

Economics 101: Problem Set #7 Solutions

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April 15, 2025

Problem 1: The 2001 Recession Case Study

This problem is based on the final historical case study from the handout on “Four Case Studies with the Aggregate Expenditures Model.” It examines the U.S. recession of 2001.

Part (i): Explanation

- **Decline in Planned Gross Investment Expenditures:**

During the 2001 recession, business expectations about future profitability declined sharply. This was largely a result of the bursting of the dot-com bubble, deteriorating market conditions, and increased uncertainty in the financial markets. With lower expected returns, firms reduced their planned gross investment expenditures.

- **Drop in Planned Consumption Expenditures:**

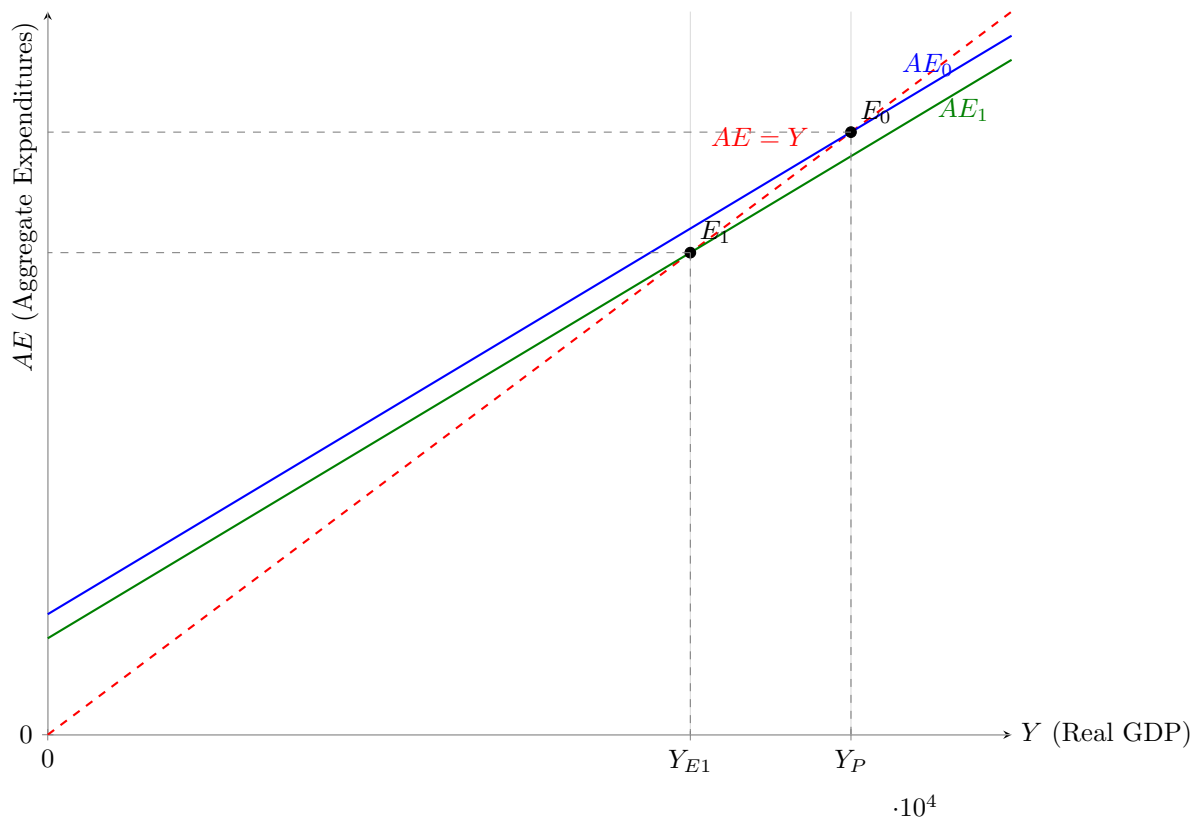
At the same time, households experienced a fall in wealth due to collapsing asset values, and uncertainty about future income increased. This led consumers to postpone or scale back spending, so planned consumption expenditures also dropped.

Part (ii): AE–Y Diagram and Explanation

The decline in both planned investment (I) and planned consumption (C) caused the Aggregate Expenditures (AE) curve to shift downward, from AE_0 to AE_1 . This shift reflects the decrease in autonomous spending. The initial equilibrium was at or near potential GDP, denoted Y_P . However, the downward shift in AE led to a new, lower equilibrium level of real GDP, denoted Y_{E1} (with equilibrium point E_1). The recessionary gap—the shortfall between full-employment output and the actual level of output—is given by

$$Y_P - Y_{E1} = 5,$$

which reflects the \$5 billion gap identified in the text. In other words, during the 2001 recession the economy was producing less than its full-employment capacity.



Note: Slopes and intercepts are illustrative. The key elements are the downward shift from AE_0 to AE_1 and the resulting equilibrium Y_{E1} being less than potential GDP Y_P .

Problem 2: Stimulus Package to Boost Equilibrium Output

In 2010, Congress was worried that the recovery might peter out and leave the economy below full employment. A stimulus package was proposed to increase government spending in order to boost aggregate expenditures and raise equilibrium output by \$500 billion.

Given:

$a = 300$ billion (autonomous consumption)

$b = 0.90$ (marginal propensity to consume)

$T = 50$ billion (lump sum taxes)

$I = 350$ billion, $G = 250$ billion, $X = 40$ billion, $M = 45$ billion.

Step-by-Step Solution:

1. Determine Autonomous Expenditures (AE intercept):

The consumption function is given by:

$$C = a + b(Y - T) = 300 + 0.90(Y - 50).$$

For the AE function (which includes investment, government spending, and net exports):

$$\begin{aligned} AE &= C + I + G + (X - M) \\ &= [300 - 0.90 \cdot 50] + I + G + (X - M) + 0.90Y \\ &= [300 - 45] + 350 + 250 + (40 - 45) + 0.90Y \\ &= 255 + 350 + 250 - 5 + 0.90Y \\ &= 850 + 0.90Y. \end{aligned}$$

2. Find Initial Equilibrium Output (Y_0):

Equilibrium is where $AE = Y$:

$$Y = 850 + 0.90Y \Rightarrow 0.10Y = 850 \Rightarrow Y_0 = \frac{850}{0.10} = 8500 \text{ billion.}$$

3. Determine the Required Increase in G :

The government spending multiplier (with no crowding out) is:

$$k = \frac{1}{1 - b} = \frac{1}{1 - 0.90} = 10.$$

To increase Y by \$500 billion,

$$\Delta G = \frac{\Delta Y}{k} = \frac{500}{10} = 50 \text{ billion.}$$

4. New AE Function:

With the increase in government spending, new $G = 250 + 50 = 300$ billion, so the new autonomous part becomes:

$$\begin{aligned} AE' &= [300 - 45] + 350 + 300 + (40 - 45) + 0.90Y \\ &= 255 + 350 + 300 - 5 + 0.90Y \\ &= 900 + 0.90Y. \end{aligned}$$

5. New Equilibrium Output (Y_1):

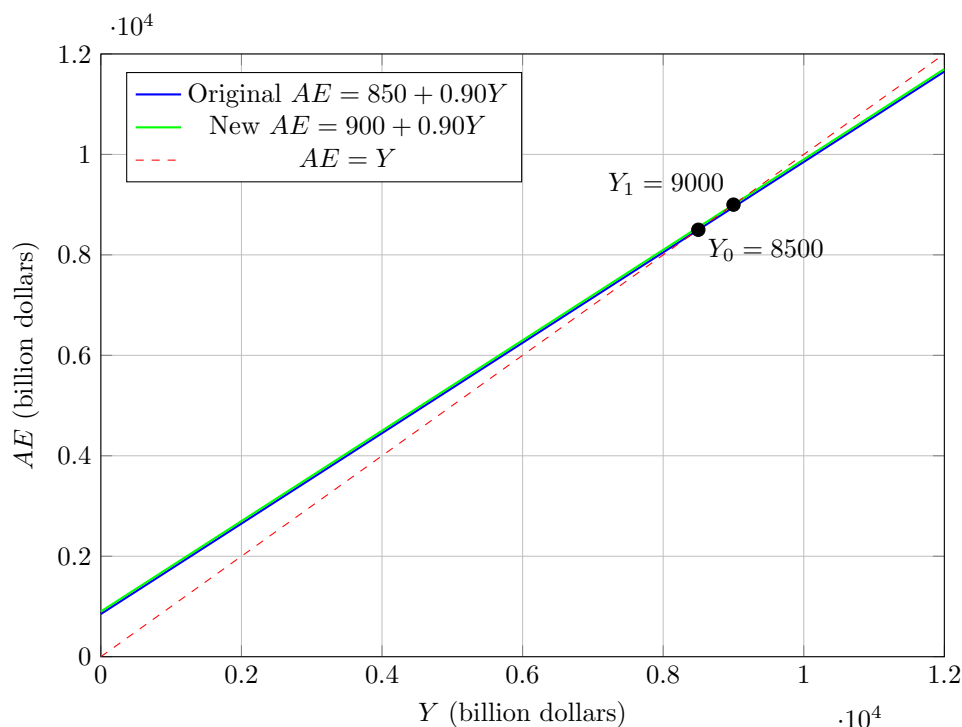
Set $Y = AE'$:

$$Y = 900 + 0.90Y \Rightarrow 0.10Y = 900 \Rightarrow Y_1 = \frac{900}{0.10} = 9000 \text{ billion.}$$

Explanation:

Increasing government spending by \$50 billion shifts the AE function upward (from $850 + 0.90Y$ to $900 + 0.90Y$). With a multiplier of 10, this raises equilibrium output by \$500 billion (from 8500 to 9000 billion dollars).

AE-Y Diagram



Problem 3: Tax Increase to Cool an Overheating Economy

In 2018, Congress was concerned that the economy was overheating—that is, actual GDP was approaching or exceeding the full-employment level. To cool the economy, a policy of increasing personal (lump sum) taxes was considered. The goal was to reduce equilibrium output by \$180 billion.

Given:

$$\begin{aligned}a &= 300 \text{ billion} && (\text{autonomous consumption}) \\b &= 0.80 && (\text{marginal propensity to consume}) \\T &= 50 \text{ billion} && (\text{lump sum taxes}) \\I &= 350 \text{ billion}, \quad G = 250 \text{ billion}, \quad X = 40 \text{ billion}, \quad M = 45 \text{ billion}.\end{aligned}$$

(A) Current Equilibrium GDP Calculation:

1. Determine the Autonomous Component:

Consumption is given by:

$$C = a + b(Y - T) = 300 + 0.80(Y - 50).$$

The autonomous part from consumption is:

$$a - bT = 300 - 0.80 \times 50 = 300 - 40 = 260.$$

Adding the other autonomous expenditures:

$$I + G + (X - M) = 350 + 250 + (40 - 45) = 350 + 250 - 5 = 595.$$

So, total autonomous expenditure:

$$A = 260 + 595 = 855.$$

2. Find Equilibrium Output:

The AE function is:

$$AE = A + bY = 855 + 0.80Y.$$

Equilibrium (where $Y = AE$) is:

$$Y = 855 + 0.80Y \quad \Rightarrow \quad 0.20Y = 855 \quad \Rightarrow \quad Y = \frac{855}{0.20} = 4275 \text{ billion}.$$

Thus, the current equilibrium GDP is 4275 billion dollars.

(B) Determining the Required Tax Increase:

An increase in lump sum taxes, ΔT , affects consumption via the term $-b\Delta T$. The new autonomous component becomes:

$$A' = [300 - b(T + \Delta T)] + (I + G + (X - M)) = [300 - bT] - b\Delta T + 595.$$

Since initially $300 - bT = 260$, we have:

$$A' = 260 - b\Delta T + 595 = 855 - b\Delta T.$$

The new equilibrium output is:

$$Y' = \frac{A'}{1 - b} = \frac{855 - b\Delta T}{1 - b}.$$

We want the equilibrium to decrease by 180 billion, i.e.,

$$Y - Y' = \frac{855}{1 - b} - \frac{855 - b\Delta T}{1 - b} = \frac{b\Delta T}{1 - b} = 180.$$

Solving for ΔT :

$$\Delta T = \frac{180(1-b)}{b}.$$

Substitute $b = 0.80$:

$$\Delta T = \frac{180(1-0.80)}{0.80} = \frac{180(0.20)}{0.80} = \frac{36}{0.80} = 45 \text{ billion.}$$

So, taxes should be increased by \$45 billion.

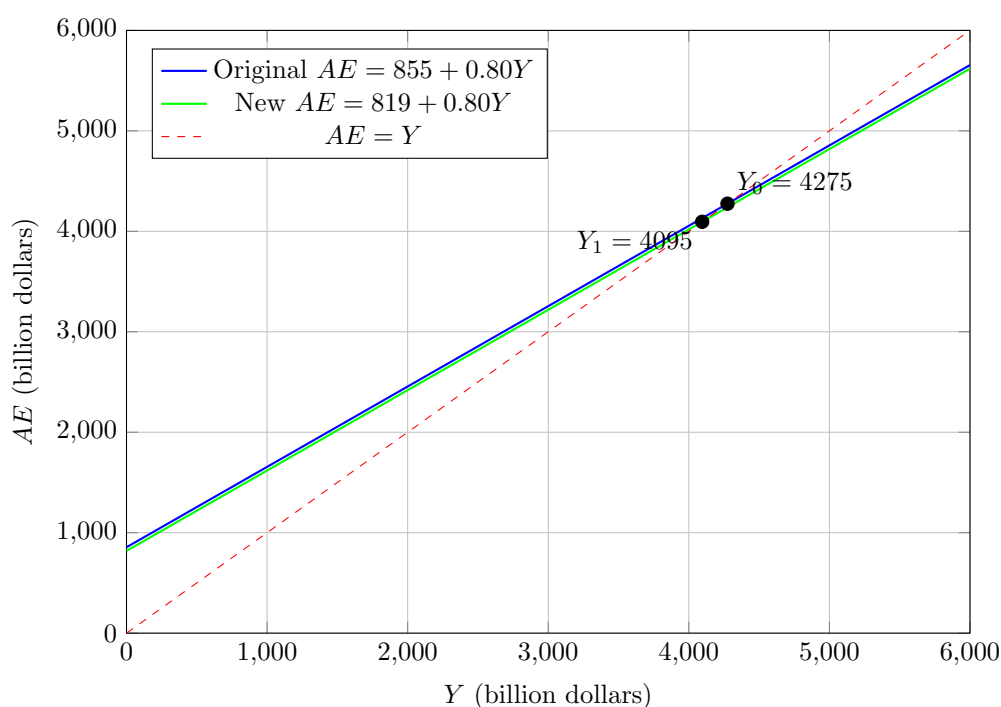
Explanation:

Increasing lump sum taxes reduces disposable income and hence consumption by $b\Delta T$. The tax multiplier in this framework is $-\frac{b}{1-b}$, so an increase of \$45 billion in taxes results in a decrease in equilibrium output by:

$$\Delta Y = -\frac{0.80}{0.20} \times 45 = -4 \times 45 = -180 \text{ billion.}$$

Thus, the desired reduction of \$180 billion in equilibrium output is achieved.

AE-Y Diagram



Overall Explanation: The increase in lump sum taxes by \$45 billion reduces disposable income and thereby consumption spending. Through the multiplier effect (with multiplier $= \frac{1}{1-b}$), the equilibrium GDP falls from 4275 billion to 4095 billion dollars—a reduction of 180 billion dollars—thus cooling the economy to help dampen inflationary pressures.