Principles of Macroeconomics: Income and Expenditure

Class 15

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- ▶ Announcements:
  - Deep breath, carry on
  - LC 11, GH 11 due Friday at 11:59pm
- ▶ Topics:
  - Consumption
  - Investment
  - Spending and GDP
- ▶ Readings:
  - Chapter 11

Situating Ourselves

▶ We have studied the production economy, comparative advantage, productivity, markets for capital and labor

▶ This is all how much we *can* produce – essentially the supply-side of the economy

▶ But now we want to think about how much we *will* produce
- Demand determines how much is produced
- And thus, actual production may fall short of total potential output

▶ Goals:
  (1) Develop a framework so we can understand business cycles
      - Demand: Consumption + Investment + Government + Trade
      - Together with supply, this determines equilibrium GDP
  (2) How can monetary and fiscal policy impact business cycles?
      - Can cause or reduce business cycle fluctuations
      - We usually think of policy as impacting aggregate demand

Road Map

This week:

- ▶ The consumption function
- ▶ Investment: planned vs unplanned investment
- ▶ Income-Expenditure equilibrium
- ▶ The multiplier

Next week:

- ▶ Aggregate Demand
- ▶ Aggregate Supply
- ▶ Short- vs Long-run

Thought Experiment

- ▶ If I give you $1000 today, would you go out and buy more?
  - • That is, would your consumption *rise*?
- ▶ Would you spend all $1000 of it? Would you spend less than $1000? Would you spend more than $1000?
- ▶ Now suppose I give you $20,000, but tell you that it will be delivered in a year. Would your consumption today change?
- ▶ Or, what if I increase your income by $20,000 a year every year forever?

The Consumption Function

▶ Let's formalize this intuition mathematically:

$$C = A + MPC \times Y^D$$

- $C \equiv$ Consumption today
- $Y^D \equiv$ Disposable Income today
- $A \equiv$ consumption shifter
  - If your future income increases, $A \uparrow$
  - If your wealth increases, $A \uparrow$
- $MPC \equiv \frac{dC}{dY^D}$, the slope of consumption
  - "MPC" stands for "marginal propensity to consume"

▶ What is savings then? Whatever you don't consume
- $S = Y^D - C = (1 - MPC) \times Y^D - A$
- Where $(1 - MPC)$ is the marginal propensity to save

▶ Gross private fixed investment
- Nonresidential fixed investment: structures, equipment, intellectual property
- Residential fixed investment (new construction of homes, apartments, etc)

▶ Change in private inventories
- "A lag generally exists between production and sale of outputs and between acquisition and use of products. Products held during such intervals (between production and sale or acquisition and use) are called inventories."
- So changes in inventories = inventory investment

- We can think of gross private fixed investment as planned investment
- Two key determinants to this:
  (1) The interest rate – recall demand for loanable funds
  (2) The future
    - Do I need more production tomorrow? Need to build today
    - Higher expected future sales? Need to build today

Unplanned Investment

► Businesses hold inventory – usually wanting a constant ratio of inventory to sales
  - But sometimes they produce more than they sell $\longrightarrow$ inventory rises
  - Sometimes they sell more than they produce $\longrightarrow$ inventory falls

► This change in inventory = inventory investment
  - Sometimes businesses can plan for this change – e.g. knowing that sales next year will be high, so they invest in inventories today
  - Many times, this is unplanned – e.g. their forecasts for sales are off

► Total investment:

$$I = I_{planned} + I_{unplanned}$$

Some simplifying assumptions for now:

(1) No government ($G = 0$)
(2) No trade $x, im = 0$
(3) Planned investment is exogenous
(4) Price level is fixed so that $NGDP = RGDP$

Then our model consists of the following equations:

$$GDP = C + I$$

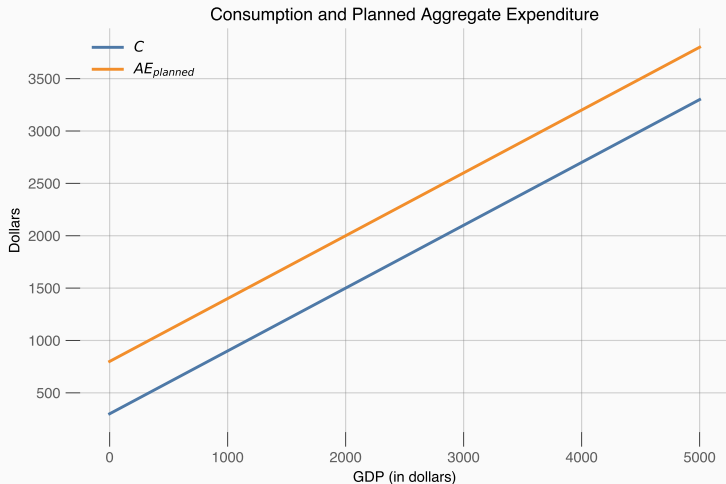$$I = I_{planned} + I_{unplanned}$$

$$C = A + MPC \times Y^D$$

$$Y^D = GDP$$

Now, define planned Aggregate Expenditure as:

$$\begin{aligned}
AE_{planned} &= C + I_{planned} \\
&= A + MPC \times Y^D + I_{planned} \\
&= A + MPC \times GDP + I_{planned}
\end{aligned}$$

Suppose that $A = 300$, $MPC = 0.6$, and $I_{planned} = 500$. Plot C and $AE_{planned}$ against GDP.

Consumption and Planned Aggregate Expenditure

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- ▶ But, sometimes $I_{unplanned}$ is not zero
  - If production > planned spending, $I_{unplanned} > 0$
  - If production < planned spending, $I_{unplanned} < 0$
- ▶ This has implications for future GDP:
  - If we produced too much this period, we produce less next period
  - If we produced too little this period, we produce more next period
- ▶ This period in math:

$$GDP = AE_{planned} + I_{unplanned}$$

$$I_{unplanned} = GDP - AE_{planned}$$

Equilibrium

- In static equilibrium, we assume that there are no surprises
  - Therefore, planned spending = actual spending
  - Therefore, $I_{unplanned} = 0$
- Solve for GDP:

$$GDP = AE_{planned} + I_{unplanned}$$
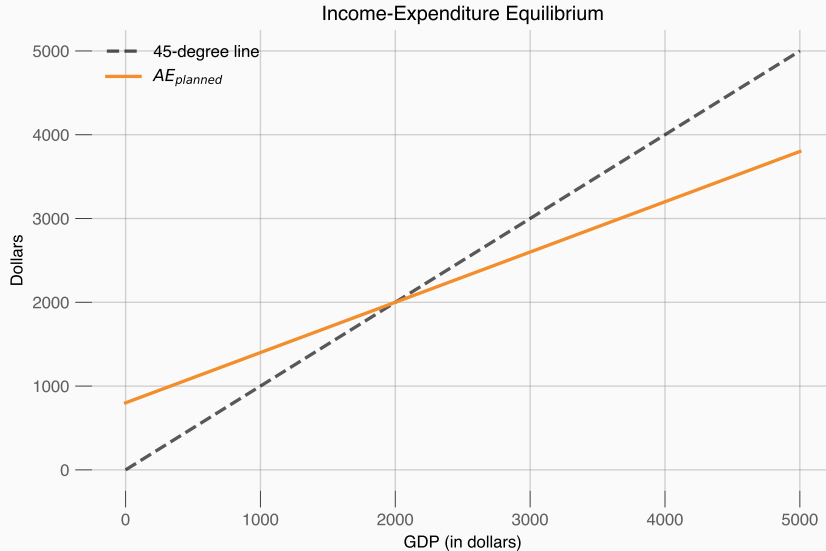$$GDP = A + MPC \times GDP + I_{planned} + I_{unplanned}$$
$$GDP = A + MPC \times GDP + I_{planned}$$
$$(1 - MPC)GDP = A + I_{planned}$$
$$GDP = \frac{A + I_{planned}}{1 - MPC}$$

- This is our equilibrium condition

Income-Expenditure Equilibrium

Suppose that $A = 250$, $MPC = 0.75$, and $I_{planned} = 450$

(1) Compute equilibrium GDP

(2) Suppose that firms actually produce $3000 worth of goods this period. Compute $I_{unplanned}$. Graphically demonstrate whether inventories fall or rise next period

(3) Suppose now that $I_{planned}$ increases by 100. What is the new equilibrium GDP?

(4) What is savings under the original equilibrium from (1)?

Solutions

(1) We start from the equilibrium condition:

$$GDP = AE_{planned} = C + I_{planned}$$
$$= A + MPC \times Y^D + I_{planned}$$
$$(1 - 0.75)GDP = 250 + 450$$
$$GDP = 2800$$

(2) Use the formula for $I_{unplanned}$:

$$I_{unplanned} = GDP - AE_{planned}$$
$$= 3000 - 2950$$
$$= 50$$

(3) Using the equilibrium condition:

$$GDP = \frac{A+I}{1-MPC}$$
$$= \frac{250+550}{1-0.75}$$
$$= 3200$$

(4) Use the savings formula:

$$S = (1-MPC) \times Y^D - A$$
$$= (1-0.75) \times 2800 - 250$$
$$= 450$$

Notice that this equals planned investment

Summary

- ▶ Consumption function – understand the intuition
- ▶ Investment – planned vs. unplanned
- ▶ Income-Expenditure model

- ▶ Remember: homework due Friday night
- ▶ Read chapter 11