

Midterm Exam II

Answer Sheet

1. (25%) Use the asset approach to exchange rate determination to explain what happens to the exchange rate, both at impact and in the long run, in the following circumstances. Use appropriate graphs wherever possible:¹

(a) A permanent increase in the nominal money supply in the US.

brief answer The impact effect of an increase in the nominal money supply is to lower domestic interest rates and cause the exchange rate to rise. In fact, it overshoots its long-

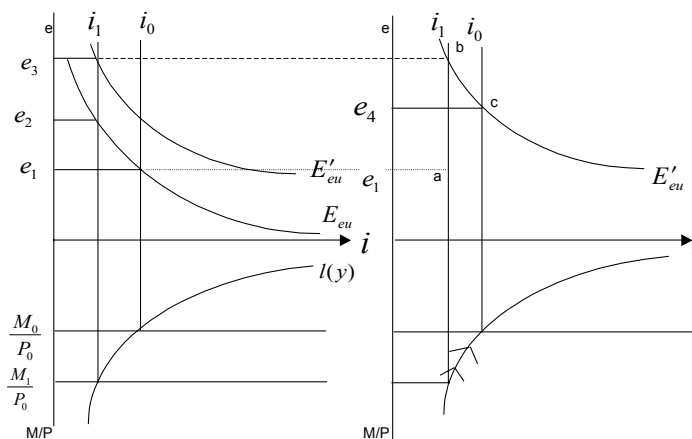


Figure 1:

run value. This overshooting is caused by the fact that the price level reacts more gradually to the money supply change than asset prices. Since interest rates are, at impact, lower in the US than in Europe people will only hold dollars if they expect capital appreciation. But this cannot happen if the current value of the exchange rate, e_t is below the long-run value, \hat{e} . So people sell dollars today until $e_t > \hat{e}$. Over time, as the price level rises in response to the monetary expansion the real money supply shrinks. This raises interest rates. As US interest rates approach their original levels interest differentials have fallen. So the expected appreciation of the exchange rate should fall. This means that e falls. One can see the path of movement from $a \rightarrow b \rightarrow c$ in figure 1. Eventually, the real money supply is unchanged as prices have risen as much as the nominal money supply. Interest rates are back to their original level as well. But since prices are now higher the exchange

¹Notice that one can use the graphical apparatus of the book or the alternative one I offered in class. Each is okay.

rate is higher than its initial level, $e_4 > e_1$. This follows because the purchasing power of the dollar has fallen due to the monetary expansion.²

(b) *A permanent decrease in US real income.*

1. A decrease in real income leads to a decrease in money demand. Hence domestic interest rates are higher for any given real money supply. By the familiar logic the exchange rate must fall on impact – otherwise no one would hold euros. The fall in the exchange rate overshoots the long run impact because eventually the price level falls. In figure 2 this is evident in the move from $e_0 \rightarrow e_1 \rightarrow \bar{e}$. Notice that once full adjustment is reached the price level has fallen to P_1 .

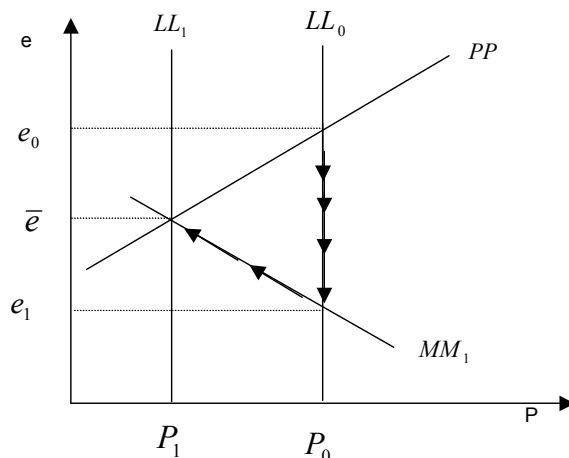


Figure 2:

(c) *An announcement today that the nominal money supply in the US will increase next week.*

brief answer An announcement that the money supply will rise next week (if it is credible) causes people to change their expectations about the future exchange rate. In this case it would cause people to expect a higher value for the exchange rate than they did before the announcement. Suppose, for simplicity, that the announcement is that next week the money supply will rise exactly as in part (a), and that everyone believes it. Then considering the notation of figure 2 it is clear that people now must expect that the future exchange rate will be \bar{e} . But $\bar{e} > e_0$, so if nothing changed the dollar would be expected to depreciate. Who would hold it? Clearly, the dollar will fall in value today. But eventually prices will be rising and this will cause the dollar to appreciate. Hence, it must fall sufficiently today so that it can appreciate in the future. So the exchange rate must rise today as in figure 2 (or as in figure 1).

2. (20%) *You are the Chancellor of the Exchequer in the United Kingdom as WW1 ends. During the war convertibility was suspended, but now you must fix the new exchange rate between the pound and the dollar. Before the war one pound was equal to 5 dollars. During the war inflation in the UK was 100% while in the US it was 50%.*

²One could also use the alternative apparatus, which is much simpler in this case. In figure 3 the same analysis leads to the movement from $e_0 \rightarrow e_1 \rightarrow \bar{e}$.

- (a) *If you use relative PPP as your guide what should the new value of the pound be? Explain how you made this decision.*

brief answer Relative PPP says that exchange rate movements are driven by inflation differentials. If inflation was double in the UK than in the US the exchange rate should increase by 50%. Let e be the number of dollars it takes to buy a pound. Then

$$\frac{e_t - e_{t-1}}{e_{t-1}} = \pi_{US} - \pi_{UK} = -50\%.$$

Since $e_{t-1} = \$5$, $e_t = \$2.5$, according to relative PPP.

- (b) *Why might it be a bad policy to rely solely on relative PPP as a guide here? What factors might call for a smaller or greater real depreciation than PPP suggests? Explain.*

brief answer The war may have caused structural changes that would impact the real exchange rate. For example, since the war hit the UK much harder, it may have impacted the economy much more severely. Government spending on the military in Britain was much higher. These are non-traded goods. Productivity may have been hurt relatively in Britain as well due to the need to convert factories for war use. The real cost of living most likely increased greater in the UK, so the dollar should strengthen in real terms by more than just the difference in inflation rates. Hence, if the pound is set according to relative PPP it may be overvalued; a real depreciation of the pound is needed. Maintaining the prewar parity could cause problems for the economy down the line.³

3. (30%) *It is typically observed that when the Federal Reserve announces that the money supply actually grew more quickly than expected in the preceding week that nominal interest rates rise. This seems to be a puzzle. Why? The two most common explanations for this use: (i) the Fisher effect and expected inflation, and; (ii) expectations of future Fed policy to bring the money supply into line.*

- (a) *How does the "Fisher effect explanation" explain why nominal interest rates rise?*

brief answer If the money supply has grown more rapidly then people expect higher inflation. Since the Fisher effect says that $i = r + \pi^e$, if expected inflation increases so does the nominal interest rate.

- (b) *How does the "expectations about future policy explanation" explain why nominal interest rates rise?*

brief answer If money growth was greater than predicted investors may expect that money growth will tighten in the future. With lower money growth and lower liquidity interest rates should rise. It is not higher expected inflation, but tighter liquidity that is causing interest rates to rise, by operating on real interest rates.

³In fact, Great Britain restored the pound to its pre-war parity (actually \$4.86 to the pound) only in 1925 (with Churchill as Chancellor of the Exchequer). The pound was seriously over-valued. For this parity to stick British prices would have to fall. Instead Britain went into depression, there was a General Strike that was eventually suppressed and Churchill fell from power, only to return at the onset of WW2.

- (c) *The two explanations have different predictions about what happens to the dollar on this announcement. Why? What would you expect to happen to the dollar in each case? Explain.*

brief answer If the Fisher explanation is correct higher US inflation means that the dollar will depreciate. From the answer to question 1, part a, we know that the dollar will depreciate now. But if the "expectations..." theory is true then the dollar should strengthen in the future. Since exchange rates overshoot, this means that the dollar will strengthen dramatically on the announcement.

4. (25%) *What does it mean when someone says that the path of the exchange rate (or tulip prices, or stocks) is a bubble? Try to be precise.*

brief answer A bubble refers to a path of prices that have diverged from fundamentals. If \hat{p}_t is the price associated with fundamentals (for example, the equilibrium price in the exchange rate model, or the expected present value of dividends with stock prices) in period t , and p_t is the asset price, then the bubble is $b_t = p_t - \hat{p}_t$. Notice that in a bubble the price rises *because of the expectation of future price growth*. That is, in a bubble $p_{t+1}^e > p_t$ not because people expect \hat{p}_{t+1} to be higher, but because people expect $p_{t+2}^e > p_{t+1}^e$. Prices rise based on their own momentum.

- (a) *Does a steadily rising price for an asset necessarily mean that there is a bubble? Explain.*

brief answer No. Rising prices may mean a bubble, but it could be due to increasing fundamentals. For example, tulip prices may have risen because some bulbs were very scarce, or because the consumption price of tulips rose due to the preference of ladies for having them on their dresses. Or in the case of the prices of stocks it could be because people believe that the internet will cause higher profits in the future. If you recall the internet bubble, many people really believed that a new economy was near. They really believed that the internet changed everything. So they believed fundamentals implied higher future prices.

- (b) *No bubble can expand forever, so does the existence of a bubble signify that investors are irrational? Can there be a rational bubble? Explain how this is possible. Is it possible to infer the market's expectation of the likelihood of the bubble's collapse? How?*

brief answer Yes, there can be a rational bubble. If people are unsure whether the bubble will collapse to fundamentals in the current period, the price will be an average of what the price would be if the bubble continued and the fundamental price. A stochastic rational bubble occurs when the price grows at this weighted average, where the weights are given by the probability of the bubble continuing and collapsing, respectively. Notice that a stochastic bubble must rise faster than a deterministic one. Why? The bubble must grow at a rate equal to the return an alternative asset – hence, at the real interest rate r – in the deterministic case.

$$\frac{b_{t+1}}{b_t} - 1 = r$$

so that $b_{t+1} = b_t(1 + r)$. In the stochastic case there is some chance that the price may crash, so that if the stochastic bubble grew only at rate r , the expected value

would be less than r . The rational bubble must thus grow at a rate faster than r for it to be rational. Hence, in this case it must grow according to $b_{t+1} = \frac{b_t(1+r)}{q}$, where $q < 1$ is the probability that the bubble does not burst in any period. This means that the probability of the bubble continuing is

$$q = \frac{b_{t-1}(1+r)}{b_t} \tag{1}$$

and if we can determine \hat{p}_t then we can calculate b_t . Since we observe prices and interest rates we can thus calculate q from (1).

- (c) *If an asset price follows a bubble path people are making money. So why is a bubble bad, if at all? Explain.*

brief answer During a bubble prices are rising so people are making money. But if it is a bubble prices will eventually collapse. So there will be future losses that offset the current gains. But that is not really the point. More important, a bubble by definition means that prices have diverged from fundamentals. So prices are not signalling properly. This means that resources are not allocated correctly. Consider the case of foreign exchange. If the dollar is on a bubble path the exchange rate is too low, US goods are less competitive then they should be. Imports are very competitive. Industries will be hurt. When prices return to fundamental the businesses may no longer be there. Or in the case of an internet bubble, think of the resources that were invested based on future profit expectations.

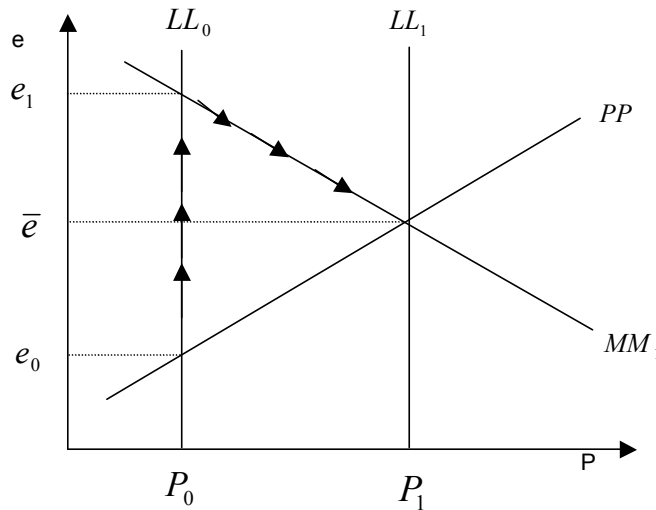


Figure 3: