Written Exam for the B.Sc. in Economics
Summer 2011

Makro B

June 22, 2011

(3-hour 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.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

All questions of both problems should be answered

Problem A

This problem focuses on understanding employment and competition in the goods market.

Consider the model

$$Y_i = BL_i^{1-\alpha}, \quad 0 < \alpha < 1, \quad B > 0 \tag{A.1}$$

$$Y_i = \left(\frac{P_i}{P}\right)^{-\sigma} \frac{Y}{n}, \quad \sigma > 1, \tag{A.2}$$

where Y_i and L_i denote real output and employment in sector i, while P_i denotes the price level on sector-i output. Y og P denote aggregate output and the aggregate price level in the economy.

1. Explain equation (A.1) and (A.2). Explain the role of σ.

Marginal revenue and marginal cost for a sector-i firm can be written

$$MR_i = P_i \left(1 - \frac{1}{\sigma}\right) \tag{A.3}$$

$$MC_i = \frac{W_i}{(1-\alpha) BL_i^{-\alpha}}, \tag{A.4}$$

where W_i is the nomimal wage level in sector i. The condition that ensures that the firm is producing the optimal quantity of output is given by $MR_i = MC_i$ and can be stated in the following way:

$$P_i = m^p \left(\frac{W_i}{(1-\alpha) BL_i^{-\alpha}}\right), \quad m^p \equiv \frac{\sigma}{\sigma - 1} > 1. \tag{A.5}$$

2. Derive and interpret (A.3) and (A.4). Explain how σ affects the price chosen by the firm and explain what happens as $\sigma \to \infty$.

By substituting (A.5) into (A.1) and (A.2) it can be shown that labour demand in sector i is given by

$$L_i = \left(\frac{Y}{nB}\right)^{\varepsilon/\sigma} \left(\frac{B(1-\alpha)}{m^p}\right)^{\varepsilon} \left(\frac{W_i}{P}\right)^{-\varepsilon} \tag{A.6}$$

$$\varepsilon \equiv \frac{\sigma}{1 + \alpha(\sigma - 1)} > 0, \tag{A.7}$$

where ε is labour demand elasticy with respect to the real wages, i.e. $\frac{dL_i}{d(W_i/P_i)} \frac{(W_i/P_i)}{L_i} = -\varepsilon$.

3. From (A.7) it is seen that the elasticity of labour demand with respect to the wage level, ε, depends on the goods-market competition σ. How is the correlation and what is the intituition behind this?

Wages in the economy are chosen by unions. The unions know how the firms in the sectors act. The utility of the union in sector i is given by

$$\Omega(w_i) = (w_i - b)[L_i(w_i)]^\eta, \tag{A.8}$$

where b denotes the level of real unemployment benefits. Assume the union wants to maximize its utility and that it knows the general price level P so that it is able to decide real wages $w_i = W_i/P$. The optimality condition of the union is

$$w_i = m^w b, \quad m^w \equiv \frac{\eta\varepsilon}{\eta\varepsilon - 1}, \tag{A.9}$$

where it is assumed that $\eta\varepsilon > 1$.

4. Interpret (A.8). Then derive (A.9) and interpret.

Assuming that all sectors in the economies are symmetric, it can be shown that long-term employment, $\bar{L}$, is given by

$$\bar{L} = n\left(\frac{B(1-\alpha)}{m^p m^w b}\right)^{1/\alpha}. \tag{A.10}$$

5. Use (A.10), which should *not* be shown, to explain how long-run employment is affected by competition in the goods market, productivity and the level of unemployment benefits. Explain.

Now assume the level of unemployment benefit is proportional to the productivity level;

$$b = cB, \quad c > 0 \tag{A.11}$$

6. Give an argument for (A.11) and explain how long-run employment is now affected by the degree of competition in the goods market, productivity and by the unemployment benefit level.

7. What can the Danish government – according to this model – do to increase long-run employment? And – looking beyond the current model – what can the Danish governement and the Danish Central Bank do to increase short-run employment?

Problem B

Consider the following closed-economy model

$$y_t = \bar{y} + \alpha_1 (g_t - \bar{g}) - \alpha_2 (r_t - \bar{r}) + v_t, \quad \alpha_1 > 0, \quad \alpha_2 > 0 \tag{B.1}$$

$$r_t \equiv i_t - \pi^e_{t+1} \tag{B.2}$$

$$i_t = \bar{r} + \pi^e_{t+1} + h (\pi_t - \pi^*) + k (y_t - \bar{y}), \quad h, k > 0 \tag{B.3}$$

$$\pi_t = \pi^e_t + \gamma (y_t - \bar{y}) + s_t, \quad \gamma > 0 \tag{B.4}$$

$$\pi^e_t = \pi_{t-1} \tag{B.5}$$

Where the notation is the same as in the textbook. Unless otherwise noted both s_t and v_t is equal to zero.

1. Explain (B.1) − (B.5).

Equation (B.1) − (B.5) can be combined to the following AD and SRAS curves:

$$\text{AD} \; : \; y_t = \bar{y} - \alpha (\pi_t - \pi^*) + z_t \tag{B.6}$$

$$\text{SRAS} \; : \; \pi_t = \pi_{t-1} + \gamma (y_t - \bar{y}) + s_t \tag{B.7}$$

where

$$\alpha \equiv \frac{\alpha_2 h}{1 + \alpha_2 k}, \quad z_t \equiv \frac{1}{1 + \alpha_2 k} [\alpha_1 (g_t - \bar{g}) + v_t] \tag{B.8}$$

2. Show graphically and formally that the long-run equilibrium is stable, i.e.. y_t og π_t converges towards their long-run levels. Explain the economic mechanisms behind this.

   Hint: With regards to the formal part: define $\hat{y}_t \equiv y_t - \bar{y}$ and $\hat{\pi}_t \equiv \pi_t - \pi^*$ and show – using equation (B.6) and (B.7) – that (when $z_t = s_t = 0$):

$$\hat{\pi}_t = \beta \hat{\pi}_{t-1} \text{ and } \hat{y}_t = \beta \hat{y}_{t-1} \text{ where } \beta \equiv \frac{1}{1 + \alpha\gamma} \tag{B.9}$$

Assume the economy is hit by a one-period *negative* supply shock, $s_t > 0$.

3. Illustrate this graphically and explain the economic mechanisms. Give a real-life example of negative supply shock.

Finally, assume that a new board takes over at the central bank and assume that the new board is more tough on inflation that the old board was (i.e. h is increased).

4. Reconsider the supply shock. Compare graphically and explain the short-run reactions in output and inflation under the new and old board. What is the trade-off that the central bank must consider when faced with a negative supply shock $(s_t > 0)$? And how is the trade-off under a negative demands shock? You are not required to illustrate the negative-demand shock.