Estimation of the Number of Rights on Properties at the Community, Regional and National Levels, in Greece and their Use in Planning and Decision-making for the Development of the Hellenic Cadastre

Panos Lolonis, Ph. D.
Manager, Project Planning Office
Kos metropoli tou K.A. (Hellenic Cadastre S.A.)
Monastiriaki 240
CH-7752/1, 2010474-622
Tel.: +30 2102106505
grmail: plolomisplolomis@ktimologiko.gr

"Forecasting is risky, especially when it has to do with the future." – Joel Horowitz

Background
The Hellenic Cadastre

- The mission of the Hellenic Cadastre is to develop a permanent, uniform, systematic and updated registration of land properties in Greece and the rights that exist on them.
- The information would be presented by the Greek State.
- In addition, the Hellenic Cadastre would assure important valuable information that is necessary for the development and activation of the country.

Overview

- Background
- The problem
- Data available
- Approach to solve the problem
- Specification of the model (calibration, internal validity, external validity)
- Use of the model to estimate the number of rights in Greece
- Use of the model in planning and decision making
- Conclusions

Background
Cadastral surveying projects

- Programs
  - Program A
    - Start 1995
    - Municipalities: 66
  - Program B
    - Start 1997
    - Municipalities: 51
  - Program C
    - Start 1999
    - Municipalities: 51

- Expected completion: 2004/2005

- Aggregate statistics:
  - Number of municipalities: 725 (68%)
  - Total area covered: 6,055,220 km² (66%)
  - Number of rights: 2,000,000 (17%)
  - Transferred cadastral offices: 2,000 (25%)

The Problem

- Estimate the number of property rights in each municipality in Greece.
- Rights collected:
  - Freehold
  - Leasehold
  - Mortgage
  - Purchase
  - Servitudes
  - Landlord

- Municipalities in Greece: 725.
- Importance to solve the problem:
  - The number of rights is the most important input data of the cadastral survey procedure.
Data available

- Urban area
- Rural area
- Grassland area
- Forest area
- Number of dwellings
- Number of agricultural parcels
- Number of businesses using agricultural land
- Number of rights registered at "1st Publication" for each municipality in the first three Programs
- Monthly rates of registrations of rights in each municipality in the project

Approach to solve the problem

Three stage approach
- Specify a model that estimates the number of rights at the time of "1st Publication".
- Estimate the rate of change of the number of rights after the "1st Publication".
- Compute the number of rights at "1st Registration".

Specification of the model

Multivariate Regression Analysis

Regression model (calibrated on the data of the 1st Main Program)

\[ N_{Rights} = 2.01 \times R + 2.31 \times D + 1.26 \times U + 0.08 \times G - 2.44 \times O \]

- \( R \): Number of rural parcels
- \( D \): Number of dwellings
- \( U \): Urban area (in 1000's of sq. meters)
- \( G \): Grassland area (in 1000's of sq. meters)
- \( O \): Number of businesses using agricultural land

\( R^2 \): 0.98

Standard Error: 3.517

Number of observations: 217

F-statistic (5, 212): 1922 (Significance: 8E-174)

Specification of the model

Internal validity checks

- Multicollinearity
- Heteroskedasticity
- Correctness of model specification
- Spatial aggregation
- Autocorrelation

Specification of the model

External validity checks

- Check against Pilot A Data
  - Deviation: 7% at the Program Level
- Check against Pilot B Data
  - Deviation: 1% at the Program Level

Estimation of the number of rights at the stage of "1st Publication"

Total number of rights for the country

\[ N_{Rights} = 29,400,000 \]

Standard error = \( \pm 1,000,000 \) (±3%)

95% Confidence interval:

\[ [27,450,000 - 31,350,000] \]

99% Confidence interval:

\[ [26,800,000 - 32,000,000] \]
Estimation of the rate of change of the number of rights after the “1st Publication”

- Use trend analysis to determine the rate of change
- \( R_m = 0.75 \) (rights/month)
- Estimation of the coefficient for converting the number of rights at “1st Publication” into the number of rights at “1st Registration”
  - \( \alpha = 1.12 \) (an expected 12% increase in the number of rights)
- Estimation of the total number of rights at “1st Registration”
  - \( N_{Rights_{1stReg.}} = 1.12 \times N_{Rights_{1stPubl.}} \)

Estimation of the number of rights at the stage of “1st Registration”

- Total number of rights for the country
  - \( N_{Rights_{1stReg.}} = 32,900,000 \)
  - Standard error = \( \pm 1,150,000 \) (\( \pm 3.5\% \))
  - A “2-sigma” confidence interval: \([30,600,000 – 35,200,000]\)

Use of the model in planning and decision-making

- Estimate cost of the project
- Determine number of rights in urban and rural areas
- Incorporate uncertainty in costing and planning
- Delimitate protected areas
- Develop scenarios about various project planning choices

Conclusions

- A model was presented for estimating the number of rights in Greece at various geographical aggregation levels (municipal, regional, national).
- The model has been validated internally and externally and used to estimate the number of property rights in Greece.
- The expected number of rights is 32,900,000 \( \pm 1,150,000 \).
- The “goodness of fit” of the model, as well as its accuracy, are satisfactory (\( R^2 = 0.98 \), Accuracy = \( \pm 3.5\% \)).

“Forecasting is risky, especially when it has to do with the future.”
- Joel Horowitz