>
</tr>
<tr>
<td>7</td>
<td>$G = GO_0$</td>
<td>Government spending on goods and services, exogenous</td>
</tr>
<tr>
<td>8</td>
<td>$X = g_0$</td>
<td>Net Exports, exogenous</td>
</tr>
</tbody>
</table>
Definitions

• Parameters: relate the behavior of two variables

• Endogenous variables: variables determined within the system of equations

• Exogenous variables: variables determined outside the system of equations

• Autonomous spending: $a_0, IN_0, GO_0, g_0$
Fiscal Policy (Lump Sum Tax Cut)

\[ AD = b(1-t)Y + A_i \]
\[ AD = b(1-t)Y + A_0 \]

\[ \Delta Y = -\bar{\alpha}b\Delta TA \]
Multipliers

\[ Y_0 = \overline{\alpha} [a_0 - bTA_0 + IN_0 + GO_0 + g_0] \]
\[ \Delta Y = \overline{\alpha} [\Delta a - b\Delta TA + \Delta IN + \Delta GO + \Delta g] \]
\[ \Delta Y = \overline{\alpha} \Delta GO \]
\[ \Delta Y = \overline{\alpha} (-b\Delta TA) \]

\[ \Rightarrow \Delta Y / \Delta GO = \overline{\alpha} \]
\[ \Rightarrow \Delta Y / \Delta TA = -\overline{\alpha} b \]
Multipliers (II)

\[ \Delta Y = \bar{\alpha} \frac{\partial A}{\partial t} \Delta t + \frac{\partial \bar{\alpha}}{\partial t} [A_0] \Delta t \]

\[ \frac{\partial \bar{\alpha}}{\partial t} = (-1) \times \left( \frac{1}{1 - b(1-t) + m} \right)^2 \times (b) \]

\[ \Delta Y = \frac{\partial \bar{\alpha}}{\partial t} [A_0] \Delta t = -b(\bar{\alpha}^2)[A_0] \Delta t \]

\[ \frac{\Delta Y}{\Delta t} = -b(\bar{\alpha}^2)[A_0] \]
Fiscal Policy, Tax Rate Cut

\[ AD = b(1-t')Y + A_0 \]

\[ AD = b(1-t)Y + A_0 \]

\[ \Delta Y = -b(\alpha^2)(A_0)\Delta t \]

(corrected 9/15)
Estimates of Multipliers

Fiscal Bang for the Buck
One-year $ change in real GDP per $ reduction in federal tax revenue or increase in spending

Tax Cuts
Nonrefundable Lump-Sum Tax Rebate 1.02
Refundable Lump-Sum Tax Rebate 1.26

Temporary Tax Cuts
Payroll Tax Holiday 1.29
Across the Board Tax Cut 1.03
Accelerated Depreciation 0.27

Permanent Tax Cuts
Extend Alternative Minimum Tax Patch 0.48
Make Bush Income Tax Cuts Permanent 0.29
Make Dividend and Capital Gains Tax Cuts Permanent 0.37
Cut Corporate Tax Rate 0.30

Spending Increases
Extend Unemployment Insurance Benefits 1.64
Temporarily Increase Food Stamps 1.73
Issue General Aid to State Governments 1.36
Increase Infrastructure Spending 1.59

Source: Moody's Economy.com
Import Function

• A more realistic net exports function – imports?

\[ X = g_0 - mY \]

Source: BEA, 09Q2 BEA 2nd release
Export Function?

Source: BEA, 09Q2 GDP 2\textsuperscript{nd} release; Federal Reserve Board
Parameter Estimates for the Multiplier

\[ b(1-t) = 0.73 \]

\[ m = 0.23 \]

\[ \alpha \equiv \left( \frac{1}{1 - b(1-t) + m} \right) \]

\[ = \left( \frac{1}{1 - 0.73 + 0.23} \right) \]

\[ = 2 \]