

V. Module 5: EITM and Measurement Error

1. The Role of Expectations and Uncertainty

- Make use of:
 - Error in variables regression
 - Recursive projection
 - Law of iterated projection
 - Signal extraction
 - Rational expectations

Example: Signal Extraction and the Lucas Supply Curve

- Lucas's (1973) supply curve utilizes agent expectations on the general price level and of the price of the goods they sell (relative prices).
- In this model “rational expectations” implies that these expectations are correct on average.
- Lucas assumes that agents are able to observe the current relative price, but that they observe inflation imperfectly and with a delay.
- When the price of their own goods rise, agents are faced with the problem of deciding whether the price rise represents a change in relative prices in their favor, which would encourage an increase in their output, or merely a rise in inflation.
- The latter interpretation by agents results in general price increases (inflation) and provides no incentive to increase output.
- Over time, experience teaches agents that part of the price increase they see is a change in relative prices and part is a change in the general price level (inflation).
- Therefore, they react to any surprise inflation increase as if it were partly an increase in relative prices. Output and

labor supply increase for any surprise increase in the inflation rate and decrease for any surprise decrease in inflation. When the inflation rate stabilizes or approaches zero over a long period, any rate above or below zero is unexpected.

- In Lucas's model, the output and inflation trade-off cannot be systematically exploited by policymakers. Any attempt to generate consistently surprising higher levels of inflation to increase output will fail. The public simply raises its expectations of what the average inflation level is, from zero or any other constant level, to the new higher level.

$$y_i = \gamma E(p_i - p | \Omega),$$

where E is conditional expectations operator, p_i is the relative price level and $p | \Omega$ is the general price level given an information set, Ω . When p_i and p are observable we can rewrite the equation as:

$$y_i = \gamma E(p_i - p)$$

Now, assume uncertainty about the price level.

Therefore, $p_i = p_i - p + p$, with $r_i = p_i - p$.

$$p_i = r_i + p$$

This means agents must rely on some expectation (projection) based on relative price information. This can be shown by using the Law of Iterated Projection:

$$E(r_i | p_i) = \frac{\sigma_r^2}{\sigma_r^2 + \sigma_p^2} [p_i - E(p)], \text{ and the supply curve now is:}$$

$y_i = \gamma E(r_i | p_i)$ and aggregating:

$$y = \gamma \left\{ \frac{\sigma_r^2}{\sigma_r^2 + \sigma_p^2} [p_i - E(p)] \right\}$$