Economics 202A Lecture III Fall 2007

The problem set on Lucas and Sargent will be due next Tuesday.

In addition you will owe me your second log.

We are going to do two things in this class.

1. I will go over the reading list, with a bit of emphasis on the first readings on rational expectations.

2. Then I will go over the first real economics article on the reading list.

I am now going to go over the reading list, which I have not done so far because I thought it was more important last week that we get a start on substantive material.

So let's go over the reading list. If you have one with you please use that.

I have made a copy of one reading list for every two people, so I will pass out new copies, but I want you to share.

Let me now go over the reading list. [Hand out copies.]

This will also serve as the introduction to today's lecture.

We have just covered the first section of the reading list.

In the first lecture I gave a review of the basic Keynesian model.
Then I reviewed math background that you should know in the second lecture.
and then I gave a review of a basic Keynesian model.

We have also covered the mathematical background to the course, which is difference equations and ARMA processes.

By now you should have done the reading on Time Series Processes. If you have not done so this is a reminder to make you feel guilty.

You should also have read David Romer's Chapter 5, which is a review of macroeconomics. If you have not done that you should be sure to do that.

This takes us to section II of the Reading List–on equilibrium concepts.

Robert Lucas and Tom Sargent posed a very interesting problem for economics in

the 1970's.

They showed that if people have *rational expectations* and if labor markets are basically clearing, then monetary policies that react to unemployment or inflation are no more stabilizing than monetary policies that are purely neutral.

The only important part of monetary policy is the *unexpected part.* Any systematic part of monetary policy has no effect–simply because people take it into account and their actions will *counteract* it.

Let's look at a very simple view of their proposition.

Suppose that you and I are playing a game, and you get a reward that is reduced by the deviation between the number you name and the number that I name.

Then it does not matter what rule I have for generating my number since you will simply copy it.

Suppose that I name the number

$$f(t) + v$$

where v is the zero-mean random part

and f(t) is the systematic part.

Suppose you know the rule f(t). You can learn the systematic part of my rule.

Then your best rule is to name f(t).

And the deviation from exact matching of the numbers is v.

It does not matter what my choice of f(t) is.

With *any* f(t) you will do equally well, or equally badly.

In sum I do not affect you by my choice of the systematic part of my number–only by the random part *v,* which is unexpected.

This is the exact picture given by Lucas and Sargent regarding monetary policy. It explains why monetary policy cannot stabilize output and employment over the long run.

We will review this interesting proposition in much more detail.

This matching proposition is absolutely central to Chicago economics.

The Chicago view is that if the monetary authority names f(t), of course *you* will also name f(t).

They obtain thereby a neutrality result.

That neutrality result is that the systematic part of the monetary policy has no effect on income and renders monetary policy ineffective.

This is one of at least five neutrality results that come from the University of Chicago.

They occur with different reasons.

These neutrality results suggest that the Keynesian models, like the one that I pictured make no sense.

Once one takes into account the rationality and intentionality of decisions you will see that private decisions will simply offset any systematic effects of monetary policy.

This is contrary to the model that I put on the board in the first class.
That Keynesian model implicitly was viewing people as acting like machines.
These machines mainly base their decisions on present oriented variables.
Especially, they make decisions about current consumption dependent on their current income.
Investors also base their decisions on current investment dependent on current profits which are also largely dependent on current income.

The decisions in such an economy are made based on some rule of thumb, rather than being tremendously well thought out.
In contrast Lucas and Sargent believe that people are much more thoughtful about their decisions.
In their model there is only one well-defined game that is being played.
That is the game that I just described where the monetary authority names f(t) and the public responds to minimize the gap between f(t) + v and f(t).

I think that it is *good* economics to see that this is the game that is being played in the classical economy.

But I think that is appallingly *bad* economics to think that people actually see through to perceive that this is the game and follow exactly the strategy that everyone at the University of Chicago says that they will follow.

I am now going to give you a cryptic note that I hope will become clearer by the end of the course.
There is another objection which I also think is basic.
That objection is that the different f(t)'s may not be neutral to how the people think they should respond.
The f(t)'s are only neutral in a very special case.
That special case is the case where people think exactly like economists, so they have no money illusion.
But if people have even some small amount of money illusion they will act as if the different f(t)'s correspond to different games.

This system only works if all the agents in the economy think exactly like an economist. But if they behave otherwise, or even if they only think that others will behave otherwise, then the system is not going to work this way.
I know that is now cryptic, but hopefully by the end of the course you will see what it means.

To continue down the reading list, we next go over the Taylor model.

The Taylor model explains why monetary-neutrality will not hold *if* there are some nominal rigidities. The Taylor model is a simple model with a *small* amount of nominal wage rigidity.

I then put in Shiller, Kahneman, Knetsch and Thaler, and Shafir, Diamond and Tversky.

Lucas and Sargent wrote very beautiful articles making the type of assumption that one might make if one were thinking about the economy in an abstract way–perhaps in a class room with no windows.

They assume that everyone has the correct model of how the Central Bank is going to behave and they react to it.

Shiller asked a different question: do people really understand inflation.

He asked people questions that revealed that they did not understand it.
You are going to see the same thing in Shafir, Diamond and Tversky, and also in Kahneman, Knetsch, and Thaler.

Now the way I have organized my part of this course is that we are going to continually contrast and compare the classical approach to macroeconomics to the New Keynesian or behavioral approach. The next step is to present the New Keynesian and the behavioral approach.

So we will look at New Keynesian Economics.

Except for market interventions such as minimum wage legislation and monopoly unions, up until 1980 economists could not imagine a market in which *Demand* was not equal to *Supply.*

Therefore *involuntary unemployment*, which occurs when workers cannot get a job at the going wage, was not possible.

The first task of the New Keynesian economics was to show how the demand for labor might not equal the supply in an equilibrium situation.

The first three articles deal with that issue.

They present *efficiency wage theory*.
They show why employers might voluntarily pay more than workers' reservation wages, but then those who cannot get jobs at those wages would be involuntarily unemployed.

However, even if wages were not market clearing, it might still be the case that all decisions would be in *real terms* so that an increase in the money supply by, for example, 5 percent, would just change prices and wages by 5 percent, but would have no effect on real wages or real prices and no effect on output.

Two articles, one by Greg Mankiw and one by Janet Yellen and myself, deal with that issue. They show that with the wage/price rigidity caused by a *small* amount of money illusion there will be a significantly larger effect on the level of real output and real wages. Thus money is not necessarily neutral in its macroeconomic effects.

This is followed by Fehr and Tyran. They show that the reason that money may not be neutral is that there is a co-ordination failure. If people are thinking in nominal terms, then when the money supply changes, their changes in prices do not just reflect how they think they alone should respond to the change. They also have to figure out how other people will respond.

They show what happens in an experiment in which people have to guess how the others respond, and another in which the response is taken by a computer rule. And they also do experimental variations where rewards are framed in nominal terms and where they are framed in real terms.

Then Maury has assigned me to give the papers on money demand.
There is a way of thinking about money demand that is very useful and that has general implications for several different areas of economics.

Since I have a comparative advantage in teaching this topic he gave it to me. That takes me back to comments that I was making when class ended last Tuesday.

You may remember that we were reviewing the Keynesian model.

I said that there were three equations in that model.

There is:

(1) the IS curve

(2) the LM curve

and

(3) aggregate supply.

And there are three endogenous variables:

Those three variables are income, Y; the interest rate r; and the price level p.

Then I said that you could differentiate the system to find out how any one of these three endogenous variables would change as policy changed.

You could for example examine the effects of monetary policy.

In that case you would want to know the values of:

$dY/d\overline{M}$, $dr/d\overline{M}$, and $dp/d\overline{M}$.

Or you could examine the effects of government spending.

In that case you would want to know the values of

$dY/d\overline{G}$, $dr/d\overline{G}$, and $dp/d\overline{G}$.

The multipliers that you derive when you do these differentiations then tell you what you would like to look for *empirically* when you examine each of the respective functions that make up the economy.

I will give some examples so you understand what that means.

Part of this course, some of it mine, and some of it Maury's, will concern

respectively:

(1) the consumption function
(2) the investment function and
(3) the demand for money.

What we want to know about these functions is determined by the different multipliers that we have just seen.

Why?

Because the shapes of these functions determine the values of the various multipliers.

For example.

1. If the marginal propensity to consume is small, the government expenditure multiplier, $dY/d\overline{G}$ will also be small.

2. If neither consumption nor investment is sensitive to the rate of interest, the money multiplier, $dY/d\overline{M}$ will be small.

3. If there is no interest elasticity to the demand for money, $dY/d\overline{G}$ is zero, and only the money supply can be used to stabilize the economy.

So that takes us to the central question that we will discuss in this section.

That central question is what is the interest elasticity and income elasticity of the demand for money, and what do they imply for the working of the macro-economy.

Especially the question we want to examine is the extent to which monetary or fiscal policy respectively are capable of affecting the level of aggregate demand.

And that will depend in standard analysis on the interest elasticity of the demand for money.

We then look at open economy macro. We will go back to David Romer's Chapter 5 and cover the two major articles that he discusses there.

Especially we shall go over the Mundell-Fleming model, and also the Dornbusch model.

Then Maury will continue on international.

That takes us to the end of the review of this half of the course. And I will let Maury review the rest of the reading list because I think that he will have a slightly different perspective from me.

That then takes us to the second topic of the day, which is the article by Lucas and Sargent, which is the first new economics reading on the reading list.

I have already intentionally motivated that to indicate what their basic logic might be.

Let's now begin to talk about Lucas and Sargent and their contribution to macroeconomics.

I will begin by discussing the article jointly by Lucas and Sargent on the reading list.
They made *four* major innovations to macroeconomics.

I will review each of them. Then this evening I will review Sargent's version of that model.

Reminder: Extra class this evening: 141 McCone Hall, 6:10-7:30.

Their *first innovation* was to change the *representation* of macroeconomic systems.

As a result, some *important implications* of the way in which macro systems were written became completely obvious.

Consider a *very large scale* macro model, such as the DRI (Data Resources) Model, or the MIT-FRB-Wharton model. This would include the current Federal Reserve model, which does a remarkably good job of forecasting.

In general, such models have *exogenous* variables, denoted *x,*

and they also have *endogenous* variables, denoted *y.*

In general such systems can be written

$$A_0 y_t + A_1 y_{t-1} + ... + A_m y_{t-m} = B_0 x_t + ... + B_n x_{t-n} + \epsilon_t,$$

where the ϵ's have the property that

$$R_0 \epsilon_t + R_1 \epsilon_{t-1} + ... + R_r \epsilon_{t-r} = u_t$$

where u_t is a vector of independent, identically distributed r.v.'s.

In general the x's, y's and ϵ's are *vectors.*

The A's, B's and R's are matrices whose dimensions conform appropriately to the y's, x's and ϵ's.

If A_0 has an *inverse* nothing stops me from rewriting the system as

$$y_t + P_1 y_{t-1} + \ldots + P_{r+m}\, y_{t-r-m} = Q_0\, x_t + \ldots + Q_{r+n} x_{t-n-r} + A_0^{-1}\, u_t$$

where

$$P_s = A_0^{-1} \sum_{j=-\infty}^{\infty} R_j\, A_{s-j}$$

$$Q_s = A_0^{-1} \sum_{j=-\infty}^{\infty} R_j\, B_{s-j}$$

FOOTNOTE: you can figure out that this is what you do by inspecting the previous pair of equations and figuring out what you need to do to add up $R_0\epsilon_t + R_1\epsilon_{t-1} + \ldots + R_r\epsilon_{t-r} = u_t$, having solved for ϵ_t's. END FOOTNOTE

So what?

Why would anyone want to do any such thing?

The *so what* is that if the model behaves in this fashion we can solve explicitly for the behavior of the system.

This is an $(r + m + 1)^{st}$ order *homogeneous linear* difference equation with forcing function

$$Q_0\, x_t + \ldots + Q_{r+n} x_{t-n-r} + A_0^{-1}\, u_t.$$

That is, it is of the form:

$$y_t + a_1 y_{t-1} + \ldots + a_{r+m} y_{t-r-m} = f_t.$$

And as you know, such equations have *explicit solutions.*

Once you have seen this point, which is only a mathematical one, you can dare to think about complications that were *not previously* explored.

The *second innovation* of Lucas and Sargent is the so-called *Lucas Critique.*

Let me explain the *Lucas Critique.*

According to previous Keynesian systems there were two classes of variables:
(1) endogenous variables, and
(2) exogenous variables.

Endogenous variables* were determined by the *private sector;
Exogenous variables* were determined by the *public sector.

The Keynesian macro econometrician, according to Lucas and Sargent, would typically estimate a reduced form type of equation:

$$y_1 + P_1 y_{t-1} + \ldots + P_{r+m}\, y_{t-r-m} = Q_0\, x_t + \ldots + Q_{r+n} x_{t-n-r} + A_0^{-1}\, u_t.$$

But there was no thought as to whether the coefficients of

$P_1, P_2, \ldots, P_{r+m}$ of the private part of the economy would be constant relative to the values of the x_t's.

The x_t's, I may remind you, include the *exogenous* variables that describe government policy.

So that the Keynesians thought that they could see the effect on the *y*'s from these estimated equations from changes in public policies.

According to Lucas and Sargent, because the *values* of the P's potentially depend on the values of the *x*'s, such Keynesian models were useless.

NOTE: the values of the Q's may also depend on the values of the *x*'s. END NOTE

Let me explain their model more fully with a homely example.

The simple example of this point comes from *Child Care.*

Suppose that you always meet your baby's needs.
When your baby cries, you respond.
That is supposed to stop the crying.

If you took a time series on *crying* you would probably see that meeting your baby's needs results in *crying abatement*.

One leading baby care book, by Penelope Leach, says that you should always

respond to your baby's crying.
That is the way to create a self-confident child. An economist would call this the *Keynesian* book of *Child Care.*

According to the analogy, with Keynesian policy, when the economy is down, you should respond to it.
You should use *countercyclical* fiscal or monetary policy–just as when the baby is crying.
You should respond to its needs.

***On the other hand,* there is another view of baby care.**
If you do not meet your baby's needs, it will not cry in the first place.
Why? because your indifference is the normal response.

So, there is an alternative view of baby care– espoused by Dr. Spock, if you want a reference.
That *view* of baby care is: *DO NOT SPOIL THE CHILD.*

Automatic response to the child causes it to be difficult and demanding.
This is the *Monetary Rule* theory of baby care.
Set firm rules as to how to handle the baby so that it does not learn to be a manipulative pest.

FOOTNOTE: but, of course, that is what you want to teach your child: how to manipulate the social universe.
END FOOTNOTE

FURTHER FOOTNOTE: There is a wonderful book by George Lakoff who describes the difference between Republican and Democrat ideologies in this way. It is curious that that also corresponds to the division of macroeconomists. The title of Lakoff's book is *Don't Think of an Elephant.* END FURTHER FOOTNOTE

Getting back to our equations, the behavior of the parent is seemingly *exogenous* because, at least in theory the parent has a *choice.*
But the parent's behavior affects the Parameters of the system, which in this case affects the baby's propensity to cry.

By *analogy*, according to Lucas and Sargent, the normal response of government affects the private reaction to governmental policies.

Now I have made the *General Point* of Lucas and Sargent that *systematic government* policies alter private sector response.
And therefore *Parameters* estimated from the private sector equations <POINT TO THEM>

cannot, necessarily, be used to estimate the effects of policy.

Why not? Because changed values of the x's result in changed values of the P's (and also of the Q's).

Let me now give you a reason why this *general point* of Lucas and Sargent might be of some *special importance* for macroeconomic systems.

Consider an economy with *money.*
This economy may be a very complicated one.

Insofar as agents in this economy are rational there should be *no money illusion.*
Therefore an *expected* change in the money supply should induce a proportional change in *nominal* variables such as *wages* and *prices*.
But the change should have no *effect* on real variables–such as employment, output, and real wages.

Monetary policy is therefore effective only insofar as the changes in the money supply *fail* to be perceived.

But *systematic responses* in monetary policy will be perceived at least after a while. Rational actors will make adjustments for such policy.
And, thus, policies with systematic responses to perceived shocks will fail to have any effect.

Thus absence of *money illusion* renders any *systematic* monetary policy as *systematically* ineffective in changing *real variables*.

The inefficacy of monetary policy I have just described occurs because the *coefficients* describing *private* behavior shift in response to changes in *governmental macro policy*.

Let me summarize:

Lucas and Sargent's *second major innovation* was to point out that the *parameters* of estimated Keynesian systems should be expected to change with systematically different monetary policies.

As a result, monetary policies that *seem* to be effective in the *short run* are not *effective* in the *long run.*

Let's go back to the analogy of the crying child.

By *analogy,* the parent sees that running to the *crying child* reduces crying in the

short run.

But the *Wise Pediatrician* knows that the parent is *spoiling* the child and changing the baby's propensity to cry–so her policy is *wrong* in the long run.
The parent is causing the child to cry in the first place.

[An empirical observation about babies, consistent with this theory, is that children in orphanages cry less often and are less active than children with private care takers.]

And one of Lucas' first papers on this subject showed that countries with higher rates of inflation also have steeper Phillips Curves–so that when there is *more* inflation the response to inflation is, indeed, less.

This now takes us to *Innovation 3* of Lucas and Sargent.
Keynesian macromodels are *not* based on rational economic behavior.

Keynesian models are models where *wages* and *prices* are sticky, but *quantities* are not.
According to Lucas and Sargent, models in which supply is not equal to demand are not consistent with the *rationality* of economic agents.

Why not?

Because if supply is not *equal* to demand*,* there are potential *gains* from trade.
If supply is not equal to demand, some supplier and some demander could meet and execute a mutually beneficial trade.
Such trade would take place in an equilibrium if all agents were rational.

So *Innovation 3* is that Keynesian models of unemployment due to *sticky wages* (and possibly also due to *sticky prices)* are not based on *rational behavior.*
And, *furthermore,* models with rational behavior will have market clearing.

***Innovation 4* of Lucas and Sargent is the following:**
it is *improper* to model agents without *rational expectations.*

By *rational expectations* they mean:

(1) agents have an understanding of the underlying structure of the economy.
(2) they use this structure plus the information available to them to form their *expectations* about the values of future variables.

Let's now consider why people have *rational* expectations.

If I understand the economy up to the limits of possible understanding, there will be profitable opportunities for me.

(1) *Presumably* businessmen who correctly perceive the economy make better decisions and therefore earn better profits.

(2) *Presumably, also,* there is a gain from the dissemination of *true* information.

If *Dr. Spock* had *really* known how children worked, he could probably have sold another 50 million copies of his baby-care book for another $500 million.

Because there are positive expected profits to people with rational expectations, such people should be expected to dominate markets.
As an economic theorist, I should say that Rational Expectations appears to be the *natural way* to model expectations.
Microeconomists had been modeling expectations this way for some time before it was used in macro and acquired its glitzy name.

As I shall show you this evening:
if you are willing to accept the preceding views of Lucas and Sargent, that is, if you are willing to accept.

(1) the linear model, which is Innovation 1
(2) Market Clearing in all markets, which is Innovation 3, and
(3) Rational Expectations, which is Innovation 4,

THEN the *Lucas Critique,* which is Innovation 2, will result.

In the context of the *macro model,* the Lucas Critique says that
Systematic Monetary Policy has no real effect on equilibrium real variables.

This evening I will demonstrate this in a model by Sargent.