Questions for Review
ECON 472 - Monetary Theory and Policy

The questions below should provide a sort of study check for you. A student who knows and understands the material we have been covering should be able to answer them without difficulty.

The list of questions that follows is by no means exhaustive. However, I do believe it is reasonably comprehensive. While you devise your study strategy for the exam, keep in mind that the learning objective of the course is two-fold:

1. The forest: You’re supposed to be learning some things about money and monetary policy. So, pay attention to the conclusions we derive, and take care not to lose the forest (the conclusions) for all the trees (all the steps we took to arrive at a conclusion).

2. The trees: You’re also supposed to be developing analytical skills to help you think independently and answer questions. This is why we have to go through the details of solving models - it forces you to think and to learn how to analyze things in a logical and scientific manner. So, make sure you know how to derive, demonstrate, and explain the things we’ve learned about money and monetary policy.

WARNING: These questions should be used as a test of your knowledge of the material, not as a study guide per se. You should study your notes until you are confident that you understand and have mastered the material. Once you have completed this task, put away your notes and see if you can successfully answer the questions listed below as well as any homework questions you’ve been given. If you misuse these questions, and use your notes while answering them, they may harm rather than help you performance on the exam. Also, keep in mind that your objective in reviewing the questions below is not simply to answer them, but to use them as a guide for thoughtful study of the course material.
The simple OLG model: The economy is populated by individuals that live for two periods. These individuals are referred to as young in the first period of life, and old in the second period of life. Each period \( t \), \( N_t \) individuals are born. These individuals derive utility from consumption. Preferences over the consumption good are assumed to be representable by strictly convex indifference curves. Consumption in the first period of life of an individual born at time \( t \) is denoted \( c_{1,t} \). Similarly, \( c_{2,t+1} \) denotes the amount that the same individual consumes in the second period of life. There is one good in this economy. The good cannot be stored from one period to the next. When young, each individual receives an endowment of the consumption good, denoted by \( y \). This completes the description of the economy. In the questions that follow, please restrict yourself to an analysis of stationary equilibria.

The simple OLG model with fiat money: Consider the above described OLG model. Assume that the government, but no one else, can costlessly produce fiat money. Assume further that fiat money can be costlessly stored across time. Each of the initial old is endowed with \( m = \frac{M}{N} \) units of fiat money.

O. Introduction

- What is monetary economics?
- What is a nominal variable? What is a real variable?

I. Money

Consider the simple OLG model with no money:

- Describe the agents in the economy and their preferences.
- What is the “marginal rate of substitution”? How is it related to marginal utility?
- What is GDP in the economy, and where does it come from?
- What is a ‘central planner’?
- What is the central planner’s objective?
- What is the central planner’s constraint?
- What is a stationary allocation?
- What is the ‘golden rule’ allocation?
- Can the central planner’s problem be implemented in practice?
- Why do we bother to find the allocation chosen by a central planner?
- Depict the golden rule allocation graphically.
- Specify the central planner’s problem. Solve the central planner’s problem.
- What is the competitive equilibrium of the simple OLG model without money? Explain.

Consider the simple OLG model with fiat money:

- What is fiat money?
- What is a monetary equilibrium?
- Find an individual’s lifetime budget constraint.
- Find the rate of return to fiat money.
- Depict the monetary equilibrium graphically.
- Specify an individual’s problem in this economy. Solve this problem.
- Does the quantity theory of money hold in this economy?
- Is the monetary equilibrium Pareto optimal?
- Is the monetary equilibrium Pareto optimal if the economy is growing?
- Why do people use money?
- Demonstrate that the existence of money makes people better off.
III. Inflation:

Consider the simple OLG economy with fiat money. Suppose that the money supply is expanding over time at the gross rate $z$. In other words, $M_t = zM_{t-1}, \forall t$. Assume that money is introduced into the economy in the form of lump-sum transfers to each old person in every period $t$. The amount of the transfer is worth $a_t$ units of the consumption good. Suppose that the population is increasing over time at rate $n$, so that $N_t = nN_{t-1}, \forall t$.

- How many units of money are printed each period in this economy?
- What is the government’s budget constraint?
- Find an individual’s lifetime budget constraint.
- Find the equilibrium rate of return to fiat money.
- What does the rate of return you just found imply about the value of fiat money over time?
- What is the rate of inflation in this economy?
- Depict the economy’s monetary equilibrium graphically. On the same graph, depict the economy’s golden rule allocation.
- Is the monetary equilibrium Pareto optimal?
- Explain why the government’s “presents” made everyone in the economy worse off.
- Demonstrate that inflation is inefficient.
- Explain in words why inflation is inefficient.

A commonly suggested policy rule (first espoused by, but later eschewed by none other than Milton Friedman) is to set the money supply growth rate equal to the growth rate of the economy.

- Explain why, at first glance, this appears to be a reasonable policy rule.
- Show that this policy does not make people better off.
- Give an intuitive explanation for why this policy is not optimal.
- What is the optimal monetary policy rule? Explain.

Suppose that increases in the money supply (1) are spent on government consumption and (2) are spent in such a way that an individual’s choice of consumption bundle is not affected.

- What is seigniorage?
- What is the government’s budget constraint?
- Find the lifetime budget constraint, the rate of return to money, and the monetary equilibrium.
- Find the feasible set and the golden rule optimal allocation.
- Is the inflation tax an efficient way to raise revenue for the government?
- Find the lifetime budget constraint, the rate of return on money, and the monetary equilibrium assuming that the government raises all its required revenues via a lump-sum tax on the old.
- Find the feasible set and the golden rule allocation assuming that the government raises all its required revenues via a lump-sum tax on the old.
- Is lump-sum taxation an efficient way to raise revenue for the government?
- Why don’t we observe lump-sum taxation?
- Is there a limit to the amount of revenue a government can collect simply by printing money? Explain.
Suppose that there are two countries: $a$ and $b$. Each country has its own fiat money. The young in each country receive an endowment when young, $y^a$ in country $a$, and $y^b$ in country $b$. The endowment good in the two countries is identical (i.e., there is one good in the world). The rates of growth of population in countries $a$ and $b$ are $n^a$ and $n^b$, respectively. The money supply growth rates in countries $a$ and $b$ are $z^a$ and $z^b$, respectively. Changes in each country’s money stock are used to purchase goods for their respective governments. Assume that the two monies can be traded at an exchange rate, $e_t = \text{units of } b \text{ money/units of } a \text{ money}$.

Express the exchange rate in terms of the value of money in country $a$, $v^a_t$, and the value of money in country $b$, $v^b_t$. Explain how you arrived at your answer.

Consider an international monetary system characterized by foreign currency controls and flexible exchange rates.

- In such a scenario, how is the exchange rate determined?
- What are the rates of return to the two monies?
- What is the time path of the exchange rate?
- Suppose the rate of growth of the population in country $a$ increases. What happens to the exchange rate? Explain.
- Suppose the rate of growth of money in country $a$ increases. What happens to the exchange rate? Explain.
- Suppose the exchange rate is fixed, instead of flexible. What does this arrangement imply for the rate of money creation in, say, country $a$? Explain.
- How do the rates of inflation in the two countries compare under the fixed exchange rate regime? Explain.
- What are the costs of foreign currency controls? What are the benefits of foreign currency controls?

Consider an international monetary system where people are free to hold the money of any country and the exchange rate is flexible.

- In such a scenario, the exchange rate is indeterminate. Show this.
- What makes the exchange rate fluctuate in this environment?
- What are the costs of exchange rate fluctuations?
- How could the exchange rate be stabilized?
- Given an example economy, you should be able to demonstrate how cooperative stabilization works.
- Why might a central bank be reluctant to participate in a cooperative stabilization plan?
- Given an example economy, you should be able to demonstrate how unilateral defense works, and why it is not a credible policy stance.
- What problem is raised by limited commitment to defend the exchange rate? Explain.
- What important political problem is raised in an international monetary system without foreign exchange controls?
- Explain why there is a greater incentive to inflate from a political perspective in an open economy than in a closed economy.
- In the absence of political coordination problems, what is the optimal international monetary system? Explain.
V. Price Surprises

The Lucas Model (Simplified Version). Consider the standard OLG model with the following extensions and details: Individuals live on two spatially separated islands. The total population across the two islands is constant over time. Half of the old in any period live on each of the islands. The old are randomly distributed across the islands, independently of where they lived when young. The young are distributed unequally across the islands, with two-thirds of the young living on one island and one-third on the other. In any period, each island has an equal and independent chance of having the large population of young. The stock of fiat money grows according to the rule \( M_t = z_t M_{t-1} \). Increases in the fiat money stock are effected through lump-sum subsidies to each old person in every period \( t \) worth \( a_t = [1 - (1/z_t)](v_t M_t/N) \) units of the consumption good. The young can directly observe neither the number of young people on their island nor the size of the subsidies to the old. The nominal stock of fiat money balances is known with a delay of one period. The price of goods on an island is only observed by the people on that island. No communication between islands is possible within a period. Individuals are assumed to have rational expectations.

- What three stylized facts does the Lucas model explain?
- What is the Phillips curve?
- Specify the household’s first-period, second-period, and lifetime budget constraints.
- What is the rate of return to work?
- Why might work effort be positively related to prices?

Suppose that inflation is nonrandom. I.e., let \( z_t = z \). In this case, agents know \( M_t \) at time \( t \) since \( M_t = z M_{t-1} \).

- Derive an expression for the price on island \( i \) at time \( t \).
- On which island are prices higher? Explain intuitively.
- What does it mean for money to be “neutral?”
- Is money neutral in the Lucas model? Explain. (Hint: This is experiment (1).)
- What does it mean for money to be “superneutral?”
- Is money superneutral in the Lucas model? Explain. (Hint: This is experiment (2).)
- Show that the Lucas model predicts that economies with relatively higher inflation will have relatively low output. (Hint: This is experiment (2) again.)

Suppose that inflation is random. Let monetary policy be described by:

\[
M_t = \begin{cases} 
M_{t-1} & \text{with probability } \theta \\
2M_{t-1} & \text{with probability } 1 - \theta 
\end{cases}
\]

- What are the possible states of the world?
- What are the prices that correspond to the states of the world?
- How many states (prices) do individuals observe?
- What information can individuals glean from the prices they observe?
- Describe the work effort of individuals in the various states.
- Plot the inflation and output combinations produced by the economy. What do you see?
- What might a naive economist infer from the data you plotted?
- Suppose the government decides to print money to stimulate output in every period. What does the Lucas model predict will happen? Explain - clearly and carefully.
- What is the primary policy lesson of the Lucas model?
- According to the Lucas model, a policy of random money growth leads to a positive relationship between inflation and output. Thus, the government can increase output by randomizing monetary policy. Should it? Explain - clearly and carefully.
- In general terms, explain what sort of empirical evidence would be consistent with the Lucas hypothesis and what sort of evidence might constitute a refutation of the Lucas hypothesis.
VI. Capital

Consider a standard OLG model with capital as an asset. The initial old begin with an endowment of capital $k_0$. The production technology of the economy is $y_{t+1} = f(k_t)$. I.e., if $k_t$ units of the consumption good are converted into capital goods at $t$, at $t + 1$ you will receive $f(k_t)$ consumption goods.

· Why do we need yet another new model?! Why isn’t (aren’t) the old one(s) sufficient?
· Suppose that $f(k_t) = xk_t$. Suppose that capital is the only asset. Specify the household’s first-period, second-period, and lifetime budget constraints.
· What is the rate of return on capital if $y_{t+1} = xk_t$? What is the rate of return on capital if $y_{t+1} = f(k_t)$
· How does the presence of an alternative asset affect people’s willingness to hold fiat money?
· In an economy with several available assets that are perfect substitutes, what can you say about the rates of return to these assets relative to each other? Explain.
· What is the Tobin effect?
· Consider an economy with capital and fiat money. Explain how an increase in inflation may cause the Tobin effect to occur.
· According to the Tobin effect, the government can increase output by increasing the rate of growth of the money supply (show how this works). Should it?
· Specify the feasible set.
· What decisions must the planner make in this economy?
· Suppose that the central planner’s objective is to invest to maximize goods available for consumption. Specify this objective formally. Find the first order necessary condition for this objective. With reference to your solution, explain the conditions under which the monetary equilibrium is pareto optimal.
· Express the real interest rate as a function of the nominal interest rate and prices.
· Express the real interest rate as a function of the nominal interest rate, $n$, and $z$.
· What is the Fisher effect?
· If the marginal product of capital is diminishing, the Fisher effect may not hold. Show that an increase in the rate of inflation may result in a decline in the real interest rate.
· What is a risk premium?
· Fiat money and capital co-exist in reality, yet their rates of return are not equal. Why might people hold fiat money even though capital offers a higher rate of return?
VII. Liquidity and Financial Intermediation

Consider the simple OLG model with capital and the following assumptions and modifications: individuals live for three periods. The population grows at rate \( n \), and the money supply (endowed to the initial old) is constant. Capital, \( k_t \), created from a unit of the consumption good produces \( X \) units of the consumption good two periods later. Capital depreciates completely in the production process. It is assumed that \( X > n^2 \). It is impossible to observe the capital created by others, and it is impossible to enforce repayment of IOUs.

- Another new model. Why? i.e., what is the point of this section on liquidity and financial intermediation?
- What are the respective rates of return to capital and fiat money in this economy?
- What does it mean for an asset to be “liquid?”
- Why do people use fiat money when there are other assets available that offer greater rates of return?
- What will be an individual’s holdings of capital and money in this economy? Explain.
- Specify the household’s first-period, second-period, third-period, and lifetime budget constraints.
- Are money and capital perfect substitutes in this economy? Explain.
- What is velocity?
- What is the velocity of money?
- What is the velocity of capital? (You may assume that the creation of capital constitutes an “exchange.”)
- We observe financial intermediation in the equilibrium of this model. Why? (I.e., what service do financial intermediaries provide, and why do they provide it?)
- What is “inside money?”
- If the market for financial intermediaries is competitive, what will be the rate of return offered by intermediaries on IOUs? Explain.
- Does financial intermediation affect capital and output? Explain.
- Are future generations and the initial middle-aged in this economy better off as a result of financial intermediation? Explain.

Consider an economy that features some uncertainty. There are a large number of entrepreneurs, each of whom is endowed with an idea for a project, but no resources to fund it. The return on the project is stochastic (uncertain). Each project requires an investment of \( \mu k \) goods (\( \mu > 1 \)) to get it up and running. Projects that succeed produce \( x\mu k \) in the next period with probability \( p \). Projects that fail produce 0 with probability \( 1 - p \). There are also investors in the economy. Each investor has \( k \) goods to invest. In order to determine whether or not his investment has succeeded or failed, an entrepreneur incurs a cost of \( \theta \) goods.

- Will we observe contracts (loans made by investors to entrepreneurs) in this economy that do not feature monitoring arrangements? Explain.
- What is the total return on an investment in \( J \) projects? What are the expected value and variance of this return? How are the expected value and variance of this return related to the number of projects invested in?
- What tradeoff do investors face when designing their investment strategies? Explain.
- Why is monitoring by individual investors inefficient in this economy?
- If an individual decides to provide monitoring services for all of the investors (for a small fee, of course), will they hire him? Explain.
- Assuming that a bank has \( \mu J \) depositors, what return can the bank promise each depositor?
- Do household’s monitor banks in the model economy? Explain.
- Why do we observe banks providing financial intermediation services in this economy instead of individuals? Explain. (A formal argument with mathematical notation is not required. A clear and complete intuitive explanation will suffice.)
XIII. Deficits and the National Debt

Consider the simple OLG model with 2-period-lived agents. Suppose there are 2 types of people: rich people, endowed with $Y$ when young, and poor people, endowed with $y$ when young. Assume further that $Y > y$. The populations of both types grow at rate $n$. There is a linear capital technology, such that $k$ goods invested at time $t$ produces $xk$ at $t + 1$. There is also a minimum investment scale, $k^*$, that satisfies $Y > k^* > y$. The money supply grows at a constant rate, $z$. And finally, investment in capital by an individual cannot be observed by the government.

- What is the role of an intermediary in this economy?
- In a monetary equilibrium with intermediation, what is the relationship between the return on fiat money and the return on capital? What does this relationship demonstrate about the feasible rate of money creation?
- How does the seigniorage revenue collected by the government in an equilibrium with intermediation compare to the seigniorage revenue collected by the government in an equilibrium without intermediation?
- Why might the government want to limit financial intermediation?
- If the government issues bonds intended to substitute for capital in the portfolios of the rich, what rate of return must the bonds pay?
- Why does the government issue high denomination debt that pays interest?

Miscellaneous Other Good Stuff

Bush State of the Union Address Issues (exam I)

- According to Gale and Orszag, what two criterion characterize an effective short-run tax stimulus package? Explain each of these criteria in the context of a graphical model.
- Do permanent tax breaks for investment meet the criterion?
- Does permanent elimination of the corporate AMT meet the criterion?
- Do temporary tax rebates for lower- and middle-income workers meet the criterion?

AD-SRAS-LRAS and the Money Market (exam I)

- You should be familiar with this basic model and be able to use it to depict economic conditions and analyze the impact of expansionary and contractionary monetary policy.

Deflation (exam II)

- We have shown that inflation causes welfare losses. We also know that the Fed increases the money supply over time. How to you reconcile these two observations?
- Explain how inflation benefits the economy via its impact on labor markets.
- Explain why deflation can be particularly harmful to the macroeconomy (discuss its impact on consumer spending, its impact on the central bank’s ability to stimulate the economy, and its impact on firms’ and banks’ finances).

The Fed and Interest Rates (exam II)

- Recently, the Fed has noted that it may pursue monetary policy targeted at influencing long-term interest rates. Why would such a policy be unusual? Why would the Fed be interested in operating on the long end of the yield curve?
- State and discuss two reasons that it may be more difficult for the Fed to manipulate long-term interest rates than the Federal Funds rate.