Income and Spending

Chapter #10

Introduction

- Why output fluctuates around its potential level?
  - In business cycle booms and recessions, output rises and falls relative to the trend of potential output
- Model in this chapter assumes a mutual interaction between output and spending: spending determines output and income, but output and income also determine spending
- The Keynesian model develops the theory of AD
  - Assume that prices do not change at all and that firms are willing to sell any amount of output at the given level of prices $\rightarrow$ AS curve is flat
  - Key finding: increases in autonomous spending generate additional increases in AD

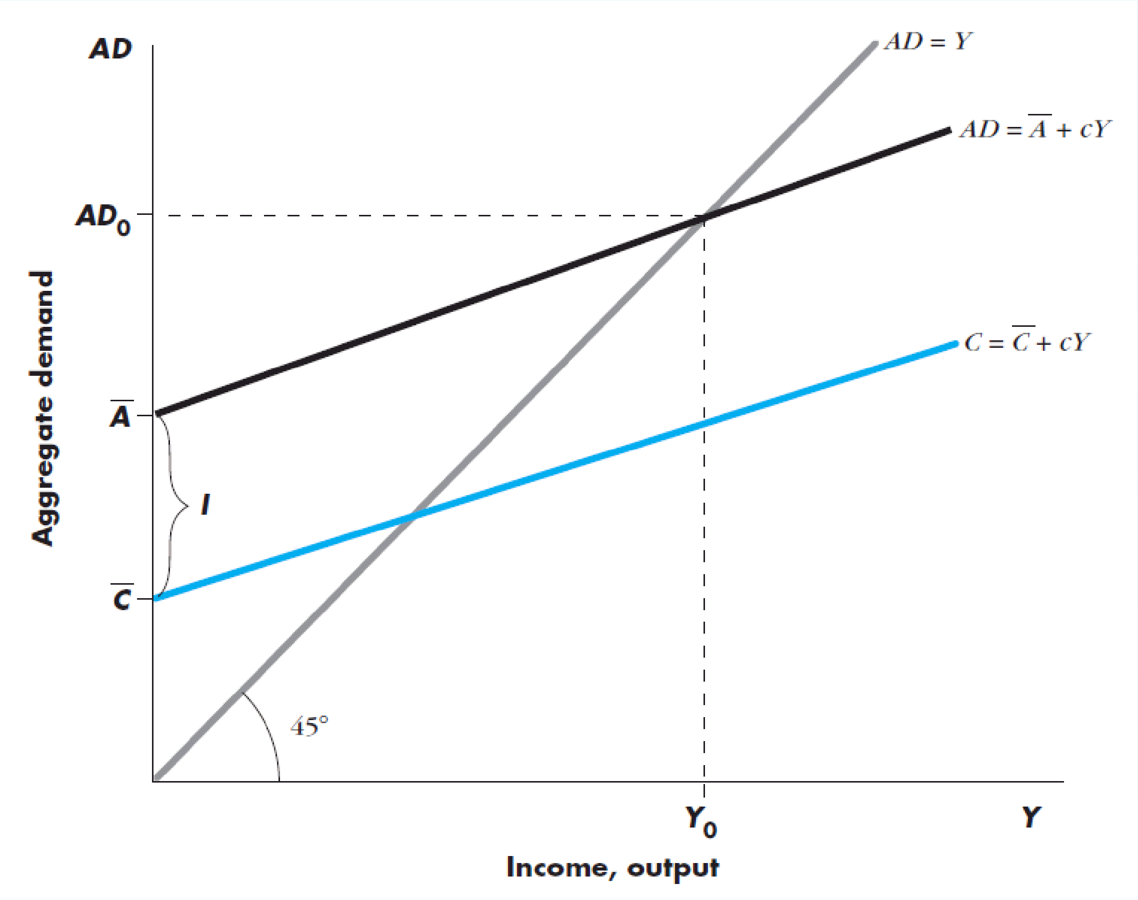
AD and Equilibrium Output

- AD is the total amount of goods demanded in the economy:
  $AD = C + I + G + NX$ (1)
- Output is at its equilibrium level when the quantity of output produced is equal to the quantity demanded, or
  $Y = AD = C + I + G + NX$ (2)
- When AD is not equal to output there is unplanned inventory investment or disinvestment: $IU = Y - AD$ (3), where IU is unplanned additions to inventory
  - If IU > 0, firms cut back on production until output and AD are again in equilibrium

The Consumption Function

- Consumption is the largest component of AD
  - Consumption increases with income $\rightarrow$ the relationship between consumption and income is described by the consumption function
  - If C is consumption and Y is income, the consumption function is $C = \overline{C} + cY$ (4), where $\overline{C} > 0$ and $0 < c < 1$
  - The intercept of equation (4) is the level of consumption when income is zero $\rightarrow$ this is greater than zero since there is a subsistence level of consumption
  - The slope of equation (4) is known as the marginal propensity to consume (MPC) $\rightarrow$ the increase in consumption per unit increase in income

The Consumption Function



Consumption and Savings

- Income is either spent or saved → a theory that explains consumption is equivalently explaining the behavior of saving
  - More formally, $S \equiv Y - C$ (5) → a budget constraint
- Combining (4) and (5) yields the savings function:

$$S \equiv Y - C = Y - \overline{C} - cY = -\overline{C} + (1-c)Y \quad (6)$$

  - Saving is an increasing function of the level of income because the marginal propensity to save (MPS), s = 1-c, is positive
    - Savings increases as income rises
    - Ex. If MPS is 0.1, for every extra dollar of income, savings increases by $0.10 <u>OR</u> consumers save 10% of an extra dollar of income

Consumption, AD, and Autonomous Spending

- Now we incorporate the other components of AD: G, I, taxes, and foreign trade (assume autonomous)
  - Consumption now depends on disposable income,

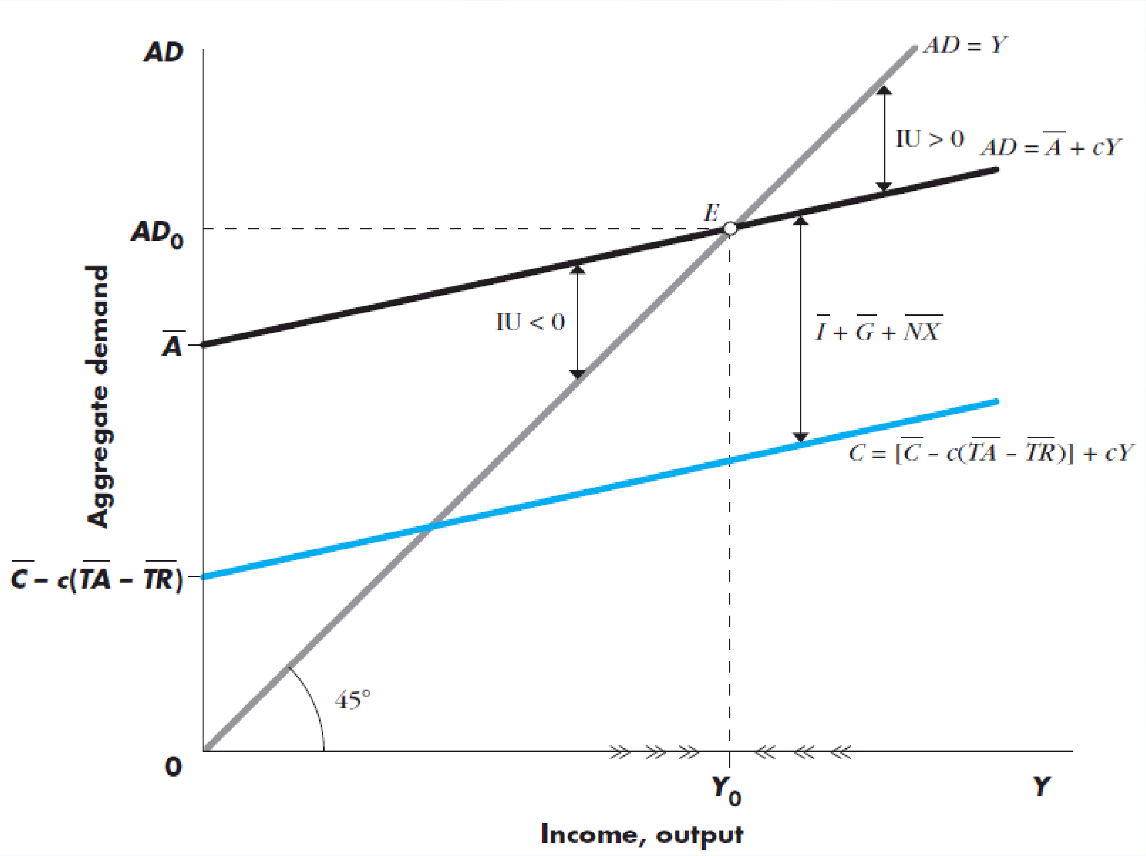
$$YD = Y - TA + TR \quad (7) \quad \text{and} \quad C = \overline{C} + cYD = \overline{C} + c(Y + TR - TA) \quad (8)$$

- AD then becomes $AD = C + I + G + NX$

$$\begin{aligned} &= \overline{C} + c(Y - TA + TR) + I + G + NX \\ &= \left[\overline{C} - c(TA - TR) + I + G + NX\right] + cY \quad (9) \\ &= \overline{A} + cY \end{aligned}$$

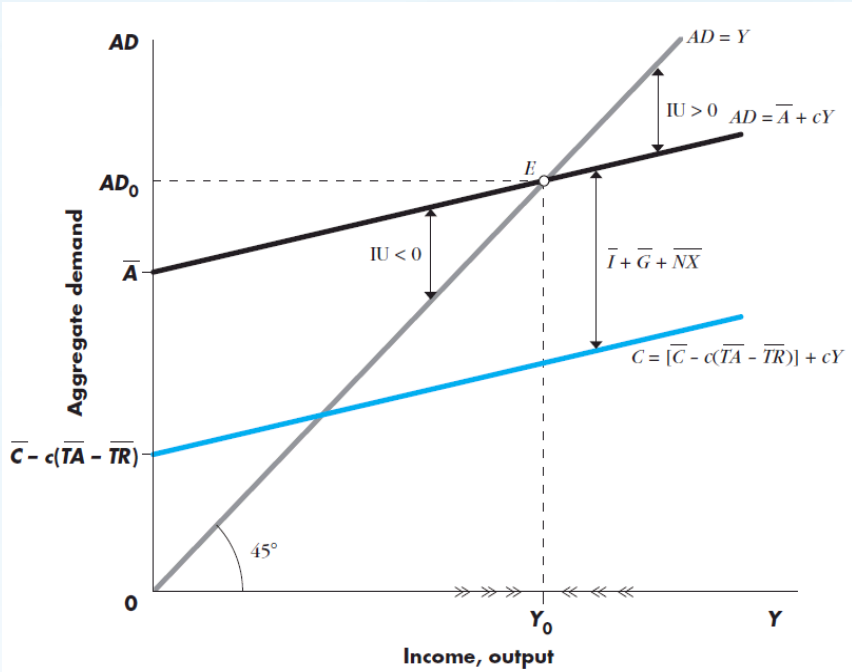
where A is independent of the level of income, or autonomous

Consumption, AD, and Autonomous Spending



Equilibrium Income and Output

- Equilibrium occurs where Y=AD, which is illustrated by the 45° line → point E
- The arrows show how the economy reaches equilibrium
  - At any level of output below Y_0, firms' inventories decline, and they increase production
  - At any level of output above Y_0, firms' inventories increase, and they decrease production



The Formula for Equilibrium Output

- Can solve for the equilibrium level of output, Y_0, algebraically:
  - The equilibrium condition is Y = AD (10)
  - Substituting (9) into (10) yields $Y = \overline{A} + cY$ (11)
  - Solve for Y to find the equilibrium level of output:

$$Y - cY = \overline{A}$$

$$Y(1 - c) = \overline{A} \quad (12)$$

$$Y_0 = \frac{1}{(1 - c)}\overline{A}$$

The equilibrium level of output is higher the larger the MPC and the higher the level of autonomous spending.

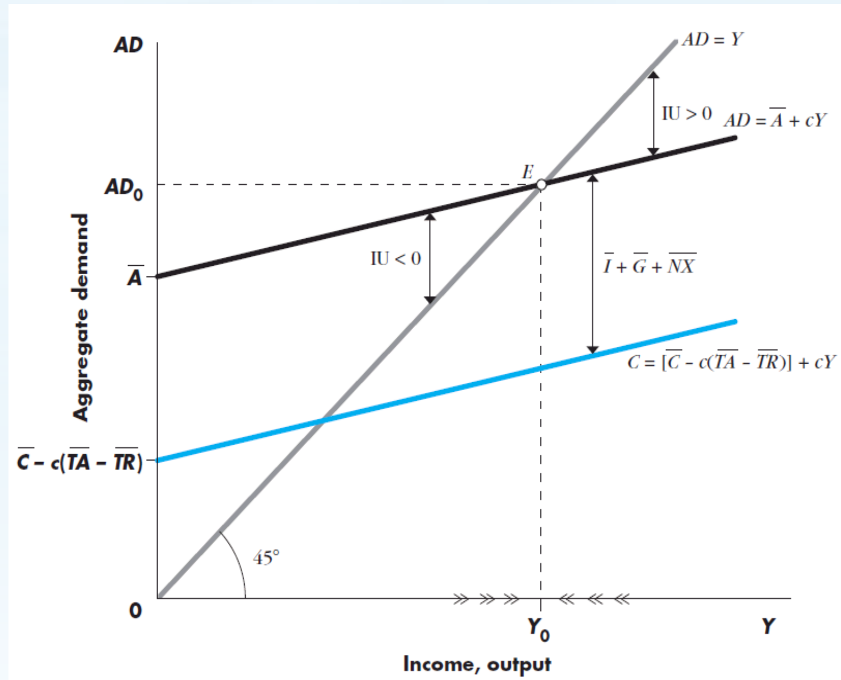
The Formula for Equilibrium Output

- Equation (12) shows the level of output as a function of the MPC and A
  - Frequently we are interested in knowing how a *change* in some component of autonomous spending would *change* output
  - Relate changes in output to changes in autonomous spending through $\Delta Y = \frac{1}{(1-c)} \Delta A$ (13)
    - Ex. If the MPC = 0.9, then 1/(1-c) = 10 $\rightarrow$ an increase in government spending by $1 billion results in an increase in output by $10 billion
    - Recipients of increased government spending increase their own spending, the recipients of that spending increase their spending and so on

Saving and Investment

- In equilibrium, planned investment equals saving in an economy with no government or trade
  - Vertical distance between the AD and consumption schedules equal to planned investment spending, I
  - The vertical distance between the consumption schedule and the 45° line measures saving at each level of income

$\rightarrow$ *at Y_0 the two vertical distances are equal and $S = I$*



Saving and Investment

- The equality between planned investment and saving can be seen directly from national income accounting
  - Income is either spent or saved: $Y = C + S$
  - Without G or trade, $Y = C + I$
  - Putting the two together: $C + S = C + I$

$$S = I$$

Saving and Investment

- With government and foreign trade in the model:
  - Income is either spent, saved, or paid in taxes: $Y = C + S + TA - TR$
  - Complete aggregate demand is $AD = C + I + G + NX$
  - Putting the two together:

$$C + I + G + NX = C + S + TA - TR$$

$$I = S + (TA - TR - G) - NX \quad (14)$$

The Multiplier

- By how much does a $1 increase in autonomous spending raise the equilibrium level of income? → The answer is <u>not</u> $1
  - Out of an additional dollar in income, $c is consumed
  - Output increases to meet increased expenditure; change in output = (1+c)
  - Expansion in output and income results in further increases

TABLE 10-1 The Multiplier

ROUND	INCREASE IN DEMAND THIS ROUND	INCREASE IN PRODUCTION THIS ROUND	TOTAL INCREASE IN INCOME (ALL ROUNDS)
1	$\Delta\overline{A}$	$\Delta\overline{A}$	$\Delta\overline{A}$
2	$c\Delta\overline{A}$	$c\Delta\overline{A}$	$(1 + c)\Delta\overline{A}$
3	$c^2\Delta\overline{A}$	$c^2\Delta\overline{A}$	$(1 + c + c^2)\Delta\overline{A}$
4	$c^3\Delta\overline{A}$	$c^3\Delta\overline{A}$	$(1 + c + c^2 + c^3)\Delta\overline{A}$
...	...	...	...
...	...	...	...
...	...	...	$\frac{1}{1 - c}\Delta\overline{A}$

The Multiplier

- If we write out the successive rounds of increased spending, starting with the initial increase in autonomous demand, we have:

$$\begin{aligned}\Delta AD &= \Delta\bar{A} + c\Delta\bar{A} + c^2\Delta\bar{A} + c^3\Delta\bar{A} + \ldots \\ &= \Delta\bar{A}(1 + c + c^2 + c^3 + \ldots)\end{aligned} \qquad (15)$$

  - This is a geometric series, where c < 1, that simplifies to:

$$\Delta AD = \frac{1}{(1-c)}\Delta\bar{A} = \Delta Y_0 \qquad (16)$$

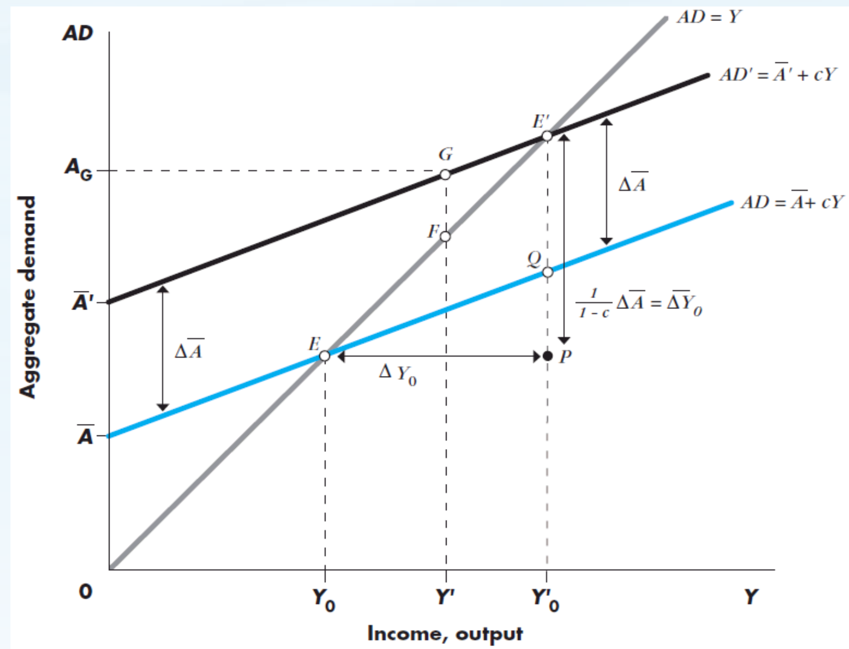
    - Multiplier = amount by which equilibrium output changes when autonomous aggregate demand increases by 1 unit

  - The general definition of the multiplier is

$$\frac{\Delta Y}{\Delta A} = \alpha = \frac{1}{(1-c)} \qquad (17)$$

The Multiplier

- Effect of an increase in autonomous spending on the equilibrium level of output:
  - The initial equilibrium is at point E, with income at Y_0
  - If autonomous spending increases, the AD curve shifts up by $\Delta \bar{A}$, and income increases to Y’
  - The new equilibrium is at E’ with income at $\Delta Y_0 = Y_0' - Y_0$



The Government Sector

- The government affects the level of equilibrium output in two ways:
  1. Government expenditures (component of AD)
  2. Taxes and transfers
- Fiscal policy is the policy of the government with regards to G, TR, and TA
  - Assume G and TR are constant, and that there is a proportional income tax (t)
  - The consumption function becomes: $C = \overline{C} + c(Y + TR - tY)$ (19)

$$= \overline{C} + cTR + c(1-t)Y$$

The Government Sector

- Combining (19) with AD: $$\begin{aligned} AD &= C + I + G + NX \\ &= \left[\overline{C} + cTR + c(1-t)Y\right] + I + G + NX \\ &= A + c(1-t)Y \end{aligned} \quad (20)$$

- Using the equilibrium condition, Y=AD, and equation (19), the equilibrium level of output is: $$\begin{aligned} Y &= \overline{A} + c(1-t)Y \\ Y - c(1-t)Y &= \overline{A} \\ Y\left[1 - c(1-t)\right] &= \overline{A} \\ Y_0 &= \frac{\overline{A}}{1 - c(1-t)} \end{aligned} \quad (21)$$

- The presence of the government sector flattens the AD curve and reduces the multiplier to $\frac{1}{(1-c(1-t))}$

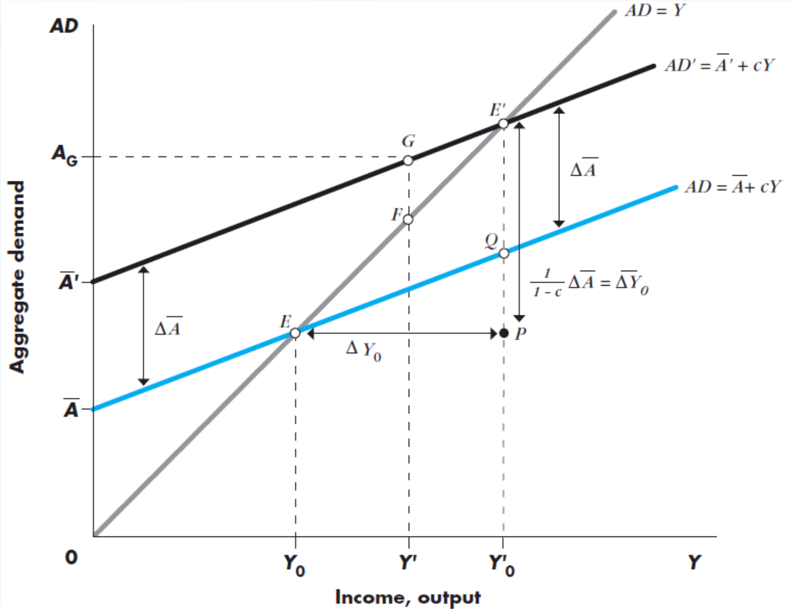
Income Taxes as an Automatic Stabilizer

- Automatic stabilizer is any mechanism in the economy that automatically (without case-by-case government intervention) reduces the amount by which output changes in response to a change in autonomous demand
  - One explanation of the business cycle is that it is caused by shifts in autonomous demand, especially investment
  - Swings in investment demand have a smaller effect on output when automatic stabilizers are in place (ex. Proportional income tax)
    - Unemployment benefits are another example of an automatic stabilizer → enables unemployed to continue consuming even though they do not have a job

Effects of a Change in Fiscal Policy

- Suppose government expenditures increase
  - Results in a change in autonomous spending and shifts the AD schedule upward by the amount of that change
  - At the initial level of output, Y_0, the demand for goods > output, and firms increase production until reach new equilibrium (E′)
- How much does income expand? The change in equilibrium income is:

$$\Delta Y_0 = \frac{1}{1-c(1-t)}\Delta\overline{G} = \alpha_G \Delta\overline{G} \qquad (22)$$



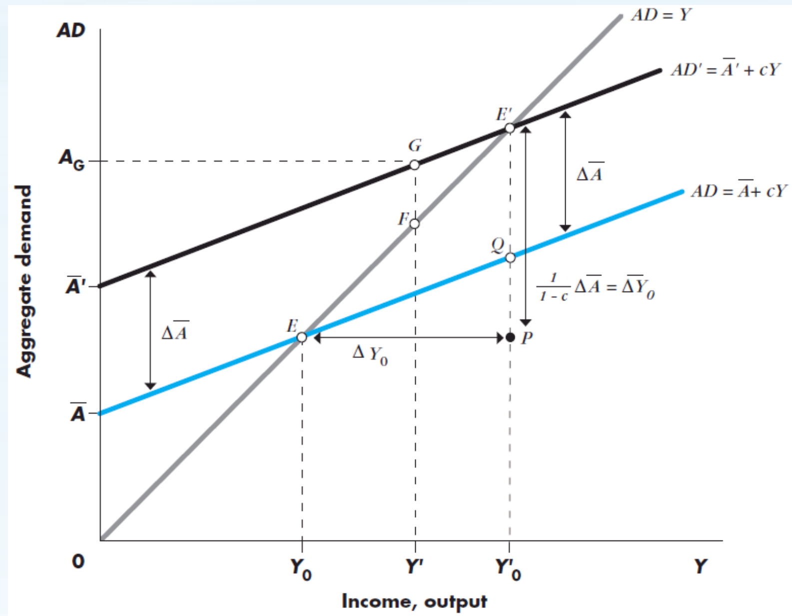
Effects of a Change in Fiscal Policy

$$\Delta Y_0 = \frac{1}{1-c(1-t)}\Delta\overline{G} = \alpha_G \Delta\overline{G} \quad (22)$$

- A \$1 increase in G will lead to an increase in income in excess of a dollar
  - If c = 0.80 and t = 0.25, the multiplier is 2.5

  → A \$1 increase in G results in an increase in equilibrium income of \$2.50

  → ΔG, ΔY shown in Figure 10-3



Effects of a Change in Fiscal Policy

- Suppose government increases TR instead
  - Autonomous spending would increase by only $c\Delta TR$, so output would increase by $\alpha_G c\Delta TR$
  - The multiplier for transfer payments is smaller than that for G by a factor of c
    - Part of any increase in TR is saved (since considered income)
- If the government increases marginal tax rates, two things happen:
  - The direct effect is that AD is reduced since disposable income decreases, and thus consumption falls
  - The multiplier is smaller, and the shock will have a smaller effect on AD

The Budget

- Government budget deficits have been the norm in the U.S. since the 1960s
- Is there a reason for concern over a budget deficit?
  - The fear is that the government's borrowing makes it difficult for private firms to borrow and invest → slows economic growth

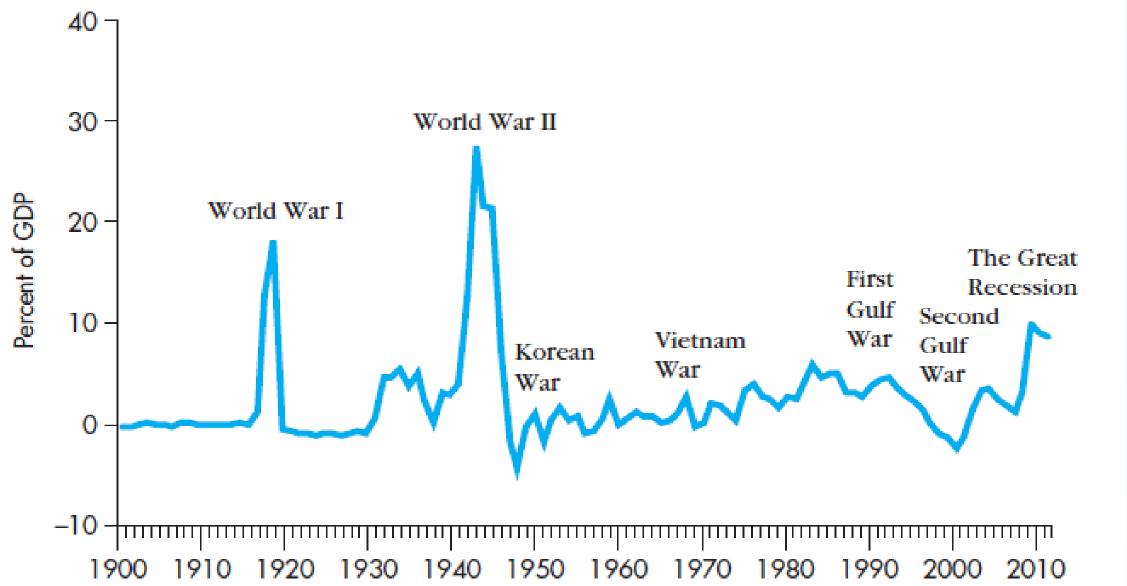


FIGURE 10-5 U.S. GOVERNMENT BUDGET DEFICIT AS A PERCENTAGE OF GDP, 1900–2011.

The Budget

- The budget surplus is the excess of the government's revenues, TA, over its initial expenditures consisting of purchases of goods and services and TR: $BS \equiv TA - G - TR$ (24)
  - A negative budget surplus is a budget deficit

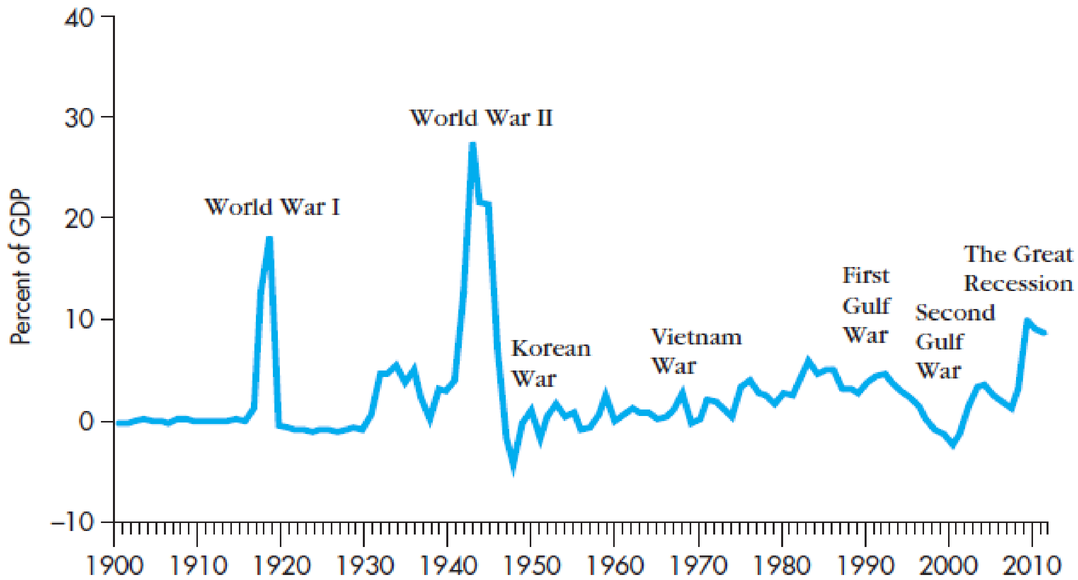
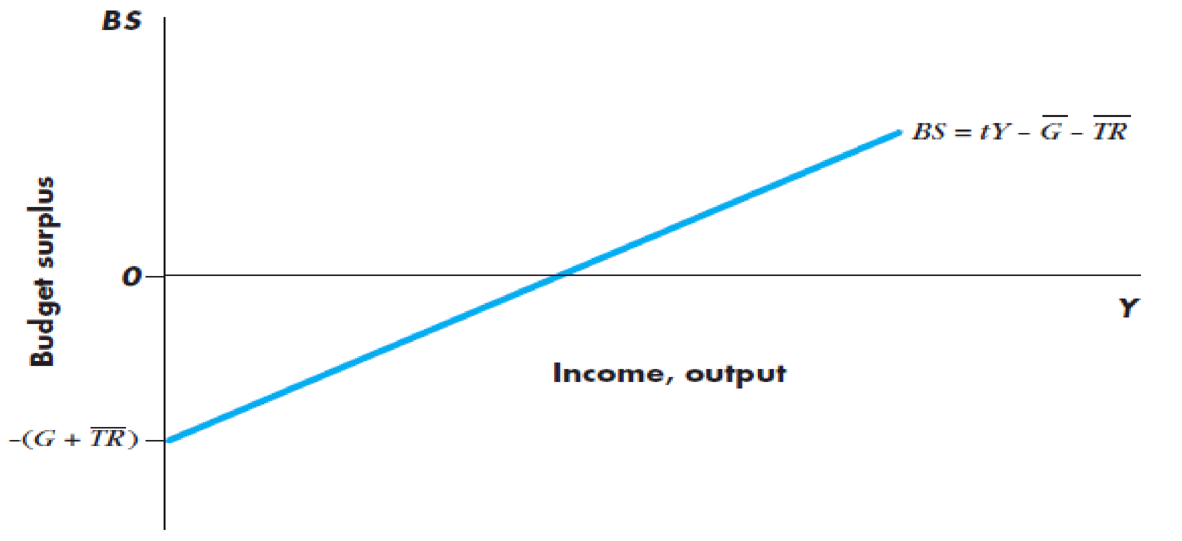


FIGURE 10-5 U.S. GOVERNMENT BUDGET DEFICIT AS A PERCENTAGE OF GDP, 1900–2011.

The Budget

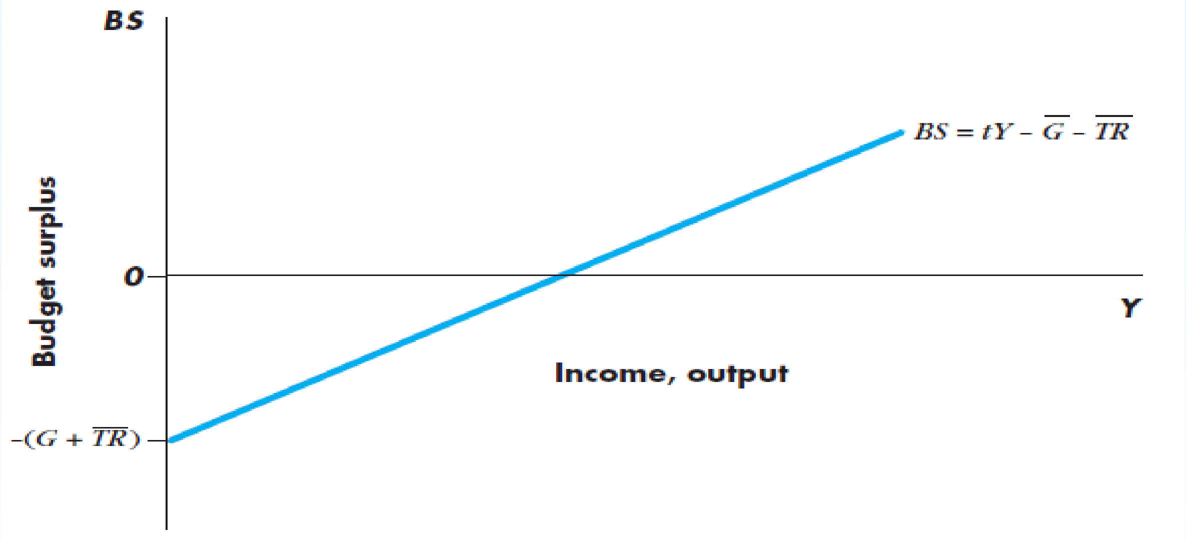
- If TA = tY, the budget surplus is defined as: $BS \equiv tY - G - TR$ (24a)
- Figure 10-6 plots the BS as a function of the level of income for given G, TR, and t
  - At low levels of income, the budget is in deficit since spends more than it receives in income
  - At high levels of income, the budget is in surplus since the government receives more in income than it spends



The Budget

- Figure 10-6 shows that the budget deficit depends on the government's policy choices (G, t, and TR) and also anything else that shifts the level of income
  - Ex. Suppose that there is an increase in I demand that increases the level of output

  → *budget deficit will fall as tax revenues increase*



Effects of Government Purchases and Tax Changes on the BS

- How do changes in fiscal policy affect the budget? OR Must an increase in G reduce the BS?
  - An increase in G reduces the surplus, but also increases income, and thus tax revenues

  → *Possibility that increased tax collections > increase in G*

Effects of Government Purchases and Tax Changes on the BS

- The change in income due to increased G is equal to $\Delta Y_0 \equiv \alpha_G \Delta G$, a fraction of which is collected in taxes
  - Tax revenues increases by $t\alpha_G \Delta G$
  - The change in BS is $\Delta BS = \Delta TA - \Delta G$

$$= t\alpha_G \Delta G - \Delta G$$

$$= -\frac{(1-c)(1-t)}{1-c(1-t)}\Delta G \qquad (25)$$