ECON4330 – International Macroeconomics

Companion Solutions Manual

Spring 2026

Instructor note. This document is written as a companion key for the agreed exam draft. It combines model answers with short grading guidance. Equivalent correct reasoning should receive credit even if notation or ordering differs.

Suggested grading principle. Full credit should require both the correct conclusion and the mechanism. Students should not receive full credit for unsupported one-line answers on conceptual questions.

1. Real exchange rates, nontradables and Balassa–Samuelson [50 points]

(a) Suggested grading. Roughly 2–3 points per correctly interpreted equation.

Solution.

- $A_T f'(k_T) = r$: in the tradable sector, the value marginal product of capital equals the exogenous world interest rate. Capital mobility ties the domestic return on capital to r.
- $w = A_T[f(k_T) - f'(k_T)k_T]$: with constant returns to scale, the marginal product of labor in tradables equals the wage. Since tradables are the numeraire, this is the real wage in units of tradables.
- $pA_N g'(k_N) = r$: in nontradables, the value marginal product of capital equals the same world interest rate. The factor price is the same, but output is valued at the relative price p.
- $pA_N[g(k_N) - g'(k_N)k_N] = w$: the value marginal product of labor in nontradables equals the wage. Labor mobility implies the same wage in both sectors.

(b) Suggested grading. Full credit for deriving the dependence of k_T on r and A_T and for explaining labor mobility clearly.

Solution. From

$$A_T f'(k_T) = r \quad \Longrightarrow \quad f'(k_T) = \frac{r}{A_T}.$$

Since $f'(\cdot)$ is decreasing in k_T, this uniquely pins down k_T as a function of r/A_T:

$$k_T = (f')^{-1}\left(\frac{r}{A_T}\right).$$

Hence the tradable capital–labor ratio is determined by the world interest rate and tradable productivity.

Once k_T is pinned down, the tradable wage is

$$w = A_T\big[f(k_T) - f'(k_T)k_T\big],$$

so the tradable sector determines the wage. Because labor moves freely across sectors, workers must be indifferent between working in T and N. Therefore $w_T = w_N = w$, and the wage set in tradables becomes the economy-wide wage.

(c) Suggested grading. Full credit for the statement that p rises with w and falls with A_N, together with a correct mechanism.

Solution. In the nontradable sector, zero profit implies that the price of nontradables must cover unit cost. Since the factor prices are w and r, and productivity is A_N, we can write schematically

$$p = \frac{\text{unit cost}(w, r)}{A_N}.$$

Therefore:

- higher wages raise nontradable unit cost, so p must rise;
- higher nontradable productivity lowers unit cost per unit of output, so p falls.

Equivalently, the conditions

$$pA_N g'(k_N) = r, \qquad pA_N\big[g(k_N) - g'(k_N)k_N\big] = w$$

say that, for given A_N and r, the relative price p must adjust to make it feasible for nontradable firms to pay the wage w. Hence, all else equal, a rise in w implies a rise in p.

(d) Suggested grading. Good answers should describe the full chain $A_T \uparrow \Rightarrow w \uparrow \Rightarrow p \uparrow \Rightarrow P \uparrow$.

Solution. When A_T rises, the tradable capital condition becomes

$$f'(k_T) = \frac{r}{A_T}.$$

Since the right-hand side falls, k_T rises. More importantly, tradable labor becomes more productive, so the tradable wage rises:

$$w = A_T\big[f(k_T) - f'(k_T)k_T\big] \uparrow .$$

Because labor is mobile, the higher tradable wage must also be paid in the nontradable sector. Nontradable productivity A_N has not changed, so nontradable firms can only afford the higher wage if the relative price p rises. Thus the relative price of nontradables increases.

Since tradables are the numeraire, a rise in p also raises the domestic consumption price level P (for example through a CPI-type index that combines tradables and nontradables). This is a real appreciation because domestic goods, especially nontradables, become more expensive relative to tradables and relative to foreign consumption baskets. In the Balassa–Samuelson interpretation, richer and more productive countries are more expensive mainly because productivity growth in tradables pushes wages up economy-wide.

(e) Suggested grading. Full credit for connecting faster productivity growth to higher future prices, a lower consumption-based real interest rate, and lower saving.

Solution. The consumption-based real interest rate is

$$1 + r^c_{t+1} = (1 + r)\frac{P_t}{P_{t+1}}.$$

Faster tradable productivity growth generates Balassa–Samuelson appreciation: future nontradable prices rise relative to tradables, so the overall price level tends to rise over time. Hence P_{t+1} is higher relative to P_t, which lowers P_t/P_{t+1} and therefore lowers r^c_{t+1}.

A lower consumption-based real interest rate means saving is less attractive in consumption units. Households then want to consume more today and save less. Since the current account equals saving minus investment (or, in the tradables block, tradable income minus tradable absorption), lower saving implies a lower current account. Faster expected productivity growth can therefore push the economy toward a current account deficit today.

2. Short questions [20 points]

(a) Solution. Home bias means that investors hold a disproportionately large share of domestic assets relative to what a globally diversified portfolio would prescribe. It is a puzzle because standard international portfolio theory says investors should hold a broad claim on world output in order to diversify country-specific risk. In the data, investors hold far more domestic equity than the world-market benchmark predicts.

(b) Solution. The forward premium puzzle is the empirical finding that currencies with high interest rates tend to appreciate, or at least fail to depreciate enough to offset the interest differential. Under uncovered interest parity, they should depreciate on average by roughly the interest differential, so the average excess return on holding the high-interest currency should be zero. In the data, the opposite pattern often appears.

This directly implies that carry trades—borrowing in a low-interest-rate currency and investing in a high-interest-rate currency—earn positive average returns. The returns are compensation for bearing exchange-rate risk, in particular the risk of sharp reversals in "risk-off" episodes when high-yield currencies can crash.

(c) Solution. If default triggers sanctions, default becomes more costly. That strengthens the country's incentive to repay and relaxes the incentive-compatibility constraint faced by foreign lenders. As a result, the country can borrow more or insure more consumption risk ex ante. The sanctions may never be used in equilibrium, but by making repayment more credible they can raise ex ante welfare.

3. Mundell–Fleming–Tobin model [30 points]

(a) Suggested grading. Students should identify a downward-sloping IS, an upward-sloping LM, an upward-sloping BB, and the fact that BB is flatter.

Solution. Under a fixed exchange rate, $E = \bar{E}$ is taken as given in the short-run diagram. In (Y, i)-space:

- the IS curve slopes downward because a higher interest rate lowers demand through consumption and investment;
- the LM curve slopes upward because higher income raises money demand and must be offset by a higher interest rate when M/P is fixed;
- the BB curve also slopes upward, but it is flatter than LM.

From the money-market equation,

$$\frac{M}{P} = m(i, Y),$$

total differentiation gives

$$0 = m_i\, di + m_Y\, dY \quad \Longrightarrow \quad \frac{di}{dY} = -\frac{m_Y}{m_i} > 0,$$

because $m_Y > 0$ and $m_i < 0$.

For the BB curve, with E fixed,

$$\frac{B}{P} = W_p(\bar{E}) - f(i, \bar{E}) - m(i, Y).$$

Differentiating gives

$$0 = -(f_i + m_i)\, di - m_Y\, dY \quad \Longrightarrow \quad \frac{di}{dY} = -\frac{m_Y}{f_i + m_i} > 0.$$

Since both $f_i < 0$ and $m_i < 0$, we have $|f_i + m_i| > |m_i|$, so the BB slope is smaller than the LM slope. Economically, the bond market can absorb higher income partly through portfolio substitution into domestic bonds as well as through money demand, so less of an interest-rate rise is needed.

(b) Suggested grading. The correct ranking is that fixed i yields the larger output effect than fixed M.

Solution. A rise in G shifts the IS curve to the right under a peg.

(i) Fixed money supply. The economy remains on the original LM curve. Output rises, but the interest rate must rise to clear the money market. The higher interest rate crowds out private demand, so the output effect is moderated.

(ii) Fixed interest rate. The central bank fully accommodates the money needed to keep i constant. There is no interest-rate crowding-out, so the fiscal multiplier is larger.

Therefore the output effect is larger under fixed i than under fixed M. The mechanism is crowding-out of private demand: whenever i is allowed to rise, part of the fiscal stimulus is offset; when i is pinned, the full stimulus passes through to output.

(c) Suggested grading. Good answers should distinguish clearly between the initial open-market purchase and the later reserve-flow response, and explain why sterilization implies larger reserve outflows.

Solution. Equation (5) is the central-bank balance sheet:

$$M = EF_g + (\bar{B} - B).$$

Sterilization means offsetting the monetary effect of reserve flows through opposite bond operations so that the money supply does not change as much, or does not change at all.

Consider an open-market purchase under a fixed exchange rate. The central bank buys domestic bonds, so $(\bar{B} - B)$ rises and M initially rises. The higher money supply lowers i on impact. The lower interest rate makes domestic assets less attractive, so reserve losses follow: $F_g \downarrow$.

Without sterilization, those reserve losses reduce EF_g and contract M again through equation (5), partly undoing the initial monetary expansion. With sterilization, the central bank offsets the reserve-induced contraction by additional bond purchases, keeping M at its new higher level. The lower interest rate is sustained, so the monetary expansion has a larger effect on demand and output.

Sterilization does not eliminate the FX pressure. On the contrary, because the interest rate stays lower, the associated reserve outflow is *larger* than without sterilization. The central bank buys monetary potency at the cost of faster reserve depletion.

(d) Suggested grading. Full credit for identifying the additional exchange-rate channel and using it to rank monetary-policy effectiveness.

Solution. Under a floating exchange rate, F_g is fixed and the FX market clears through E. A rise in i attracts capital and causes an appreciation, so E falls; a fall in i generates a depreciation. Through the net-export term $X(E, Y)$, the exchange-rate response reinforces the interest-rate effect on demand. A change in i now shifts demand through two channels:

- the standard direct effect on consumption and investment;
- an indirect exchange-rate effect through net exports.

Hence in (Y, i)-space the ISFX curve is flatter than the IS curve under a peg: a given change in i produces a larger change in Y.

For monetary policy, this means: under a float, a monetary expansion lowers i, depreciates the currency, and boosts net exports. The exchange-rate channel amplifies the expansion. Under a peg, the same initial fall in i produces reserve outflows that contract M through equation (5) and partly undo the monetary shock. Therefore

Monetary policy is more effective under floating than under fixed exchange rates.