

Homework Assignment #3: Answer Sheet

This assignment is due on Thursday, December 10, 2009, at the beginning of class (or sooner).

1. *Consider the graphical model of the gold standard. Analyze graphically (be sure to distinguish impact effects from long-run effects. Assume the economy started in full equilibrium) what happens to the price level and the stock of gold if:*

- (a) *there is a rise in foreign income.*

brief answer An increase in foreign income increases exports so the flow supply of gold coming into the country will increase. This causes the stock of gold to rise. Given the demand for gold the relative price of gold must fall. Under the gold standard this requires the price level to rise. This makes us less competitive than before. Once the price level rises sufficiently the flow supply of gold is once again equal to the flow demand and the stock of gold stops changing. The gold stock is now higher than before and the relative price of gold is lower.

- (b) *credit cards reduce the need for money in making transactions*

brief answer This reduces the monetary demand for gold. The same level of transactions can be made with the same level of gold. With the demand for gold decreased the relative price of gold must fall. At the lower relative price, the flow supply of gold is below demand. The gold stock decreases, and this raises the relative price of gold until we reach equilibrium. Notice that the new equilibrium price level is the same as before as long as the flow supply and demand curves do not shift. What happens is that the gold stock is lower than in the initial equilibrium.

- (c) *technological progress in foreign lands increases productivity in the rest of the world*

brief answer This reduces costs of production elsewhere, so it raises our imports and lowers exports at the initial price level. Hence, the flow supply of gold falls. The price level falls till we are competitive again at a higher relative price of gold.

- (d) *a tariff on imported goods is imposed.*

brief answer This increases the flow supply of gold as exports exceed imports. But the rise in the stock of gold raises the price level and lowers competitiveness. At the lower relative price of gold trade is again balanced.¹ This is why Adam Smith said that no country, no matter how vigilant, can retain an inflow of gold

- (e) *silver is to be coined at a rate of ϕ per unit of gold (that is one ounce of silver is now worth ϕ ounces of gold).*

¹We ignore any second-order effect such as the tariff lowering efficiency, making us poorer and reducing income. These are important, but surely second order effects.

brief answer This is the equivalent of increasing the stock of monetary gold. The stock of money in circulation is now: $M = \lambda[P^G(G + \phi S)]$, where S is the stock of silver. This will increase the price level (lower the relative price of gold). We will become less competitive, and exports will fall relative to imports. Gold will flow out of the country until the price level returns to where it was. If other countries do not coin gold, we lose gold and essentially replace it with silver. Notice that the answer is essentially the same as for a gold discovery.

2. *Suppose that an economy deliberately fixes its exchange rate at a value that gives it a competitive advantage in world markets (whatever this means). What would you expect would happen to the demand for its currency in world markets? Explain.*

brief answer The economy undervalues its exchange rate to make exports cheaper. The demand for its currency rises in world markets – after all, it is undervalued – the price is too low. People need to buy this currency to purchase cheap exports from this country, and it will import less, so it purchases less foreign currency. This leads to an increase in the supply of foreign exchange as the central bank must purchase sell domestic currency to prevent its price from rising. Reserves rise.

- (a) *Can the economy maintain a permanent competitive advantage? To answer this, you may use the gold standard model to fix ideas.*

brief answer Unlikely. The rise in reserves, or the inflow of gold, will cause the money supply to swell, which will put upward pressure on the price level. In a gold standard world, the stock of gold rises as does the price level. If the economy was not on the gold standard then the monetary base would rise and the money supply would swell. This will lead to rising prices, and will erode the competitiveness derived from undervaluing the exchange rate. The central bank could try to sterilize the inflow, selling bonds domestically to absorb liquidity and offset the effects of the rise in reserves.

- (b) *If the economy is open to capital flows does this make it easier or more difficult to maintain a competitive advantage? Explain.*

brief answer This will make it more difficult. The more mobile is capital the more difficult it is to keep domestic interest rates different from those outside the country. This raises the cost of sterilization. China, which has very high restrictions on movements of capital, is better able to sterilize than most countries – hence, they can keep their currency undervalued for a long time. Others find it harder. People will not purchase low interest domestic assets when they can earn higher returns on foreign assets. Moreover, capital may flow into the country *anticipating* a revaluation of the currency. If this occurs, the pressure on the central bank will accelerate, as it will enhance the already large inflows of reserves. If the price level adjusts, then so will the real exchange rate.

3. *In spite of the flaws of the pre-1914 gold standard, exchange rates crises were rare for major European powers, the U.S., and Japan. In contrast, such changes became quite frequent in the interwar period. Can you think of reasons for this contrast?*

brief answer Changes in parities reflected both initial misalignments and balance of payments crises. This was due to massive inflation during WW1, and the attempt to return to gold at too low a price. Attempts to return to the parities of the prewar period after the war ignored the changes in underlying economic fundamentals that the war caused. This made some exchange rates less than fully credible and encouraged balance of payments crises. Central bank commitments to the gold parities were also less than fully credible after the wartime suspension of the gold standard and as a result of the increasing concern of governments with internal economic conditions. This meant that prices and wages were not as flexible in the downward direction as they needed to be to restore the gold standard. After the Civil War the US had deflation for 12 years till gold was restored. Post WW1 economies could no longer suffer that long.

4. *Under a gold standard, countries may adopt excessively contractionary monetary policies as all countries compete for a larger share of the limited supply of world gold reserves.*

(a) *What happens if a country tries to do this in isolation? What happens if all countries try to do this?*

brief answer A monetary contraction, under the gold standard, will lead to an increase in the gold holdings of the contracting country's central bank if other countries do not pursue a similar policy. All countries cannot succeed in doing this simultaneously since the total stock of gold reserves is fixed in the short run.

(b) *Can the same problem arise under a reserve currency standard (that is, where countries fix their currencies relative to a reserve currency like the pound or dollar) when bonds denominated in different currencies are all perfect substitutes?*

brief answer Under a reserve currency system, however, a monetary contraction causes an incipient rise in the domestic interest rate, which attracts foreign capital. The central bank must accommodate the inflow of foreign capital to preserve the exchange rate parity. There is thus an increase in the central bank's holdings of foreign reserves equal to the fall in its holdings of domestic assets. There is no obstacle to a simultaneous increase in reserves by all central banks because central banks acquire more claims on the reserve currency country while their citizens end up with correspondingly greater liabilities.

5. *Suppose that Caledonia is on the gold standard and that interest rates suddenly fall below the world rate (perhaps the economy has gone into recession). What would happen to the stock of gold in Caledonia in the short run?*

brief answer If $i < i^*$ then gold will flow out of Caledonia.

(a) *If Caledonia operates according to the rules of the classical gold standard what happens to the price level? How does Caledonia adjust to a new full equilibrium?*

brief answer The outflow of gold causes prices to fall and Caledonia becomes more competitive. This causes gold to flow back in, the money stock to rise, and prices adjust back to the initial equilibrium.

- (b) *Now suppose that the Central Bank of Caledonia reacts to offset the immediate impact on stock of gold (they like their initial stock). What would they do? What happens to the domestic economy? Explain.*

brief answer They could move to raise interest rates to prevent a gold outflow by conducting a contractionary monetary policy. This would cause aggregate demand in the domestic economy to fall, worsening the recession. You could think of the IS curve shifting to the left to start the process reducing interest rates (and causing the recession) and the monetary authorities reacting by reducing the money supply and shifting the LM curve to the left making everything worse.² This is, perhaps, what happened to the US in the period after the Stock Market crash of 1929

6. *Consider a small open economy with a flexible exchange rate. Explain what happens to the exchange rate, and if it will overshoot or not if:*

- (a) *the money supply contracts*

brief answer A monetary contraction causes the exchange rate to depreciate (the currency to appreciate) once we reach full equilibrium: $\tilde{e} < e_0$. Because the price level (or output) do not change instantaneously, we do not reach the full equilibrium right away. Since $\frac{M_0 - \Delta M}{P_0} < l(i^*, Y)$, money demand must fall to restore money market equilibrium. Income cannot adjust right away, so the only thing is the cost of holding money. Since i^* is fixed, the cost of holding money can rise only if the currency is expected to depreciate. But we know that $\tilde{e} < e_0$, so the exchange rate must fall by even more today – it must overshoot – so that people expect currency depreciation. Thus e falls to $e_1 < \tilde{e}$, then rises gradually to the full equilibrium value.

- (b) *there is a fiscal expansion*

brief answer A fiscal expansion causes the currency to appreciate (e to fall), but there is no overshooting. The reason is that output does not change, only the exchange rate. There is no slow adjustment to the full equilibrium. This is because fiscal policy is impotent under flexible exchange rates with capital mobility. Think of the YY curve shifting to the right. The LL curve does not move, so the intersection is at a lower e , but no overshooting.

- (c) *the world interest rate decreases*

brief answer Let us think of the PPP world for simplicity. A fall in $i^* \implies l(i^* - \Delta i^*, Y)$ is now higher than before. So with M given P must fall to restore equilibrium. In the new full equilibrium $\tilde{e} < e_0$. But prices cannot adjust immediately, so just as in part (a) the exchange rate must overshoot. It must fall by more than $(e_0 - \tilde{e})$ today so that people will expect currency depreciation and hold less money now. As the real money supply rises money demand can rise, and the $e \rightarrow \tilde{e}$.

- (d) *the foreign price level rises*

brief answer This makes the PP curve flatter, so e falls, but there is no overshooting. In the PPP world we have $e = \frac{P}{P^*}$, so clearly $e \downarrow$. In the Keynes-type world, the rise

²For review of IS-LM see the textbook, or my lecture note on income determination. <http://econ.la.psu.edu/~bickes/income.pdf>

in P^* makes us more competitive, that raises net exports, so it has the same effect as a fiscal expansion, as analyzed in part (b), so same answer.

7. Compare and contrast the effectiveness of fiscal policy to stabilize output if:

(a) *the exchange rate is fixed and there is no zero capital mobility*

brief answer Fiscal policy can be effective in changing output in the short run. A positive shock to the IS curve, for example, causes Y, i to both increase. If capital were mobile, then $i > i^* \implies$ capital inflow and thus $\uparrow IR \implies MB \uparrow$ and LM shifts to the right until $i = i^*$. But the question is about zero capital mobility. In this case, Y increases, so imports increase and the trade balance deteriorates. So an excess demand for foreign exchange causes IR and the MB to fall, so LM shifts left., until we return to the initial level of income. From the BP constraint we have $\bar{T} - mY + \phi q + \beta(i - i^*) = \Delta IR$. But with zero capital mobility we have $\beta = 0$, so there is only one level of income that keeps $\Delta IR = 0$, that is, $\hat{Y} = \frac{1}{m}(\bar{T} + \phi q)$. So fiscal policy can affect output only as long as the change in reserves can be sterilized. Since there is zero capital mobility, this is not insignificant.

(b) *the exchange rate is fixed and there is perfect capital mobility*

brief answer Now $\beta \rightarrow \infty$, so as noted in (a) if $i > i^*$ this causes a capital inflow and $\uparrow IR \implies MB \uparrow$, so LM shifts right, and the effect of fiscal policy is *augmented* by the shift in the LM curve. So fiscal policy is very potent. From the BP constraint we can see that with $\beta = \infty$ we must have $i = i^*$.

(c) *the exchange rate is flexible and there is perfect capital mobility*

brief answer We still have $i = i^*$, but now the exchange rate is flexible. When $i > i^*$ the currency appreciates, q falls as we become less competitive. This shifts the IS curve back until $i = i^*$. The exchange rate adjustment renders fiscal policy impotent.

(d) *Re-do a-c but consider the effectiveness of monetary policy*

brief answer Regarding (a) monetary policy is relatively impotent with fixed exchange rates. Only as long as the change in reserves can be sterilized can monetary policy have any effect. The reasoning is similar to part (a) in that there is only one level of income that satisfies the BP constraint (or one price level that satisfies external balance – if a monetary expansion raised prices we would lose competitiveness, and thus reserves and the money supply would fall). For part (b) monetary policy is completely impotent in this case, since the CB cannot sterilize with $\beta = \infty$; any deviation of i from i^* would cause a massive capital flow that would change reserves and thus counter the monetary policy. As for (c) monetary policy is potent now. With a flexible exchange, any capital flow causes a currency change which augments the monetary change. For example, monetary contraction, LM shifts left, $i > i^*$ the exchange rate depreciates and we become less competitive, so IS also shifts left until we have $i = i^*$