The ergodic hypothesis in South East Europe

Viktor Stojkoski[1]
Dragan Tevdovski[2]

[1]Macedonian Academy of Sciences and Arts
[2]Faculty of Economics, University Ss. Cyril and Methodius in Skopje

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Introduction

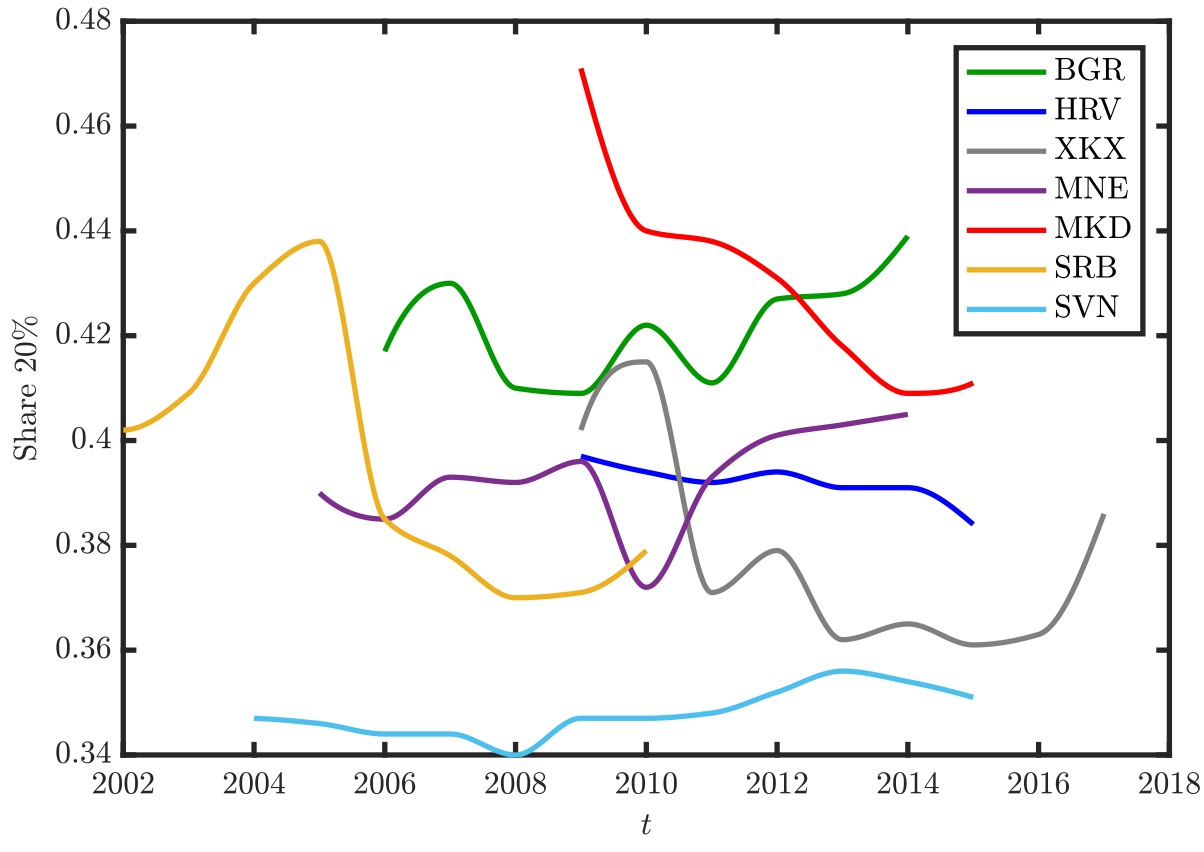
Ergodic hypothesis – the distribution of (a transformation) of wealth has a *stationary distribution*, [Samuelson, 1968].

Consequences:

- **Inequality** – within the society becomes stable and can be easily modeled.
- **Mobility** – individuals can easily move across the wealth distribution.

Motivation – Inequality in Southeast Europe

- 7 countries – Bulgaria, Croatia, Kosovo, Montenegro, North Macedonia, Serbia and Slovenia.



Source: World Development Indicators.

Contribution

Observation – Inequality is not *stable* over time.

Is the ergodic hypothesis indeed valid for Southeast Europe (SEE)?

Our contribution – We test the *validity* of the ergodic hypothesis in SEE through the lenses of a simple model for wealth dynamics.

A simple model for wealth dynamics

- The wealth $x_i(t)$ of person i at time t follows *reallocating geometric Brownian motion* (RGBM):

$$dx_i = \underbrace{x_i\left(\mu dt + \sigma dW_i\right)}_{\text{individual growth}} - \underbrace{\tau\left(x_i - \langle x\rangle_N\right)dt}_{\text{reallocation}},$$

where μ – drift term, σ – noise amplitude, $\langle\cdot\rangle_N$ – population average.

- τ is the *effective* reallocation parameter:
  - $\tau > 0$ – reallocation from rich to poor;
  - $\tau = 0$ – no reallocation;
  - $\tau < 0$ – reallocation from poor to rich.

Inequality in RGBM

- Define

$$y_i(t) = \frac{x_i(t)}{\langle x(t) \rangle_N},$$

as the **rescaled wealth** of individual i. Then, when:

- $\tau > 0$ – stationary power law distribution of rescaled wealth;
- $\tau = 0$ – no stationary distribution;
- $\tau < 0$ – non-ergodic wealth dynamics.

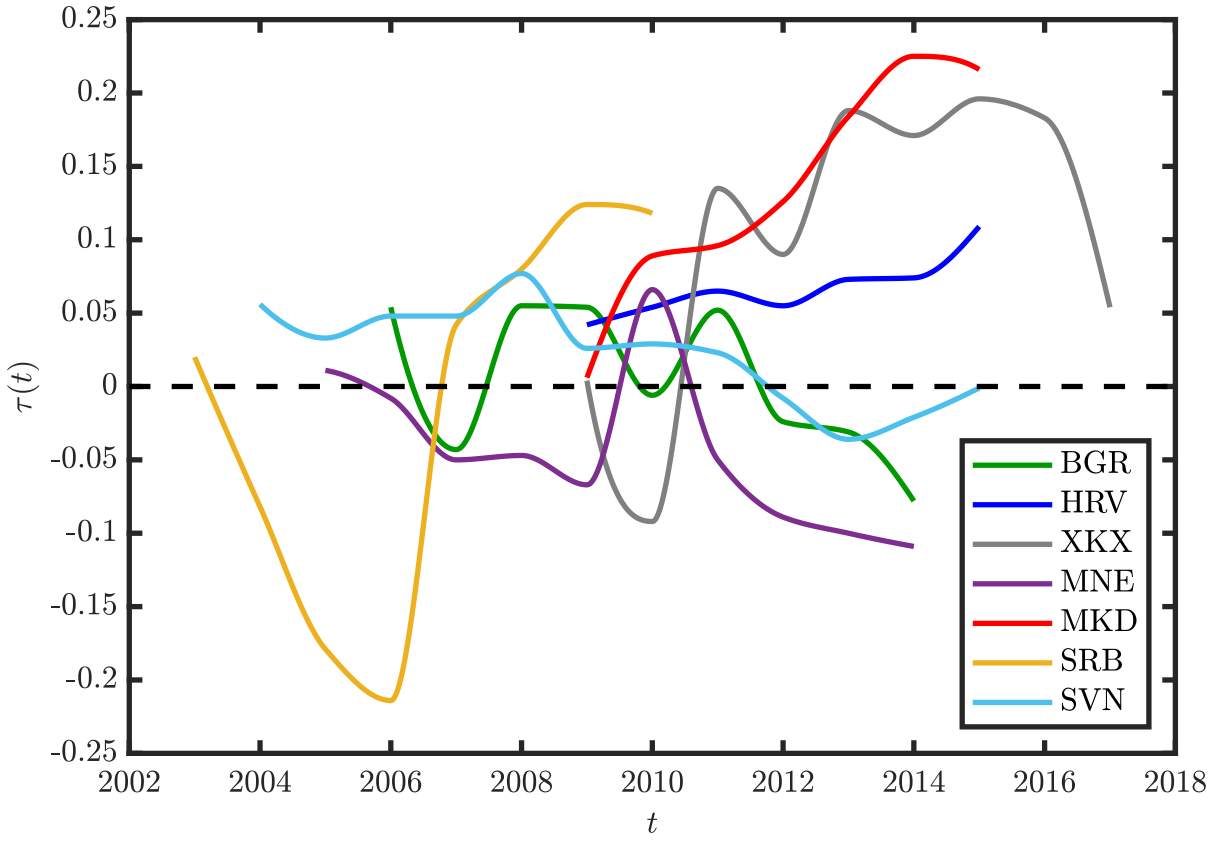
Estimation procedure

Three-step procedure for estimating $\tau(t)$:

1. Estimate μ and σ from GDP per capita at constant prices data.
2. Initialise N individual wealths, $x_i(0)$, as random variates of the RGBM stationary distribution with parameters chosen to match the wealth share of the highest 20% individuals.
3. Propagate $x_i(t)$ according to the RGBM equation, using the value of $\tau(t)$ that minimises the diference between the wealth share in the modelled population, and the empirical wealth share[1].

[1] We use the Nelder-Mead algorithm, [Nelder and Mead, 1965].

Effective Reallocation in SEE



Implications

- In 5/7 countries negative τ is observed.
- Only MKD and HRV are constantly in the positive τ regime.
- BGR, MNE and SVN are in the negative τ regime with the last available data.

Statement: The ergodic hypothesis is only partially valid in SEE.

Discussion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