Macroeconomics Qualifying Exam
Part I (Economics 6110)
21 August 2006

1. Consider the following model embodying rational expectations:

(IS)	$y_t = -a[i_t - E_{t-1}(p_{t+1} - p_t)]$
(LM)	$m_t = p_t + b_1 y_t - b_2 i_t + \eta_t$
(AS)	$y_t = c(p_t - E_{t-1}p_t) + u_t$
(Policy)	$m_t = \gamma\eta_t + \lambda u_{t-1}$

where $\{a, b_1, b_2, c\}$ are positive and all time-dependent variables are expressed as natural logarithms except for the nominal interest rate. E_{t-1} is a mathematical expectations operator conditional on information available through date $t-1$. The stochastic shocks η_t and u_t are **independent** white noise disturbances with variances σ_η^2 and σ_u^2, respectively. The coefficient pair (γ, λ) represent the systematic feedback parameters that govern the response of monetary policy to economic events.

a. Briefly discuss a **microeconomic** rationale behind the aggregate supply assumption that only unexpected movements in the price level $(p_t - E_{t-1}p_t)$ generate departures of real output y_t from some normal level.

b. Determine the rational expectations solution for real output y_t and the price level p_t.

c. Find an expression for the **unconditional** variance of y_t in terms of the variances of the stochastic shocks and the model's exogenous parameters.

d. Explain the Sargent-Wallace *policy ineffectiveness proposition* and ascertain whether or not (or in what sense) this proposition holds in the model. Explain the economic rationale behind your result.

e. Suppose that the only shocks hitting the economy are LM shocks ($\sigma_u^2 = 0$). How should the policymaker set the systematic feedback coefficients if it wants to minimize the impact of LM shocks on real output y_t?

f. Repeat part (e) assuming that the goal of monetary policy is to minimize the impact of **both** shocks on the price level p_t?

2. Consider a Diamond overlapping generations economy where individuals live for two periods and have the following lifetime utility function:

$$U_t = \frac{C_{1,t}^{1-\theta}}{1-\theta} + \frac{1}{1+\rho}\frac{C_{2,t+1}^{1-\theta}}{1-\theta}$$

where $\theta > 0$ and $\rho > 0$ determines the rate at which individuals discount future consumption. $C_{1,t}$ refers to the time t consumption of the young generation born in period t and $C_{2,t}$ is the time t consumption of the old generation born in period $t-1$. Firms in this economy combine the labor supplied *inelastically* by the young generation with the capital accumulated by the old generation to produce output according to the following neoclassical production function:

$$Y_t = K_t^{\alpha}[A_t L_t]^{1-\alpha}$$

where $\alpha \in (0,1)$ is the capital (K_t) elasticity of output (Y_t) and n and g are the growth rates of labor (L_t) and technology (A_t), respectively. Young people supply 1 unit of labor, dividing the earned labor income between consumption in period t and saving. In period $t+1$, the ensuing old cohort consumes the saving plus interest earned. The old generation does not work.

a. Given values of the real wage w_t and the return to capital r_{t+1}, what are the utility maximizing choices of $C_{1,t}$, $C_{2,t+1}$, and saving s_t?

b. According to the model, do agents tend to increase or decrease their consumption over time? Explain your answer.

c. Derive analytic expressions for $\frac{\partial s_t}{\partial w_t}$ and $\frac{\partial s_t}{\partial r_{t+1}}$. Try to determine the qualitative sign of each of these partial derivative expressions. Interpret your results.

d. Assume that preferences are logarithmic ($\theta = 1$). Show that the economy converges to a balanced growth path? What are the steady-state values of capital k^* and output y^* per effective worker? Be sure to sketch the graph of k_{t+1} as a function of k_t and explain why the economy converges to a stable balanced growth path.

e. Consider the effects of an increase in the population growth rate n. Illustrate graphically the impact of this increase on k^*. Derive a formula for the elasticity of output per effective worker with respect to the population growth rate. In other words, find an expression for $(n/y^*)(\partial y^*/\partial n)$.