# Regional downscaling of the long-term economic forecast for Hungary

## A methodological and literature review

Zsuzsanna Márkusné Zsibók

research fellow
HAS CERS

Szeged, 22 October 2015

MTA KRTK RKI

# The NAGiS project

- National Adaptation Geo-information System (NAGiS) project: aims to develop a multipurpose geo-information system that can facilitate the policy-making, strategy-building and decision-making process related to the impact assessment of climate change and founding necessary adaptation measures in Hungary
- The aim of our current CERS project is to forecast the long-term socio-economic development path of Hungary until 2050, and to foster the adaptation to climate change
- The results (data base) will be integrated into the NAGiS
- NAGiS will be extended by new data describing the future socio-economic characteristics of Hungary


Zsuzsanna Márkusné Zsibók zsibok@rkk.hu

# Socio-economic forecasts in the NAGiS project

- Our project investigates and quantifies
  - demographical,
  - economic and
  - land-use change

  on various geographical and temporal scales,
- taking into account the interdependence of socio-economic spatial processes and climate change
- nater.rkk.hu

LONG-TERM SOCIO-ECONOMIC FORECASTING FOR HUNGARY

MTA KRTK RKI

# Economic forecast

- Macro modelling framework
- Two model blocks:
  - a DSGE (dynamic stochastic general equilibrium) block generating temporary equilibrium
    - a mainstream medium-sized macro model (about 50 variables)
    - households, companies, investment sector, government, external sector
  - „drivers” generating long-term dynamics
    - productivity
    - climate change
    - based on OECD Env-Growth model
- Model estimation: Bayesian method (*to be elaborated in the near future*)



Zsuzsanna Márkusné Zsibók zsibok@rkk.hu

# Regionalisation

- The macro model provides forecast for the national level
- The geographical scale of the required forecast is the regional and micro-regional scale, and in some cases, a 10 x 10 km raster depending on the variable type
- Theoretical, methodological and practical problems of decomposition: e.g. GDP
- Scenarios concerning future regional trends:
  - baseline: no policy intervention
  - business-as-usual: extends the past trends into the future } continuing polarisation
  - active regional policy: effective policy intervention (diminishing regional inequalities)


Zsuzsanna Márkusné Zsibók zsibok@rkk.hu

# Basic concepts

- What we would like to do: regionalisation, downscaling, regional disaggregation, regional decomposition
- Downscaling is more common in climate models and geostatistics
  - appears only exceptionally in economic models ☹
- Downscaling is the process of transferring the (climate) information from a (climate) model with coarse spatial resolution to the finer resolution required as input by other models that address the effects (of climate) at a more detailed scale


Zsuzsanna Márkusné Zsibók zsibok@rkk.hu

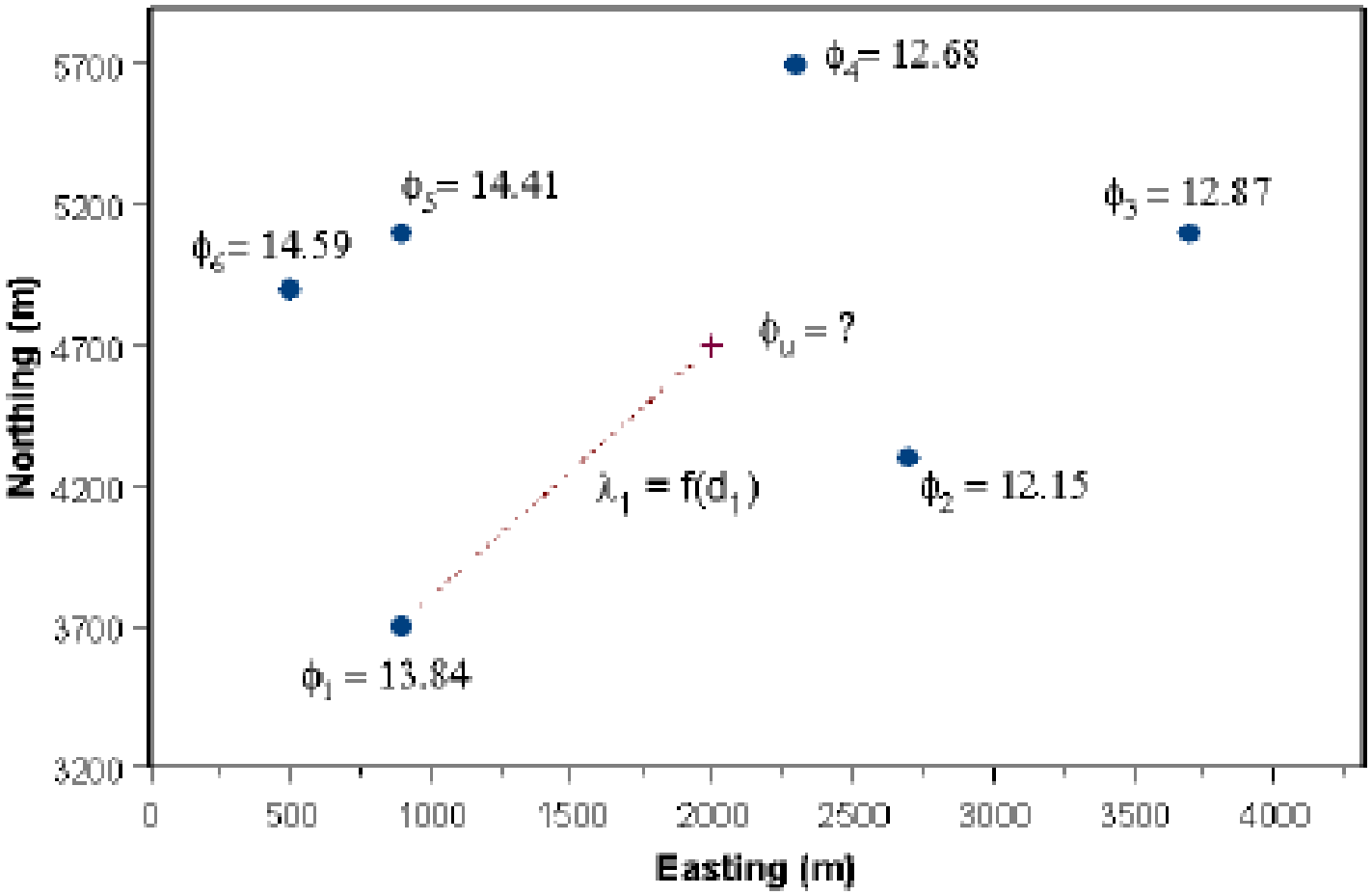
# Basic concepts

- Statistical interpolation: apply statistical relations between historical data at greater spatial resolution and smaller resolution
  - the estimation of a variable at an unmeasured location from observed values at surrounding locations
- Kriging (or Gaussian process regression)
  - named after Danie G. Krige
  - Interpolation algorithms estimate the value at a given location as a weighted sum of data values at surrounding locations
  - Almost all assign weights according to functions that give a decreasing weight with increasing distance
  - kriging assigns weights according to a data-driven weighting function (based on spatial covariance values)


Zsuzsanna Márkusné Zsibók zsibok@rkk.hu

# Spatial interpolation

- Bohling et al. 2005 p2.



# Other methods

- Inverse Distance Weighting interpolation
  - based on the common fact that the interpolated surface should be influenced most by nearby points and less by more distant points
  - the interpolation result is a weighted average of the scattered points
  - the weighting coefficients assigned to each scattered point diminish as the distance from the interpolation point to the scatter point increases
  - after a certain spatial limit the weights become 0 (no influence)
- Spatial interpolation through evaluating spatial autoregressive models
  - impose a linear regression structure to the spatial model
- Linear regression based method
  - the disaggregated data are regressed against the aggregated data or, alternatively, against a “driving” variable
- Simple decomposition based on time-invariant spatial weight structure
  - the initial weights are constant at the forecast period
  - the weight structre is based on a driving variable such as population or a complex index number
  - two kinds of weights:

nistic

tic (a certain distribution is assumed with a mean and variance)

# My ideas

- Regressing regional variables against the national-level variable and extrapolate the trend
- Regressing regional variables against population as a driving variable
- Mixing these two alternatives
- Using population forecast as a driving variable when allocating regional weights
- ???


Zsuzsanna Márkusné Zsibók
zsibok@rkk.hu

# Thank you for your attention!

The project is supported by the EEA Grants.

ID: EEA-C12-11

ICELAND
LIECHTENSTEIN
NORWAY
eea grants

REGIONAL ENVIRONMENTAL CENTER

MTA KRTK RKI

Zsuzsanna Márkusné Zsibók zsibok@rkk.hu