

Practice Problem Set #7 – Solutions

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Chapter 14

5. a. See Figure 4 in Chapter 14, on page 284 of the custom-printed version of the textbook. The ZZ and NX lines shift up. Domestic output and domestic net exports will be higher in the new goods market equilibrium compared to the old.
- b. Unless stated otherwise, we should always assume that investment depends positively on output and negatively on the interest rate. Therefore, domestic investment will be unambiguously higher in the new equilibrium because output has increased and, as stated in the question, the interest rate does not change. There is no effect on the domestic government budget balance (i.e. public saving, which is given by $T - G$ as usual): taxes are assumed to be constant as stated in the question, and since nothing is stated about government expenditure, we should assume that it too is constant.
- c. $NX = S - I + (T - G)$, or, to use the notation from class, which I think is clearer, $NX = S_{priv.} + S_{pub.} - I$. We have so far argued that public saving (i.e. the domestic budget balance) is unchanged while I and NX have increased in the new equilibrium relative to the old. Therefore, because this equation linking saving, investment and the trade balance must always hold, $S_{priv.}$ must have increased as well. (If private saving did not change, the left-hand side would be higher than the right-hand side because of the increase in investment, which enters negatively on the right, and because of the increase in net exports, which enters positively on the left. So private saving must increase by more than investment has increased in order to bring the two sides of the equation back into balance. We can also determine that private saving has increased by thinking about the consumption function: private saving is disposable income minus consumption, so the change in private saving is the change in disposable income minus the change in consumption; the change in consumption is the marginal propensity to consume times the change in disposable income; and since the marginal propensity to consume is less than one, the increase in consumption is less than the increase in disposable income, so that private saving must be higher on net.)
- d. Except for G and T , which are modeled here as exogenous, the variables in this equation linking saving, investment and the trade balance (i.e. equation (5) in Chapter 14, on page 292 of the custom-printed version of the textbook, derived from the condition for equilibrium in the goods market) are determined endogenously because they depend on the endogenous variable output. An exogenous shock such as an increase in foreign output thus affects private saving, investment and net exports simultaneously through various channels. More specifically, the increase in foreign output increases exports directly, which increases demand for domestically-produced goods and hence domestic output. The higher domestic output increases consumption and investment (which leads to yet higher domestic output) and higher imports (which pulls net exports and domestic output partially back). And so on as the goods market converges to its new equilibrium. So even though the change in foreign output does not have a direct effect on private saving and investment, it does have an indirect effect through the induced change in domestic output and the associated multiplier process.

7. a. $Y = C + I + G + X - IM$
 $Y = c_0 + c_1(Y - T) + d_0 + d_1Y + G + x_1Y^* - m_1Y$
 $Y^{eq} = [1/(1 - c_1 - d_1 + m_1)][c_0 - c_1T + d_0 + G + x_1Y^*]$

- b. The equilibrium level of output increases by the multiplier, which equals $1/(1 - c_1 - d_1 + m_1)$. As compared to the very first multiplier we saw for the closed economy with everything exogenous except consumption, $1/(1 - c_1)$, there are two additional parameters: d_1 , which captures the effect of an additional unit of income on investment (which we've seen before, though it was denoted ' b_1 ' before); and m_1 , which captures the effect of an additional unit of income on imports (which is new to the open-economy model). The investment effect tends to increase the multiplier; but the import effect tends to reduce the multiplier (because imports reduce domestic output, since they represent domestic income spent on foreign-produced goods).

The condition $0 < m_1 < c_1 + d_1 < 1$ ensures that the model is internally consistent and sensible in a few ways. First, $0 < m_1$ implies that imports increase with output, which is a basic assumption we want to capture. Second, $m_1 < c_1 + d_1$ implies that domestic demand for both domestically-produced as well as foreign-produced goods increases with income. (Otherwise, any positive exogenous shock would lead to a huge increase in imports and an actual decrease in demand for domestically-produced consumption and investment goods, which doesn't seem realistic.) Finally, $c_1 + d_1 < 1$ ensures the stability of the model. The analogous condition for the closed economy was discussed in the very first set of practice problems. If it did not hold, domestic demand would tend to increase without end in response to even tiny positive exogenous shocks.

- c. When government purchases INCREASE by one unit, net exports FALL by $m_1\Delta Y = m_1/(1 - c_1 - d_1 + m_1)$. The change in output due to the one-unit change in government expenditure, denoted ΔY , is simply the multiplier. Government spending and the balance of trade (i.e. net exports) change in opposite directions because, as the increased government spending pushes domestic output up, imports increase, and higher imports means lower net exports. Remember that exports depend on foreign output only, so are staying fixed as domestic output is increasing.
- d. NOT REQUIRED. This is a "stylized fact" that I think is mentioned somewhere in Chapter 13. You don't need to remember it. The larger economy will likely have the smaller value of m_1 . Larger economies tend to produce a wider variety of goods domestically, and therefore to spend less of an additional unit of income on foreign-produced goods than smaller economies do.

e.

	$\frac{\Delta Y}{\Delta G}$	$\frac{\Delta NX}{\Delta G}$
$m_1=0.5$	1.1	-0.6
$m_1=0.1$	2	-0.2

- f. Fiscal policy has a larger effect on output in the economy with $m_1=0.1$, but a larger (absolute) effect on net exports in the economy with $m_1=0.5$. These statements are mutually consistent, and should make a lot of intuitive sense. When government expenditure increases, demand first increases directly, then the corresponding increase in output has three indirect effects through the multiplier process: consumption increases, pushing output higher; investment increases, pushing output higher; and imports increase, pulling output partially back. In the economy with $m_1=0.5$, a lot of the additional output

goes to funding more imports, so imports increase a lot and domestic output only a bit more because only a small amount of the new income is left over for consumption of domestically-produced goods. The opposite is true in the economy with $m_1=0.1$: most of the additional output is used to purchase domestically-produced consumption and investment goods, hence leading to a large second-round increase in domestic income, with only a bit used to purchase imports, which will hence only slightly offset the higher domestic output.

Chapter 15

3.
 - a. A monetary expansion shifts the LM curve down, and hence leads to a new equilibrium with higher output and a lower interest rate. Consumption increases because output increases. Investment increases because output increases and the interest rate falls.
 - b. A monetary expansion has an ambiguous effect on net exports. The interest parity relation requires that the lower equilibrium interest rate be met with a lower nominal exchange rate (that is, a depreciation of the domestic currency). This nominal depreciation tends to *increase* net exports (by decreasing imports, since they become more expensive for us, and increasing exports, since they become cheaper for other countries). But the increase in output tends to *reduce* net exports (by giving us extra income with which to buy imported goods).

(When we analyzed a depreciation in the context of the goods market only, we showed how net exports shifted up and pushed up demand directly, then how output increased through the multiplier effect. The direct effect on net exports was positive, because we always assume that the Marshall-Lerner condition holds. The subsequent increase in output led to indirect increases in imports through the multiplier process, but we argued that the overall effect on net exports was an improvement in the trade balance, because demand for domestically-produced goods also increases through the multiplier process. Figure 4 in Chapter 14 shows the essentials of this argument, and there is an accompanying discussion a few pages later. In the present case, there is an additional factor pushing output upwards: the lower interest rate pushes investment up more than was the case when we were implicitly holding the interest rate constant in the analysis restricted to the goods market. Thus, the depreciation combined with the interest rate effect on investment push output strongly upwards, potentially leading to such a large increase in imports that net exports actually decrease overall.)

6.
 - a. The IS curve shifts to the left. Output falls, the interest rate falls, and the currency depreciates. A currency depreciation on its own tends to increase output by increasing net exports. Therefore, the exchange rate movement dampens the effect of the fall in business confidence, i.e. output does not fall by as much as it would if there were no exchange rate effect. (In a graph of the goods market only, the drop in business confidence would be illustrated by a downward shift in Z , then the exchange rate depreciation would be illustrated by a partial shift back up in Z .) The same argument can be made in reverse for an exogenous *increase* in business confidence. We can therefore say that a flexible exchange rate acts as an “automatic stabilizer” to autonomous expenditure shocks, because it reduces the output fluctuations associated with IS shifts relative to the closed-economy case (and even more in relation to the fixed exchange rate case, though we did not cover this, and the associated subsequent parts of this question are not required).