1 Equilibrium in the more general setting

• Suppose \( Y = 100 \) is fixed. Suppose the consumption function is \( C(Y - T) = 20 + M(Y - T) \), where \( M \) is a constant that is between 0 and 1. Suppose the investment function is \( I(r) = 30 - 50r \). Suppose we leave \( G \) and \( T \) as unspecified constants.

• Remember the equilibrium condition for the economy is

\[
Y - C(Y - T) - G = I(r)
\]

Substitute \( Y = 100 \) and \( C = 20 + M(Y - T) \) and \( I(r) = 30 - 50r \) into the equilibrium condition to get

\[
100 - [20 + M(100 - T)] - G = 30 - 50r
\]

solve this equation for the equilibrium interest rate

\[
r^* = \frac{50 - M(100 - T) - G}{-50}
\]

or

\[
r^* = \frac{-50 + M(100 - T) + G}{50}
\]

• We can make several predictions based on the above equation.
  (1) When \( G \) rises, \( r^* \) rises and so \( I(r^*) \) falls. This is what we called the “crowding-out effect”.

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(2) When $T$ increases, $r^*$ decreases and $I(r^*)$ increases. What happens here is, as $T$ goes up, disposable income $Y - T$ falls, so consumption falls, and saving goes up, and this induces the supply of loanable funds to go up. What happens next is competition among banks (who all want to find borrowers for their loanable funds) will bid down the price for the use of funds or the interest rate.

(3) When $M$ increases, $r^*$ increases.

- Note given the form of the consumption function, $M$ is equal to the marginal propensity to consume (MPC). Can you show this?

- Suppose we have two countries. Country 1 (Japan) has a lower $M$ than country 2 (US). According to our model, Which country has a lower interest rate?
2 The Equilibrium GDP (Mankiw Chapter 10-1)

- Let $\overline{Y}$ denote the economy’s potential GDP. $\overline{Y}$ is the maximum amount of goods and services that the economy can produce if all the economy’s available resources are fully utilized.

- As before, let $Y^*$ be the economy’s equilibrium GDP. Assume $Y^* < \overline{Y}$.

That is, the economy is operating at a level that is strictly below its potential. Imagine the economy is in a recession where many workers are unemployed and factories are closed.

- Question: That can be done to raise the equilibrium GDP?

- Remember the equilibrium condition for the economy is:

$$Y = C(Y - T) + I(r) + G$$

Note that so far we have always treated $Y$ (together with $G$ and $T$) as the model’s exogenous variable. This time we want to use the model to determine $Y$, that is, we now want to assume $Y$ is the model’s endogenous variable.

- To make our life easy, as a first step let’s assume interest $r$ is fixed (by the Federal Reserve Bank which, we assume, has full control over the financial market) That is treat $r$, $G$ and $T$ as the model’s exogenous variables.
• **Example 1**

Suppose $G = 10$, $T = 10$. $C(Y - T) = 20 + 0.5(Y - T)$, $I(r) = 30 - 50r$ and $r = 0.1$. Compute the equilibrium $Y$.

Substitute $G = 10$, $T = 10$. $C(Y - T) = 20 + 0.5(Y - T)$, $I(r) = 30 - 50r$, $r = 0.1$ into the equilibrium condition to obtain

$$Y = 20 + 0.5(Y - 10) + 30 - 50 \times 0.1 + 10$$

so

$$0.5Y = 20 - 5 + 30 - 5 + 10 = 50$$

and $Y^* = 100$.

• Consider now the following more general case. Suppose $C(Y - T) = M(Y - T)$, where $M$ is the constant $MPC$. $0 < M < 1$. Suppose the investment function $I(r)$ and $G$ and $T$ are left unspecified.

• Substitute the above information into the equilibrium condition $Y = C(Y - T) + I(r) + G$ to obtain

$$Y = M(Y - T) + I(r) + G$$

which implies

$$Y = MY - MT + I(r) + G$$

or

$$(1 - M)Y = -MT + I(r) + G$$
or

\[ Y^* = \frac{-MT + I(r) + G}{1 - M} \]

- The above equation makes the following predictions:
  1. An increase in \( G \) implies an increase in \( Y^* \).
  2. An increase in \( T \) implies a decrease in \( Y^* \).
  3. An increase in \( r \) implies a decrease in \( Y^* \).

- What happens if the government reduces \( G \)?
  What happens if the government reduces \( T \)?
  What happens if the Fed reduces \( r \)?

- **Example 2** Suppose \( G = 10, T = 10 \). \( C(Y - T) = 20 + 0.5(Y - T) \). \( I(r) = 30 - 50r \) and \( r = 0.1 \).
  1. Suppose now the Fed decides to cut interest rate by one percent. Will GDP increase or decrease? By how many percentage points? (hints) With \( r = 0.1 \), \( Y^* = 100 \). With \( r = 0.09 \), \( Y^* = 101 \). So GDP goes up by one percent.
  2. Suppose the Fed wants to pursue an interest rate policy that implements the following (full-employment) policy objective: \( Y^* = \overline{Y} \) and \( \overline{Y} = 102 \). How should the Fed set its interest rate target.