ECN 506
Price Surprises

1. **Consider the interpretation of our model where the endowment *y* is in units of time and young individuals can choose to allocate time between leisure ($c_{1,t}$) or labor ($_t$). Explain why thinking of *y* in terms of units of time and units of the consumption good are actually equivalent. Explain in words or use a figure.**

   A unit of time can be used as either leisure, $c_{1,t}$, or labor, $_t$. If the time is used as leisure the individual receives additional utility from "consuming" the unit of time as leisure. Alternatively, the individual can use the unit of time as labor in which case they produce one unit of the consumption good. The individual has two options. First, they can sell this good in the market to obtain money, which can then be used to consume when old. Alternatively, the worker can consume the good while young and receive the additional utility of consuming the good. The embedded assumption is that a unit of leisure and a unit of consumption are perfect substitutes for each other. A figure is provided at the start of lecture notes 4 that depicts this.

2. **Consider the interpretation of our model where the endowment *y* is in units of time and young individuals can choose to allocate time between leisure ($c_{1,t}$) or labor ($_t$). Suppose the money supply is growing at rate $z > 1$ (e.g. money supply doubles in each period) in all future periods.**

   (a) Is monetary equilibrium efficient? Why or why not? Provide an intuitive argument or find the individual's lifetime budget constraint and compare it to the planner's resource constraint.

   The monetary equilibrium is not efficient when there is inflation $z > 1$. The introduction of new money is a form of revenue for the government called "seigniorage". However, this value obtained by the government (they use the new money to obtain units of the consumption good) is not free and comes at the cost of the existing holders of money. This is called an "inflation tax". The introduction of new money devalues existing money. This reduces the return to work for the young and results in an increase in leisure when young and a decrease in labor relative to the planner's solution (i.e.

individuals choose inefficient levels of leisure and labor when money is being devalued through inflation). The budget constraint and resource constraint of the planner are those found at the start of lecture 4 and are not identical, meaning the monetary equilibrium does not achieve the planner's solution.

(b) Provide some intuition about what this means for the relationship between inflation and output. That is, consider two economies with the same preferences and different known inflation rates z_A and z_B. Where is output higher?

Higher inflation is associated with a lower real rate of return of money (or return to work). In the higher inflation economy, existing money is being devalued by more and so individuals will supply relatively less labor when young. This results in a lower level of output in the economy with higher inflation, so there is a negative relationship between inflation and output across these economies.

(c) Explain the relationship depicted in the Phillips Curve.

The Phillips Curve depicts a significantly positive relationship between inflation and output within a country and over time (or a significantly negative relationship between inflation and the unemployment rate within a country and over time).

(d) Is the relationship in the Phillips curve consistent with what you described in part (b)? Why or why not?

It is not inconsistent with the relationship we described in part (b). The relationship in (b) is a long-run relationship between inflation and output across countries/economies, while the Phillips curve is a short-run relationship between inflation and output within a country and over time. We can write down a model that is consistent with both of these relationships (this was the point of Chapter 6 and the second half of lecture 4).

(e) In this course we are studying the microeconomic foundation of money. Explain what this means.

We develop a model of money that focuses on individual decision making/utility maximization. To do so we develop a framework in which money is valued and is used to facilitate trade (OLG model) and then determine how changes in the money supply affect individual decisions (utility maximization) and how these individual decisions aggregate to affect macroeconomic features of the economy such as output. This contrasts other models of money that focus on modeling relationships between macroeconomic variables such as output and inflation, but do not model the individual decisions that generate these relationships.

(f) Why is developing a microfoundation important when studying the Phillips curve and its flattening over time? That is, suppose you were the central bank in the US in 1970 and did not have the model we have talked about. From just looking at the Phillips curve for the previous decade, what would you infer? How does the microfoundation we have developed help your understanding of the effect of monetary policy? How do individual decisions play a role?

Without a microeconomic foundation of money, one might infer that the relationship between inflation and output depicted in the Phillips curve could be exploited purely through the expansion of money (i.e. increase output by increasing inflation). As economists tried to exploit this relationship, it disappeared over time. The problem is that the observed relationship is actually being generated by individual decisions that are affected by inflation. We have shown that if workers know the inflation rate is high then they actually want to supply less labor, which would result in lower output of the economy. Without modeling individual decision-making, this would be an unexpected result if we were basing decisions purely on the relationship observed in the Phillips curve.

(g) Recently, the Bank of Canada did not cut its core interest rate, stating that they are inflation "targeters" and believe that Canada is still a "Phillips" country. What do you think this means? If the inflation rate is within the Bank of Canada's target range, why would they not change

interest rates? (We have not really talked about interest rates yet, but think about what the Bank of Canada's goal is and what the Phillips curve tells them).

The statement implies that the Bank of Canada still believes there is a tight relationship between inflation and output in the Canadian economy. Saying that inflation is in the target range implies that the output of the economy is in their target range and therefore there is no current need for monetary policy to change the current functioning of the economy (to change output).

(h) Why do expectations and "price surprises" play a role in the effect of monetary policy? If it makes it easier, explain using the example of the two island model in class. How does uncertainty affect an individual's decisions to supply labor? How does this affect aggregate labor and output, and the relationship between inflation and output?

In our model, individuals are rational, forward looking individuals. This means that when they know what inflation will be in the future, they will make their current decisions based on this information. That is, if they expect inflation to be high, then they will supply less labor and output in the economy will be relatively low (as in part (b)). However, if individuals do not know what inflation is (there is some uncertainty about the money supply), then they may not necessarily make the same decision.

For example, consider an economy where individuals have uncertainty about both the (i) inflation rate, and (ii) some other factor affecting prices of goods (in our model in class this was the population of young individuals on their island supplying labor). Population affects the prices of goods because if there are less individuals supplying labor then there is less supply of the good, which would imply a higher price given the same demand. Similarly, higher inflation also increases the price of goods because the supply of money (not the real supply of money) is higher. As a result, the individual may not know whether the relatively high price is the result of limited supply of the consumption good (in which case they would want to work more), or higher inflation (in which case they would want to work less). As a result, individuals will work more than they would if they knew the high price was the result of inflation as in (b).