# PhD Macro 2 Topic 0 Questions

These are designed to get you back into thinking about macro after the break. Hopefully it should not be too hard.

1) Suppose prices are flexible. Nominal interest rates satisfy the Fisher equation $i_t = r + \pi_{t+1}$, where $r$ is the (constant) real interest rate, and $\pi_t$ is inflation in period $t$. The central bank follows the monetary rule $i_t = r + \phi\pi_t$. (There is no expectation operator in the Fisher equation as the economy is non-stochastic.)

a) Prove that for determinacy, the central bank must satisfy the Taylor principle by setting $|\phi| > 1$.

b) What happens when $|\phi| \le 1$?

c) Give the intuition for the Taylor principle here.

2) Suppose that in period $t$, a household chooses their savings $B_t$ and consumption $C_t$ to maximise $V_t = \mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \log C_{t+s}$ subject to the budget constraint $R_t B_{t-1} = C_t + B_t$, where $\log R_t \sim$ NIID$(\mu, \sigma^2)$.

a) Derive the household's Euler equation.

b) Guess a solution for $C_t$ in terms of $R_t B_{t-1}$ and one or more undetermined coefficients, and then solve for those coefficients.

c) For what values of $\beta$, $\mu$ and $\sigma$ is $\lim_{s\to\infty} \mathbb{E}_t C_{t+s}$ (i) equal to $\infty$, (ii) equal to $C_t$ or (iii) equal to 0? Is volatility in returns beneficial here?

d) Solve for $V_t$ as a function of $R_t$, $B_{t-1}$, $\beta$, $\mu$ and $\sigma$. Does the household like volatility in returns?

3) Suppose that in economy A, in period $t$, households choose their savings $B_t$, consumption $C_t$ and labour supply $L_t$ to maximise $\mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \left[\log C_{t+s} - \frac{1}{2}L_{t+s}^2\right]$ subject to the budget constraint $C_t + B_t = A_t L_t + E_t + R_{t-1}B_{t-1}$, where $A_t$ and $E_t$ are stochastic processes. Suppose that in economy B, households maximise $\mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \log \left(C_{t+s} - \frac{1}{2}L_{t+s}^2\right)$ subject to the same budget constraint. Suppose further that bonds are in zero net supply in both economies. (There is no interaction at all between the two economies, this question is just about the impact of preferences.)

a) Derive the households' first order conditions in each economy. Using market clearing for bonds, solve for $C_t$ and $L_t$ as functions of $A_t$ and $E_t$ in each economy.

b) Derive $\frac{dL_t}{dA_t}$ and $\frac{dL_t}{dE_t}$ in each economy. Are they positive? Are they less than one?

c) Explain why positive news about future productivity is likely to act like an increase in $E_t$.

d) In a richer model including investment, under which preference specification would positive news about future productivity be more likely to produce an increase in labour supply today?