Universidade de Lisboa
Instituto Superior de Economia e Gestão
Departamento de Economia

Master in Monetary and Financial Economics
Fundamentals of Financial Economics
2019-2020

Lecturer: Paulo Brito
Exam: **Época de Recurso** (Re-sit exam)
2.7.2020
Second part: 19:00 - 20:05

Warning:

- This is an online open book exam. This implies that in the assessment the following two points will be taken into consideration:
    1. Please provide a **very short explanation** of your reasoning. In its absence, your response, even if correct, may be discounted.
    2. Your answer should be concise, objective and specific. Any notation, calculation, motivation, discussion or explanation **not strictly related to the specific question** it tries to address will either not be considered or have a negative assessment.
- Points: 1(a) - 1, 1(b) - 1.5, 1(c) - 1.5, 2(a) - 2, 2(b) - 2, and 2(c) - 2.
- Your exam will only be considered if it is uploaded in Aquila between 19:30 and 20:10.

1 Consider an economic policy authority (EPA) in charge of assessing and controlling the economic growth of an economy, for the period of one year. It has the following information: it observes the growth factor $g_0 = 1 + \gamma$, at the beginning of the year, and it assumes that the growth factor follows a binomial random variable $G_1 = (g_1, g_2) = (1 + \gamma - \sigma, 1 + \gamma + \sigma)$, for $0 < \sigma < 1 + \gamma$, at the end of the year.

(a) If the EPA assumes that the process $\{g_0, G_1\}$ is a martingale (tip: a martingale is a process $\{X_t\}_{t=0}^{T}$ such that $\mathbb{E}_t[X_{t+1}] = x_t$), what will be the expected value and the standard deviation for G_1 ?

(b) The EPA measures the cost of macroeconomic volatility by $C(G_1) = \mathbb{E}[G_1] - CE(G_1)$, where $CE(G_1)$ is the certainty equivalent of the growth factor, assuming an utility function $u(g) = \ln(g)$. Find $C(G_1)$. Explain its meaning.

(c) Let the EPA have a state-independent instrument $\tau \in (-g_0, g_0)$ that can additively change the growth factor to $\tilde{G}_1(\tau) = (g_1 + \tau, g_2 + \tau)$. If the EPA would use the instrument τ in order minimize $\tilde{G}_1(\tau)$ what would be the minimum cost of volatility that it can achieve ? Can it be zero ? Why ?

2 Consider an homogeneous agent endowment finance economy in which there is money, with a return equal to 1 at all times and states of nature, and a risky asset with return $R = (1 + \varepsilon, 1 - \varepsilon)$, for $\varepsilon > 0$. The endowment process is $Y = \{y_0, Y_1\}$ where $Y_1 = ((1 + \gamma)y_0, (1 - \gamma)y_0)$ for $0 < \gamma < 1$. The representative consumer has the intertemporal utility functional

$$U(c_0, C_1) = \frac{c_0^{1-\theta} - 1}{1 - \theta} + \beta \sum_{s=1}^{2} \pi_s \frac{c_{1s}^{1-\theta} - 1}{1 - \theta},$$

for $0 < \beta < 1$ and $\theta > 1$. Assume that all those parameters, $(\varepsilon, \gamma, \beta, \theta)$, in this economy are known.

(a) Find the dynamic stochastic general equilibrium for this economy.

(b) Find the probabilities for the two states of nature assuming that there are no arbitrage opportunities (tip: use the condition $\mathbb{E}[M(R - R^f)] = 0$ where R^f is the return for the risk-free asset and M is the equilibrium stochastic discount factor.).

(c) Find the Sharpe index and the Hansen-Jaganathan bound. Provide an intuition for your results.