PSET 7 Solutions

1. For 2017:4–2022:4 (the forecast period) increase COG by $87 billion, use the interest rate rule of the Fed, and examine the effects on GDPR, GDPD, RS, UR, SGP, PCGDPR, and PCGDPD. Using your knowledge of the AS/AD model and the various extensions, explain why each of the first five variables changed the way it did (i.e., why it went up or down).

(a). GDPR, real GDP, increases gradually relative to the baseline during the period of increased spending. This is consistent with the effects of an increase in G in the AS/AD model, in which an increase in G shifts the IS curve right both by increasing spending directly and through a multiplier effect, raising aggregate demand and so increasing output. It is good to mention that the spending multiplier is greater than one.

(b). GDPD, the price level (as measured by the GDP deflator), gradually rise relative to the baseline during the period of stimulus. This is consistent with the effects of an increase in G in the AS/AD model, in which the rise in AD moves the economy along the aggregate supply curve and raises the price level.

(c). RS, the interest rate on 3 month bills, begins to rise immediately relative to the baseline. Note that this is a change relative to a baseline, which predicts the interest rate rising from 2016 on. This is consistent with the Fed rule in the version of the AS/AD model we studied; as output and price level rise, the Fed raises interest rates to control the expansion of the economy.

(d). UR, the unemployment rate, falls during the period of increased spending. The decline in the unemployment rate as aggregate demand expands is consistent with the predictions for the labor market that were discussed, as changes in desired output as AD shifts induce corresponding changes in labor demand in the same direction.

(e). SGP, the government deficit, rises during the period of increased expenditure. The fact that the deficit change is not exactly the amount of the change in expenditure likely reflects two forces. One is endogenous taxes and transfers, which raise taxes and reduce transfers as output improves, and the other is interest payments, which increase government costs persistently after an increase in the government debt, which accumulates when deficits are positive.

(f). PCGDPR, growth in real GDP, rises relative the baseline as spending begins, consistent with (a).

(g) The change in PCGDPD follows from (b). This follows the same logic as the level of prices.

2. Do experiment 1 again but also add that TRGHQ decreases by $87 billion. Why does GDPR still increase? What happens to the government deficit, -SGP, and why?

GDPR still increases because a $100 billion increase in COG has a greater multiplier effect than a $100 billion decrease in TRGHQ. This is consistent with the AS/AD Model, which suggests that government spending has a more direct effect on output than transfer payments, because not all transfer payments are spent on consumption (as determined, in part, by the marginal propensity to consume). Government deficit = G – T = G – (tY – TR). Government deficit decreases because while changes in G and TR offset each other, the government collects larger taxes because output increases.

3. For the forecast period take RS to be exogenous (that is, drop equation 30, the Fed rule), increase it by 1 percentage point, and explain the effects on GDPR, UR, GDPD, INTG, SGP, and RB.

An increase in the interest rate by 1 percentage point over a period from 2016:4 to 2022:4 has results similar to those our AS/AD model predicts. An exogenous increase in the interest rate acts like a shift up in the Fed rule, which contracts spending and aggregate demand. GDP falls relative to the baseline, leading to a rise in the unemployment rate. The contraction in AD results in a fall in the price level, GDPD, relative to baseline. As the interest that the government must pay on its debt, INTG, is increasing in the interest rate on assets in the economy, this quantity rises as RS goes up. These higher payments in part account for the increase in the government deficit, SGP, that occurs (recall that a deficit is when the surplus is negative), though changes in tax and transfer payments as income declines also contribute. Finally, the rate on long term bonds (RB) also increases, by an amount somewhat less than one percent, as higher short term rates lead to greater discounting of the payoffs of these bonds. This is roughly as predicted by the expectations hypothesis for the term structure of interest rates, which proposes that long rates are determined by expected average short rates over the duration of the bond, as short rates in this experiment go up for part but not all of the duration of the long term bonds.

4. Drop equation 25 and increase the value of CG in 2017:4 by 4000 (4 trillion). THIS IS A CHANGE FOR 2017:4 ONLY. Solve the model for the forecast period. (Use the interest rate rule of the Fed for this experiment.) Explain the effects on GDPR, RS, CD, and SRZ.

A one-time $4 trillion dollar increase in capital gains (i.e. the value of the stock market), increases GDPR (real GDP) by an amount which grows to around $40 billion per quarter. This is consistent with the lifecycle consumption view, which suggests increases in wealth increase spending by an amount, which is spread out over many years, and hence is much smaller each year than the size of the initial change in wealth. This is reflected in a persistent increase in CD (consumption of durable goods) by around $7 billion per quarter, and a decline in the savings rate (SRZ). (Much of the rest of the increase in GDP can be accounted for in terms of increases in other types of consumption expenditures and firm investment, not shown). The increase in output results in a response of the Fed raising interest rates; according to the model, RS, the 3 month rate, goes up relative to the baseline model.

5. For the forecast period increase PIM by 20 percent of its base values, use the interest rate rule of the Fed, and examine the effects on GDPR, GDPD, RS, UR, AA, WR, PCGDPR, and PCGDPD. Explain why each of the first six variables changed the way it did (i.e., why it went up or down).

After you raise PIM, price of imports, by 20% in the model, you will find the following changes: GDPR drops, because the increase in import price is negative cost shock, which is represented by an inward shift of the AS curve. GDPD increases, because import price is included as part of aggregate price level and it also affects aggregate price level indirectly by raising the cost of imported intermediary goods. RS increases as a result of the Fed's reaction to counteract the price shock. Unemployment rate (UR) increases because GDPR drops, imposing a negative impact on the labor market. Total wealth (AA) falls because an increase in import price results in higher general price level, which reduces the value of real wealth. Real wage rate (WR) falls because of the combination of falling output and increase in the general price level.

6. Drop equation 30 (the Fed rule) and do experiment 5 again. Note that the effect on GDPR is still negative. This is contrary to the AS/AD model presented in class, where the effect would be zero. (Why would the effect be zero?) What is going on in the US model to make the effect negative? (Hint: think about the effects on AA and WR.)

Without the Fed rule, the AD curve in the AS/AD framework presented in class is no longer downward sloping, (remember how to explain its downward slope), but becomes vertical in the short run. According to this class model, leftward shift of the AS curve would have a zero impact on GDPR, or output. However, this simple AS/AD setting does not capture the existence of wealth (AA) and income effect (WR). The US Model captures this, and therefore following an import price shock, as explained in part 5, there is a decline in both total wealth and real wage rate, which leads to a decline in household consumption, and GDPR, which can be (informally) thought of as an inward shift in the vertical AD curve.