Financial Econometrics Econ 40357
Local Projections

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September 10, 2020

Pitfalls of VARs

- VAR is optimally designed for one-period ahead forecasting.
- An impulse response, is a function of forecasts at increasingly distant horizons. Therefore misspecification errors are compounded with the forecast horizon.
- It might be better to use a collection of projections local to each forecast horizon instead. This is called a **local projection**.

Local Projection

Illustrate with the VAR(1). The first equation is

$$y_{1t+1} = a_1 y_{1t} + b_1 y_{2t} + \epsilon_{t+1,1}$$

Run these regressions

$$
\begin{aligned}
y_{1t+2} &= a_2 y_{1t} + b_2 y_{2t} + \epsilon_{t+2,2} \\
y_{1,t+3} &= a_3 y_{1t} + b_3 y_{2t} + \epsilon_{t+3,3} \\
&\vdots \\
y_{1,t+k} &= a_k y_{1t} + b_k y_{2t} + \epsilon_{t+k,k}
\end{aligned}
$$

- The impulse response of y_1 to a shock to iself is $a_1, a_2, ..., a_k$.
- The impulse response of y_1 to a shock to y_2 is $b_1, b_2, ..., b_k$.
- Òscar Jordà worked out the math to prove, if the true DGP is the VAR, the impulse responses from Local Projections and the VAR are identical (asymptotically).
- Construct confidence bands with Newey-West standard errors (the estimate divided by the t-ratio).

Local Projection

Illustrate with VAR(2). The first equation is

$$y_{1t+1} = a_1 y_{1t} + c_1 y_{1t-1} + b_1 y_{2t} + d_1 y_{2t-1} + \epsilon_{t+1,1}$$

Run these regressions

$$
\begin{aligned}
y_{1t+2} &= a_2 y_{1t} + c_2 y_{1t-1} + b_2 y_{2t} + d_2 y_{2t-1} + \epsilon_{t+2,2} \\
y_{1,t+3} &= a_3 y_{1t} + c_3 y_{1t-1} + b_3 y_{2t} + d_3 y_{2t-1} + \epsilon_{t+3,3} \\
&\vdots \\
y_{1,t+k} &= a_k y_{1t} + c_k y_{1t-1} + b_k y_{2t} + d_k y_{2t-1} + \epsilon_{t+k,k}
\end{aligned}
$$

- The impulse response of y_1 to a shock to iself is $a_1, a_2, ..., a_k$.
- The impulse response of y_1 to a shock to y_2 is $b_1, b_2, ..., b_k$.
- Construct confidence bands with Newey-West standard errors (the estimate divided by the t-ratio).

Revisit Climate Change and the Real Exchange Rate