ECON 1550 Spring 2026: Problem Set 2 Answer Key

1. It is possible to tell stories in which the effect on the current account goes either way. There are many valid answers. Here, we focus on investment (as discussed in class), which empirically is often the key factor in determining whether the current account improves. Public and private saving can, of course, also change.

One direct channel through which investment can increase is through an increase in demand. When imported goods become more expensive or less available, consumers may switch to domestic substitutes. Another channel is through profits. If domestic producers' monopoly power increases because of the reduced competition from abroad, profits can increase. If profitability is expected to be persistent, it can induce domestic firms to invest to increase future production.

On the other hand, investment might fall in industries that face higher costs of imported intermediate goods, or higher costs of domestic substitutes.

Equation (2-2) is a powerful accounting identity: it must hold at all times and is therefore sufficient to rule out many common claims about the current account. In particular, it makes clear that tariffs affect the current account insofar as they also change private saving, domestic investment, or the government budget balance.

At the same time, the accounting identity alone cannot generate predictions about the direction or magnitude of specific variables, as evidenced by the examples above. Making such predictions requires additional assumptions—an explicit model with behavioral equations.

We will introduce and study those models later in the course.

2. (a) Here are a few examples (you only need one that contributes positively and one negatively for full credit).

Contribute positively:

- Wages paid to Prof. Duarte for teaching in France.
- Profits earned by Nike's subsidiary in Vietnam.
- Dividends received by a U.S. resident on shares of the Japanese firm Toyota.
- Interest received by U.S. residents on bonds they own that were issued by the Government of Mexico.
- Interest received by the Federal Reserve from the Banco Central do Brasil on dollars provided through a currency swap line during the Covid pandemic.

Contribute negatively:

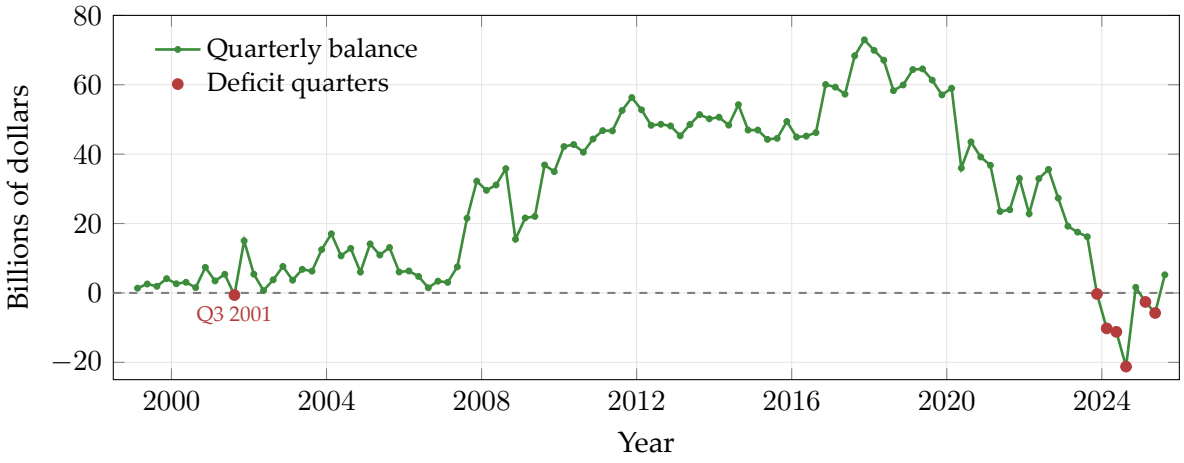
- Dividends paid to a U.K. resident on shares of the U.S. company NVIDIA.
- Interest paid by Bank of America to an Australian resident on U.S. dollar deposits.
- Interest paid by the U.S. Treasury to the People's Bank of China on its holdings of U.S. Treasury securities.

(b) There are only seven negative quarters in the entire dataset:

- Q3 2001: –$620 million
- Q4 2023: –$297 million
- Q1 2024: –$10,219 million
- Q2 2024: –$11,210 million
- Q3 2024: –$21,225 million
- Q1 2025: –$2,596 million
- Q2 2025: –$5,772 million

Additional information (not needed for full credit):

Here is the plot for the entire series, obtained from `https://fred.stlouisfed.org/series/IEABCPI`. The balance on primary income for each quarter is shown in the figure below. Quarters with negative values are marked with red dots.



(c) Assets is a stock variable, while income is a flow variable[1]. That the value of foreign assets owned by the U.S. is less than the value of American assets owned by foreign countries (the U.S. is a net debtor) is a comparison between two stock variables. On any

[1]Stock: a variable that can be expressed as a quantity at a point in time (such as physical capital). Flow: a variable that can be expressed as a quantity per unit of time (such as investment).

given quarter, the income flow generated by the smaller stock of foreign assets owned by the U.S. can be larger than the income flow generated by the larger stock of American assets owned by foreign countries. If bucket A has less water than bucket B, you can still pour more water out of bucket A than out of bucket B.

Income over one quarter equals assets at the beginning of the quarter multiplied by the return on those assets. Historically, the U.S. received a substantially higher rate of return on its foreign assets than other countries did on their U.S. assets. Key reasons include:

- U.S. foreign direct investment tends to earn higher returns than portfolio investment
- A substantial amount of foreign-held U.S. assets are Treasury securities, which have relatively low returns
- U.S. multinational corporations book profits in low-tax jurisdictions, inflating measured returns on foreign assets

The 2024 reversal suggests these advantages are no longer sufficient to offset the growing interest payments on the U.S.'s large net debtor position at the current relatively high level of interest rates.

(d) From BEA Table 1.1 for the year 2024:

- Line 6 (Primary income receipts): \$1,451,065 million
- Line 14 (Primary income payments): \$1,492,104 million
- Balance (Line 6 – Line 14): \$1,451,065 – \$1,492,104 = $-$41,039 million

Sum of quarterly IEABCPI values for 2024:

$$\begin{aligned}\text{Q1 2024} + \text{Q2 2024} + \text{Q3 2024} + \text{Q4 2024} &= (-10{,}219) + (-11{,}210) + (-21{,}225) + 1{,}615 \\ &= -41,039 \text{ million.}\end{aligned}$$

The two values match exactly. The quarterly series comes from BEA Table 1.2 (Expanded Detail), while Table 1.1 is the summary table—but both contain the same primary income balance data.

(e) The textbook's assumption that the U.S. receives more on its foreign assets than it pays on its liabilities held true for over two decades but reversed starting in Q4 2023. Q4 2023 marked the first quarterly deficit since Q3 2001, and Q1–Q3 2024 plus Q1–Q2 2025 all had deficits (Q4 2024 was positive), with Q3 2024 being the largest at $-$21.2 billion.

In Q3 2024 specifically, primary income receipts (earnings from overseas investments) fell by \$15.5 billion, or 4.3%, primarily driven by declining direct investment earnings,

while primary income payments decreased only slightly (BEA Survey of Current Business, January 2025). The deterioration was broad-based, with declining balances across all three major categories: direct investment, portfolio investment, and other investment earnings.

This structural shift reflects several factors:

- Rising interest rates increased payments on U.S. debt held by foreigners (much of it in Treasury securities). Net external interest payments now reach 1.3% of GDP.
- The "low-for-long" era of near-zero interest rates ended, so the U.S. can no longer borrow as cheaply while earning high returns abroad. When this profit-shifting is excluded, the income advantage largely disappears.
- Returns on American assets, dominated by AI-related industries, became relatively more profitable than U.S. investments overseas, further eroding the traditional return differential.

3. (a) The unemployment rate is

$$u \equiv \frac{L - N}{L}.$$

This is an identity so we use $\equiv$ instead of $=$.

(b) The short-run solution is:

$$\begin{aligned} N &= Y \\ W &= P^e \frac{Y}{L} \\ u &= 1 - \frac{Y}{L} \\ P &= P^e(1+\mu)\frac{Y}{L}(1+\tau). \end{aligned}$$

We now show how to derive this answer. The production function gives the solution for N:

$$N = Y.$$

Using the answer from a) and $N = Y$, we get the solution for u:

$$u = \frac{L - N}{L} = \frac{L - Y}{L} = 1 - \frac{Y}{L}.$$

Combine the wage and price setting relationships:

$$P = P^e(1+\mu)(1-u)(1+\tau).$$

Using the solution for u gives the solution for P:

$$\begin{aligned} P &= P^e(1+\mu)(1-u)(1+\tau) \\ &= P^e(1+\mu)\left(1-\left(1-\frac{Y}{L}\right)\right)(1+\tau) \\ &= P^e(1+\mu)\frac{Y}{L}(1+\tau). \end{aligned}$$

Plugging the solution for P into the price setting relationship:

$$P^e(1+\mu)\frac{Y}{L}(1+\tau) = (1+\mu)W(1+\tau).$$

Simplifying and solving for W gives:

$$W = P^e\frac{Y}{L}.$$

(c) The medium-run solution is:

$$\begin{aligned} N &= \frac{L}{(1+\mu)(1+\tau)} \\ W &= \frac{P}{(1+\mu)(1+\tau)} \\ u &= 1-\frac{1}{(1+\mu)(1+\tau)} \\ P^e &= P \\ Y &= \frac{L}{(1+\mu)(1+\tau)}. \end{aligned}$$

We now show how to derive this answer. First, we note that the equations that give the short-run solution obtained in part b) are valid equations in the medium run with $P = P^e$ (can you see why?). The short-run solution for P with $P = P^e$ gives:

$$1 = (1+\mu)\frac{Y}{L}(1+\tau).$$

Solving for Y gives:

$$Y = \frac{L}{(1+\mu)(1+\tau)}.$$

Plugging the last equation into the solutions for u and W from part b), and using $P = P^e$,

we get:

$$u = 1 - \frac{Y}{L} = 1 - \frac{1}{(1+\mu)(1+\tau)},$$
$$W = \frac{P}{(1+\mu)(1+\tau)}.$$

(d) Short run

Using the answers from part b), we can see that an increase in the labor tax τ leads to an increase in the price level P and no change in any of the other variables.

The intuition is as follows. Since output Y, the labor force L, and the expected price level P^e are exogenous, they are unchanged. To produce the same output as before the increase in tax, the production function implies that firms need to hire the same number of workers, so N remains unchanged. With N and L unchanged, the unemployment rate u also remains unchanged. The wage setting relation implies that the nominal wage W also stays the same: since the unemployment rate is unchanged, the bargaining power of workers and firms does not change, and since the expected price level is unchanged, the real standard of living that workers expect and the real wage bill that firms expect to pay both remain unchanged. By the price setting relation, higher labor taxes increase firms' marginal cost $W(1+\tau)$ even if wages have not changed. To keep earning the same markup μ as before the tax increase, firms increase the price P at which they sell their goods.

(e) Medium run

Using the answers from part c), we can see that an increase in the labor tax τ leads to lower N, W and Y; higher u; and unchanged P^e.

The intuition is as follows. Since P did not change, the price that firms charge for the goods they sell is unchanged. By the price setting relation, to earn the same profit margin μ at the given price level P, firms keep the marginal cost $W(1+\tau)$ unchanged. For a given nominal wage W, the increase in tax τ makes marginal cost go up. To offset the increase in marginal cost caused by the higher tax rate, firms pay a lower nominal wage. In turn, a lower nominal wage W and an unchanged expected price level P^e leads to a lower expected real wage W/P^e. By the wage setting relation, the lower expected real wage leads to an increase in the unemployment rate u or, equivalently, a reduction in employment N, as workers' willingness to work declines. The production function then implies that the lower number of workers produce less output Y.

(f) In part b), we found that

$$P = P^e(1+\mu)\frac{Y}{L}(1+\tau).$$

Using the answer from part a), we can re-write the last equation as:

$$P = P^e(1+\mu)(1-u)(1+\tau).$$

Introducing time subscripts for all variables gives:

$$P_t = P_t^e\,(1+\mu_t)\,(1-u_t)\,(1+\tau_t)\,.$$

Dividing both sides by P_{t-1}, we get:

$$\frac{P_t}{P_{t-1}} = \frac{P_t^e}{P_{t-1}}\,(1+\mu_t)\,(1-u_t)\,(1+\tau_t)\,.$$

Using the definitions for inflation and expected inflation, we get:

$$1+\pi_t = (1+\pi_t^e)\,(1+\mu_t)\,(1-u_t)\,(1+\tau_t)\,.$$

This is the *non-linear* Phillips curve (because inflation is not a linear function of π_t^e and u_t).

(g) From c), we have that

$$u = 1 - \frac{1}{(1+\mu)(1+\tau)},$$
$$u_t^n = 1 - \frac{1}{(1+\mu_t)\,(1+\tau_t)}.$$

Substituting the last equation into the non-linear Phillips Curve from part f) and re-arranging, we find that

$$\frac{1+\pi_t}{1+\pi_t^e} = \frac{1-u_t}{1-u_t^n}.$$

(h) Using the hint with $x = \pi_t$ and $y = \pi_t^e$ gives the approximation

$$\frac{1+\pi_t}{1+\pi_t^e} \approx 1 + \pi_t - \pi_t^e.$$

Using the hint with $x = -u_t$ and $y = -u_t^n$ gives the approximation

$$\frac{1-u_t}{1-u_t^n} \approx 1 - u_t + u_t^n.$$

Plugging the two approximations into the expression

$$\frac{1+\pi_t}{1+\pi_t^e} = \frac{1-u_t}{1-u_t^n}$$

found in part g) gives

$$1+\pi_t-\pi_t^e = 1-u_t+u_t^n.$$

Re-arranging, we get

$$\pi_t = \pi_t^e - (u_t - u_t^n).$$

This is the Phillips curve, which is a linear equation (inflation is a linear function of π_t^e and u_t).

(i) The answer from part a), the production function $Y = N$, and $L = 1$, imply

$$u = 1 - Y.$$

After adding time subscripts and the superscript n for the medium run, plugging the last equation into the Phillips Curve from part h) gives

$$\pi_t = \pi_t^e - ((1-Y_t) - (1-Y_t^n)).$$

Simplifying,

$$\pi_t = \pi_t^e + (Y_t - Y_t^n).$$

(j) From part c), the initial medium-run equilibrium with $L = P = 1$ has

$$Y = Y^n = \frac{1}{(1+\mu)(1+\tau)},$$

$$P^e = P = 1.$$

The short-run solution from part b) with

$$\begin{aligned} L &= 1, \\ Y &= Y^n = \frac{1}{(1+\mu)(1+\tau)}, \\ P^e &= 1, \end{aligned}$$

is

$$
\begin{aligned}
N &= Y^n, \\
W &= Y^n, \\
u &= 1 - Y^n, \\
P &= (1+\mu)\,(1+\tau^{new})\,Y^n = \frac{1+\tau^{new}}{1+\tau} > 1.
\end{aligned}
$$

Inflation in the short-run equilibrium is positive

$$\pi_t = \frac{\frac{1+\tau^{new}}{1+\tau} - 1}{1} = \frac{\tau^{new} - \tau}{1+\tau} > 0.$$

(k) The new medium-run natural level of output after taxes increase from τ to τ^{new} is

$$Y^{n,new} = \frac{1}{(1+\mu)\,(1+\tau^{new})}.$$

Plugging this $Y^{n,new}$ and the expressions for Y^n and π_t from part j) into the Phillips Curve

$$\pi_t = \pi_t^e + (Y^n - Y^{n,new})$$

gives

$$\frac{\tau^{new} - \tau}{1+\tau} = \pi_t^e + \left(\frac{1}{(1+\mu)(1+\tau)} - \frac{1}{(1+\mu)\,(1+\tau^{new})} \right).$$

Solving for π_t^e and simplifying,

$$
\begin{aligned}
\pi_t^e &= \frac{\tau^{new} - \tau}{1+\tau} - \left(\frac{1}{(1+\mu)(1+\tau)} - \frac{1}{(1+\mu)\,(1+\tau^{new})} \right) \\
&= \frac{1}{(1+\mu)(1+\tau)} \left((\tau^{new} - \tau)(1+\mu) + \frac{1+\tau}{1+\tau^{new}} - 1 \right).
\end{aligned}
$$

Expected inflation is positive:

$$
\begin{aligned}
&\Longrightarrow \pi_t^e > 0 \\
&\Longrightarrow \frac{1}{(1+\mu)(1+\tau)} \left((\tau^{new} - \tau)(1+\mu) + \frac{1+\tau}{1+\tau^{new}} - 1 \right) > 0 \\
&\Longrightarrow (\tau^{new} - \tau)(1+\mu) + \frac{1+\tau}{1+\tau^{new}} - 1 > 0 \\
&\Longrightarrow (1+\mu)(1+\tau^{new}) > 1.
\end{aligned}
$$

Where I have used that μ, τ, and τ^{new} are positive and that $\tau^{new} > \tau$.