Lezione 6 – 08/10/2019

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SUMMARIZE del prof

We are interested in time series because

- We want to know summary statistic (moments)
- We want to know the effects of past shade (impulse response)
- We want to forecast future values

We first look at stationary and ergodic series. Here, we find ARMA models to be convenient. ARMA are not the only stationary and ergodic processes**, however ARMA are particularly convenient because**:

- Easy to derive IRF (impute response function)
- Easy to make forecast (does not really require the inversion of a big matrix)
- Only require a small number of parameter (estimation will be easy)
- Can characterize fairly wide range of situations at leas for point close in time.
- The class is close with respect to sum (sums of ARMA still ARMA processes)

Prof want to summarize where we will want to go.

If we got a question: why ARMA models are a good choice? The answer will be IRF, forecast ecc. It's elegant answer.

Revise: skip the section 1,2 of the book. The chapter of ARMA model will give us some examples. Then we go back to study chapter 1,2 and 3.

Chapter 4 tells us what we want to answer. To revise is convenient to start from CH4.

Sum of ARMA processes

Sum still ARMA and that's a cool feature, because we can treat any aggregate as an ARMA. If we think of macroeconomics for individual investment and for population.

ARMA model can fit each of then and then aggregate them will fit ARMA model anyway.

Example of a series that's a sum of two processes.

Proprieties of Y? we have to characterize his moment. The mean is 0 and variance will be (1 + ..).

E(X v) = 0 because they are independent

Gamma2 = 0

So Yt is MA(1) because if j >= 2 ➔ 0

We can characterize the moment of this parametrizations. Teta and as the parameter of x and v.

We expect we can't derive the individual from a sum of ARMAs.

Autocovariance of Y will be the sum of the Autocovariance X and W.

The order is the highest of the two processes.

Case of two AR(1)

Then Xt = PI Xt -1 + mut

Xt = PI L Xt + mut

(1 – L PI) Xt = mut

$Y_t = \varepsilon_t + \theta \varepsilon_{t-1}$

$Y_{t-1} = \varepsilon_{t-1} + \theta \varepsilon_{t-2}$

$\varepsilon_{t-1} = Y_{t-1} - \theta \boxed{\varepsilon_{t-2}}$

$Y_t = \varepsilon_t + \theta Y_{t-1} - \theta^2 \varepsilon_{t-2}$

Multiply each side for (1 – rho) in each part and I get

(1 – rho L) (1 – PI L) Wt = (1 – rho L) ut

This is an ARMA(2,1)

Sum of 2 ARMA processes will be and ARMA process → in the slide p < = p1 + p2

Yt = Xt + vt has proprieties that depends on X and v. Another thing that we saw was that if I know Y I can not recover sigma^2, delta and ecc. The reason is if I have aggregate of 10 people I have different information and I cannot get the single individual.

The original X and v are characterized by delta, sigma^2. It's like having 2 equations and 3 unknown so we cannot identify these three guys.

This idea is important because for some reason sometimes economist or journalist the like to cast the data in this way: we have our process of interest X but we observer Y. Is like speaking about core inflation where vt is a disturbance. Because of that would be nice to eliminate vt.

Someone thinks about average. We usually get yearly inflation that is inflation of January, February and so on. The idea is that the noise will be average. So hopefully we go away. Is simpler to get average than an MA(k). So will increase the dependence.

When we look at inflation is better to look at the inflation of more months, because the last will not tell where we are going.

Chapter 5

RHO1 = PHI

If I have AR(p) it's the same.

If I have an MA?

If I don't know teta I can use this relation to estimate teta. We have two solution; it turns out that both solutions are possible but one of them will be smaller in absolute value and the other one will be bigger. Which one will you choose? The smaller one because it's the one that give us invertibility.

Example3.

These are easy to compute and ARMA it's nice because we have a small number of parameters to define a lot of situation. I can estimate this parameter easy and I can characterize different situation.