ECON 202A

Lectures VII - IX

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So far we have been discussing First Order Difference Equations.

Having fully analyzed the First Order Difference equation, let's now analyze a harder case, the 2nd Order Difference Equation.

It has quite Interesting Behavior.

Let's first take a look at the 2nd order linear difference equation

Let's look at the homogeneous equation

$$y_{t+2} + a_1 y_{t+1} + a_2 y_t = 0.$$

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Having shown you this easy proof, which is rather ~~gee~~ pedestrian and algebraic, I think that it should be easier to understand a ~~more~~ general proof. This general proof shows you why certainty equivalence holds.

Let's consider the more general case where 2nd period income is

$$\bar{Y}_2 + \epsilon$$

where $E(\epsilon) = 0$.

~~Again let's~~

Again assume the same Utility function, the same expected income in periods 1 and 2, and the same interest rate, as in the Certainty Case.
Let's see what happens.

By the budget constraint.

$$(1) \quad C_1 + \frac{\bar{C}_2}{1+r} = Y_1 + \frac{\bar{Y}_2 + \epsilon}{1+r}$$

Let's examine now <Far Righthand Board>

$$E\left(E(p_t/\theta_{t-1})/\theta_{t-1}\right).$$

If you think about it for a long time you will see that

$E(p_t/\theta_{t-1})$ is a constant.

It is a number independent of any event which occurs at time t.

The expected value of a constant is that number

So

$$E\left(E(p_t/\theta_{t-1})/\theta_{t-1}\right) = E(p_t/\theta_{t-1})$$

And as a result <Middle Board>

$$E(y_t - k_t/\theta_{t-1}) = \gamma E(p_t/\theta_{t-1}) - \gamma E(p_t/\theta_{t-1})$$

$$= 0.$$

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using equation (1)

$$E(y_t \mid \theta_{t-1}) = E(k_t \mid \theta_{t-1}) + \gamma E(p_t - {}_t p_{t-1}^{*} \mid \theta_{t-1}) + E(u_t \mid \theta_{t-1})$$

If you think about it for 23 seconds you will see that R.E. says that the second term on the RHS is 0.

Purely formally

$$= E(k_t \mid \theta_{t-1}) + \gamma E(p_t \mid \theta_{t-1}) - \gamma E(E(p_t \mid \theta_{t-1}) \mid \theta_{t-1}) + E(u_t \mid \theta_{t-1})$$

Now let's consider the last two terms.

$E(u_t \mid \theta_{t-1}) = 0$, because u_t is an innovation uncorrelated with prior events.

It is defined as this period's random shock.

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< top Righthand Blackboard >

the assumption of rational expectations is the following.

$$_{t-1}P_t^* = E(P_t \mid \Theta_{t-1})$$

that is: the expectations people make at t-1 about the price level at t

is the Expected value of the price level which will actually occur at time t, given the information available at time t-1.

the symbol Θ_{t-1} here represents the information available at t-1.

3. This week's problem set will be due two weeks from today.

4. Four notes about organization and grades.

1. There will be a mid-term which will be graded.

2. There will be a final examination which will also be graded.

3. The problem sets will be handed in. Menzie will check to see that you have done them. They might count in a marginal decision about a grade.

In a very close call between one grade and another might determine whether you got the higher, or the lower grade by how conscientious you were on the homework.

4. The major incentive for doing the homework faithfully is That we will model some exam questions after problems on the homework.