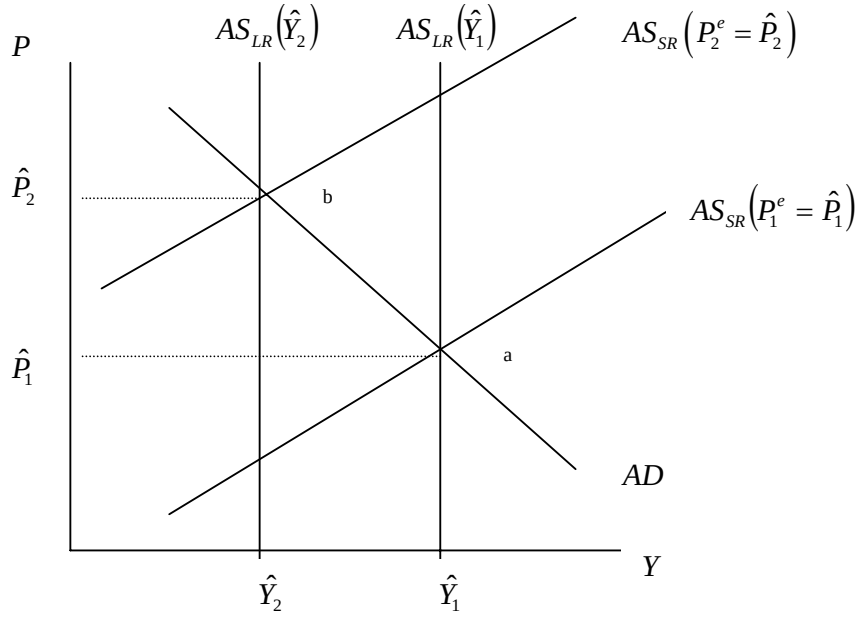
Chapter 9 Review Questions

1. Using the AD-AS model, show that if markets clear and agents have rational expectations then temporary shocks cannot have persistent effects on output.

If markets clear and agents have rational expectations then temporary productivity shocks cannot have persistent effects on output. The economy will simply switch between two different equilibrium positions.



Suppose the economy starts of at point *a*. If markets clear, and agents have rational expectations, then following an adverse productivity shock the economy will move quickly from point a to point b. The transition is fast because wages and prices are flexible so change quickly in response to any disequilibrium, and also because price expectations are updated quickly.

However, if the productivity shock is temporary, once it disappears the economy would then be expected to move back, equally fast, to its original position. Therefore, fluctuations in output simply follow the fluctuations in productivity innovations. If these are short lived, then cycles will also be quite short.

Empirical evidence tends to suggest that business cycles tend to last several years, so temporary shocks on their own do not generate persistent enough output movements. A permanent productivity shock will generate a persistent effect on output, but this reflects a change in equilibrium and wouldn't explain cyclical movements where the effects on output are persistent but ultimately die away.

2. How does real business cycle theory explain fluctuations in output and employment?

From question 1, temporary shocks would only expect to have temporary effects on output. The challenge for RBC is to explain why temporary shocks can create sustained output movements when prices are flexible and agents form expectations rationally.

To do this, RBC theorists argue that the effect of a shock on the economy is the product of impulse and propagation effects. The impulse is the actual productivity shock; propagation describes how this then creates a sustained movement in output.

A common propagation effect is consumption smoothing behaviour. Households which maximise lifetime utility subject to lifetime resources will tend to use saving and borrowing to smooth consumption over time. Therefore, if current income rises due to a positive productivity shock- rational maximising consumer will save some of the procedures to enable higher future consumption. This can be achieved by investing in the capital stock, which then creates sustained output movements.

For example, suppose output is a function of productivity and the existing capital stock:

$$Y_t = A_t F(K_t)$$

All output or either consumed or saved

$$Y_t = C_t + S_t$$

Savings are recycled by financial institutions such as banks into loans that finance corporate investment.

$$S_t = I_t$$

The future capital stock will therefore be a function of current investment decisions.

$$K_{t+1} = g(I_t)$$

Therefore, output next period is a function of the current level of investment, or saving:

$$Y_{t+1} = A_{t+1} F\left(g\left(I_t\right)\right) \text{ or } Y_{t+1} = A_{t+1} F\left(g\left(S_t\right)\right)$$

It is quite easy to see how consumption smoothing behaviour following a one period productivity shock can be propagated forward.

The strength of this propagation effect depends on the strength of consumption smoothing behaviour. Critics would argue that the propagation effects tend to be quite weak.

Given that output and employment tend to move together over the business cycle another challenge for RBC theorists is to explain how temporary productivity shocks can generate fluctuations in employment.

A model by Lucas and Rapping (entitled *Real wages, employment and inflation* and published in 1969 in the Journal of Political Economy) examines how households allocate time between work and leisure in a two period model. They propose that employment in each period is described by the following relationship

$$\frac{N_1}{N_2} = \left[\frac{w_1}{\frac{w_2}{(1+r)}(1+\theta)} \right]^{\sigma}$$

Where N_i is employment in each period, w_i is the real wage in each period, r is the interest rate, θ the discount rate and σ is the elasticity of substitution. This essentially argues that the ratio of employment in each period is positively related to the present discounted value of real wages in each period. If we assume that the discount rate and the interest rate are the same then this makes things easier, as employment simply moves in line with real wages.

$$\frac{N_1}{N_2} = \left[\frac{w_1}{w_2} \right]^{\sigma}$$

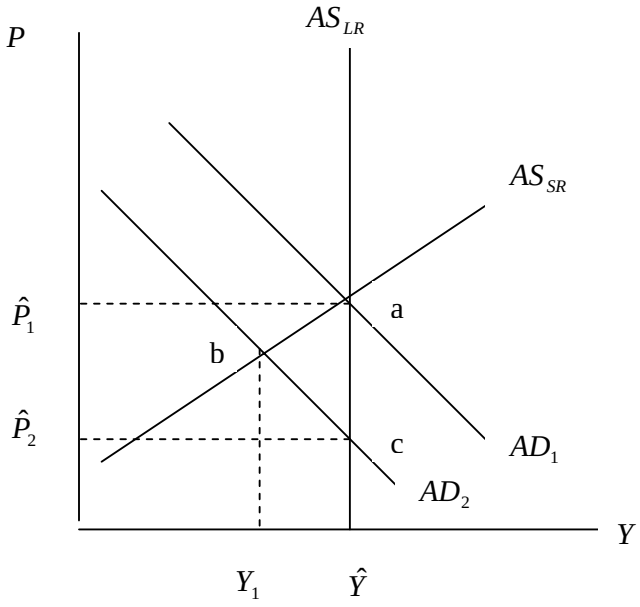
Real wages are assumed to move in line with productivity (the outcome of a competitive labour market). Therefore a one period productivity shock would see wages and employment increase in that period. The intuition of the model is that over time, households work more in periods of high real wages and consume more leisure in periods of low real wages. If wages were to rise in both periods there would be no substitution effect of work between periods.

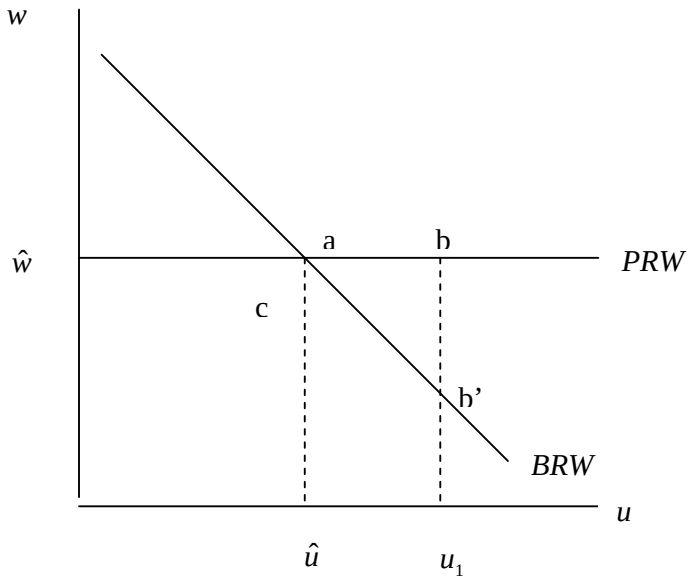
The key element to the story is the parameter σ or the elasticity of substitution. This describes how willing households are prepared to substitute hours of labour over time. If this is large, then small changes in real wages can generate large employment movements, if small then the employment effects are vice-versa.

The elasticity of substitution reflects the curvature of the disutility of work function. If this is very curved, then it signals that the marginal disutility from extra work in each

period is very high, and hence workers are less likely to substitute labour over time so the elasticity is low.

3. Using the AD-AS model, explain how the presence of wage and/or price rigidities can lead to persistent movements in output following demand shocks.





At point a the economy is on the long run aggregate supply curve and unemployment at the NAIRU, so both goods and labour markets are in equilibrium. Following a demand shock the economy moves down the short run supply curve to point *b*, and

consistent with lower output unemployment rises above the NAIRU. However, the economy would be expected to equilibrate through falling prices and return back to the long run aggregate supply curve (NAIRU) at point c.

The bargained real wage curve (BRW) is derived from the wage setting behaviour of workers

$$W = P^e(Z - \beta u)$$

and the price determined real wage agues that firms set prices as a mark up on costs.

$$P = (1 + \mu)\frac{W}{LP}$$

These two relationships describe how a rise in unemployment would then be expected to bring about the fall in the price level required to move the economy back to its long run equilibrium level of output, and employment back to the NAIRU.

$$\uparrow u \rightarrow \downarrow W \rightarrow \downarrow P \rightarrow \downarrow P^e \rightarrow \downarrow W \rightarrow \downarrow P \rightarrow \downarrow P^e \rightarrow \downarrow W \rightarrow .....$$

The speed at which the economy returns to equilibrium depends on how flexible are wages and prices, and second how quickly price expectations are adjusted in response to changes in actual prices.

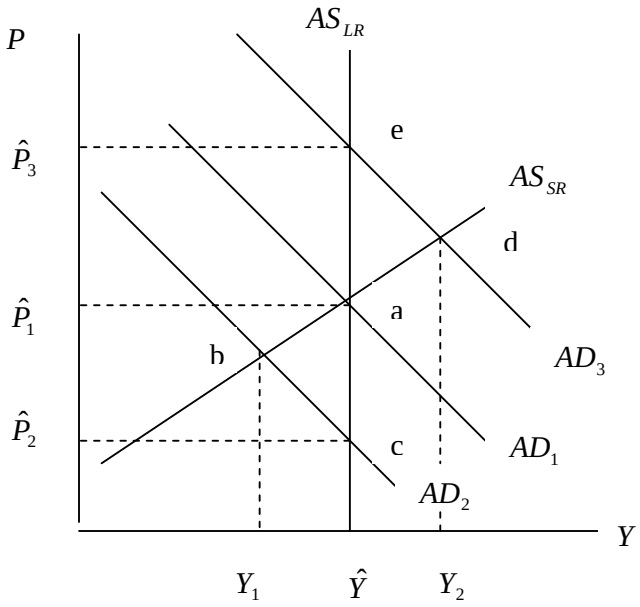
If there are significant nominal rigidities, and price expectations are adjusted slowly then prices adjust slowly. Therefore, following a demand shock the economy might deviate from its equilibrium level for a sustained period of time.

4. Explain how more accurate economic forecasting can make it easier for policy makers to stabilize the economy. What other problems might policy makers face in operating stabilization policy?

It is recognised that there are significant lags in operating monetary and fiscal policies. Monetary policy can be changed quickly, but may take up to two years to fully effect the economy. On the other hand, fiscal policy has a more immediate impact but cannot be changed so quickly.

As a result, stabilisation policy requires pre-emptive action, where the policy is enacted to try and offset cyclical movements in the future, rather than waiting for the cycle to happen and assuming that policy will work to immediately change it.

Therefore, stabilisation policy requires accurate forecasts of the economy. First to identify any future cycle or shock that requires offsetting, then in formulating the required stabilisation policy.



For example, suppose the economy is in position a but a negative demand shock is predicted in the future. If this shock or movement isn't predicted, then the economy will move to point b (a recession) when the shock arrives. If forecasts detect the shock, but fail to detect its magnitude then again the policy response might be too weak to provide an effective stabilisation remedy.

Alternatively, if the stabilisation remedy is too strong then the economy may bounce back too far and end up at point d where inflationary pressures result. This could happen because the forecast of the drop in aggregate demand was too pessimistic, or because the forecasted response of the required policy was too weak.

If policy-makers get it just right the policy response will offset the shock and keep the economy at point *a*. These examples identify the importance of forecasting in stabilisation policy. Generating accurate forecasts though can be a very difficult science. First, predicting the future always carries unknowns, but prescribing the right policy response is also difficult. An exact knowledge of all the key multipliers and elasticities would be required. Also, according to the Lucas critique, these in themselves may not be stable across different policy regimes.

More advanced problems

5. If monetary shocks are correlated with output movements, does this suggest that real business cycle is irrelevant.

One of the key assumptions of RBC theory is that markets clear (so wages and prices are flexible) and agents in the economy are rational and utility maximising (so form rational expectations of prices). Under these conditions monetary shocks would be neutral, because expectations, wages and prices will adjust quickly. The price level will change but output not, all that happens in the economy is a movement along the long run aggregate supply curve.

RBC protagonists argue that these assumptions are valid. Prices respond to disequilibria in markets, and households are rational. Given this description of the economy- cycles can only arise from real shocks such as productivity movements or changes in the supply and efficiency of factors of production. If monetary shocks are correlated with output movements, then it would imply that the conditions RBC theorists assume might be wrong.

One possibility is that if a monetary shock is unanticipated, then even though markets clear and agents form rational expectations they may be taken by surprise. It is not controversial to argue that agents do not have perfect information, and can therefore be surprised. In this case, a movement in prices may be confused with a productivity shock generating some short run correlation between money on output. However, this would only last as long as agents continue to be surprised.

It is also worth mentioning that even if the assumptions in RBH theory are not entirely steadfast; shocks may still be generated by productivity movements.