



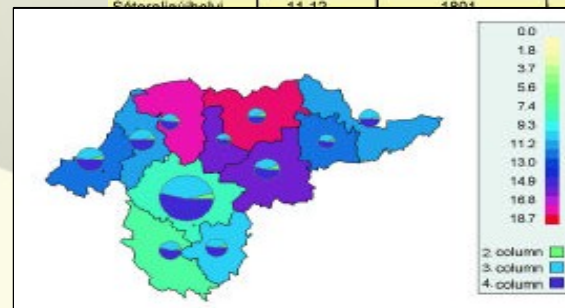
MULTIRÁCIÓ

multitalent solutions

Small Area Unemployment Statistical System

Kázmér Koleszár
project leader
MultiRáció, Hungary

Microregion	Unemp.rate	Unemployed	Employed	Inactives
Edelényi	7,87	8001	93603	117889
Encsi	17,1	2127	10312	14407
Kazincbarcikai	18,7	2362	10267	12560
Mezőkövesdi	11,11	2809	22485	25807
Miskolci	6,69	1065	14851	19608
Ózdi	11,92	3358	24813	28728
Sárospataki	12,11	1207	8762	11150
Sátoraljaújhelyi	11,12	1891	14389	16623
Szegedi	11,12	18705	25855	34560
Székesfehérvári	11,12	6047	7480	13527
Tatabányai	11,12	15469	18779	34248





Summary

slide 2

Small Area Unemployment Statistical System

History

- Labor force data processing in Hungary
- The beginnings of SAUS

The SAUS System

- Tasks
- Methods
- Information system

R&D Projects

- EURAREA project
- EUROSEAS project proposal and the consortium
- ELTE-Soft project for European countries
- Future plans



Labor force data in Hungary

- Since 1992 – Employment Office, Labor Force Survey
- Reliable county-level data: need large sample size – large cost

Looking for solution – World Bank supported project (1993-96)

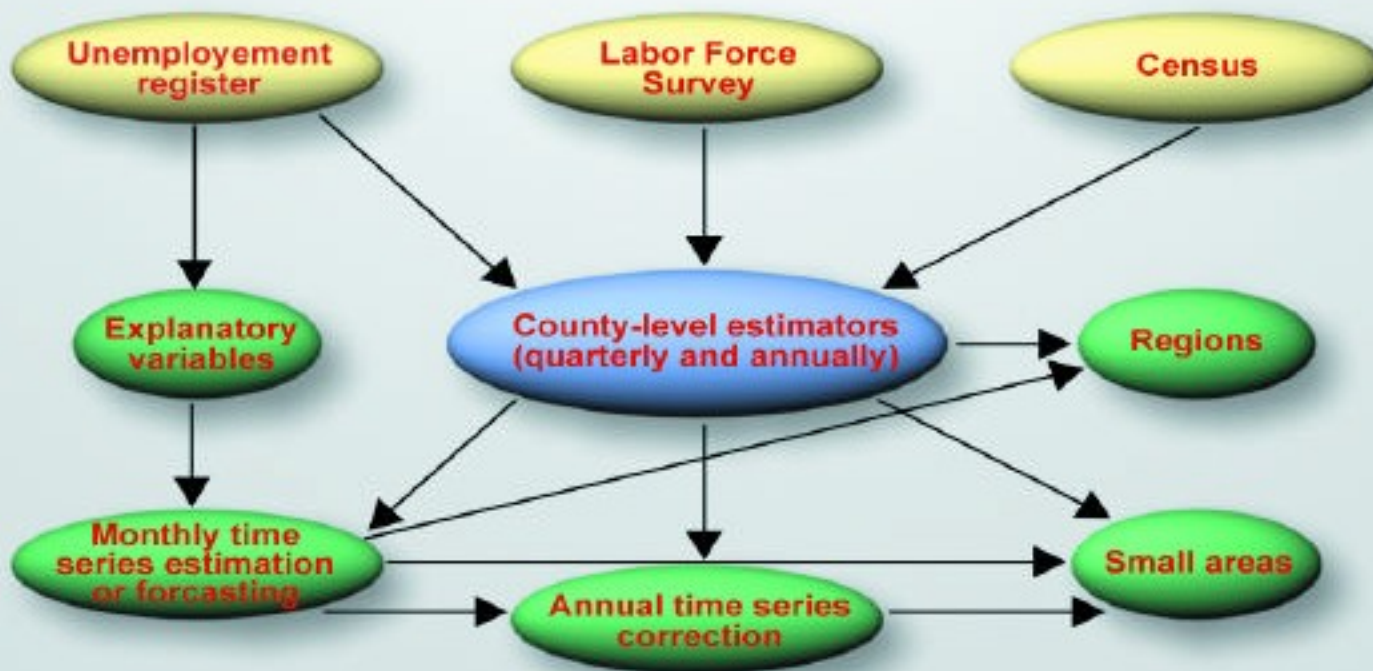
- Study of BLS, USA methods
- Feasibility study
- Testing the methods on real Hungarian labor force data
- Multiráció developed the predecessor of SAUS

Official Use (Since 1998)

- SAUS is the official data source of small area employment data in Hungary



SAUS – flowchart





Methodology based on BLS methods

- Combine model-based estimators with structural time series model

Direct estimator

- Sampling error large on small areas (under NUTS2)

Estimator functions

- Adjust small area data using larger area patterns
- Tested 26 variants
- Corrigated synthetic regression

$$\hat{Y}_a = \hat{Y}_{e,a} + B_e (\hat{X}_a - X_{e,a})$$

Error estimation

- Jackknife-method, subsamples



State-space model = Signal + Noise

- Hidden state vector → Measurable data
- State equation
- Measurement equation

$$\alpha_{t+1} = d_t + T_t \alpha_t + H_t \epsilon_t$$

$$y_t = Z_t \alpha_t + G_t \epsilon_t \quad \epsilon_t \sim NID(0, I)$$

Signal components:

- Trend
- Seasonal
- Regression – use registry data

Noise components:

- ARIMA – sampling error
- Irregular

α_t	: hidden state vector
ϵ_t	: normal distribution error
y_t	: observed value
T_t, H_t, G_t, Z_t	: system matrices



Kalman filter

- Recursive algorithm
- Estimation, forecast and smoothing

Model selection

- Known structure (sampling procedure)
- $\text{Signal} + \text{Noise} = (\text{Trend} + S(12)) + (S(3) + \text{AR}(3))$

Parameter fitting

- Maximum likelihood, EM algorithm, BFGS



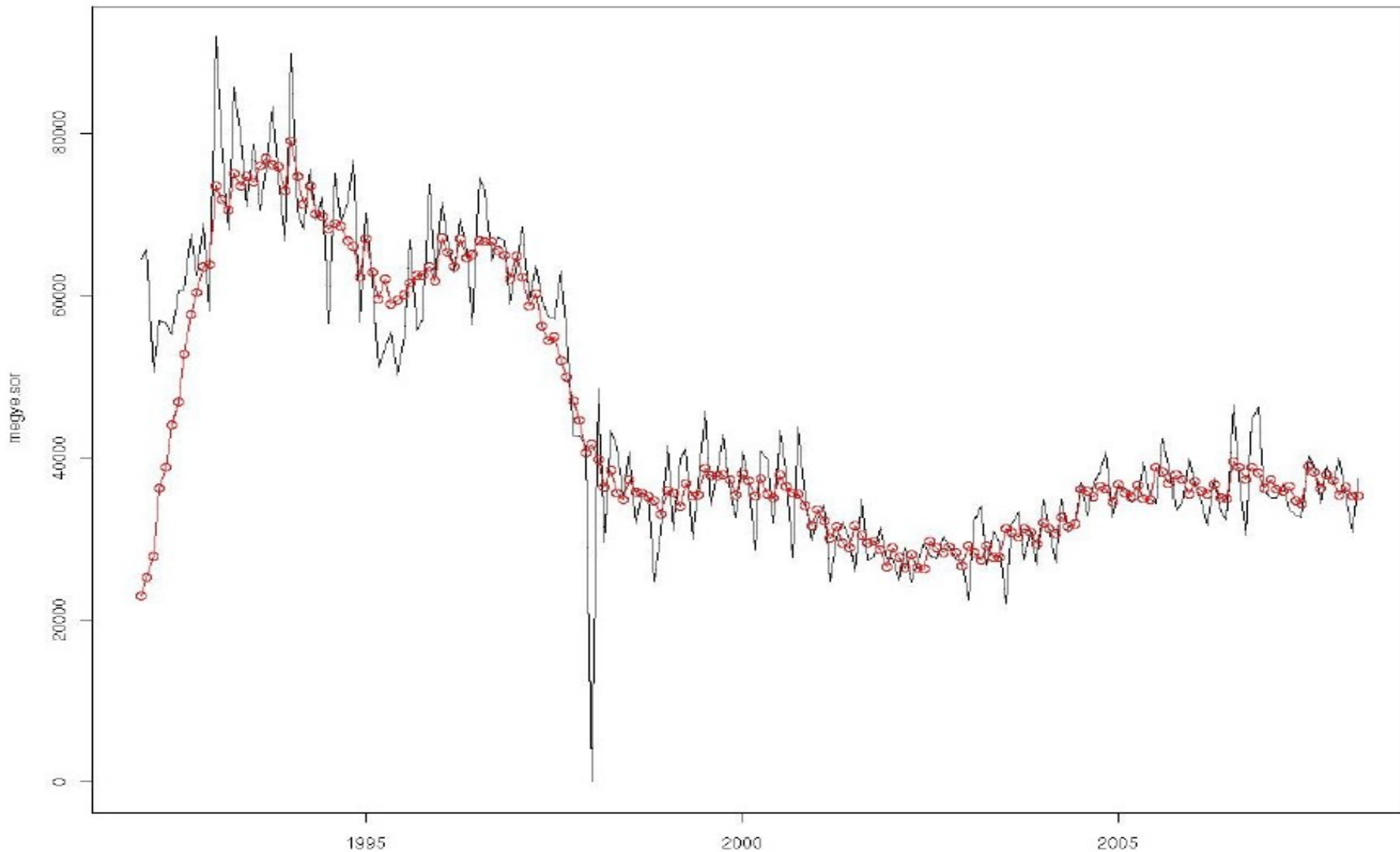


Methods – time series analysis

slide 8

Small Area Unemployment Statistical System

Munkanélküliség a(z) 1. megyében 1992 január - 2008 március





Estimation results

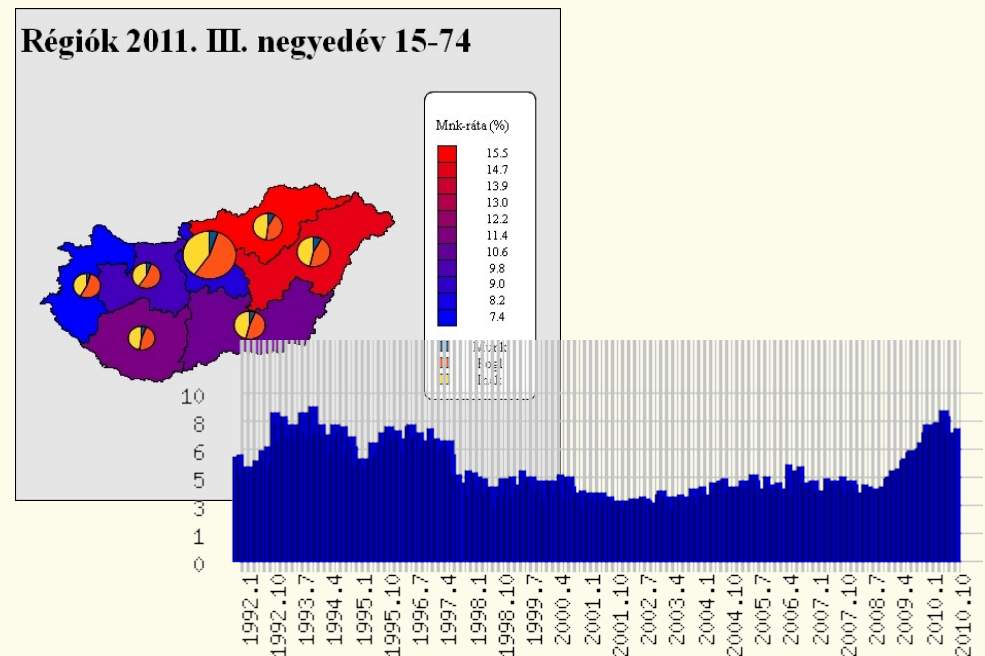
- Monthly data
- Regional (NUTS2), county (NUTS3) and small area (NUTS4) levels

Visualization

- Tables
- Graphs (time series view)
- Map charts (spatial view)

Means of publication

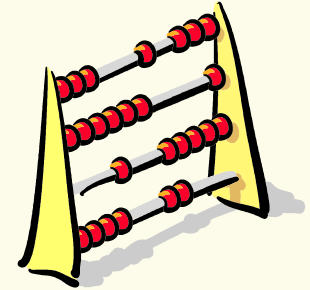
- Quarterly reports
- Website
 - <http://kisterseg.munka.hu/index.php?static=kister&lang=english>





Reliability

- Linux operating system
- MySQL relational database
- Regular automatic backups help avoid data loss



Modularity

- Separate statistical program modules written in R statistical language
- Input and output to the database
- Independent development and testing

Maintainability

- Mainstream open source technologies
- Avoid solutions that require special knowledge



The project

- Research of small area estimation methods
- Funded by Eurostat under FP5
- 2001-2004
- Participants:
 - Statistical institutes, universities and research consultancies from across the EU

Results and conclusion

- Model based estimators outperform design based ones
 - Difference more substantial at NUTS4 and NUTS5 levels
 - Need for good correlating explanatory variable
- “Borrowing strength over time”
 - Using data of the past increases estimation precision
 - Keynote speaker Danny Pfefferman adviser of LAUS in BLS



EUROSEAS project proposal

slide 12

Small Area Unemployment Statistical System

Continue EURAREA research with **emphasis on time series methods**

Shortlisted FP7 proposal

The consortium:

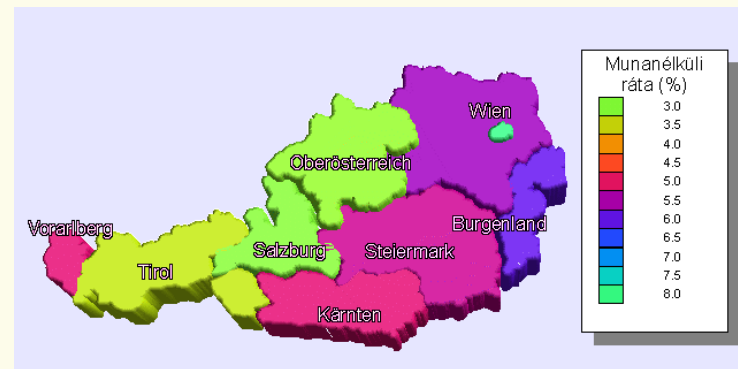
- Eötvös University, HU
- University of Southampton, UK, (Danny Pfefferman)
- Jagiellonian University, PL
- MultiRacio Ltd., HU
- Collegium Budapest, HU
- University Bamberg, DE





Research projects with Hungarian government funding

- Adapt and test SAUS methods on labor data of other European countries
- Duration: 2006-2012
- Participants:
 - Eötvös University, Budapest
 - Multiráció Ltd.

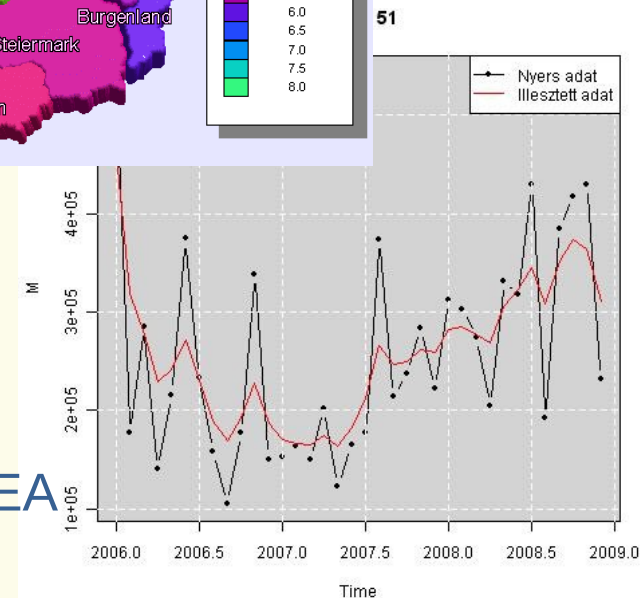


Data sources:

- Eurostat Labor Force Survey data
- Online registered employment data

Methods tested:

- Model based estimators proposed by EURAREA
- Time series models used in SAUS
- Model selection by diagnostic tests, parameter fitting





Methodology research

- Test latest methods and procedures
 - Time series analysis methods
 - Model diagnostics and parameter fitting
- Find and test explanatory variables
 - Utilizing on-line data sources

Information system development:

- Extend and normalize database
- Integrate new data sources
- Generalize data structure and reporting functions

Members of the EUROSEAS consortium ready to continue research...



Thank you!

More information:

www.multiracio.com

