Suggestive solution for

Written Exam for the B.Sc in Economics 2010-II

Macro B - New Syllabus

Competence description: This course builds on the part of Macro 1 explaining the economy in the short run and on some of the methods of analysis that are included in Macro 2. The focus is on describing and explaining the macroeconomic fluctuations in the short run, i.e. the business cycles around the long run growth trend. An important part is to also describe the economic mechanisms that tend to pull the economy back to the long run growth trend which is the subject in Macro 2.

Students are to learn the most important stylized facts about business cycles and to acquire knowledge about theoretical models aimed at explaining these facts. While Macro 1 mainly includes static models, students in Macro 3 are to learn how to use simple dynamic models which may describe the business cycle over time.

In connection with this, the aim is to make students familiar with the distinction between deterministic and stochastic models and backward-looking expectation. Furthermore students are to gain an understanding of the distinction between the impulses initiating a business cycle and the propagation mechanisms that give business cycles a systematic character.

Finally students are to learn how to use the models for analyzing the effects of macroeconomic stabilization policy under various assumptions w.r.t. expectations and exchange rate regime. The very good should at the end of the course be able to demonstrate full capability of using the techniques of analysis taught in the course as well as a thorough understanding of the mechanisms in the business cycle models for open and closed economies, including the ability to use relevant variants of the models in order to explain the effects of various shocks and the effects of macroeconomic stabilization policies under alternative monetary and exchange rate regimes.

0.1. Problem A.

Question 1.. The Keynes Ramsey rule is derived from the standard 2 generation consumption model, with utility function of the form

$$U = u(C_1) + \frac{u(C_2)}{1+\phi} \tag{0.1}$$

where $u' > 0$, $u'' < 0$ and ϕ denotes the time preference of the agent. Furthermore the intertemporal budget constraint is of the form

$$C_1 + \frac{C_2}{1+r} = V_1 + H_1 \tag{0.2}$$

where r denotes the interest rate, V_1 is the initial financial wealth and H_1 is the present value of the agents life time disposal labor income.

Solving the utility maximization problem under the intertemporal budget constraint yields the Keynes Ramsey rule of the form

$$\frac{u'(C_1)}{u'(C_2)/(1+\phi)} = MRS(C_2 : C_1) = 1 + r \tag{0.3}$$

The Keynes Ramsey rule tells us, at optimum, the consumer must be indifferent between consuming an extra unit today and saving an extra unit today.

Question 2.. The constant money growth rule proposed by Friedman is of the form

$$i = \overline{r} + \pi + (\frac{1-\beta}{\beta})(\pi - \mu) + (\frac{\eta}{\beta})(y - \overline{y}) \tag{0.4}$$

where η is the income elasticity of money demand, β is the semi-elasticity of money demand with respect to the interest rate and μ can be considered as the growth rate of the nominal money supply.

Freidman believed that securing a stable money supply base will also secure a stable growth rate of nominal income, when β is close to zero. Further, he believed that active monetary policy, i.e. by adjusting the money base, created long and variable lags through the real economy and therefore the best way to stabilize the economy was to conduct a stable/constant money growth and let the market forces work to bring the economy back to equilibrium.

The fact that Friedman's rule was dependent on the parameter β and η derived from the money demand function had the weakness that it was prone to volatility through changed money demand. Furthermore, an active monetary policy might as well control the short term interest rate directly.

This is exactly proposed by the American economist John Taylor, of the form

$$i = \overline{r} + \pi + h(\pi - \pi^*) + b(y - \overline{y}) \tag{0.5}$$

where both h and b are positive. This is also the exact reason why most central bank now days, note, unannounced publicly follows a Taylor of some sort as this gives the flexibility of changing the short term interest rate according to disturbances in output and price stability.

Question 3.. The overshooting behavior refers to cases, for instance, where, as a reaction to monetary policy, the economy overreact, achieving an adjusted short term equilibrium and then over time, adjust to the new long run equilibrium.

It should be noted that since explaining overshooting requires/involves Rational Expectation, it suffices if the student simply in words explain the overshooting behavior. It can follow a such logic:

Financial investor may correctly anticipate that a permanent positive demand shock requires a long term appreciation of the exchange rate. If the central bank raises the domestic interest rate above the foreign interest rate in response to the shock, the exchange rate will then have to appreciate even more in the short run than in the long run to generate market expectations of a future depreciation so that domestic assets are no more attractive than foreign assets.

0.2. Problem B.

Question1.. Solving the UMP:

$$\max_{c_1,c_2} U = u(c_1) + \frac{1}{1+\phi}u(c_2) \tag{0.6}$$

$$s.t.\ c_1 + \frac{1}{1+r}c_2 = \left(Y_1^L - T_1 + \frac{1}{1+r}\left(Y_2^L - T_2\right) + V_1\right) \tag{0.7}$$

by using the Keynes Ramsey rule and the intertemporal budget:

$$\frac{u'(c_1)}{u'(c_2)/(1+\phi)} = (1+\phi)\frac{c_2}{c_1}^{\frac{1}{\sigma}} = 1+r \tag{0.8}$$

$$\Leftrightarrow\ c_2 = (\frac{1+r}{1+\phi})^{\sigma} c_1 \tag{0.9}$$

$$c_1 + \frac{1}{1+r}c_2 = (H_1 + V_1) \tag{0.10}$$

where $H_1 = Y_1^L - T_1 + \frac{1}{1+r}\left(Y_2^L - T_2\right)$, this combined yields the expression for optimal consumption in the 1. period

$$c_1 + \frac{1}{1+r}(\frac{1+r}{1+\phi})^{\sigma} c_1 = (H_1 + V_1) \tag{0.11}$$

$$c_1(1 + (1+r)^{\sigma-1}(1+\phi)^{-\sigma}) = (H_1 + V_1) \tag{0.12}$$

Question 2.. The coefficient θ denotes the propensity to consume out of current wealth and is between 0 and 1. In other words, when income/current wealth increase with 1 unit, current consumption will increase with less than 1 unit. This is due to the fact that the consumer wants to smooth his/her consumption over time. The good student will explain further the relationship between the real interest rate and θ and how this is affected by the size of σ, which we a priori can not determine. The mention of income / substitution effect should be included.

Question 3.. Use the fact that when $dT1 = dT2$ we have $\frac{\partial T2}{\partial T1} = -1$ and based on the result from Question 1, it can be found that

$$\frac{\partial c_1}{\partial T_1} = \theta\left(-1 + \frac{1}{1+r}\left(-\frac{\partial T2}{\partial T1}\right)\right) = \theta\left(-1 + \frac{1}{1+r}(-1)\right) = -\theta\left(1 + \frac{1}{1+r}\right) \tag{0.13}$$

When $r = \phi$ it follows from the expression for θ that

$$\theta = \frac{1}{1+(1+\phi)^{\sigma-1}(1+\phi)^{-\sigma}} = \frac{1}{1+(1+\phi)^{-1}} = \frac{1}{\frac{1+\phi+1}{1+\phi}} = \frac{1+\phi}{2+\phi} \tag{0.14}$$

insert this back to get

$$\frac{\partial c_1}{\partial T_1} = -\frac{1+\phi}{2+\phi}\left(1 + \frac{1}{1+\phi}\right) = -1 \tag{0.15}$$

When $r = \phi$ the Keyes Ramsey rule becomes $c_2 = c_1$, which is the same as saying that the consumer wants to perfectly smooth consumption. When this is the case, a permanent increase in taxes, which decreases disposable income in both periods by the same amount, will obviously lead consumers to just decrease consumption in both periods by the increase in taxes.

Question 4.. Taking derivative with regard to T_1 of the government budget constraint to yield

$$0 = 1 + \frac{1}{1+r}\frac{\partial T2}{\partial T1} \Rightarrow \tag{0.16}$$

$$\frac{\partial T2}{\partial T1} = -(1+r) \tag{0.17}$$

this can again be inserted into

$$\frac{\partial c_1}{\partial T_1} = \theta\left(-1 + \frac{1}{1+r}\left(-\frac{\partial T2}{\partial T1}\right)\right) = \theta\left(-1 + \frac{1}{1+r}\left(- - (1+r)\right)\right) = \theta\left(-1+1\right) = 0 \tag{0.18}$$

Thus, a change in taxes with public consumption unchanged will not affect private consumption. The reason is that when public consumption is not changed, consumers will realize that higher taxes now will imply lower taxes in the future (when the government budget constraint holds) and the present value of the lower future taxes will be exactly equal to the higher current taxes. Thus the total life time income of consumers will be unaffected in which case consumers do not want to change the consumption pattern. To be specific, in case T_1 is increased by dT_1 consumers will leave c_1 unaffected and just borrow dT_1 in the current in order to pay the extra taxes. In period 2 the consumer will then have to pay $(1+r)dT_1$ on the extra loan made in period 1 but since taxes in period 2 will be lowered by $dT_2 = (1+r)T_1$ the saved taxes in period 2 can exactly finance this payment.

Question 5.. Below is a list of reason that can be discussed and elaborated.

A. Consumer may not be sophisticated enough to understand the government's intertemporal budget constraint.

B. The planning horizon of consumers and government may not be identical.

C. Consumers are different and taxes are redistributive in nature.

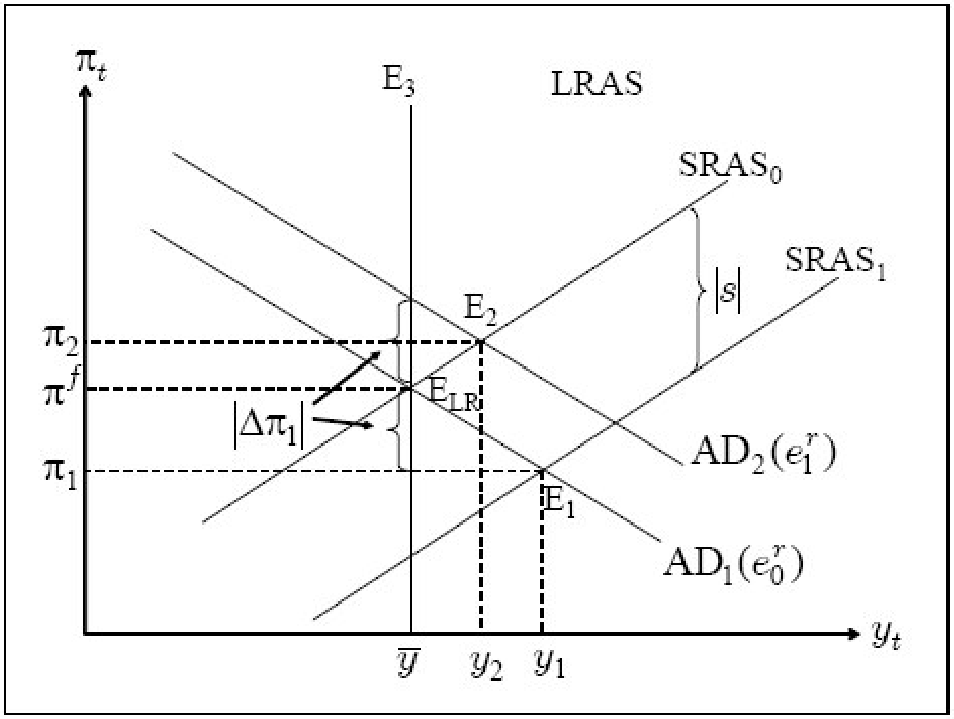
D. Real taxes are distortionary - not lump sum.

E. Some consumers may be credit constrained.

F. The interest rate faced by consumers and the government may not be the same.

0.3. Problem C.

Question 1.. The figure below (graphical analysis is not required) shows how, in the period of the shock (period 1), the SRAS curve shifts down to SRAS_1 by the distance |s|, thereby moving the economy from the equilibrium at E_{LR} to E_1 where output is higher and inflation is lower.



The economic reason is the following: a positive supply shock decreases firm's marginal costs thereby leading to lower prices and consequently to lower inflation. This increases the real exchange rate which increases goods market demand and consequently real output.

In period 2 the supply shock is gone and the SRAS curve moves back to SRAS_0. However, since inflation in period 1 was below foreign inflation, the AD curve now moves upwards by the distance $\pi^f - \pi^1$ and consequently the economy moves to the equilibrium at E_2. The economic reason is the following: Due to lower inflation in period 1, the real exchange rate will increase between period 1 and 2 stimulating goods market demand and thus real output. The increase in real output increases inflation through the supply side of the economy as explained above and inflation is further increased by the disappearance of the positive supply shock (and this dampens the increase in the real exchange rate).

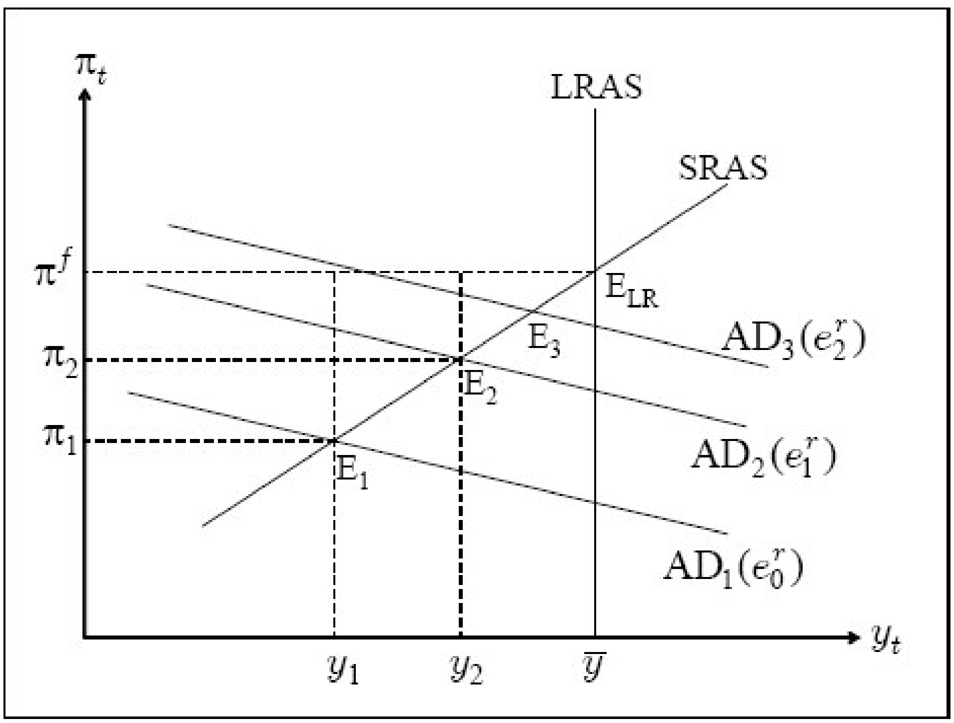
From period 3 and onwards the economy adjusts back to the long run equilibrium through the gradual adjustment of the exchange rate due to the difference in domestic and foreign inflation. The explanation could be of the following sort: when domestic inflation is below foreign inflation the real exchange rate will be increasing over time thereby improving the competitiveness of domestic goods. This increases net exports and consequently goods market demand leading to higher equilibrium real output. The increase in real output increases labour demand and decreases the unemployment rate. This puts upward pressure on wages (according to the efficiency wages theory) causing firm's marginal costs to increase which in turn lead to higher prices and thereby to increased inflation.

If the economy were in a flexible exchange rate regime the AD curve would be flatter (not shown) and in this case the downward shift in the SRAS in period 1 would imply a larger increase in real output. The reason would be that the lower inflation would lead the monetary authorities to lower the interest rate which would further stimulate demand both directly (through investment and possibly consumption) and indirectly since the lower interest rate would lead to a depreciation of the domestic currency that would further increase the real exchange rate.

The fact that the AD curve in the flexible exchange rate case is flatter than in the fixed exchange rate case may be seen from Eqs. 3.1 and 3.5 in the text. In the fixed exchange rate case, the slope of the AD curve is, as already noted, $\frac{1}{\beta_1}$. In the flexible exchange rate case, however, it is seen to be

$$\frac{1}{\widehat{\beta}_1} = \frac{1}{\beta_1 + h(\beta_1\theta^{-1} + \beta_2)} < \frac{1}{\beta_1} \tag{0.19}$$

Question 2.. The question does not require a graphical analysis but for ease of exposition, consider the below figure which shows an economy being outside long run equilibrium at point E_1 where $\pi < \pi^f$. Just as in the fixed exchange rate regime this will over time increase the real exchange rate improving the competitiveness of domestic goods leading to higher goods market demand and consequently to higher real output and higher inflation, as the economy moves towards the long run equilibrium.



Compared with the fixed exchange rate case, however, there are two additional effects, both (directly and indirectly) stemming from the fact that in the flexible exchange rate case, the economy is able to conduct independent monetary policy. We know that when the domestic inflation increases towards π^f this will lead the monetary authorities to increase the nominal exchange rate. Given expected inflation this will increase the real exchange rate which will put downward pressure on real output (through lower goods market demand due to lower investment and possibly lower private consumption). This will tend to dampen the speed of convergence towards the long run equilibrium compared with the fixed exchange rate case where independent monetary policy is impossible.

At the same time, however, there is also and effect that tends to increase the speed of convergence. This follows because according to the monetary policy rule, it will be the case that $i < i^f$ whenever $\pi < \pi^f$. When $i < i^f$ the domestic currency will then depreciate, i.e. the nominal exchange rate will increase. This will further increase the real exchange rate, thereby further increasing net exports and this tends to speed up adjustment.

Due to these two extra counteracting effects on the speed of adjustment compared with the fixed exchange rate case, one cannot (without knowledge of the specific parameter values) conclude whether adjustment in the flexible exchange rate case will be faster or slower.