Public Affairs 854
Macroeconomic Policy and International Financial Regulation
Lecture 7
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Outline

- A demand determined model w/o money
- Aggregate demand determination
- Policy and Multipliers

A Demand Determined Model w/o Money

Demand Determined Model w/o Money

- Demand determined implies output passively responds to demand
- Later on, we’ll add in supply side
- Adding in the supply side will allow us to talk about the price level and inflation
- But before talking about the price level, we’ll have to introduce money (which occurs in IS-LM)

Sketch for Next Six Weeks

- Keynesian cross - demand side dominates
- IS-LM – adds money to Keynesian cross
- Mundell-Fleming – adds cross-border (int'l) financial flows to IS-LM
- Aggregate Demand-Aggregate Supply – adds supply side (firms, labor market) to IS-LM
- Yields an integrated model of income/output, interest rates, price level

Aggregate Demand Determination

Aggregate Demand

- Hold constant net income and net transfers (F, V = 0)

$$(13.1) \qquad AD \equiv C + I + G + \underbrace{X - IM}_{\substack{trade\ balance \\ or \\ net\ exports}}$$

"planned total Spending"

"Planned" or "desired"

$$(13.1) \qquad AD \equiv C^p + I^p + G^p + \underbrace{X^p - IM^p}_{\substack{trade\ balance \\ or \\ net\ exports}}$$

Equilibrium Condition

- Production/income = aggregate demand
- This is why “Y” is both GDP and income
- Y moves passively to respond to changes in AD

$$Y = AD \tag{13.2}$$

- Firms are assumed to ramp up or down production in response to demand changes, instead of raising prices
- But we now need to say how each of the components of AD (*C*, *I*, *G*, *X*, *IM*) behave

Consumption

- Consumption (largest component of GDP) is modeled as function of disposable (i.e., after-tax & transfers) income:

$$(13.3)\quad C = \underbrace{\bar{C}}_{\substack{autonomous\\ consumption}} + c\underbrace{(Y - \bar{T})}_{\substack{\text{Disposable}\\ \text{income (aka}\\ \text{“after tax}\\ \text{income”}}}$$

Consumption

- Consumption (largest component of GDP) is modeled as function of disposable (i.e., after-tax & transfers) income:

$$(13.3)\quad C = \underbrace{\bar{C}}_{\substack{autonomous\\ consumption}} + c\,\underbrace{(Y - \bar{T})}$$

Disposable income (aka "after tax income"

Marginal propensity to consume, the change in Consumption for a one unit change in Disposable income, ∂C/∂(Y-T)

Consumption

- Consumption (largest component of GDP) is modeled as function of disposable (i.e., after-tax & transfers) income:

Taxes

$$(13.3)\quad C = \underbrace{\bar{C}}_{\substack{autonomous\\ consumption}} + c\underbrace{(Y - \bar{T})}_{\substack{\text{Disposable}\\ \text{income (aka}\\ \text{“after tax}\\ \text{income”}}}$$

Consumption

- Consumption is modeled as function of disposable income:

$$(13.3)\quad C = \underbrace{\bar{C}}_{\substack{autonomous\\ consumption}} + c\underbrace{(Y - \bar{T})}_{\text{Disposable income}}$$

"Lump sum taxes"

- A bar over a variable means it is constant unless changed. A bar over T refers to "lump sum taxes". In this economy there is no income tax. With lump sum and income taxes:

$$T = \bar{T} + tY$$

We won't use this for this derivation; but be prepared to do so on problem sets

Other Equations

- Investment, government, export spending are at levels that are determined by factors outside of our model.
- Investment (building factories, spending on equipment) is determined by businesses
- Government spending is determined by Congress, Executive branches
- Export spending is determined by foreigners

$$I = \bar{I}\,, G = \bar{G}\,, X = \bar{X}$$

Imports

- Some of consumption is composed of imported goods & services
- Since aggregate demand is for American made goods & services, have to subtract this out

$$IM = \underbrace{\overline{IM}}_{\substack{autonomous \\ imports}} + mY \qquad (13.4)$$

Marginal propensity to import, the change in Imports for a one unit change in income, ∂IM/∂Y

Definitions

- This is a “model”, usually a system of equations
- Parameters: symbols that define behavior, e.g. *c*
- Autonomous spending: spending that occurs regardless of other variables, e.g., $\bar{G}$
- Exogenous variable: variable that is determined ***outside*** the system of equations, viz., “exo”, e.g., *G, I, X*
- Endogenous variable: variable that is determined ***inside*** the system of equations, viz., “endo”, e.g., *Y, AD, C, IM*

Solving the System

- Use equilibrium condition and definition of aggregate demand:

(13.5a) $$\underbrace{Y = AD}_{\substack{equilibrium \\ condition}} \equiv \underbrace{C}_{consumption} + \underset{investment}{I} + \underset{government}{G} + \underset{exports}{X} - \underbrace{IM}_{imports}$$

- Substitute equations for each variable:

(13.5) $$\underbrace{Y = AD}_{\substack{equilibrium \\ condition}} \equiv \underbrace{\bar{C} + c(Y - \bar{T})}_{consumption} + \underbrace{\bar{I}}_{investment} + \underbrace{\bar{G}}_{government} + \underbrace{\bar{X}}_{exports} - \underbrace{(\overline{IM} + mY)}_{imports}$$

Solving the System

- Re-arranging to pull together "bar" terms and Y terms separately:

$$(13.6) \qquad \underbrace{Y = AD}_{\substack{equilibrium \\ condition}} \equiv (\bar{C} - c\bar{T} + \bar{I} + \bar{G} + \bar{X} - \overline{IM}) + (c - m)Y$$

- Drop AD, bring Y terms top left-hand-side (LHS):

$$Y - (c - m)Y = Y\big(1 - (c - m)\big) = (\bar{C} - c\bar{T} + \bar{I} + \bar{G} + \bar{X} - \overline{IM})$$

Solving the System

- Solve by dividing through by (1-(c-m))

$$(13.7) \qquad Y_0 = \underbrace{\left(\frac{1}{1-c+m}\right)}_{\substack{multiplier \\ \equiv \bar{\alpha}}} [\underbrace{\bar{C} - c\bar{T} + \bar{I} + \bar{G}}_{\substack{autonomous \\ domestic \\ spending \\ \equiv \bar{A}}} + \bar{X} - \overline{IM}]$$

"0" subscript denotes this is an "equilibrium" value of the variable Y, i.e., the solution, to differentiate it from the variable generally

Solving the System

- Solve by dividing through by (1-(c-m))

(13.7) $$Y_0 = \underbrace{\left(\frac{1}{1-c+m}\right)}_{\substack{multiplier \\ \equiv \overline{\alpha}}} [\underbrace{\bar{C} - c\bar{T} + \bar{I} + \bar{G}}_{\substack{autonomous \\ domestic \\ spending \\ \equiv \bar{A}}} + \bar{X} - \overline{IM}]$$

A constant which depends on the value of parameters *c*, *m*; typically larger than 1

Solving the System

- Solve by dividing through by (1-(c-m))

(13.7) $$Y_0 = \underbrace{\left(\frac{1}{1-c+m}\right)}_{\substack{multiplier \\ \equiv \bar{\alpha}}} \boxed{[\underbrace{\bar{C} - c\bar{T} + \bar{I} + \bar{G}}_{\substack{autonomous \\ domestic \\ spending \\ \equiv \bar{A}}} + \bar{X} - \overline{IM}]}$$

Sum of all spending that takes place regardless of other variables in the model

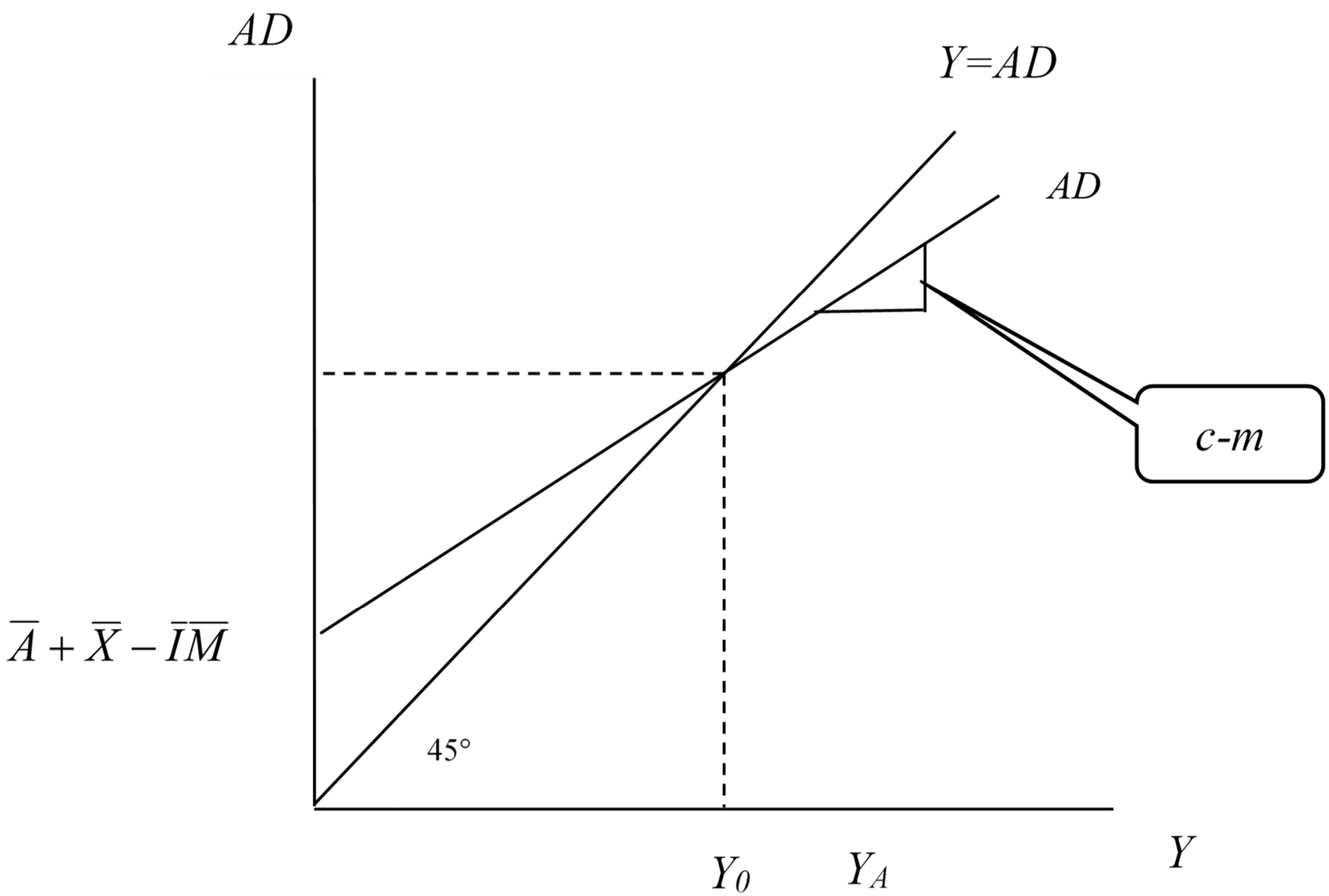
In words: the equilibrium level of output is a multiple of the total amount of autonomous spending; hence, changes in autonomous spending (e.g., government spending) will change the equilibrium level of output/income

Interpretation

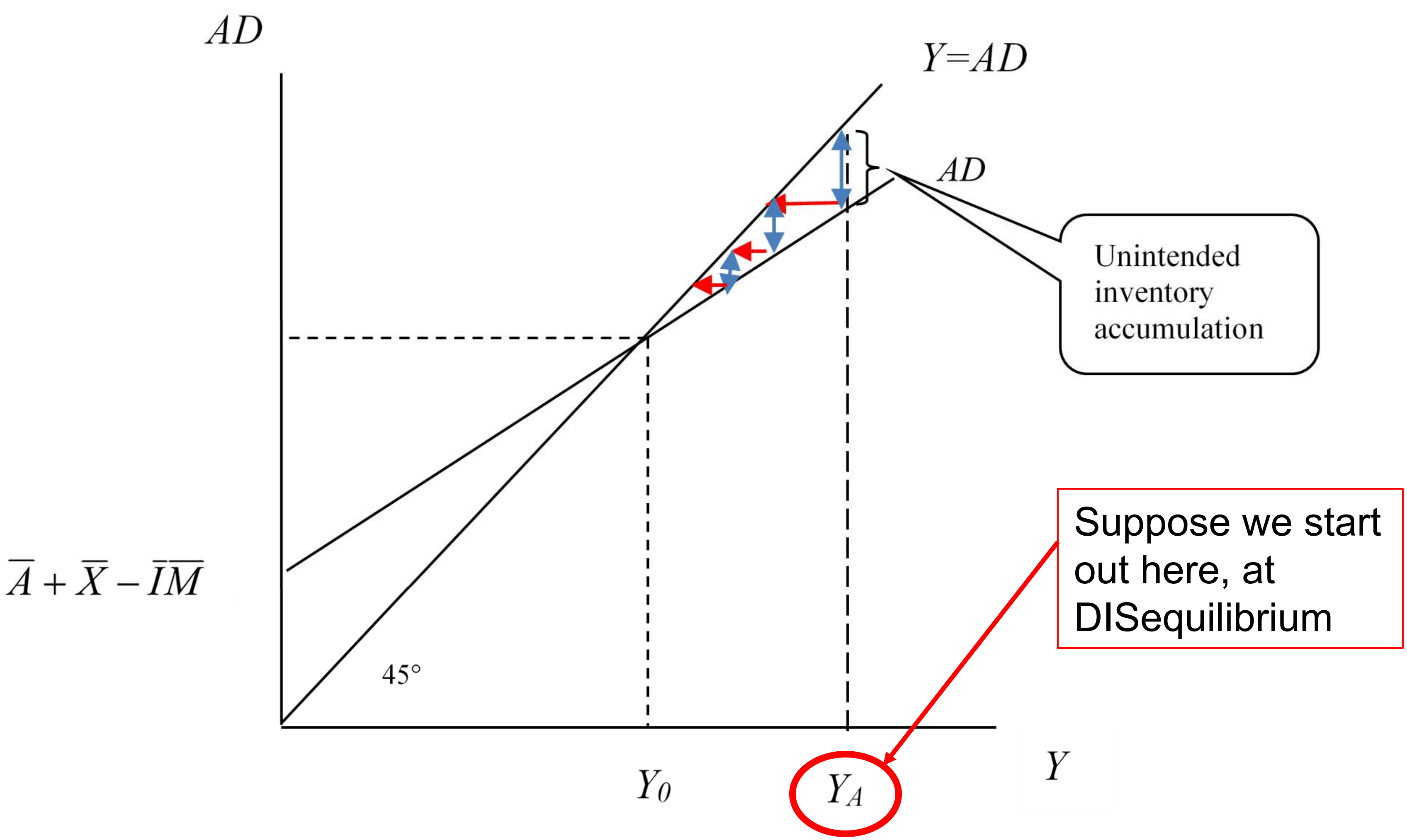
- Each (real) dollar's worth of autonomous spending (i.e., spending that takes place regardless of values of other variables in the system) is matched by production that results in income for the factors of production, that then results in additional (endogenously determined) consumption.

$$(13.8)\quad Y = (\bar{A} + \bar{X} - \overline{IM}) + (c - m)(\bar{A} + \bar{X} - \overline{IM}) + (c - m)^2(\bar{A} + \bar{X} - \overline{IM}) \cdots$$

Keynesian Cross: Graphical Interpretation



Keynesian Cross: Interpreting Disequilibrium



Adjustment to Equilibrium - Economics

- Changes in inventories is the means by which adjustment of output to aggregate demand occurs
- In equilibrium actual inventories equals desired inventories. *If desired inventories are stable*, then in equilibrium inventories do not change.

Policy and Multipliers

Equilibrium, Total Differentiation

- Equilibrium is given by

$$(13.7) \qquad Y_0 = \underbrace{\left(\frac{1}{1-c+m}\right)}_{\substack{multiplier \\ \equiv \overline{\alpha}}} [\underbrace{\bar{C} - c\bar{T} + \bar{I} + \bar{G}}_{\substack{autonomous \\ domestic \\ spending \\ \equiv \bar{A}}} + \bar{X} - \overline{IM}]$$

- If something is true in levels, it's true in "changes". In math, this is a total differential (remember *c*, *m* are constant)

$$(13.9) \qquad \Delta Y = \overline{\alpha}\left[\Delta A + \Delta X - \Delta IM\right]$$

Multipliers

(13.9) $$\Delta Y = \overline{\alpha}\left[\Delta A + \Delta X - \Delta IM\right]$$

$$\bar{A} \equiv \bar{C} - c\bar{T} + \bar{I} + \bar{G}$$

$$\Delta A \equiv \Delta C - c\Delta T + \Delta I + \Delta G$$

- With this, we can examine policy by holding all else constant, and changing government spending on goods & services

Multipliers

(13.9) $$\Delta Y = \overline{\alpha}\left[\Delta A + \Delta X - \Delta IM\right]$$

Hold constant all else

$$\Delta C = 0, \Delta T = 0 + \Delta I = 0, \Delta X = 0, \Delta IM = 0$$

(13.10) $$\Delta Y = \overline{\alpha}\Delta G$$

Equivalently

(13.11) $$\frac{\Delta Y}{\Delta G} = \overline{\alpha} \equiv \frac{1}{1 - c + m} > 1$$

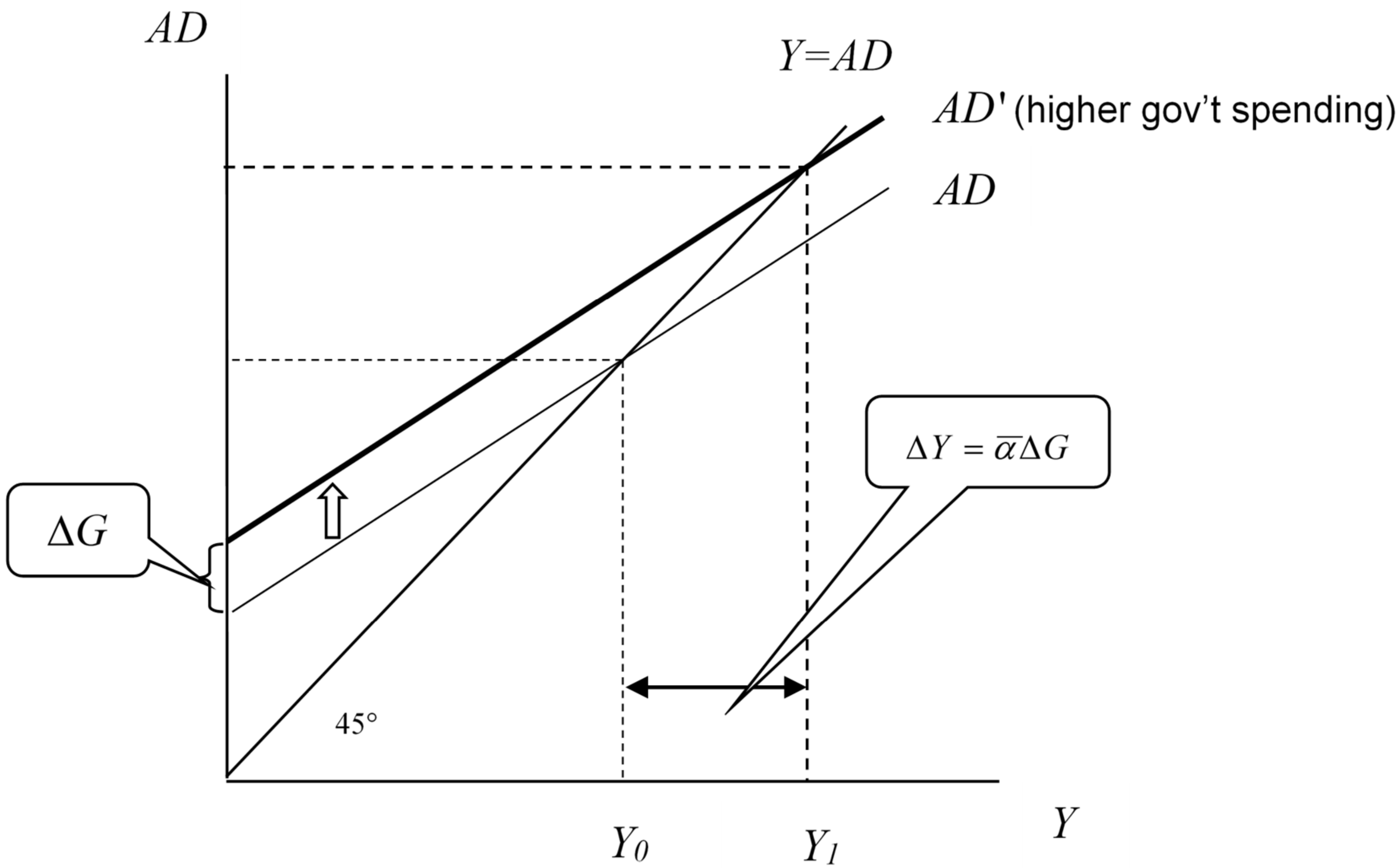
Economic Intuition

- In math, a shock to system (increase in G of $1) results in an infinite geometric sequence; setting m=0, the increases to GDP is given by:

$$= 1 + c^1 + c^2 + c^3 + c^4 + c^5 + \ldots = 1/(1-c)$$

- This logic works as long as there are underutilized resources

Graphical Interpretation



Tax Multiplier

(13.9) $$\Delta Y = \overline{\alpha}\left[\Delta A + \Delta X - \Delta IM\right]$$

Hold constant all else

$$\Delta C = 0, \Delta G = 0 + \Delta I = 0, \Delta X = 0, \Delta IM = 0$$

(13.12) $$\Delta Y = \bar{\alpha}(-c\Delta T)$$

Equivalently

(13.13) $$\frac{\Delta Y}{\Delta T} = -c\bar{\alpha} \equiv -\frac{c}{1-c+m}$$

Tax Multiplier

(13.9) $$\Delta Y = \overline{\alpha}\left[\Delta A + \Delta X - \Delta IM\right]$$

Hold constant all else

$$\Delta C = 0, \Delta G = 0 + \Delta I = 0, \Delta X = 0, \Delta IM = 0$$

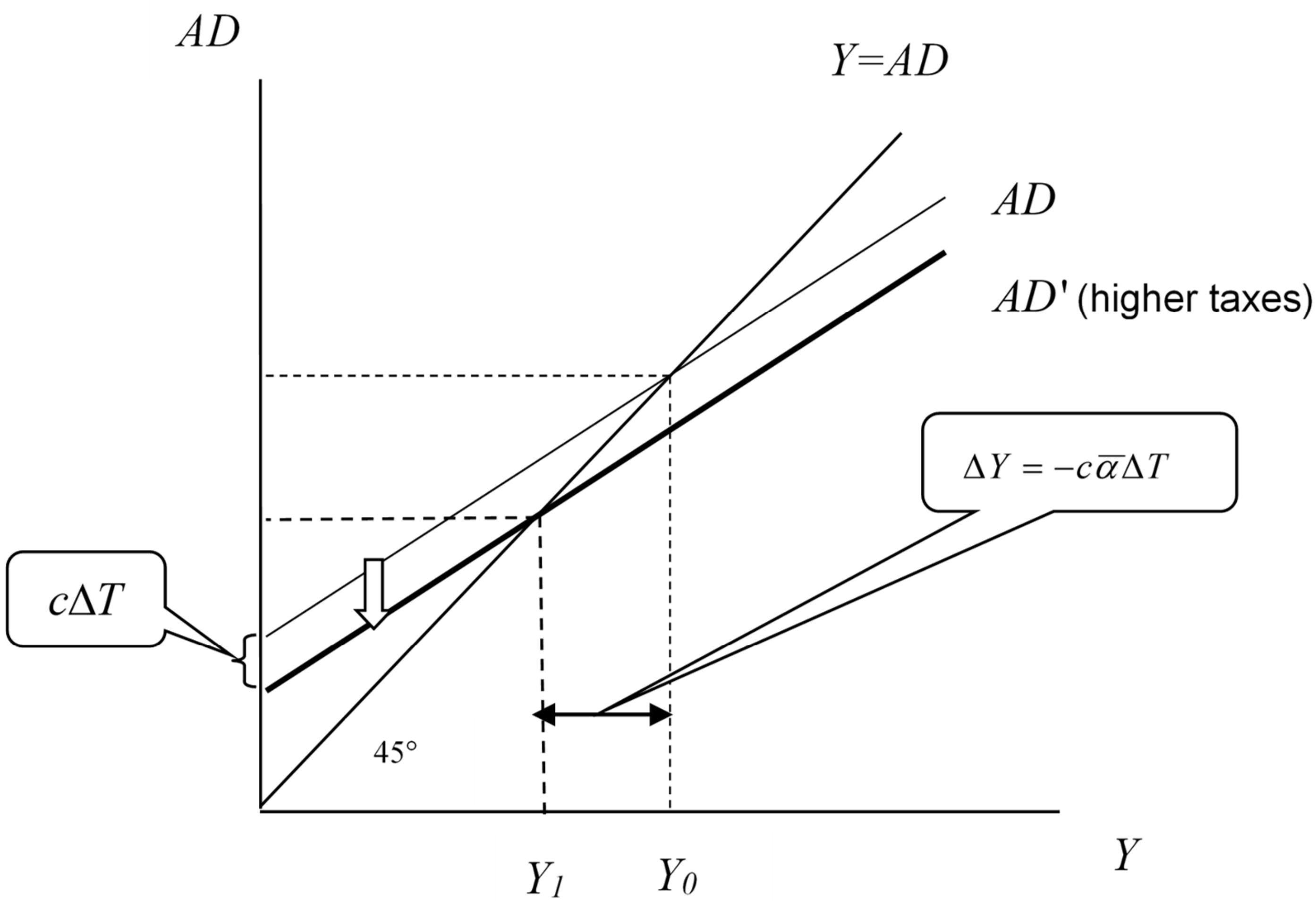
(13.12) $$\Delta Y = \bar{\alpha}(-c\Delta T)$$

Equivalently

(13.13) $$\frac{\Delta Y}{\Delta T} = -c\bar{\alpha} \equiv -\frac{c}{1-c+m}$$

Notice absolute value of ΔY/ΔT is smaller than ΔY/ ΔG – because ΔG enters directly, ΔT enters by affecting disposable income and then consumption

Graphical Interpretation



Fiscal Policy

- Economic output can be managed by fiscal policy – changing government spending on goods and services, G
- Or by changing taxes, T
- Or by changing transfers (unemployment insurance, SNAP), which is inverse of taxes, -T

Budget and Trade Balances

Trade Balance

- Also known as Net Exports – defined as:

  $TB \equiv X - IM$

- Insert functional forms for each variable:

(13.14) $$TB = \bar{X} - (\overline{IM} + mY)$$

Notice G and T don't enter. Does that mean they don't affect the trade balance? No….

Trade Balance

- Take total differential

$$\Delta TB = \Delta X - (\Delta IM + m\Delta Y)$$

- Hold constant the autonomous components of imports, exports

$$\Delta TB = -m\Delta Y$$

- But *Y* is endogenous, and depends on other variables:

$$\Delta TB = -m\,\underbrace{\bar{\alpha}\Delta G}_{=\Delta Y} < 0 \qquad (13.15)$$

Budget Balance

- Taxes minus government spending

$$BuS \equiv T - G$$

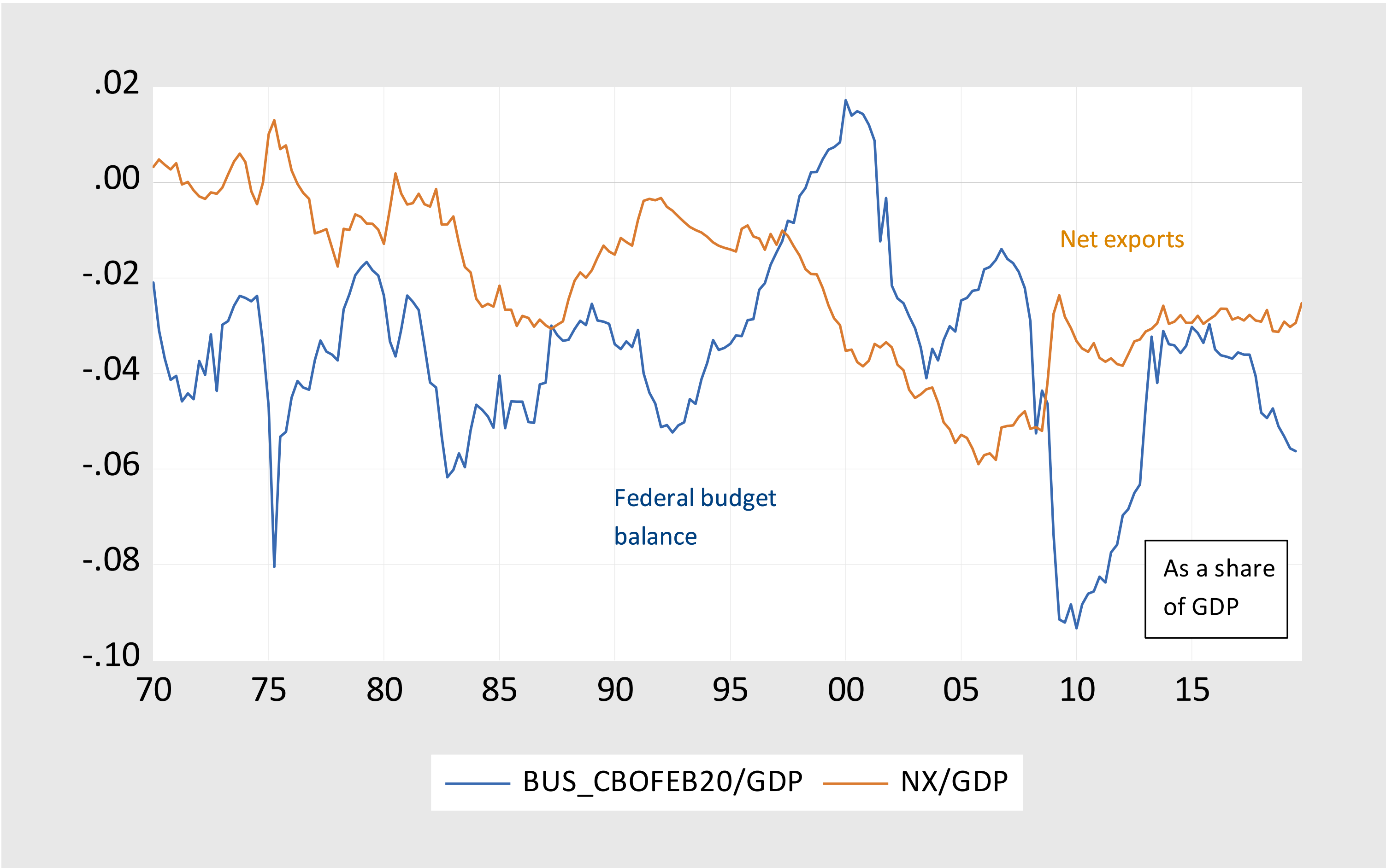
(13.16) $$BuS = \overline{T} - \overline{G}$$

- Total differential (w/lump sum taxes)

(13.17) $$\Delta BuS = -\Delta G < 0$$

- So when G changes, TB, BuS move same way. When other things change, then not necessarily

Twin Deficits - Sometimes



Next Lecture

- Review of Keynesian model
- Budget and trade balances
- Policy
- Net Exports/Trade Balance
- The Real Exchange Rate
- Large Country Model/Spillovers