ECON 402 Discussion: Week 5

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Announcements

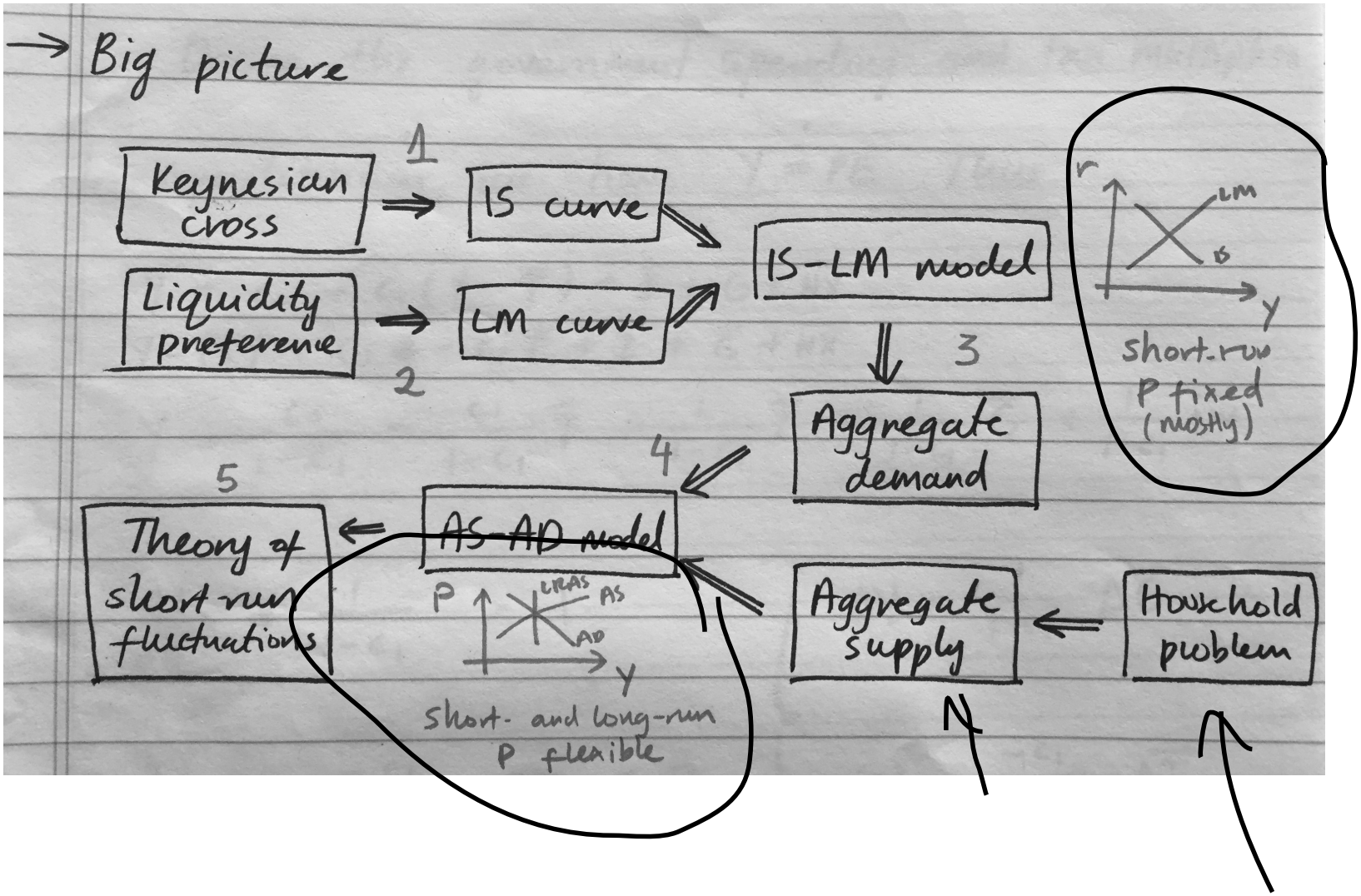
- The context in which you learn shapes not only how well you accumulate knowledge, but what you end up doing with it. ✓
- Exam 1: grades are posted, and...
- Homework 3: due June 7th at 11:59pm, as one (small) .pdf doc!
- Office hours: Fridays at 2pm on Zoom, or by appointment.
- Instructor and course evaluations. ✓
- Topics today
  1. Introduction
  2. Keynesian Cross $\Rightarrow$ IS curve
  3. Liquidity Preference $\Rightarrow$ LM curve
  4. IS-LM model $\Rightarrow$ AD curve
  5. AS-AD model

Introduction

- So far, we have considered microfoundations for macroeconomic phenomena like growth, savings, consumer optimization, etc.
- Today we consider the aggregate implications of government policy in a very simple, old school macro model of the economy.

- Examples of government policies:
  1. Fiscal policy: government spending and taxing, by congress.
  2. Monetary policy: regulating money supply through bond purchases with printed ca$h, by the federal reserve.
  3. ~~Some other (more interesting) policy?~~

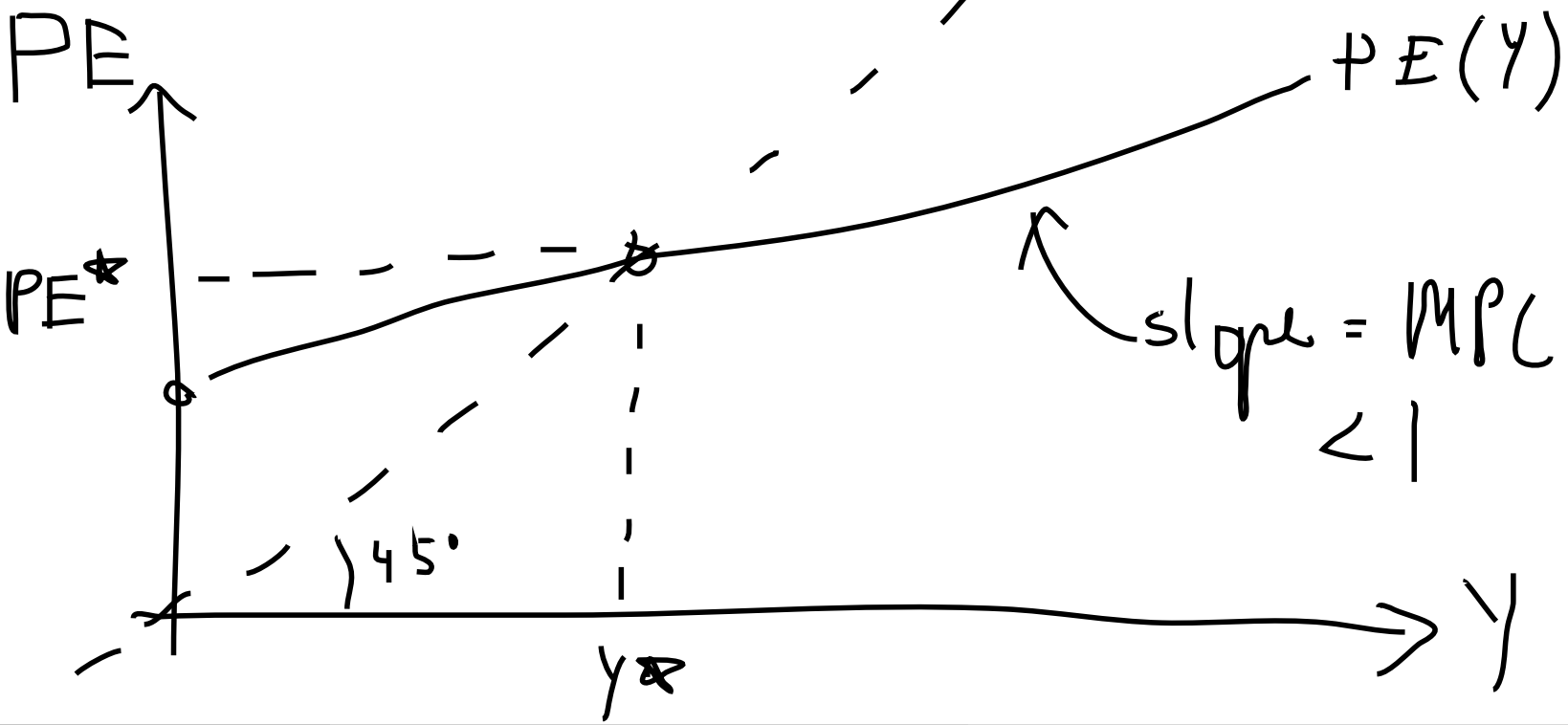
Introduction



Keynesian Cross

- Definition: The Keynesian cross plots aggregate planned expenditures (PE) versus actual expenditures/output (Y). Given constants $c_0 > 0$ and $c_1 \in (0, 1)$, planned expenditures are

$$PE_t := \underbrace{c_0 + c_1(Y_t - \overline{T})}_{:=C_t} + \overline{I} + \overline{G} + \overline{NX}$$



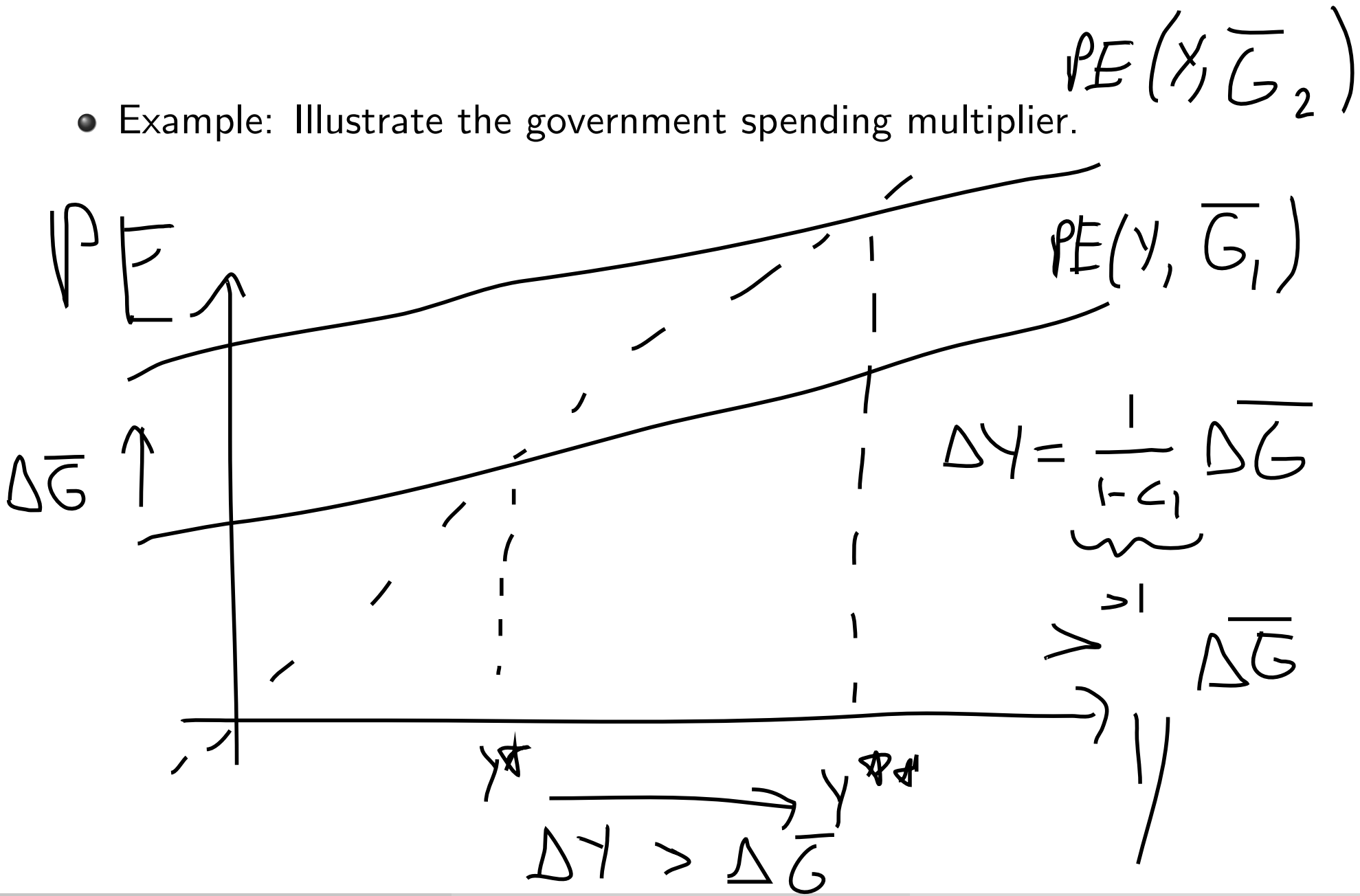
Keynesian Cross

- Example: Derive the government spending and tax multipliers.
- Solution: In equilibrium, we must have goods market clearing, so

$$
\begin{aligned}
Y_t &\overset{!}{=} PE_t \\
Y_t &= c_0 + c_1(Y_t - \overline{T}) + \overline{I} + \overline{G} + \overline{NX} \\
Y_t - c_1 Y_t &= c_0 - c_1 \overline{T} + \overline{I} + \overline{G} + \overline{NX} \\
Y_t &= \frac{c_0}{1-c_1} - \frac{c_1}{1-c_1}\overline{T} + \frac{1}{1-c_1}(\overline{I} + \overline{G} + \overline{NX}) \\
\Rightarrow \frac{\partial}{\partial \overline{G}} Y_t &= \frac{1}{1-c_1} > 1 \\
\frac{\partial}{\partial \overline{T}} Y_t &= -\frac{c_1}{1-c_1} < 0
\end{aligned}
$$

Keynesian Cross

- Example: Illustrate the government spending multiplier.



Keynesian Cross

- Example: Find the change in output from an equal and simultaneous increase in government spending and taxation (balanced budget).
- Solution: Given equilibrium output

$$\Delta Y_t = \frac{c_0}{1-c_1} - \frac{c_1}{1-c_1}\overline{T} + \frac{1}{1-c_1}(\overline{I} + \overline{G} + \overline{NX})$$

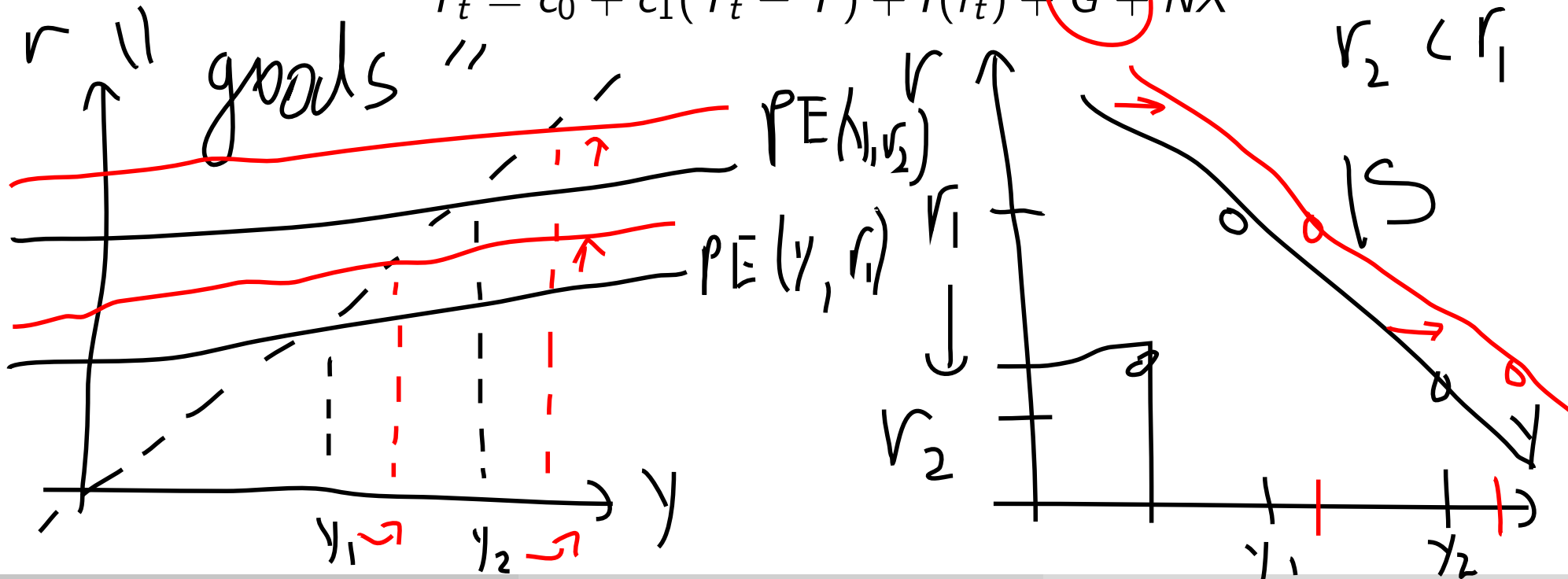
and $\Delta\overline{G} = \Delta\overline{T} > 0$, we can compute

$$\begin{aligned}
\Delta Y &= \frac{1}{1-c_1}\Delta\overline{G} - \frac{c_1}{1-c_1}\underbrace{\Delta\overline{T}}_{=\Delta\overline{G}} \\
&= \Delta\overline{G}\left(\frac{1}{1-c_1} - \frac{c_1}{1-c_1}\right) \\
&= \Delta\overline{G}
\end{aligned}$$

IS Curve $Y - C - G - NX = I \iff PE = Y$

- We have written investment $I_t = \overline{I}$ so far, but actually $I_t = I(r_t)$ where $I'(r_t) < 0$. Why should this derivative be negative?
- Definition: The investment-saving (IS) curve plots all combinations of the interest rate r_t and output Y_t that lead to goods market equilibrium, where $PE_t \stackrel{!}{=} Y_t$. Why is this equivalent to $I_t \stackrel{!}{=} S_t$?

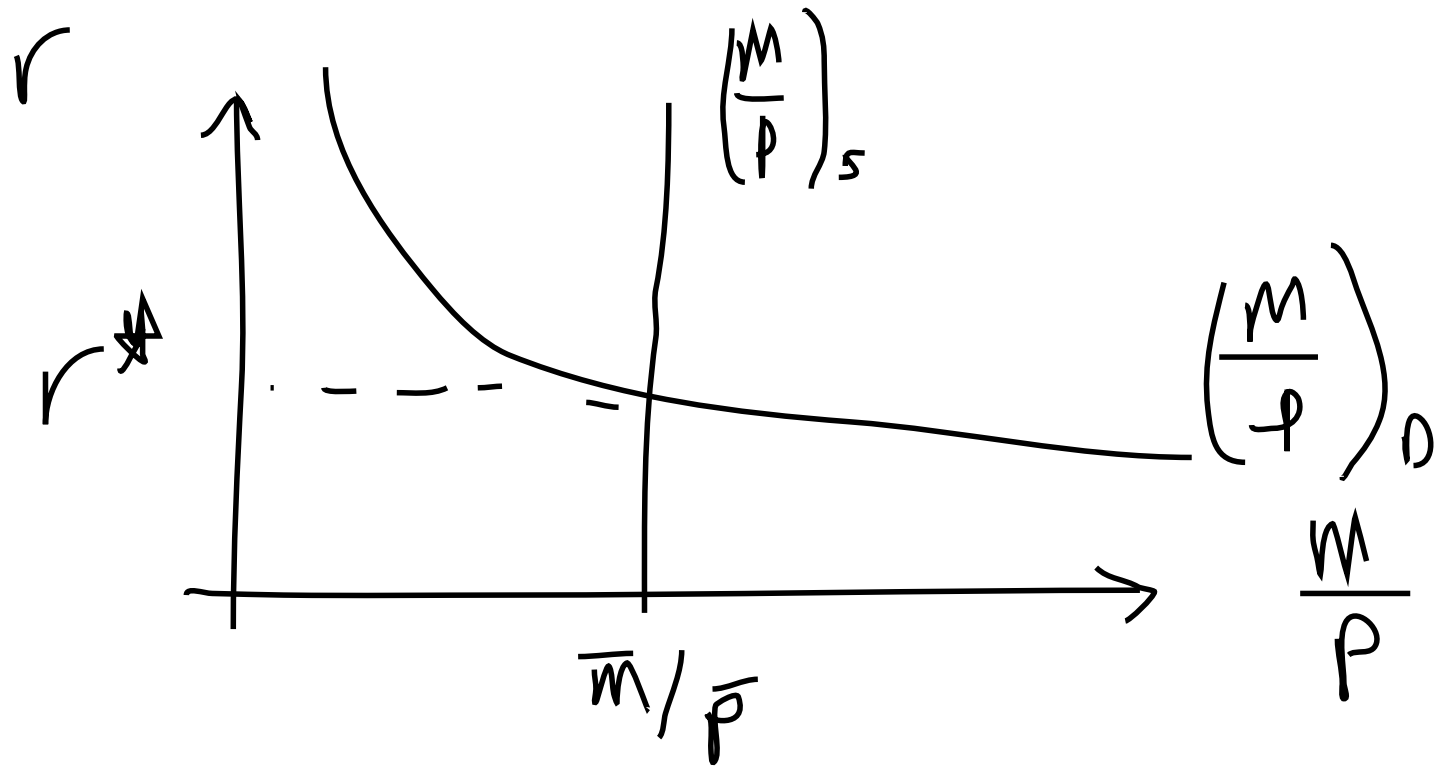
$$Y_t = c_0 + c_1(Y_t - \overline{T}) + I(r_t) + \overline{G} + \overline{NX}$$



Liquidity Preference

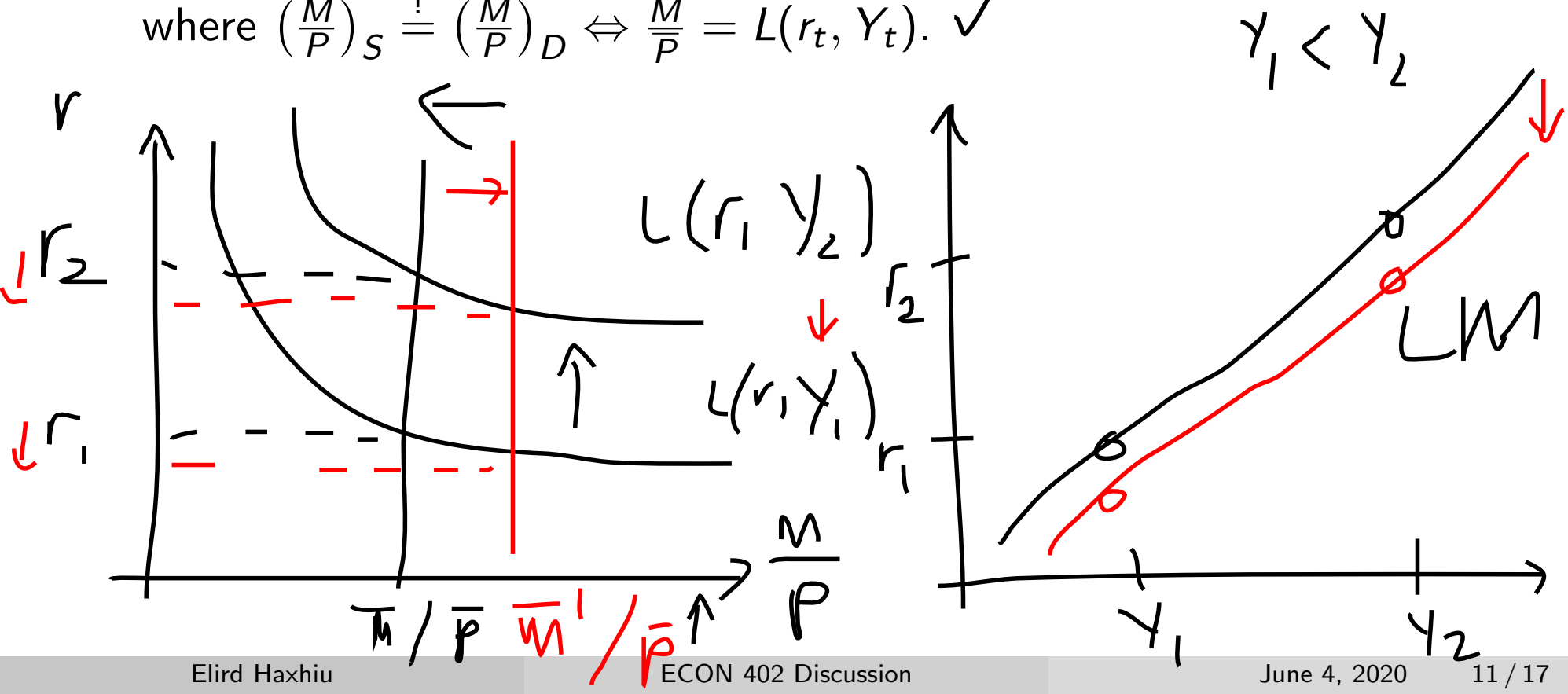
- Definition: The (real) money market is composed of
  - (i) Supply: $\left(\frac{M}{P}\right)_S = \frac{\overline{M}}{\overline{P}}$ where $P = \overline{P}$ means prices are fixed (short run).
  - (ii) Demand: $\left(\frac{M}{P}\right)_D = L(r_t, Y_t)$ where $\frac{\partial}{\partial r_t} L < 0$ and $\frac{\partial}{\partial Y_t} L > 0$.

  and r_t adjusts until we have an equilibrium where $\left(\frac{M}{P}\right)_S \stackrel{!}{=} \left(\frac{M}{P}\right)_D$.



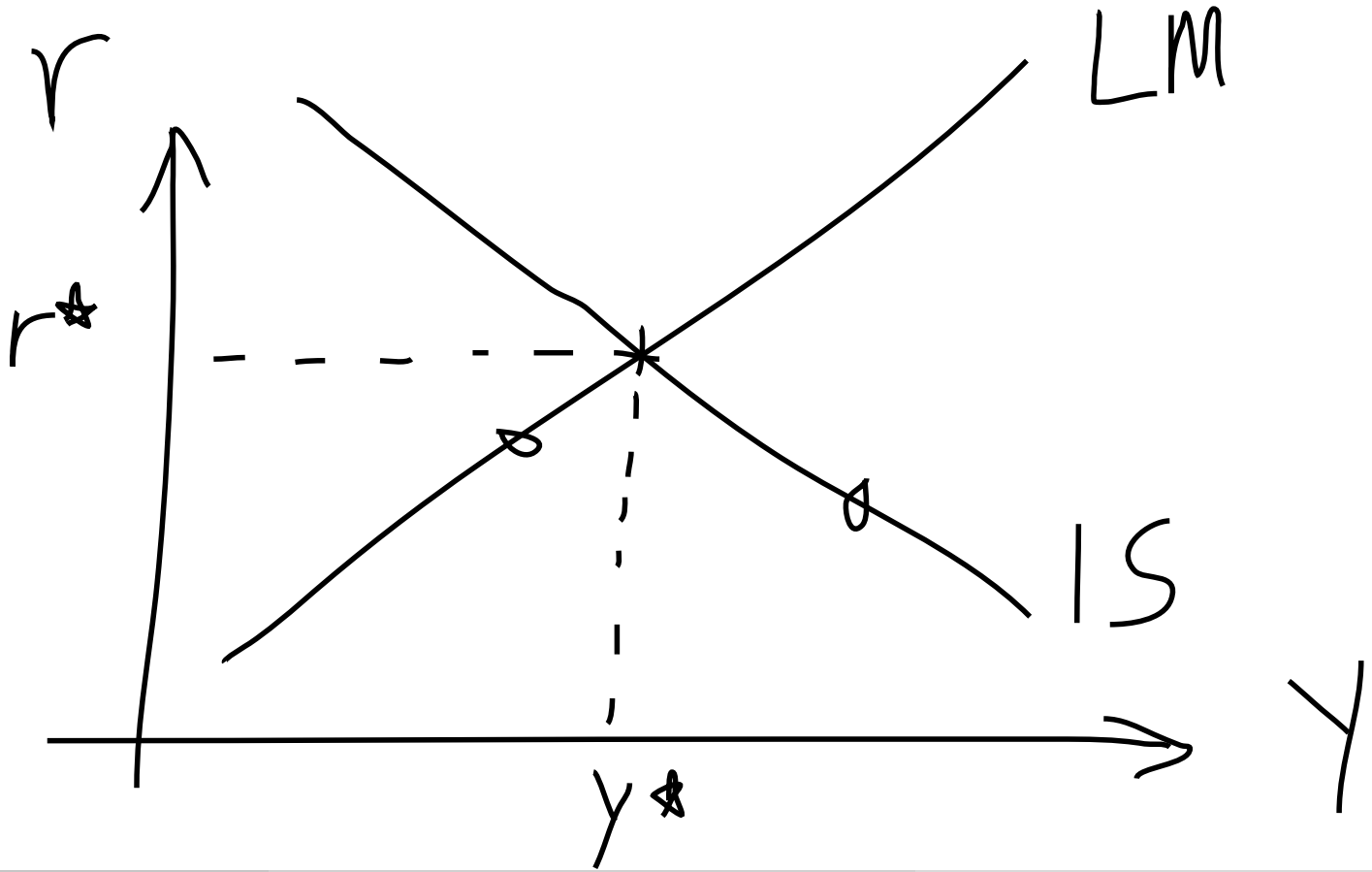
LM Curve

- The IS curve represents pairs of (r_t, Y_t) that lead to an equilibrium in the goods market. What about the money market?
- Definition: The liquidity preference-money supply (LM) curve plots all combinations of r_t and Y_t that lead to a money market equilibrium, where $\left(\frac{M}{P}\right)_S \overset{!}{=} \left(\frac{M}{P}\right)_D \Leftrightarrow \frac{\overline{M}}{\overline{P}} = L(r_t, Y_t)$.



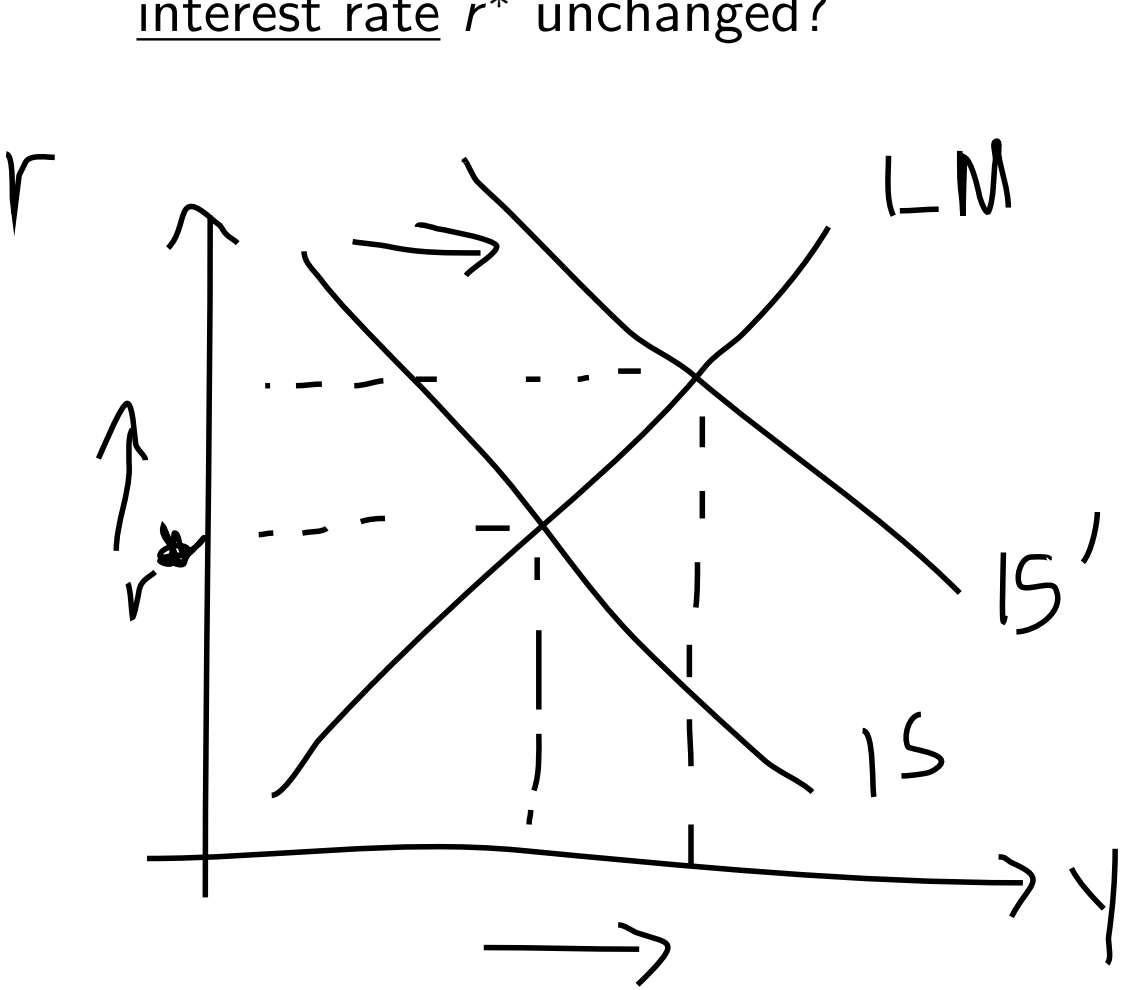
IS-LM Model: Short Run Equilibrium

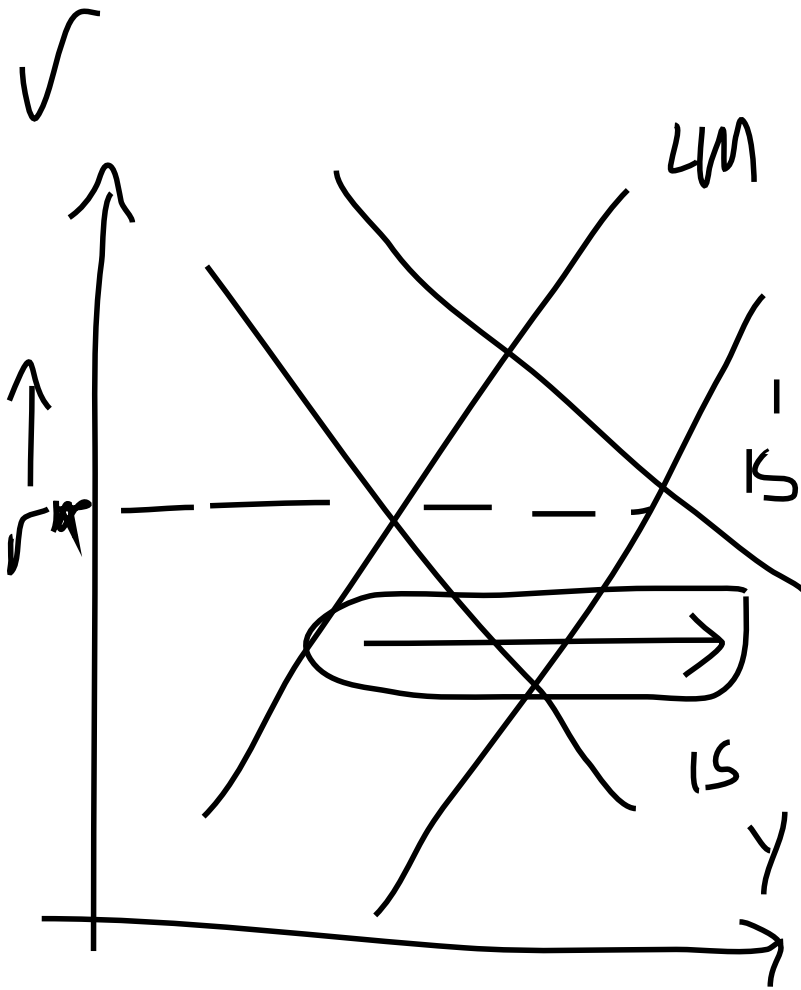
- Definition: The short run equilibrium interest rate r^* and output level Y^* are the values of (r_t, Y_t) that result in a goods market and money market equilibrium, where $IS \stackrel{!}{=} LM$.



IS-LM Model

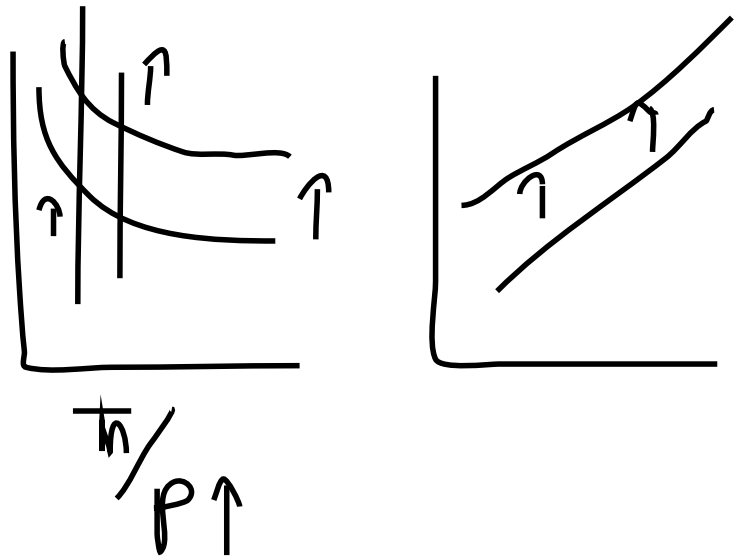
- Example: Suppose congress increases spending $\overline{G}$. What should the federal reserve do if they want to keep the short run equilibrium interest rate r^* unchanged?

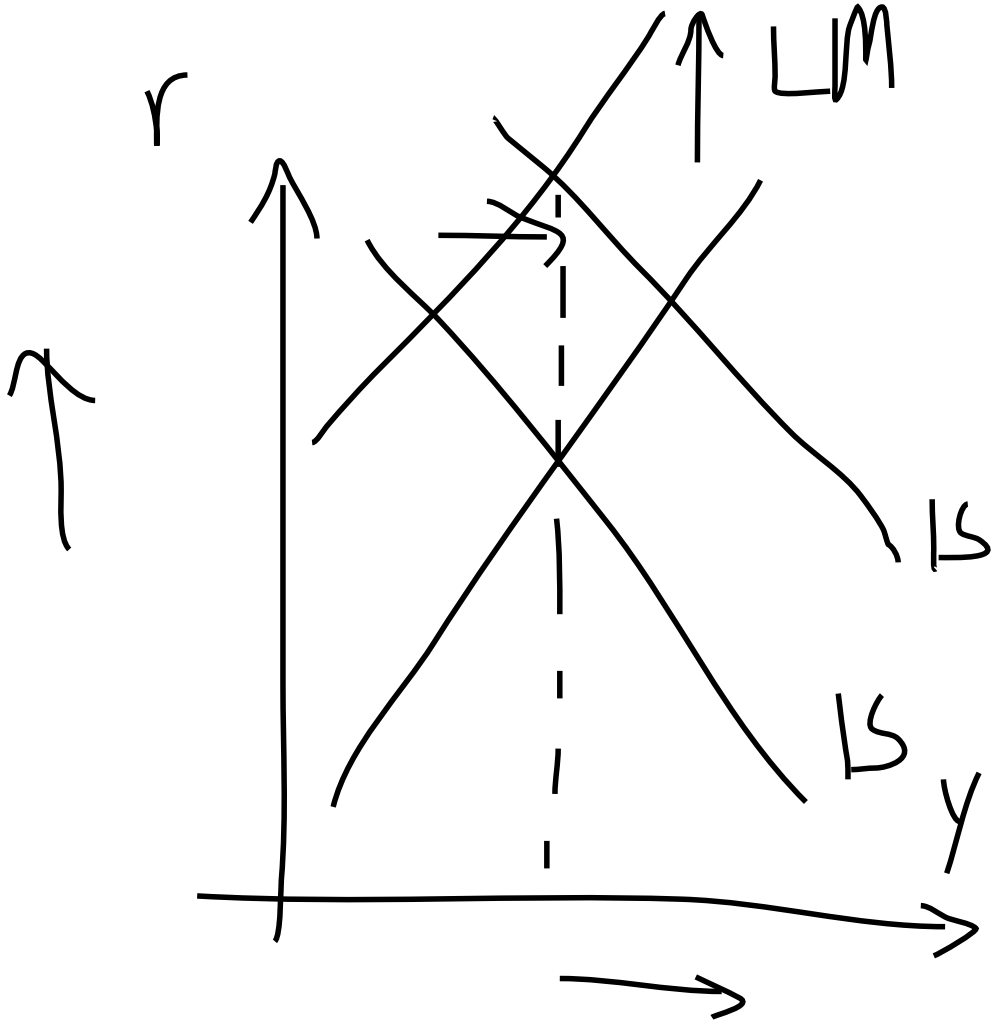




IS-LM Model

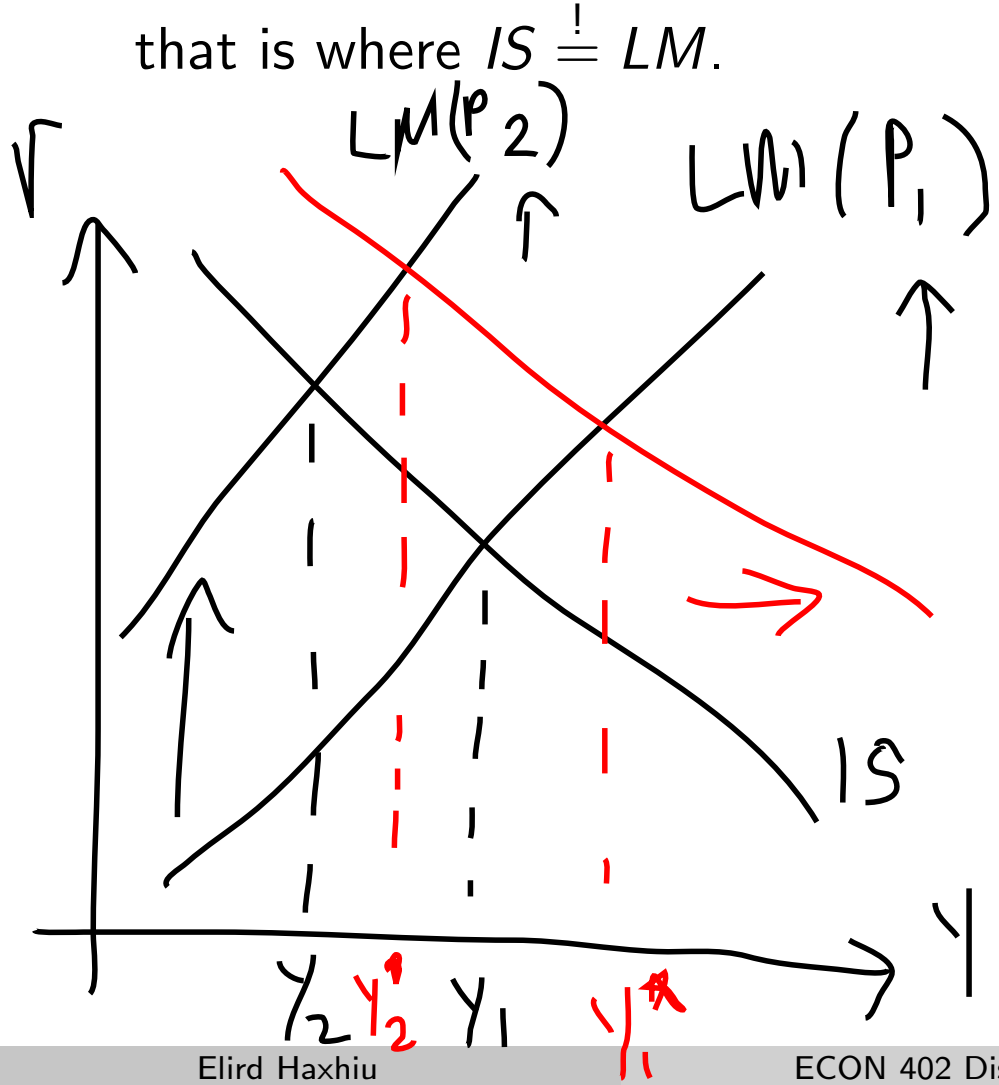
- Example: Suppose congress increases spending $\overline{G}$. What should the federal reserve do if they want to keep the short run equilibrium output Y^* unchanged?

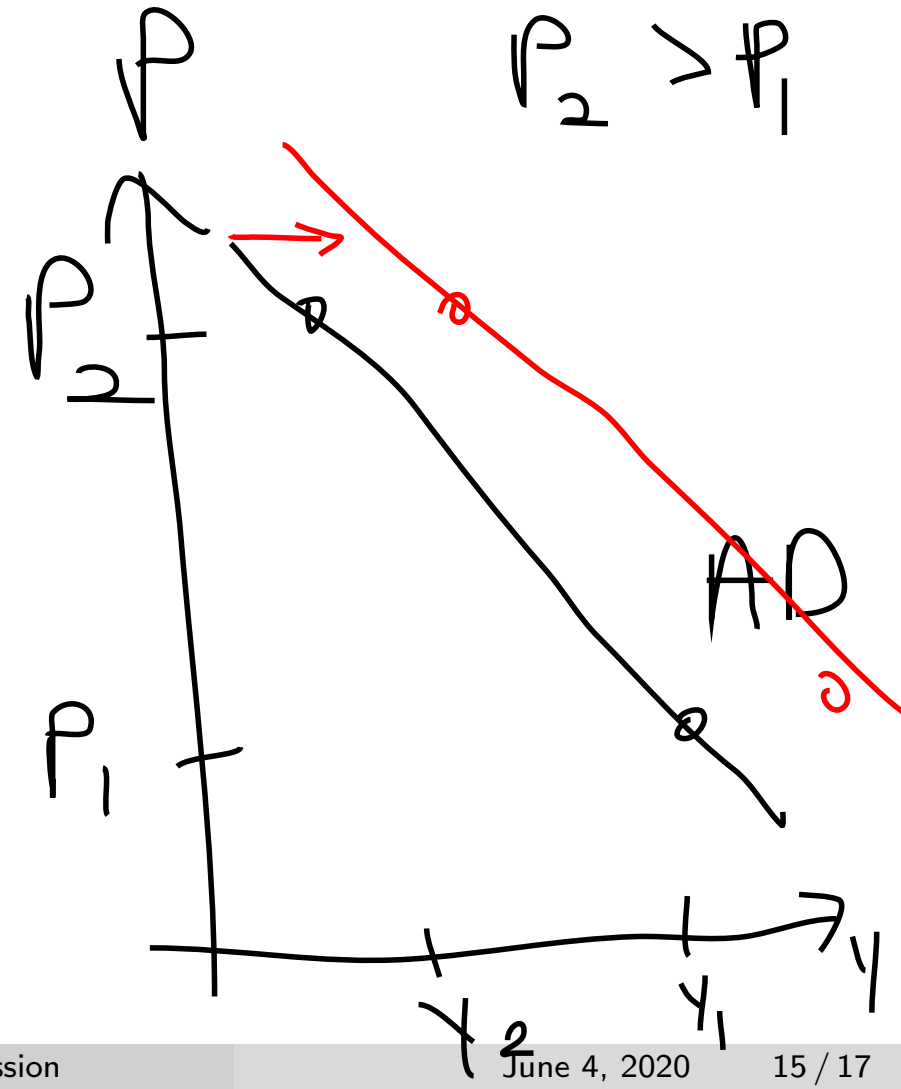




Aggregate Demand

- Definition: The aggregate demand (AD) curve plots all combinations of price level P_t and output Y_t when there is a short run equilibrium, that is where $IS \stackrel{!}{=} LM$.



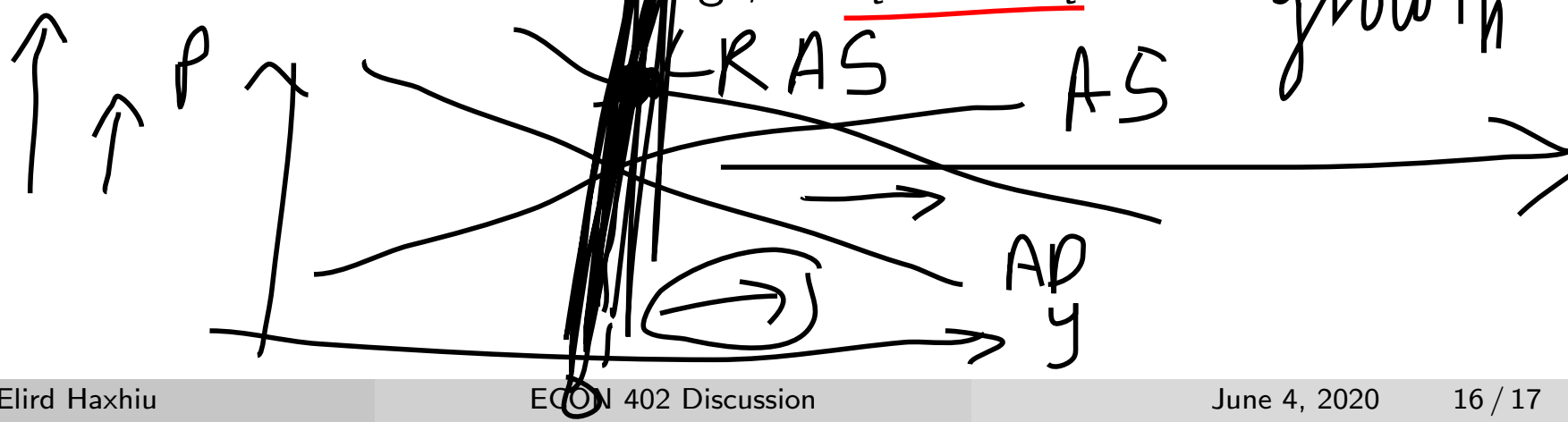


AS-AD Model

- Note: Expansionary monetary policy (increase $\overline{M}$) shifts the LM curve to the ~~right~~, and expansionary fiscal policy (increase $\overline{G}$) shifts the IS curve to the right. Both will generally shift the AD curve to the right.

- Definition: The aggregate supply-aggregate demand (AS-AD) model describes the short and long run equilibrium, and includes
  - (i) AD: $Y_t = \frac{M_t}{P_t}$ or $y_t = m_t - p_t$ in logs.
  - (ii) AS: $y_t = a(p_t - E(p_t))$ from household optimization and imperfect information (see lectures for more detail).
  - (iii) LRAS: $Y_t = 1$ or $y_t = 0$ since $p_t = E(p_t)$ in long run.

  where lower case letters denote logs, so $x_t := \ln X_t$.



AS-AD Model

- Some important implications of the AS-AD model include
  1. Expansionary policy by the government can increase output and the price level in the short run,
  2. In the long-run output remains constant and expansionary policy only causes inflation (increase in price level),
  3. Economic growth in the long-run (pushing out the line) comes from other things: productivity increases, innovation, human capital investments, etc. (not the savings rate!),
  4. In the short run, negative shocks that reduce output can be combated with expansionary policy to restore long run output levels.
     - Example of negative shock: covid-19 impacts on society.
     - (Normative) This is why congress *should* be spending (and the Fed should be printing/buying bonds) right now! I hope last week ($r < g_Y$) convinced you that we're not screwing our grandchildren by doing this!

$$d_t = \frac{D_t}{Y_t} \in \mathbb{R}$$