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 ~~par~~ 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 2^{nd} 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.

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

Let's examine now <Far Righthand Board>

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

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

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

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

The expected value of a constant is That number

So

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

And as a result <Middle Board>

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

$$= 0.$$

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.

<middle board>

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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

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

the symbol θ_{t-1} here represents the <u>information</u> available at t-1.

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

4. <u>Four</u> notes about <u>organization</u> and <u>grades</u>.

   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 <u>might</u> count in a marginal decision about a grade.

   In a very close call between one grade and another [illegible] <u>might</u> determine whether you got t[illegible]igher, or the lower grade by how conscientious you were on the homework.

   4. The <u>major</u> incentive for doing the homework faithfully is that we will model some exam questions after problems on the homework.