UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4310 – Macroeconomic Theory**

Date of exam: Wednesday, December 19, 2012

Time for exam: 09:00 a.m. – 12:00 noon

The problem set covers 4 pages (incl. cover sheet)

Resources allowed:

- No resources allowed

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Exam in ECON4310

Delayed exam

December 2012

1 Bubbles and asset pricing (80%)

Consider a closed economy inhabited by people who live for two periods – young and old. The population size of each cohort is constant and equal to one. Each person maximizes discounted lifetime utility

$$\begin{aligned} & \max \left\{ u\left(c_t^Y\right) + \beta u\left(c_{t+1}^O\right) \right\} \\ \text{subject to } c_t^Y \quad \geq \quad & 0 \text{ , } c_{t+1}^O \geq 0 \\ & \text{and budget constraints,} \end{aligned} \tag{1}$$

where $u(c) = \sqrt{c}$, and c_t^Y stands for consumption of the young in period t and c_{t+1}^O stands for consumption of the old in period $t+1$. Moreover, $1/2 < \beta < 1$. There is one asset in the economy – one-period bonds. The net supply of bonds is zero.

People have labor income w_t when young and $w_t/4$ when old. For now, assume that w_t is constant over time (so $w_t = w$ for all $t \geq 0$). The budget constraints for an individual household born in period t then becomes

$$\begin{aligned} c_t^Y + a_{t+1} &= w \\ c_{t+1}^O &= (1 + r_{t+1})\, a_{t+1} + \frac{w}{4}, \end{aligned}$$

where r_{t+1} is the interest rate on bonds and a_{t+1} is the holdings of bonds between period t and period $t+1$.

1. Given the interest rate r_{t+1}, write down the first-order condition for a young person. Use this to solve for the optimal consumption when young and old.

2. Explain why the bond purchases, a_{t+1}, must be zero in equilibrium.

3. Summarize the conditions for a competitive equilibrium in this economy.

4. Explain in words what a stationary competitive equilibrium (i.e., a *steady state*) would look like if it exists. Using the equilibrium conditions, solve for a stationary competitive equilibrium allocations and prices. Use both a diagram and mathematical expressions.

5. Suppose that one day (in period $t = 0$) a pink meteorite hits the economy and breaks into many equally sized stones. All the stones are picked up by the old before the young figures out what happened. All individuals expect that no meteorites will ever hit the economy in the future.

(a) The old get a potentially good idea, namely to sell the moonstones to the young in return for some real goods. Suppose all individuals expect a future price sequence $\{p_0, p_1, p_2, ...\}$ for the stones.

(b) Explain why the price of the moonstones can be expressed as

$$p_t = \beta \frac{u'\left(c_{t+1}^O\right)}{u'\left(c_t^Y\right)} p_{t+1}. \tag{2}$$

(c) Show that there are now *two* stationary competitive equilibria, one where the pink stone is a bubble (i.e., where the stone has positive value), and one without a bubble.

(d) Explain the intuition for why there can be a "rational asset bubble" where all individuals are fully rational and still are willing to pay for an asset that will never pay a dividend.

6. Suppose the economy is in a steady state with a bubble. The government is getting worried that the bubble could burst at some point, and they are looking for ways to defuse the bubble as soon as possible. You get appointed to be their advisor.

(a) Assume first that the government proposes to introduce a "Tobin tax" on moonstone transactions, where half the sales price of the stone get taxed by the government, and the proceeds get redistributed lump sum to the young. Explain to the government why this will affect prices but that it will have no effects on the allocations in the bubble steady state.

(b) Convinced by your argument, but no less determined, the government decides to introduce an information campaign arguing that the price of the moonstones will fall to zero next period. Explain why this information campaign could achieve the aim of bursting the bubble and driving the stone price to zero immediately. Would it be good for society to burst the bubble? Motivate the answer.

7. Asset pricing. Now we change the economy and assume that the young get a wage of $w = 1$ every period, while the old get a risky wage y_t. Moreover, assume that there exists one asset in the economy (a "tree") which lives for ever and pays a dividend each period (a "fruit" d_t in period t).

(a) Suppose first that the dividend and the income for the old are perfectly correlated (i.e., d_t is high when y_t is high). Explain why the expected return on the risky asset would be higher than the return on a risk free bond (no math, just explanation)

(b) Suppose instead that the dividend and the old-age income are negatively correlated (i.e., d_t is high when y_t is high). Explain why this would imply that the price of the risky asset is higher than the price of the bond (so the risk asset has a *lower* expected return than the safe bond). Emphasize intuition (no math).

(c) Derive an equation characterizing the price of the asset [hint: generalize equation (2) and recall that $d_t > 0$]. Use this equation to motivate your answer of 7.a and 7.b.

2 Unemployment (20%)

Imagine you get a job as an advisor in the Ministry of Finance. Your first task is to evaluate the effect of a reduction in unemployment benefits. The Minister of Finance has often heard the argument that such policy would reduce the unemployment rate. Now she wants to understand the theoretical foundation for this argument.

1. Use the Shapiro-Stiglitz model to provide an explanation for why lower benefits would reduce the unemployment rate (only intuition, no math).

2. The Minister is skeptical to the mechanism you sketched – she is not a big believer in shirking. Provide an alternative explanation, now based on a search and matching model (you can use either the one-sided or the two-sided model – no need to use both).