Problems

1. The response to a temporary change in government spending in the real business cycle model is the same as the response to such a disturbance in the monetary intertemporal model, as the two models are equivalent. Government spending shocks in this model wrongly predict that consumption, investment, and the real wage are countercyclical. In response to a temporary increase in government spending, output increases and the real interest rate increases. Because the net effect on money demand is ambiguous, the effect on the price level is also ambiguous. Therefore, there can be no contradiction of model’s predictions on the cyclical behavior of the price level.

2. We already know that persistent increases in total factor productivity are consistent with all of the business cycle facts. As developed in the answer to problem 4, above, we noted that temporary increases in government spending were not consistent with several of the business cycle facts. If both disturbances are combined, the ability to fit the facts depends on which of the parts of the disturbance are stronger. In particular, if the increase in government spending produces a small increase in total factor productivity, then this type of disturbance will not fit the facts very well. For this type of disturbance to fit the business cycle facts, a small increase in government spending would need to generate a large increase in total factor productivity.

3. Business optimism about future total factor productivity.
   (a) First consider the fundamental effects of the increase in expected future total factor productivity. Such a disturbance shifts the aggregate demand curve to the right. In the coordination failure model, this results in an increase in output and employment in the good equilibrium and a decrease in output and employment in the bad equilibrium. The increased optimism might also move the economy from the original bad equilibrium to the new good equilibrium.
   (b) Let us focus on the effects of changes in future total factor productivity on the good equilibrium. This disturbance shifts the aggregate demand curve to the right. The good equilibrium is at higher levels of output and employment, and a lower real interest rate. In the labor market, the reduction in the real interest rate also increases the real wage rate. The decrease in the real interest rate increases consumption spending. The increase in the real interest rate likely mitigates, but does not reverse, the direction of the effect of the disturbance on investment. All of these effects are consistent with the business cycle facts. Finally, the increase in output and the reduction in the real interest rate both work to increase money demand. The price level therefore decreases, which is also consistent with the business cycle facts.
   (c) The increased optimism decreases the price level in the good equilibrium. Therefore, the monetary authority should increase the money supply when firms become more optimistic and reduce the money supply when firms become more pessimistic. Note that if the money supply is a sunspot variable, there may be a difficulty with reducing the money supply when firms become more pessimistic. This policy response is therefore consistent with the nominal money supply being procyclical. Such a change in the money supply may also shift the economy from the good equilibrium to the bad equilibrium, and this factor obviously greatly complicates the analysis.

4. Announced policies in the segmented markets model.
   (a) In this case, the expected real interest rate $r^e$ is unaffected, despite the announcement, and money supply $M$ is reduced. This is equivalent to an unexpected decrease of the money supply, and we have the exact opposite situation from what is described in Figure 11.5 of the textbook. Thus, the interest rate and the price level will increase; employment, output, consumption, and investment all decrease.
   (b) As this announcement is believed, all agents will be able to react to it and there is no market segmentation. We are thus back to the monetary model of Chapter 10. Real aggregates are unaffected, only the price level decreases.
(c) The price level changes more in the second situation, as there is no real impact that would counterbalance it. Now to make its policy announcements more credible, the central bank would need to show consistently that it is acting like it said it would. This can, for example, be attained by sticking to a well-publicized rule.

5. We want to compare here a positive money supply shock as it affects economies $a$ and $b$ that are initially at steady state. The shock is larger in economy $a$. The figures below build on Figure 11.5 from the textbook, the only difference being the amplitude of the shocks. The steady states are the same for both countries, with one exception: money demand is lower in country $a$ due to the higher uncertainty about prices. Indeed, households do not like variations, thus all agents will use more banking services to avoid the larger consequences from price variations. The consequence is that all aggregates fluctuate more in country $a$. While the price level is initially higher in country $a$, it may fall below the one in the other country, depending on the difference in money demands between the two countries. But the price level fluctuates more for sure in country $a$. The figures below illustrate this.
6. If the money supply were the only variable that shifts the economy between the bad and good states, the monetary authority would need to increase the money supply only if the economy starts out in the bad state. However, once the good state is reached, there is no further need to make any changes in the money supply. Both models are therefore consistent with a predictable money supply as the best way to make consumers better off.

On the other hand, if there was a disturbance that shifted the economy into the bad state, it would be optimal for the monetary authority to increase the money supply when output falls. In the money surprise model, changes in the money supply in response to disturbances can only make consumers worse off.

7. The reduction in the demand for leisure implies a rightward shift in labor supply. This shift in labor supply implies an equilibrium in the labor market with less employment and a decreased real wage. The aggregate supply curve therefore shifts to the left. The increase in the demand for consumption goods shifts the aggregate demand curve to the right. Therefore, in the good state, output increases and the real interest rate decreases. In the bad state, output decreases and the real interest rate increases.

8. The permanent increase in government spending does not affect the aggregate demand curve, because the increase in government spending generates an approximately equal decrease in consumption. The implied increase in taxes shifts the labor supply curve to the right. In the coordination failure model this produces a leftward shift in aggregate supply. Recall that the labor demand curve is upward sloping and steeper than the labor supply curve. A leftward shift in aggregate supply is depicted in the figure below.

In the “good” equilibrium, output increases and the real interest rate decreases. That output increases requires that employment increase. The increase in employment moves the economy along the labor demand curve, so that the real wage rate must also increase. Finally, the increase in output combined with the decrease in the real interest rate implies that money demand shifts to the right, and so the price level decreases.

In the “bad” equilibrium, output decreases and the real interest rate increases. That output decreases requires that employment decrease. The decrease in employment moves the economy along the labor demand curve, so that the real wage rate must also decrease. Finally, the decrease in output combined with the decrease in the real interest rate implies that money demand shifts to the left, and so the price level increases.
9. The effects of the decrease in the capital stock depend on the specific model we are working with. The effect of the decrease in capital in the real business cycle is depicted in the figure below.
The real interest rate unambiguously increases. The diagram depicts a case in which real output decreases. In this case, the demand for money unambiguously decreases, and so a decrease in the money supply is required to maintain price stability. If, on the other hand, the increase in investment demand is strong enough, then the aggregate demand curve may shift to the right by more than the shift to the left in aggregate supply. In this case, real output increases. If real output increases enough, then the demand for money may increase. This case would require an increase in the money supply.

In the coordination failure model, the situation is more complex. The decrease in the capital stock shifts the aggregate production function downward, as in the figure below. The new aggregate production function is flatter, so that the aggregate labor demand curve shifts downward. Employment would therefore increase. The increase in employment coupled with the decrease in the capital stock, may either increase or decrease the level of output. If, as depicted in the figure below, output on net decreases, then the aggregate supply curve shifts to the left.

The decrease in the capital stock also shifts the aggregate demand curve to the right. If the aggregate supply curve shifts to the left, then the situation is as depicted in the figure below. In the bad equilibrium, output decreases and the real interest rate increases. Money demand would therefore decrease, and the money supply would need to decrease to maintain price stability. In the good equilibrium, output increases and the real interest rate decreases. Money demand would increase, and so the money supply would need to increase to maintain price stability.