Applied Macroeconometrics
Problem Set 2

Due on Monday July 3, 23:59pm

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1. Local Projections and Bootstrapping - 40 points

In this problem, you will learn about local projections, a "recent" methodology introduced by Òscar Jordà (2005), which was thought to have advantages over the traditional VARs until Plagborg-Møller and Wolf (2021) found it was not the case. You will apply projection methods to estimate the pass-through from exchange rate to consumer prices in Mexico. Capistrán et al. (2012) use VARs. Implement the projection method using one lag ($p = 1$) and $h = 0, 1, \ldots, 20$ using equation (1), p. 959 in Plagborg-Møller and Wolf (2021). Do not use any controls. Save your $\{\hat{\beta}_h\}_{h=0}^{20}$ and other relevant estimated projection coefficients. Then, implement the simple i.i.d. bootstrap procedure discussed in class to calculate an Efron's 90 percent confidence interval around $\{\hat{\beta}_h\}_{h=0}^{20}$ (use 2000 replications), by simulating equation (1) in the above paper. Refer to the database PASSTHROUGH.XLSX containing time series for the consumer price index and the peso-dollar nominal exchange rate. **Hint:** Use the scripts LOCALPROJ.M and LOCALPROJ_EX.M as a reference.

2. Implementation of the Adda-Cooper Method (Kopecky and Suen, 2010) - 40 points

Write a Matlab script that implements the Adda-Cooper discretization method, compare it to the three discretization methods discussed in class (for this purpose, you can extend the script DISCRETIZATION_EX0), and explain your results. The Adda-Cooper method could be implemented as follows:

State-space: The real line is partiotioned into N intervals. Let $I_n = [x_n, x_{n+1}]$ be the n-th interval with $x_1 = -\infty$ and $x_{N+1} = \infty$. The cut-off points $\{x_n\}_{n=2}^{N}$ are the solutions of the following system of equations:

$$\phi\left(\frac{x_{n+1}}{\sigma_z}\right) - \phi\left(\frac{x_n}{\sigma_z}\right) = \frac{1}{N}, \quad \text{for } n = 1, 2 \ldots, N,$$

where ϕ is the probability distribution function for the standard normal distribution and σ_z is the standard deviation of the autoregressive process. The n-th element in the state space is the mean value of the n-th interval.

Stochastic kernel: For any $i, j \in \{1, 2, \ldots, N\}$, the transition probability $\pi_{i,j}$ is defined as the probability of moving from interval I_i to interval I_j in one period.

3. Transformation Method - 20 points

Write a Matlab script that implements the transformation method to generate pseudo-random numbers following the Weibull distribution. Test your script and show that your method reasonably reproduces the true distribution's moments, say, mean, median, and variance.

References

Capistrán, C., R. Ibarra, and M. Ramos (2012): "El traspaso de movimientos del tipo de cambio a los precios. Un análisis para la economía mexicana," *El Trimestre Económico*, 0, 813–838.

Kopecky, K. and R. Suen (2010): "Finite State Markov-chain Approximations to Highly Persistent Processes," *Review of Economic Dynamics*, 13, 701–714.

Plagborg-Møller, M. and C. K. Wolf (2021): "Local Projections and VARs Estimate the Same Impulse Responses," *Econometrica*, 89, 955–980.

Òscar Jordà (2005): "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review*, 95, 161–182.