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Using Statistical Inference in Macro-Economic Statistics:

Challenges, Obstacles, Misunderstandings

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Outline

- Aims of the social, economic and environmental statistics
- Approximations and estimates in social and economic statistics
- Expectations from mathematic statisticians to the economic statisticians
- Examples (statistics of economic activity, statistics of income and living conditions, household budget survey, GDP estimates)
- Challenges for future

Aims of the social, economic and environmental statistics

- The main aim is to quantify and analyze social, economic and environmental phenomena at given economic area
- Two views on social-economic statistics:
  - Practical discipline (collection, processing, presentation and analysis of data)
  - Theoretical/scientific discipline (finding of best practices related to methods and approaches how to quantify social and economic phenomena)

Approximations and estimates in the social and economic statistics

- Social and economic phenomena and their development are just *approximated* by the related indicators, in many cases there are more than one indicator for one phenomenon
  - (e.g. average wage; unemployment rates; inflation rates)
- Statistical indicators are just *estimated* (majority of indicators are based on sample surveys)
- Value of indicators is influenced by the particular methodology
- Example - inflation rate
  - approximations – just consumer prices
  - estimates – sample of products, sample of retailers, estimated weights
  - methodological issues – type of the price index formula (Laspeyres)

Expectations from mathematic statisticians to the economic statisticians

- When the statistical indicators are not measured by estimated, the mathematic statisticians sometimes ask for the level of accuracy and reliability of estimates (confidence interval) which is typical for mathematic statistics

- In some cases it is possible to costruct the confidence intervals, in some cases it is not (and the economic statistics is slightly misunderstood)

- Important reminder: confidence intervals are related just to the sampling error, not to the non-sampling error (non-response, wrong data from responding enterprises / households / persons, not sufficiently clear methodology etc.)

Example 1 – Statistics of Economic Activity

- Data on number of employed, unemployed and economically inactive from the LFSS persons are published not just for the whole population, but also for the specific groups / areas:
  - Age group
  - Gender
  - Education
  - Branch
  - Region
- Tables of 95% confidence interval are published
- Some data (4Q 2012):
  - Thousands of unemployed 379.5 ± 16.0 (± 4.2%)
  - Thousands of unemployed in Olomoucky region 26.6 ± 4.5 (±16.7%)
  - Rate of unemployment CZ total 7.2 % ± 0.3 %
  - Rate of unemployment Olomoucky region 8.5 % ± 1.4 %
- Possibility of comparison of the results from Census and from the LFSS

Example 2 – Statistics of Income and Living Conditions

- Data on the level of income, income poverty, living conditions, health status etc., including subjective feelings of household members, are published including the 95% confidence intervals
- Examples (2011):
  - Net money income per capita (CZK): 149,564 ± 2,618 (±1.8%)
  - Self-employment income per capita (CZK): 23,203 ± 2,314 (±10.0%)

  - Net money income per capita in Olomoucky region (CZK):
    127,661 ± 8,050 (± 6.3%)

Example 3 – Household Budget Survey

- Data on household's expenditures on consumption are collected and processed
- Households keep the detailed evidence of individual expenditures on consumption.
- Confidence intervals are not relevant due to the sampling scheme (quota sampling) preferred for the high level of non-response.

Example 4 – Gross Domestic Product

- Three approaches (methods) of GDP estimate:
  - Production Approach
  - Expenditure Approach
  - Income Approach

- Production and Expenditure Approaches are mutually independent
- In both approaches the sampling and non-sampling errors occur
- The estimate of GDP by production approach is different from the estimate by expenditure approach
- Question for NSIs: to balance or not to balance?
  - When balanced, expert approaches to balancing are used (individual items are balanced)
  - No possibility to estimate variance and confidence intervals (although it should be useful to say that GDP y-o-y growth is 1.5 % ± 0.4 %...)

Challenges

- Usage of statistical inference is used in the Czech Republic according to the best statistical practice and could be just slightly improved
- Usage of other mathematical and statistical methods should be developed, e. g. at construction of the flash estimates of GDP
  - Analysis of coherence between statistical indicators, multi-dimensional analysis of time series etc.

Conclusion

- Statistical data are just the approximation of the social and economic reality.
- Statistical indicators are not measured, by estimated.
- For just small number of estimates it is possible to construct the confidence interval (but also for them take the non-sampling error into account!)
- The estimates are much less accurate for smaller area (it is known generally, but consider it at comparison of specific groups or regions especially using surveys with small number of observations)
- Using of mathematical and statistical method could be further developed at the official statistics.

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Questions and remarks are welcome.

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