

Macroeconomic Analysis - Exam

(F.Bagliano)

Time available: **2 hours**

1. Consider a macroeconomic model with rational expectations composed of the following aggregate demand and aggregate supply functions (standard notation):

$$\begin{aligned}y_t &= (m_t - p_t) + u_t \\y_t &= \gamma(p_t - E_{t-2}p_t)\end{aligned}$$

where u_t is a demand shock generated by the following stochastic process: $u_t = \rho u_{t-1} + \varepsilon_t$ (with $0 < \rho \leq 1$) where ε_t is *white noise* with variance σ_ε^2 .

- (i) Explain the particular form of aggregate supply (with reference to the models that you think appropriate);
- (ii) solve the model and obtain the equilibrium equation for output y_t ; discuss the "monetary policy ineffectiveness" proposition in the case of the following feedback rule for money supply:

$$m_t = m_{t-2} + \alpha y_{t-2}$$

where $\alpha > 0$.

- (iii) Now suppose that the monetary policy feedback rule is the following:

$$m_t = m_{t-2} + \alpha y_{t-2} + \delta \varepsilon_{t-1}$$

Find the variance of output ($var(y_t)$) around the full employment level (here zero). If a policymaker aimed at minimizing $var(y_t)$, what value of δ should he choose? Explain intuitively the reason for the effectiveness or ineffectiveness of monetary policy in this case.

2. Consider the following simplified version of the dynamic IS-LM model with the stock market by Blanchard (1981), with all endogenous variables being functions of time t and all parameters being positive:

$$\begin{aligned}
 y^D &= q + \bar{g} && \text{(aggregate demand)} \\
 \dot{y} &= \beta(y^D - y) && \text{(output dynamics)} \\
 \bar{m} - \bar{p} &= y - r && \text{(money market equil.)} \\
 \frac{\dot{q}}{q} + \frac{\pi_0}{q} &= r
 \end{aligned}$$

q is the stock market index, r is the (instantaneous) interest rate on short-term bonds, \bar{m} and \bar{g} are money supply, and an index of fiscal policy, respectively (all exogenous). π_0 is the initial level of (exogenously given) profits.

- (a) Explain clearly the last equation of the model;
- (b) obtain the stationary equations for y and q ($\dot{y} = 0$ and $\dot{q} = 0$) and plot them in the (q, y) space. Explain the economic nature of the equations and briefly discuss the dynamics of the two variables off the stationary relations.
- (c) Graphically describe the dynamics of q , y , and r if, at t_0 , agents come to expect a future permanent increase in profits from π_0 to $\pi_1 > \pi_0$, starting from time $t_1 > t_0$. Provide a clear economic explanation for the dynamics of the variables;
- (d) clearly justify the long-run level of q with respect to its initial equilibrium value. During the adjustment process, is the return on shares higher or lower than the short-term interest rate? (briefly explain your answer)

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1. Consider a macroeconomic model with rational expectations composed of the following aggregate demand and aggregate supply functions (standard notation):

$$\begin{aligned}y_t &= (m_t - p_t) + v_t \\y_t &= (p_t - E_{t-1}p_t) + u_t\end{aligned}$$

where v_t is an aggregate demand shock and u_t is an aggregate supply shock. Both shocks are uncorrelated *white noise* with the *same* variance: $\sigma_v^2 = \sigma_u^2 = \sigma^2$.

- (i) Solve the model and find the equilibrium price level p_t and the equilibrium output y_t ;
- (ii) discuss whether the "monetary policy ineffectiveness" proposition applies if the monetary authorities follow a purely *feedback rule* in setting money supply m_t .
- (iii) Now suppose that the monetary policy rule is the following:

$$m_t = \bar{m} + \gamma v_t + \delta u_t$$

Find the variance of output ($\text{var}(y_t)$) around the full employment level (here zero). If a policymaker aimed at minimizing $\text{var}(y_t)$, what values of γ and δ should he choose? Explain intuitively the reason for the effectiveness or ineffectiveness of monetary policy in this case.

2. Consider the following simplified version of the Dornbusch's (1976) model of exchange rate determination, with all endogenous variables being functions of time t and all parameters being positive:

$$\begin{aligned}
 y &= -\alpha r + \beta (e + p^* - p) && \text{(output)} \\
 \bar{m} - p &= y - r && \text{(money market equil.)} \\
 \dot{p} &= \theta (y - \bar{y}) && \text{(price adjustment)} \\
 r &= r_0^* + \dot{e}
 \end{aligned}$$

e is the nominal exchange rate, p and p^* the domestic and foreign goods price levels respectively, r and r^* the (instantaneous) interest rates on domestic and foreign short-term bonds, y is domestic output, \bar{y} is full-employment domestic output, \bar{m} is the (exogenous) domestic money supply. All variables, with the exception of r and r^* , are in logarithms.

- (a) Explain clearly the last equation of the model;
- (b) obtain the stationary equations for p and e , and plot them in the (e, p) space. Explain the economic nature of the equations and briefly discuss the dynamics of the two variables off the stationary relations, assuming that $\beta < 1$.
- (c) Graphically describe the dynamics of e , y , p and r if, at t_0 , an expansionary *foreign* monetary policy is implemented, such that the foreign interest rate r^* is *permanently decreased* from r_0^* to $r_1^* < r_0^*$. Provide a clear economic explanation for the dynamics of the variables;
- (d) what is the effect of the decrease in r^* on the *real* exchange rate in the new steady state and during the adjustment path? (explain briefly the underlying economic mechanisms).