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Spatial distribution dynamics: an application

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Motivation and outline of the study

Motivation:

- it is quite common in convergence analyses across spatial units (countries, regions) that data exhibit strong spatial dependence
- neglecting spatial dependence may affect the results

$\Rightarrow$ employ SNP within the distribution dynamics approach for the analysis of cross-sectional convergence when data are spatially dependent

Outline

- present data and discuss potential bias from cyclical dynamics
- analyze convergence among US states

Data

USA context

- 48 coterminous US states
- quarterly data on personal per capita income (1971:Q1-2010:Q4)
- orthodromic distance between state capitals

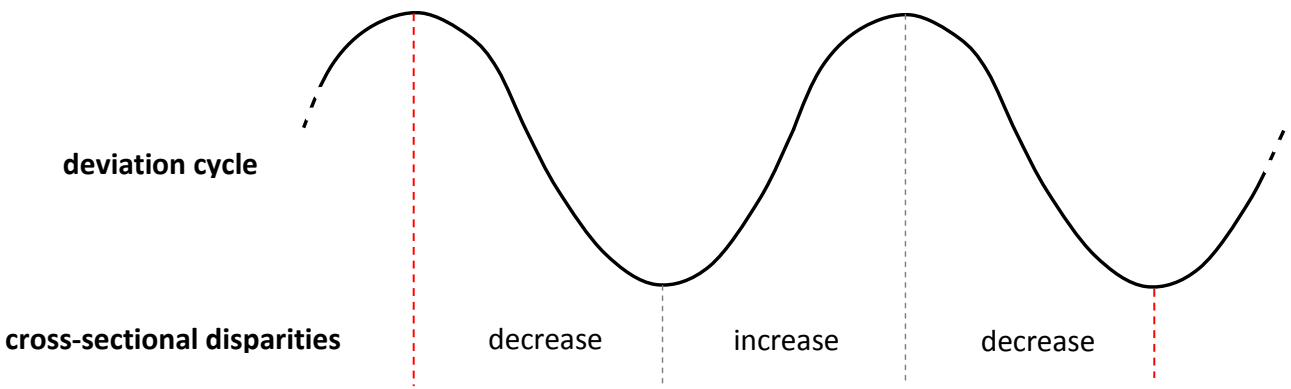
Allow for short-run, cyclical dynamics (Magrini, Gerolimetto and Duran, 2013; Gerolimetto and Magrini, 2014)

- the object of interest to convergence analysts is, essentially, the evolution of **potential** output
- measured output is a **noisy** indicator of potential output, contaminated by business cycle dynamics

Bias from cyclical dynamics

Suppose:

- regional disparities follow a pro-cyclical pattern
  $\Rightarrow$ increase during expansions and diminish during slowdowns
- the period of analysis contains more slowdowns than expansions



$\Rightarrow$ biased results due to an over-representation of the dynamics towards convergence

Solution to cyclical dynamics

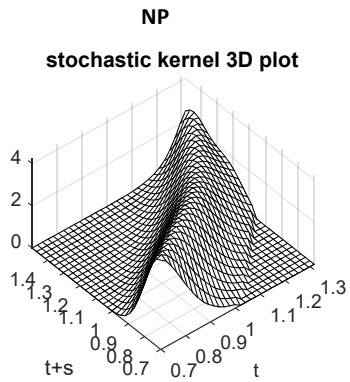
In fact, policy makers need to discriminate between:

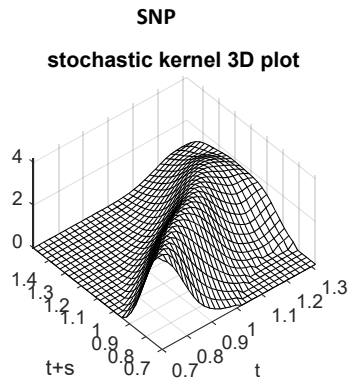
- a short-run component of the disparities (bound to vanish)
- a long-run one (possibly requiring structural intervention)

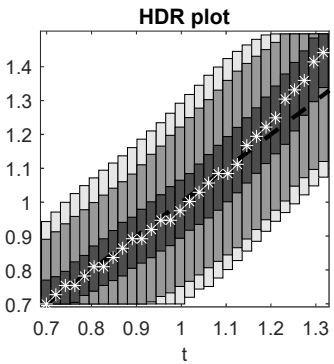
$\Rightarrow$ the true object of interest is the evolution of (relative) potential output

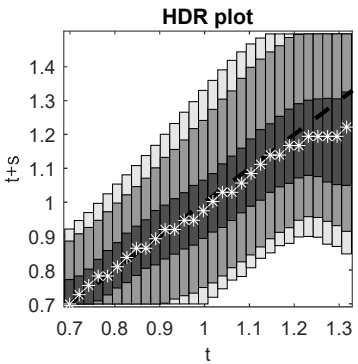
- apply the Hodrick-Prescott filter to each regional time series to filter out short-run fluctuations
  - $\rightarrow$ λ (parameter controlling the degree of smoothness of the estimated trend) large enough to allow for all cyclical swings
- choose any two points in time and study convergence on HP-filtered data
  - $\rightarrow$ focus on the period between two major economic crises: 1981:Q1-2007:Q2

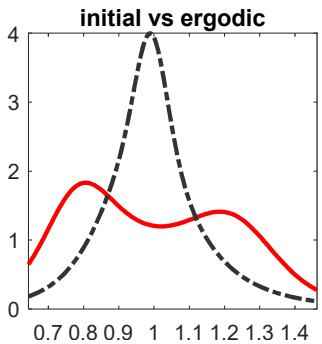
1981:Q1-2007:Q2 with cross-validation minimization bandwidth











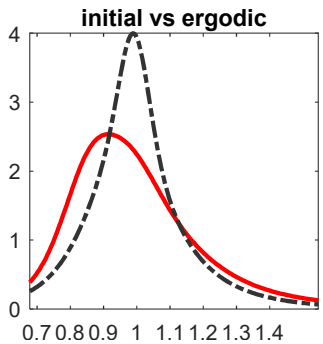


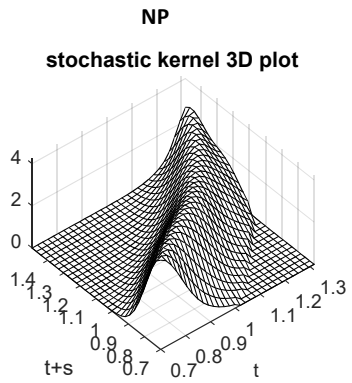
Table: Results

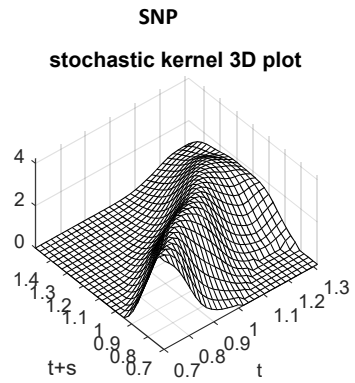
	Moran's I	p-value
observed initial	0.1993	0.0066
observed final	0.2877	0.0001
filtered initial	0.2206	0.0029
filtered final	0.3030	0.0001
residuals NP	0.4694	0.0000
residuals SNP	-0.0938	0.3627
	CV	IR
HP-filtered initial	0.1427	0.2144
HP-filtered final	0.1730	0.2382
ergodic NP	0.2189	0.4257
ergodic SNP	0.1819	0.2492

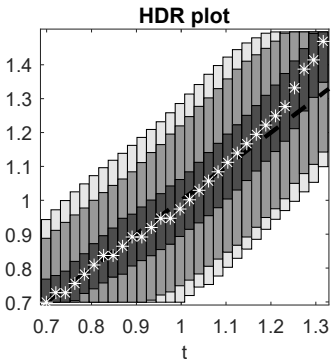
Table: Estimated half-life values

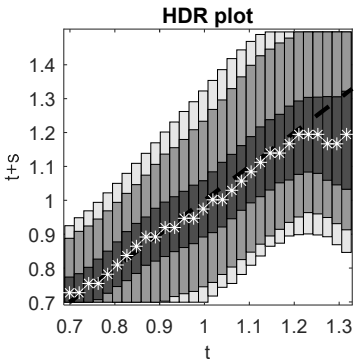
ergodic via NP	ergodic via SNP
7.3949	2.6620

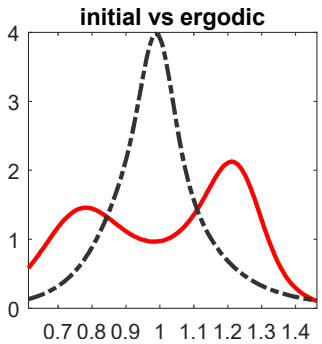
1981:Q1-2007:Q2 with direct plug-in bandwidth











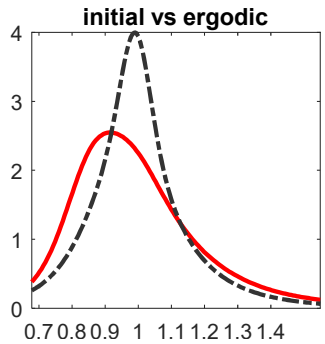


Table: Results

	Moran's I	p-value
observed initial	0.1993	0.0066
observed final	0.2877	0.0001
filtered initial	0.2206	0.0029
filtered final	0.3030	0.0001
residuals NP	0.4635	0.0000
residuals SNP	-0.0360	0.8528
	CV	IR
HP-filtered initial	0.1427	0.2144
HP-filtered final	0.1730	0.2382
ergodic NP	0.1817	0.2476
ergodic SNP	0.2186	0.4627

Table: Estimated half-life values

ergodic via NP	ergodic via SNP
9.5737	2.6622

Conclusions

Overall, we find

- evidence of a **very strong** process of **divergence** using NP to estimate the mean function
  - $\rightarrow$ the ergodic distribution is clearly bimodal
- strong spatial dependence in data and NP regression residuals
- evidence of a **weak - moderate** process of **divergence** using SNP to estimate the mean function
  - $\rightarrow$ no signs of bimodality in the ergodic distribution
- strong spatial dependence in data but no evidence of spatial dependence in SNP regression residuals
- results are robust to the choice of bandwidth

Specifically, results show that

- neglecting spatial dependence might affect the results
- the bias is particularly strong in the analysed period (1981:Q1-2007:Q2) stretching between two major crises