Economics 602
Macroeconomic Theory and Policy
Problem Set 7
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1. **Deriving a Money Demand Function.** Denote by $\phi(c_t, i_t)$ the real money demand function. Here you will generate particular functional forms for $\phi(\cdot)$ using the MIU model we have studied.

   In an MIU model, recall that the consumption-money optimality condition can be expressed as

$$\frac{u_{m_t}}{u_{c_t}} = \frac{i_t}{1+i_t},$$

   where u_{m_t} denotes marginal utility with respect to **real** money balances (what was named u_2 in our look at the MIU model) and u_{c_t} denotes marginal utility with respect to consumption (what was named u_1 in our look at the MIU model). In each of the following, you are given a utility function and its associated marginal utility functions. For each case, construct the consumption-money optimality condition and use it to generate the function $\phi(\cdot)$. In each case, your money demand function should end up being an increasing function of c_t and a decreasing function of i_t. (**Note:** Be careful to make the distinction between real money holdings and nominal money holdings. The marginal utility function u_{m_t} is marginal utility with respect to **real** money holdings.)

   a. $u\left(c_t, \frac{M_t}{P_t}\right) = \ln c_t + \ln\left(\frac{M_t}{P_t}\right)$.

   b. $u\left(c_t, \frac{M_t}{P_t}\right) = 2\sqrt{c_t} + 2\sqrt{\frac{M_t}{P_t}}$.

   c. $u\left(c_t, \frac{M_t}{P_t}\right) = c_t^{\sigma} \cdot \left(\frac{M_t}{P_t}\right)^{1-\sigma}$.

2. **The Keynesian-RBC-New Keynesian Evolution.** Here you will briefly analyze aspects of the evolution in macroeconomic theory over the past 25 years.
   a. Describe **briefly** what the Lucas critique is and how/why it led to the demise of (old) Keynesian models.
   b. Briefly define and describe the neutrality vs. nonneutrality debate surrounding monetary policy today. Which type of shock does this debate concern?

3. **M1 Money and M2 Money.** Consider an extended version of the infinite-period MIU framework. In addition to stocks and nominal bonds, suppose there are **two** forms of money: M1 and M2. M1 money (which we will denote by M_t^1) and M2 money (which we will denote by M_t^2) both directly affect the representative consumer's utility. The period-*t* utility function is assumed to be

$$u\left(c_t, \frac{M_t^1}{P_r}, \frac{M_t^2}{P_t}\right) = \ln c_t + \ln \frac{M_t^1}{P_t} + \kappa \ln \frac{M_t^2}{P_t},$$

which, note has three arguments. The Greek letter "kappa" (κ) in the utility function is a number between zero and one, $0 \le \kappa \le 1$, over which the representative consumer has no control. The period-t budget constraint of the consumer is

$$P_t c_t + M_t^1 + M_t^2 + B_t + S_t a_t = Y_t + M_{t-1}^1 + (1+i_{t-1}^M)M_{t-1}^2 + (1+i_{t-1})B_{t-1} + (S_t + D_t)a_{t-1},$$

where i_t denotes the nominal interest rate on bonds held between period t and $t+1$ (and hence i_{t-1} on bonds held between $t-1$ and t) and i_t^M denotes the nominal interest rate on M2 money held between period t and $t+1$ (and hence i_{t-1}^M on M2 money held between $t-1$ and t). **Thus, note that M2 money potentially pays interest, in contrast to M1 money, which pays zero interest.**

As always, assume the representative consumer maximizes lifetime utility by optimally choosing consumption and assets (i.e., in this case choosing all four assets optimally).

   a. Using the functional form for utility given in this problem, **what is the marginal rate of substitution between real M1 money and real M2 money?** (Hint: You do **not** need to solve a Lagrangian to answer this – all that is required is using the utility function.) Explain the important steps in your argument.
   b. A sudden, unexplained change in the value of κ would be interpretable as which of the following: a preference shock, a technology shock, or a monetary policy shock? Briefly explain.
   c. Let $\phi^2(c_t, i_t, i_t^M)$ denote the real money demand function for M2 money. Note the three arguments to the function $\phi^2(.)$. Using the first-order conditions of the representative

consumer's Lagrangian, generate the function $\phi^2(c_t, i_t, i_t^M)$ (i.e., solve for real M2 money demand as a function of c_t, i_t, and i_t^M). Briefly explain (economically) why i_t^M appears in this money demand function. (**Note:** you must determine yourself which are the relevant first-order conditions needed to create this money demand function – draw on our approach from Chapter 14.)