ISCTE — INSTITUTO UNIVERSITÁRIO DE LISBOA

Master in Economics

MACROECONOMICS

Problem sets: The choice of optimal policy instruments (Poole model)

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Questions

1. Explain what are monetary policy tools, policy instruments (or operating targets), intermediate targets, and the final goals. Give examples of each.

2. According to the Poole model, what is the main consideration for the choice of policy instrument?

3. The Poole model was initially presented in 1970. For a period close to 20 years the main result of the model was relegated to the dustbin of economic thought. Why do you think that recently this model has become so relevant for modern macroeconomic theory? Can you find some support for the main result of the model from the two following figures in the next page?

Problem 1

Consider an economy characterized by an IS–LM model with Rational Expectations. The IS function is given by

$$y_t = -\beta(i_t - E_t\pi_{t+1}) + z_t$$

where y stands for output, i for the nominal interest rate, $E_t\pi_{t+1}$ is expected inflation, z is an exogenous shock and β is a parameter ($\beta > 0$). The LM
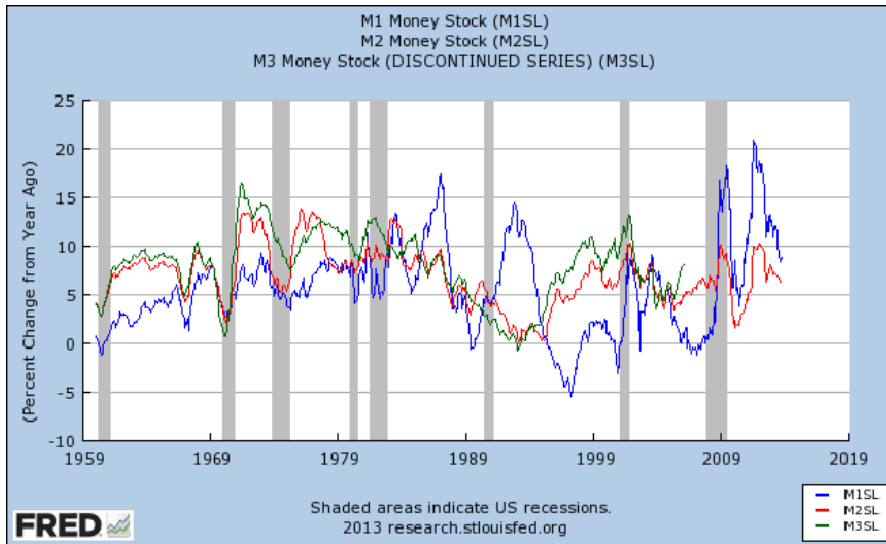
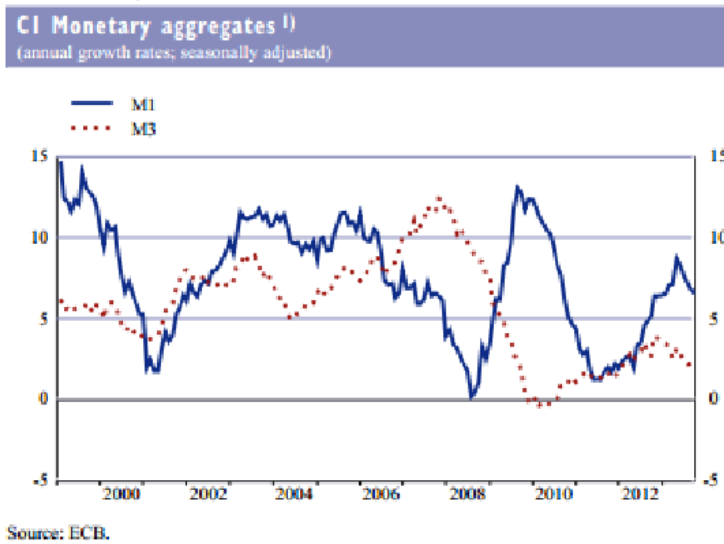Figure 1: Growth of major monetary aggregates (USA).

Figure 2: Growth of major monetary aggregates (EU).

curve expresses (in log values) the real money demand $(m_t - p_t)$ as dependent upon output, the interest rate and exogenous shocks (v_t)

$$m_t - p_t = y_t - \phi i_t + v_t. \tag{1}$$

For simplicity, assume that the price level is constant and equal to $P_t = 1$, which implies that $p_t = 0$.

1. Assuming that $\phi = 10, \beta = 100$, obtain the solution to the optimal levels of output and nominal interest (y^*, i^*), as if there were no shocks to the economy.

2. Determine the variance of output in the case the Central Bank uses the interest rate as its monetary policy instrument.

3. Do the same as in (2), but now considering that the Central Bank uses the money stock as its instrument.

4. Discuss the relevance of the magnitude of the volatility associated with money demand and with the IS function for the choice of the optimal instrument in monetary policy, under this particular case

Problem 2

Consider an economy characterized by an IS–LM model with Rational Expectations. The IS function is given by

$$y_t = -b(i_t - E_t \pi_{t+1}) + z_t$$

where y stands for output, i for the nominal interest rate, $E_t \pi_{t+1}$ is expected inflation, z is an exogenous shock and b is a parameter $(b > 0)$. The LM curve expresses (in log values) the real money demand $(m_t - p_t)$ as dependent upon output, the interest rate and exogenous shocks (v_t)

$$m_t - p_t = y_t - \phi i_t + v_t. \tag{2}$$

For simplicity, assume that the price level is constant and equal to $P_t = 1$, which implies that $p_t = 0$.

Assuming that the main goal of the central bank is to minimize the variance of percentage deviations of output with respect to its long term expected value — that is minimizing $E[y - y^*]^2$ —- one can obtain these results:

$$E[y - y^*]^2_{i^*} = \sigma_z^2$$

$$E[y - y^*]^2_{m^*} = \left(\frac{b}{2a + b} \right) \sigma_v^2.$$

1. Explain what factors determine whether i or m is a better policy instrument in order to reduce the volatility of short term business cycles.

2. Assume that $a = 0$, (the money demand is not affected by the short term interest rate). What instrument looks better? Explain your answer.

3. Assume that σ_v^2 is twice as large as σ_z^2, and $a = 50, b = 200$. What is the best policy instrument in this case?

4. And what about if, $a = 50, b = 200$ and $\sigma_v^2 = \sigma_z^2$, which is best?

Problem 3

In the previous problem, it was assumed that the central bank efficiently controls the level of money in the economy.

1. What is the major criticism that may be directed towards such model?

2. Assume now that the central bank does not directly control de quantity of money in the economy. Instead it controls the monetary base (h). Discuss the relevance of using h or the short term interest rate as policy instruments in order to manage short term volatility in the economy:

$$E[y - y^*]_{i*}^2 = \sigma_z^2$$

$$E[y - y^*]_{m*}^2 = \left(\frac{b}{2(a + e) + b}\right)\left(\sigma_v^2 + \sigma_\omega^2\right)$$

3. Consider that the central bank "knows" that $a = 50, b = 200, e = 10$. The bank is also confident that the variances of z and ω are relatively stationary (and equal to $\sigma_v^2 = 5, \sigma_\omega^2 = 5$). However, it finds very difficult to estimate the variance of money demand (v_t), because of the large instability facing this demand. What would be the value of the variance of money demand, such that it will be irrelevant for the central bank to use one or the other major policy instruments?