

Written Exam for the B.Sc. in Economics winter 2015

Macro B

Final Exam

January 13 2015
(3 hours closed-book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. *I.e.* if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

This exam question consists of 6 pages in total

All questions of both problems should be answered

Problem A

This exercise asks you to analyse aspects in monetary policy.

Money market equilibrium requires that

$$M/P = L(Y, i), \quad L_Y > 0, L_i < 0 \quad (\text{A.1})$$

where the notation is as usual. In line with the assumptions made in the text book money demand takes the specific form

$$L(Y, i) = kY^\eta e^{-\beta i}, \quad k, \beta, \eta > 0. \quad (\text{A.2})$$

1. Describe equation (A.1) and (A.2). Show that $dL/dY \cdot Y/L = \eta$ and that $dL/di \cdot 1/L = \beta$. Interpret these results.

Milton Friedman believed that the demand for real balances was a stable function of income and the interest rate. Also, according to Friedman money demand appears not to be sensitive to interest rates (*i.e.* β is close to zero).

2. Milton Friedman argued that a constant growth rate (CMG) in money supply is the best way to conduct monetary policy in order to stabilize the real economy. Explain briefly the reasoning behind this policy recommendation? You may apply equations (A.1) and (A.2) in your answer.

Under a few additional assumptions, it is shown in the text book that when monetary policy aims at securing a constant growth rate, μ , in money supply the following equation is governing the central bank's interest rate setting

$$i = \bar{r} + \pi + \left(\frac{1 - \beta}{\beta} \right) (\pi - \mu) + \frac{\eta}{\beta} (y - \bar{y}). \quad (\text{A.3})$$

3. Explain that the interest becomes an endogenous variable when monetary policy follows a CMG rule. (You are *not* expected to derive equation (A.3)). Interpret the central bank's interest rate setting given by equation (A.3); you are expected to interpret \bar{r} . Also, you are expected to explain why the central bank is adjusting the interest rate in response to changes in output and inflation and how the changes in i depends on the parameters in money demand.

Use equation (A.3) to explain that the CMG rule may result in a fluctuating central bank interest rate. Explain how John Taylor overcame these shortcomings when proposing the famous Taylor rule (notation as usual):

$$i = \bar{r} + \pi + h(\pi - \pi^*) + b(y - \bar{y}), \quad h, b > 0. \quad (\text{A.3})$$

In the text book it is argued that a version of the Taylor rule may be an optimal monetary policy. However, it is also shown that the Taylor rule does not describe an optimal monetary policy for a central bank under ideal conditions, *i.e.* if the central bank is:

- perfectly informed
- perceived fully credible by economic agents and
- able to adjust interest rates instantaneously.

According to the textbook the optimal monetary policy under ideal conditions is given by the equation

$$\begin{aligned} i^p = & \bar{r}^* + \pi^* - (\rho - \bar{\rho}) + \frac{v + \alpha_1(g - \bar{g})}{\alpha_2} - \frac{1 - \alpha}{\alpha_2(a_l + \alpha\gamma a_\pi)} a_d \\ & + \frac{\alpha\gamma a_\pi}{\alpha_2(a_l + \alpha\gamma a_\pi)} (1 - \alpha)(m - \bar{m}) - \frac{a_l + \gamma a_\pi}{\alpha_2(a_l + \alpha\gamma a_\pi)} (b - \bar{b}) \end{aligned} \quad (\text{A.4})$$

where i^p is the monetary policy rate, \bar{r}^* is the risk free equilibrium real interest rate and π^* is the fully credible inflation target for the central bank. The notation follows the text book so that the trend/normal value of variable is denote by "-". a_d, a_l, a_π are weights in the social loss function attached to market distortions, fluctuations in employment and fluctuations in inflation respectively. α_1 and α_2 are parameters in the condition for goods market equilibrium for a closed economy

$$y - \bar{y} = \alpha_1(g - \bar{g}) - \alpha_2(r - \bar{r}) + v. \quad (\text{A.5})$$

All parameters ($a_d, a_l, a_\pi, \alpha, \alpha_1, \alpha_2$ and γ) are positive. The real interest rate is given by $r = i^p - \pi_{+1}^e + \rho$ where ρ is a risk premium.

4. Explain why the 3 conditions mentioned above constitute ideal conditions for monetary policy.

5. Describe how monetary policy should react to shocks under ideal conditions. As part of your description you are expected to a) comment on why central bank's policy rate in general do not match the rate prescribed by a Taylor rule, b) explain in detail the optimal policy response to a change in government consumption and c) comment on whether demand shocks (v, g and ρ) and supply shocks (m and b) should be perfectly stabilized.

The policy rate set by the central bank is a very short-term interest rate. However, firms and consumers use longer-term interest rates when financing investments and consumption. Consider the equation

$$(1 + i_t^l)^n = (1 + i_t) \times (1 + i_{t+1}^e) \times (1 + i_{t+2}^e) \times \dots \times (1 + i_{t+n-1}^e) \quad (\text{A.6})$$

where i_t^l is the long-term interest rate in period t , i_t is the short-term interest rate in period t , and i_{t+j}^e is the expected short-term interest rate in period $t + j$.

6. Explain why equation (A.6) should be expected to hold and show that it can be transformed into

$$i_t^l \approx \frac{1}{n} (i_t + i_{t+1}^e + i_{t+2}^e + \dots + i_{t+n-1}^e) \quad (\text{A.7})$$

State the approximations made in the derivation. Interpret equation (A.7). In particular, describe why central bank credibility is essential for the central bank's ability to affect the long-term interest rates.

Assume that the central bank can control the short-term interest rate i_t so that it equals the bank's policy interest rate. Furthermore, assume that the central bank is considered fully credible by economic agents. Consider a scenario where each period is one year.

7. Consider the following three policy options:
 - a. January 1st the central bank reduces the monetary policy rate by 1 percentage point and announces that it intends to keep the policy rate at this lower level for exactly one year. Thereafter the policy rate is raised to the original level.

- b. January 1st the central bank reduces the monetary policy rate by 1 percentage point and announces that it intends to keep the policy rate at this lower level for a period of exactly 5 years in total (this year and the following 4 years). Thereafter the policy rate is raised to the original level.
- c. January 1st the central bank reduces the monetary policy rate by 1 percentage point and announces that it intends to keep the rate at this level until the end of the year but raise the policy rate to the original level as soon as possible - certainly within a period of 5 years.

How much will this affect the current 10-year interest rate? How much will it affect the 30-year interest rate? Explain. How is your answer changed if the central bank has no credibility at all?

Problem B

1. The short-run aggregate demand curve is downward-sloping under both fixed and flexible exchange rate, but for different reasons. Explain.
2. Explain why it is not a sustainable policy to attempt to keep unemployment below its natural level via a demand orientated economic policy according to the expectations-augmented Phillips curve model.
3. Assume that the social loss function of a policy maker takes the form

$$SL = \sigma_y^2 + \kappa \sigma_\pi^2, \quad \kappa > 0$$

where σ_y^2 is the variance of the output gap and σ_π^2 is the variance of the inflation rate around its target level. Explain why the policy maker is concerned with the variability of inflation. Also, comment on the choice of target value for inflation.