Determination of Aggregate Output

The total quantity demanded of an economy's output is the sum of four types of spending

\[ Y^{ad} = C + I + G + NX \]

Equilibrium occurs in the economy when the total quantity of output supplied equals the total quantity of output demanded

\[ Y = Y^{ad} \]

Analysis assumes the price level is fixed
Consumption Expenditure and the Consumption Function

Income is the most important factor determining consumption spending.

Disposable income ($Y_D$) is total income less taxes ($Y - T$).

The marginal propensity to consume ($mpc$) is the slope of the consumption function ($\Delta C / \Delta Y_D$), the change in consumer expenditure that results from an additional dollar of disposable income.

$a$ is autonomous consumer expenditure, the amount of consumer expenditure that is independent of disposable income (how much will be spent when disposable income is 0).

\[
C = a + mpc(Y_D)
\]
**Table 1**  
Consumption Function: Schedule of Consumer Expenditure C When $mpc = 0.5$ and $a = 200$ ($\$ billions$)

<table>
<thead>
<tr>
<th>Point in Figure 1</th>
<th>Disposable income $Y_D$ (1)</th>
<th>Change in Disposable Income $\Delta Y_D$ (2)</th>
<th>Change in Consumer Expenditure $\Delta C (0.5 \times \Delta Y_D)$ (3)</th>
<th>Consumer Expenditure C (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>0</td>
<td>—</td>
<td>—</td>
<td>$200 \ (= a)$</td>
</tr>
<tr>
<td>F</td>
<td>400</td>
<td>400</td>
<td>200</td>
<td>400</td>
</tr>
<tr>
<td>G</td>
<td>800</td>
<td>400</td>
<td>200</td>
<td>600</td>
</tr>
<tr>
<td>H</td>
<td>1,200</td>
<td>400</td>
<td>200</td>
<td>800</td>
</tr>
</tbody>
</table>
FIGURE 1 Consumption Function

The diagram illustrates the consumption function, which is given by the equation:

\[ C = 200 + 0.5Y_D \]

Where:
- \( C \) represents Consumer Expenditure (in billions of dollars)
- \( Y_D \) represents Disposable Income (in billions of dollars)

The points E, F, G, and H on the graph represent different levels of disposable income and corresponding consumer expenditures. The intercept at \( a = 200 \) and the slope of the line indicate the relationship between disposable income and consumer expenditure.
Investment Spending

• Fixed investment—always planned
• Inventory investment—can be unplanned
• Planned investment spending
  ◆ Interest rates
  ◆ Expectations
**FIGURE 2 Keynesian Cross Diagram**

Aggregate Demand, $Y^{ad}$ ($billion$)

- $Y^{ad*} = 1000$

Aggregate Output, $Y$ ($billion$)

- $I = 300$
- $a = 200$

Equations:

- $Y^{ad} = C + I = 500 + 0.5Y$
- $C = 200 + 0.5Y$
- $I^u = +100$
- $I^u = -100$

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Expenditure Multiplier

A change in planned investment spending leads to an even larger change in aggregate output.

An increase in planned investment spending leads to an additional increase in consumer expenditure which raises aggregate demand and output further.

$$
\Delta Y = \left( \frac{1}{1 - mpc} \right) \Delta I
$$

$$
\frac{\Delta Y}{\Delta I} = \left( \frac{1}{1 - mpc} \right)
$$
FIGURE 3 Response of Aggregate Output to a Change in Planned Investment

\[ Y^ad = C + I_2 = 600 + 0.5Y \]

\[ Y^ad = C + I_1 = 500 + 0.5Y \]
**Figure 4** Response of Aggregate Output to the Collapse of Investment Spending, 1929–1933

*Source: Economic Report of the President.*
Changes in Autonomous Spending

Any change in autonomous spending will lead to a multiplied change in aggregate output

\[ \Delta Y = (a + I)\left(\frac{1}{1 - mpc}\right) \]

The shift in the aggregate demand function can come from a change in planned investment, a change in autonomous consumer spending, or both.

Changes in autonomous spending are dominated by animal spirits.
Government’s Role

Government spending and taxes can be used to change the position of the aggregate demand function.

Government spending adds directly to aggregate demand.

Taxes do not affect aggregate demand directly.

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

If taxes change, consumer expenditure changes in the opposite direction.

\[ \Delta C = -mpc \times \Delta T \]
FIGURE 5  Response of Aggregate Output to Government Spending and Taxes
Role of International Trade

A change in net exports (exports - imports) is positively related to changes in aggregate output

\[ \Delta Y = \Delta NX \left( \frac{1}{1 - mpc} \right) \]
Figure 6: Response of Aggregate Output to a Change in Net Exports
<table>
<thead>
<tr>
<th>Variable</th>
<th>Change in Variable</th>
<th>Response of Aggregate Output, Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous consumer expenditure, $a$</td>
<td>$\uparrow$</td>
<td>$\uparrow$</td>
</tr>
<tr>
<td>Investment, $I$</td>
<td>$\uparrow$</td>
<td>$\uparrow$</td>
</tr>
<tr>
<td>Government spending, $G$</td>
<td>$\uparrow$</td>
<td>$\uparrow$</td>
</tr>
<tr>
<td>Taxes, $T$</td>
<td>$\uparrow$</td>
<td>$\downarrow$</td>
</tr>
<tr>
<td>Net exports, $NX$</td>
<td>$\uparrow$</td>
<td>$\uparrow$</td>
</tr>
</tbody>
</table>

*Note: Only increases (↑) in the variables are shown; the effects of decreases in the variables on aggregate output would be the opposite of those indicated in the “Response” column.*
The ISLM Model

• Includes money and interest rates in the Keynesian framework

• Examines an equilibrium where aggregate output equals aggregate demand

• Assumes fixed price level where nominal and real quantities are the same

• IS curve is the relationship between equilibrium aggregate output and the interest rate

• LM curve is the combinations of interest rates and aggregate output for which $M^D = M^S$
Equilibrium in the Goods Market:  
The IS Curve

• Interest rates and planned investment spending
  ✷ Negative relationship

• Interest rates and net exports
  ✷ Negative relationship

• The points at which the total quantity of goods produced equals the total quantity of goods demanded

• Output tends to move toward points on the curve that satisfies the goods market equilibrium
FIGURE 7 Deriving the IS Curve

(a) Interest rates and planned investment spending

(b) Interest rates and net exports

(continues)
FIGURE 7 Deriving the IS Curve (continued)
FIGURE 7
Deriving the IS Curve

(a) Interest rates and planned investment spending

(b) Interest rates and net exports

(c) Keynesian cross diagram

(d) IS curve
Equilibrium in the Market for Money: The LM Curve

- Demand for money called liquidity preference
- $M^d/P$ depends on income ($Y$) and interest rates ($i$)
- Positively related to income
  - Raises the level of transactions
  - Increases wealth
- Negatively related to interest rates
Equilibrium in the Market for Money:
The LM Curve (cont’d)

• Connects points that satisfy the equilibrium condition that $M^D = M^S$
• For each level of aggregate output, the LM curve tells us what the interest rate must be for equilibrium to occur
• The economy tends to move toward points on the LM curve
FIGURE 8 Deriving the LM Curve
**FIGURE 9** ISLM Diagram: Simultaneous Determination of Output and the Interest Rate