

ECON 1550

Spring 2026

Problem Set 1

Due: February 4, 2026 at 11:59pm ET

Instructor: Fernando Duarte

Head TA: Leo Zucker

Undergraduate TAs: Eric Kim, Raisa Axenie, Nathalie Peña

Submission: Canvas or Gradescope

Instructions

- When submitting to Gradescope, indicate the page where each question is answered to avoid a 5-point deduction.
- Full credit is given for correct answers. If multiple steps are needed, you must show them to get full credit.
- Points are shown for each part. Partial credit is given for partially correct answers; show your work to maximize it.
- Late submissions receive a score of zero.
- If you have technical problems submitting, email your work to the Head TA before the deadline.
- Collaboration with classmates is encouraged; use of generative AI is permitted but discouraged.
- You must write, understand, and submit your solutions individually. Copying other students' or AI-generated answers, even fragments, is not allowed.

1. Multiple Choice (18 points)

For each question, select the one correct answer.

- (a) [2 points] In the IS-LM-PC model, when the money supply is exogenous and the nominal interest rate is endogenous, the LM curve is
- ☐ (A) flat
 - ☐ (B) upward sloping
 - ☐ (C) downward sloping
 - ☐ (D) vertical
- (b) [2 points] In the IS-LM-PC model, when the money supply is endogenous and the nominal interest rate is exogenous, the LM curve is
- ☐ (A) flat
 - ☐ (B) upward sloping
 - ☐ (C) downward sloping

- ☐ (D) vertical
- (c) [2 points] Assume the nominal interest rate is exogenous. An increase in this exogenous nominal interest rate
- ☐ (A) keeps the IS curve unchanged
 - ☐ (B) shifts the IS curve to the right
 - ☐ (C) shifts the IS curve to the left
 - ☐ (D) cannot be determined without more information
- (d) [2 points] When inflation expectations are unanchored, if output exceeds potential output, the inflation rate over time
- ☐ (A) remains stable
 - ☐ (B) spirals downward
 - ☐ (C) increases
 - ☐ (D) decreases
- (e) [2 points] In the IS-LM-PC model with anchored inflation expectations, starting from a medium-run equilibrium, the government increases taxes. After the increase in taxes, the resulting medium-run equilibrium has
- ☐ (A) higher output than in the original medium-run equilibrium
 - ☐ (B) a higher real interest rate than in the original medium-run equilibrium
 - ☐ (C) an IS curve that is to the left of the IS curve of the original medium-run equilibrium
 - ☐ (D) the answer depends on whether the LM curve is flat or upward sloping
- (f) [2 points] In the Phillips curve, which of the following changes is associated with an increase in the current inflation rate (keeping everything else fixed)?
- ☐ (A) a decrease in the expected inflation rate
 - ☐ (B) an increase in the unemployment rate
 - ☐ (C) a lower natural rate of unemployment
 - ☐ (D) an increase in the markup
- (g) [2 points] Assume that the Phillips curve is given by

$$\pi_t = \pi_t^e + m + z - \alpha u_t.$$

Which of the following causes a reduction in the natural rate of unemployment?

- ☐ (A) an increase in m

- ☐ (B) an increase in z
 - ☐ (C) an increase in α
 - ☐ (D) an increase in π_t^e
- (h) [2 points] The price setting equation is $P = (1 + m)W$. When there is perfect competition, we know that
- ☐ (A) $m > 0$
 - ☐ (B) $m = 0$
 - ☐ (C) $m < 0$
 - ☐ (D) the price setting equation does not hold
- (i) [2 points] The natural rate of unemployment is the rate of unemployment that occurs when
- ☐ (A) the money market is in equilibrium
 - ☐ (B) the markup is zero
 - ☐ (C) the economy is in a medium-run equilibrium
 - ☐ (D) none of the above

2. True, False, or Uncertain (12 points)

For each statement below, answer true, false, or uncertain. Explain your answer. Use graphs or equations if useful.

- (a) [3 points] In the accounting identity $Y = C + I + G$, a simultaneous 1% increase in all three variables Y , C , and I can occur while $G > 0$ remains unchanged.
- (b) [3 points] In U.S. postwar data, real investment is substantially more volatile than real consumption and real government purchases.
- Hint: Consult your intermediate macro textbook or plot the data using [FRED](#).
- (c) [3 points] In the IS-LM model, an increase in government spending raises output in the short run.
- (d) [3 points] Assume that investment is a function of output and the real interest rate. In the IS-LM model with an exogenous money supply, a decrease in government spending lowers investment.

3. A War Scare in the Short-Run IS-LM (32 points)

Consider the following closed-economy IS-LM model. The goods market equilibrium condition is

$$Y = C + I + \bar{G},$$

where Y is output, C is consumption, I is investment, and \bar{G} is government spending. The behavioral equations for consumption and investment are

$$C = c_0 + c_1(Y - \bar{T}), \quad I = b_0 - b_1 i,$$

where \bar{T} denotes taxes, i is the nominal interest rate, and $c_0 > 0$, $0 < c_1 < 1$, $b_0 > 0$, and $b_1 > 0$ are parameters. Assume expected inflation is constant (so changes in the nominal interest rate i correspond one-for-one to changes in the real interest rate). The money market equilibrium condition is

$$\bar{M}^s = m_0 + m_1 Y - m_2 i,$$

where \bar{M}^s is real money supply (we normalize the price level $P = 1$ so $\bar{M}^s/P = \bar{M}^s$), and $m_0 > 0$, $m_1 > 0$, and $m_2 > 0$ are parameters. The exogenous variables are \bar{G} , \bar{T} , \bar{M}^s , and the model parameters. The endogenous variables are Y , C , I , and i .

- (a) [4 points] Derive the IS curve and its slope.
- (b) [4 points] Derive the LM curve and its slope.
- (c) [4 points] Solve for equilibrium output Y^* and the equilibrium interest rate i^* .
- (d) [4 points] Consider an increase in the money supply \bar{M}^s . What happens to Y^* and i^* ? Explain using the IS-LM diagram.
- (e) [4 points] Suppose a “war scare” raises precautionary demand for money, increasing m_0 to $m_0 + \Delta m_0$, where $\Delta m_0 > 0$. Find the new equilibrium level of output Y^W .
- (f) [4 points] Under the war scare described in (e), how do the IS and LM curves shift? Explain the resulting movement in equilibrium Y and i .
- (g) [4 points] Now suppose fiscal policy follows the rule

$$G = \bar{G} + g_1(Y - Y^*),$$

where Y^* is the original equilibrium output from (c). How does this rule affect the IS curve relative to the constant- \bar{G} case?

- (h) [4 points] Using an IS-LM diagram, assess whether the fiscal policy rule in (g) stabilizes the economy after the war scare.

4. An Endogenous Initial Price Level (38 points)

Consider a closed economy described by the following equations. The goods market is in equilibrium when

$$Y_t = C(Y_t - \bar{T}) + I(R_t) + \bar{G},$$

where Y_t is output, $C(\cdot)$ is the consumption function, \bar{T} denotes taxes, $I(\cdot)$ is the investment function, R_t is the real interest rate, and \bar{G} denotes government spending. Note that investment depends only on the interest rate R_t and does not depend on output Y_t . The money market is in equilibrium when

$$\frac{\bar{M}^s}{P_t} = \mathcal{L}(i_t, Y_t),$$

where \bar{M}^s is the nominal money supply, P_t is the price level, $\mathcal{L}(\cdot, \cdot)$ is the real money demand function, and i_t is the nominal interest rate. The Fisher equation is

$$R_t = i_t - \pi^e,$$

where π^e is expected inflation. The labor market implies an aggregate supply relation of the form

$$P_t = (1 + m)P_t^e F\left(1 - \frac{Y_t}{L}, z\right),$$

where m is the markup, P_t^e is the expected price level, L is the labor force, $u_t = 1 - \frac{Y_t}{L}$ is the unemployment rate, z is a catch-all variable for factors affecting the nominal wage other than P_t^e and u_t , and $F(\cdot, \cdot)$ is a function decreasing in its first argument and increasing in its second one. Assume the functional forms

$$C(Y - \bar{T}) = 1 + \frac{1}{2}(Y - \bar{T}),$$

$$I(R) = 2 - R,$$

$$\mathcal{L}(i, Y) = 2 + Y - 0.2i,$$

$$F(u, z) = 1 - \alpha u + z,$$

where $\alpha > 0$ is a parameter.

- (a) [3 points] Is the consumption function $C(\cdot)$ increasing or decreasing in its argu-

ment? Provide economic intuition.

- (b) [3 points] Is the investment function $I(\cdot)$ increasing or decreasing in its argument? Provide economic intuition.
- (c) [3 points] Is the money demand function $\mathcal{L}(\cdot, \cdot)$ increasing or decreasing in each of its arguments? Provide economic intuition.
- (d) [3 points] Derive the IS curve (when plotted with the nominal interest rate i_t on the vertical axis and output Y_t on the horizontal axis).
- (e) [3 points] Derive the LM curve (when plotted with the nominal interest rate i_t on the vertical axis and output Y_t on the horizontal axis).
- (f) [3 points] Combine the IS and LM relations to eliminate i_t and obtain an aggregate demand relation of the form

$$Y_t = AD \left(\frac{\bar{M}^s}{P_t}, \bar{T}, \bar{G}, \pi^e \right),$$

where AD is a function increasing in \bar{M}^s/P_t , \bar{G} , and π^e , and decreasing in \bar{T} .

Hint: Your final expression should be linear in \bar{M}^s/P_t , \bar{T} , \bar{G} , and π^e , i.e., AD is a linear function.

- (g) [4 points] Find potential output, denoted Y^n , as a function of m , z , α , and L .
- (h) [4 points] Explain briefly why, in this model, potential output Y^n does not depend on monetary and fiscal policy variables such as \bar{M}^s , \bar{T} , and \bar{G} .
- (i) [4 points] Assume the economy is in a medium-run equilibrium at $t = 0$, so $Y_0 = Y^n$ and $P_0^e = P_0$. Use the aggregate demand relation from (f) and the condition $Y_0 = Y^n$ to solve for the initial price level P_0 as a function of \bar{M}^s , \bar{T} , \bar{G} , π^e and the parameters m , z , α , and L .
- (j) [4 points] At time $t = 1$ the government announces an unexpected increase in taxes from \bar{T} to $\bar{T} + \Delta T$, where $\Delta T > 0$. Assume that, in the short run, the price level is fixed at $P_1 = P_0$. Compute the short run equilibrium values of output Y_1 and the interest rate i_1 . Express your answers in terms of \bar{M}^s , P_0 , \bar{T} , \bar{G} , π^e , and ΔT .
- (k) [4 points] Assume the tax increase is permanent. Assume the economy eventually returns to a medium-run equilibrium with $Y = Y^n$ and $P^e = P$. Compute the new medium-run price level P_{MR} and compare it to P_0 .