On representativity and quality of Big Data for Real Estate Market Analysis

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Outline

Motivation

Key motivation points

- Shifting paradigms in Official Statistics (from surveys to registers to new data sources),
- Looking beyond administrative sources,
- Internet data sources & Big Data,
- Importance of real estate market in economy.

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Current work on internet data sources - selected topics

- Online auctions - Shmueli, Jank and Bapna (2005),
- E-commerce portals - Bapna et al (2006),
- Measure inflation - Cavallo (2012), MIT: the Billion Price Project,
- Measuring prices - Hoekstra, ten Bosch, Harteveld (2010), Daas et al (2011),
- Sentiment analysis - Daas et al (2013), Daas et al (2014a).
- Forecasting elections with non-representative polls - Wang W., Rothschild D., Goel S. and Galeman A. (under review in Journal of Forecasting).

First concept for measuring representativity of Big Data - Buelens et al (2014), Daas i Puts (2014b).

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- to propose a definition of Big Data/internet data sources in context of existing definitions,
- to present quality and representativity problems when analysing real estate using internet data sources,
- to present first results of assessing representativity of real estate market in Poland.

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Existing data sources

- Price and Value of Real Estates Register (pol. *Rejestr Cen i Wartości Nieruchomości*) - held by local governments in poviats (LAU1). Contains: transactions on primary and secondary market.
- Two research programs conducted by Central Statistical Office in Poland and National Bank of Poland:
  - residential resource management,
  - real estate trading and survey of prices of residential,
  - commercial property.

Real estate market as a hard-to-reach populaton

What is hard-to-reach population?

- Lack of list of all units,
- Problems when reaching and approaching units of this population,
- Problems when using classical approach to estimation (no design),
- Usage of non-probability samples (eg. respondent driven sampling, indirect sampling).

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REM as a hard-to-reach population

- Lack of registers of brokers, real estates,
- On one hand brokers are not willing to give information concerning their work (offers),
- On the other hand in order to sell real estate they need to present detailed information - mainly on the Internet.

Real estate market in Poland

Internet data sources

When speaking about Internet data sources we think about:

- brokers' portals (np. HomeBroker.pl, Metrohouse.pl),
- brokers associations' portals (np. REAL NET - nieruchomista.pl, PFRN - fagora.pl),
- portals offering support in sale (np. otodom.pl, domiporta.pl),
- portals that aggregate other portals (np. dom.money.pl).

. . . of different quality.
Existing research indicates that from 80% to 90% of people who bought real estates used Internet in order to get information (non-official statistics, otodom.pl and TNS Poland (2014)).

Big Data and Internet data sources

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Internet data sources and Big Data are not precisely defined in statistics. Terms are widely discussed in the context of Big Data characteristics pointed out by Bayler (2011) and Lanley (2012) in 3 (or more) Vs definition - volume, velocity and variety.

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Which is also true for some types of Big Data.

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- ...
- Place in statistical information system.

Concept of representativity I

Kruskal and Mosteller (1979a, 1979b, 1979c) definitions

The key elements of statistical data sources are representativity and quality. In literature many definitions can be found, but none is given explicitly. Kruskal and Mosteller (1979a, 1979b, 1979c) made a complex literature review and presented nine definitions of representativity. In the papers authors refer to the following aspects:

- general acclaim about data,
- lack of selective forces,
- miniature of population,
- typical/ideal cases,
- reflects variability of population,
- definition without explaining what it means,
- refers to specific sampling methods (equality of probability of inclusion),
- provides good estimation,
- fit to specific purposes.

Bethlehem definition

Bethlehem (2009) defined representativity with respect to sample when *relative distributions are the same in sample and population*. It means that sample is representative when **characteristics of sample and populations are the same**. This statement can be understood that representative sample is the same as miniature of population by Kruskal and Mosteller (1979a, 1979b, 1979c).

Concept of representativity

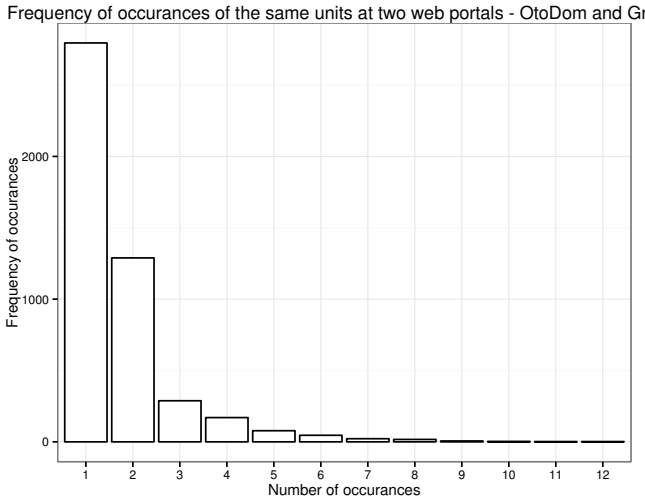
In context of which representativity definition should we assess representativity? Or we need another definition?

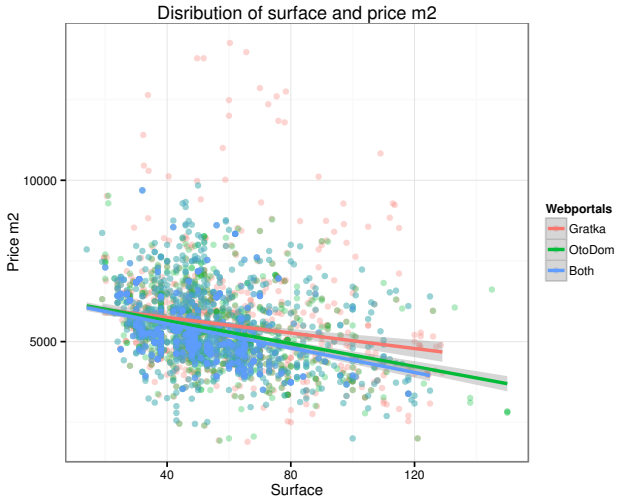
- miniature of population ...
- or more precisely definition proposed by Bethlehem (2009) - characteristics of sample is the same as in the population

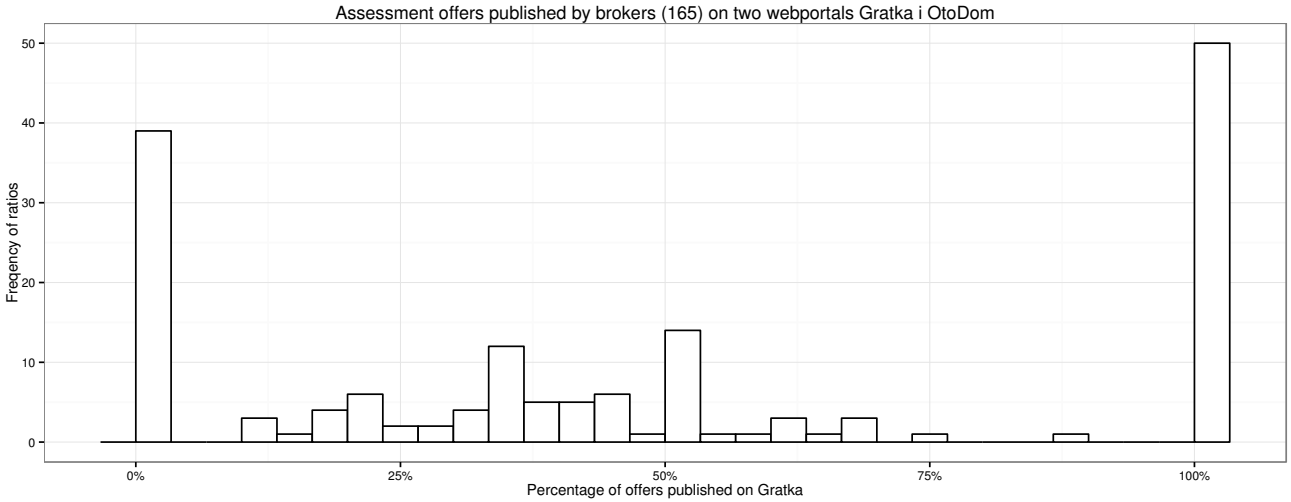
Research

- Web scraping algorithm was developed (in R with RCurl, XML and httr packages),
- Three web portals were choosen - otodom.pl, gratka.pl and nieruchomosci-online.pl (for the last was the longest time period),
- Population - flats offered on secondary market in Poznań, Poland.
- Reference research by National Bank of Poland and Central Statistical Office was taken.

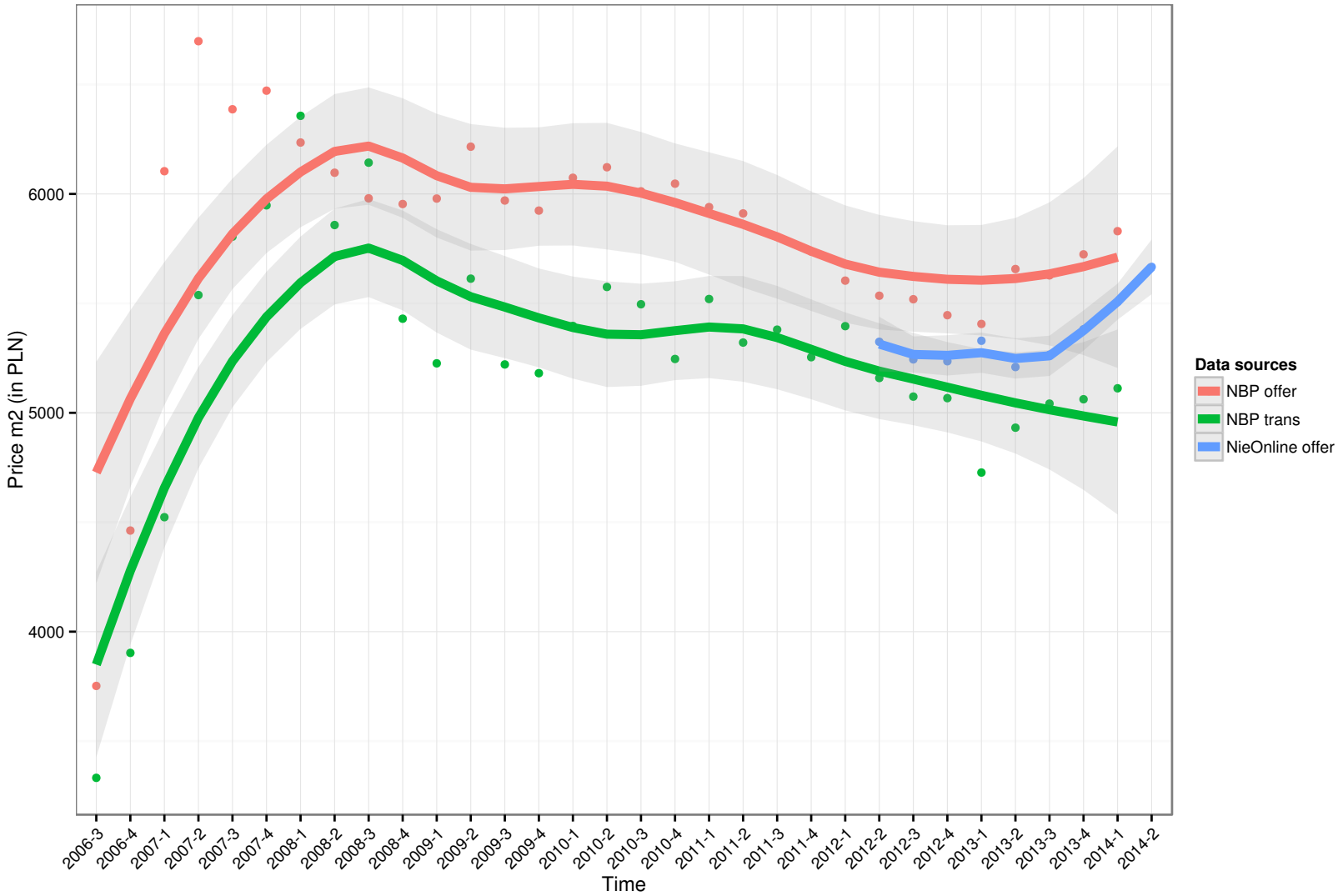
Selectivity



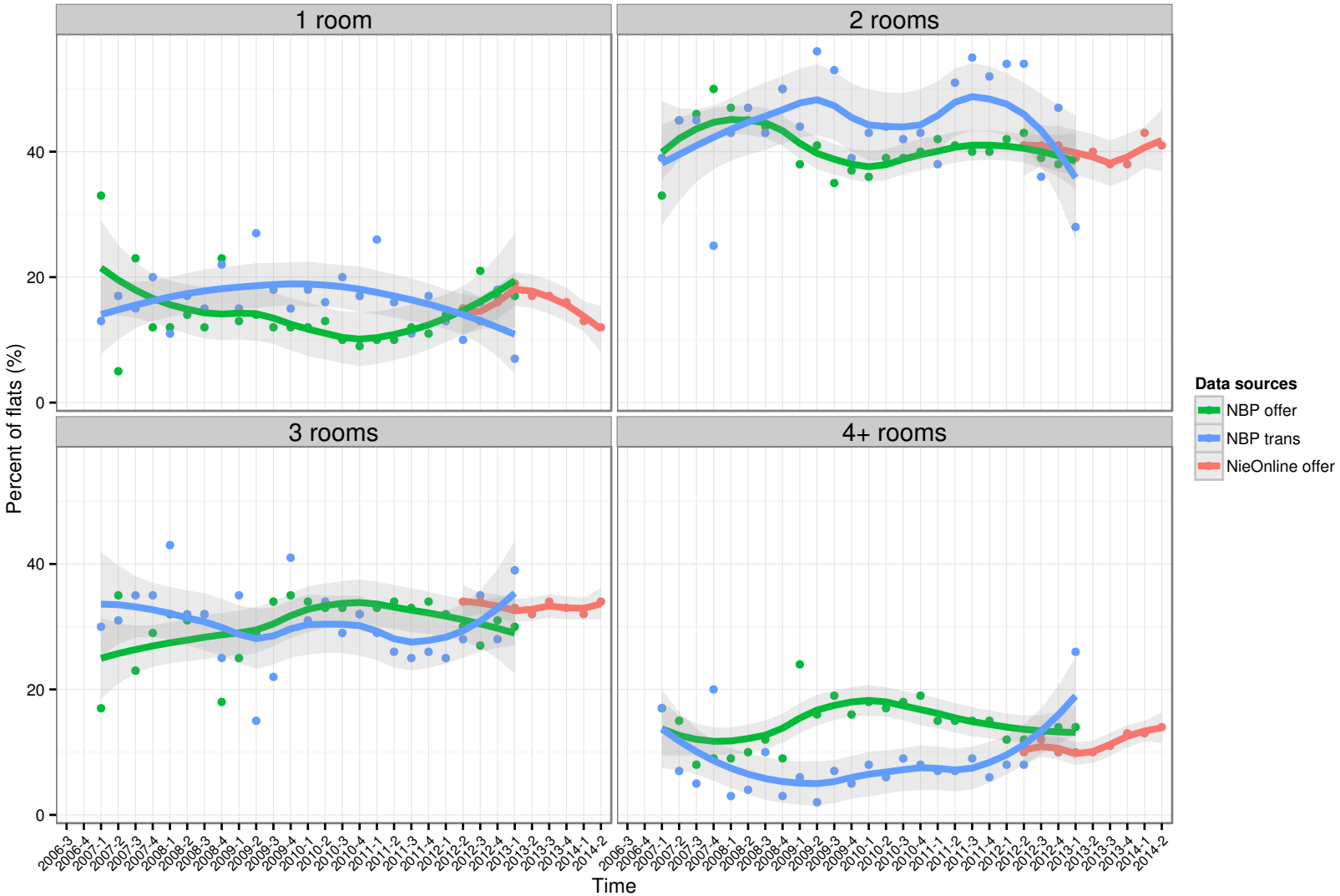




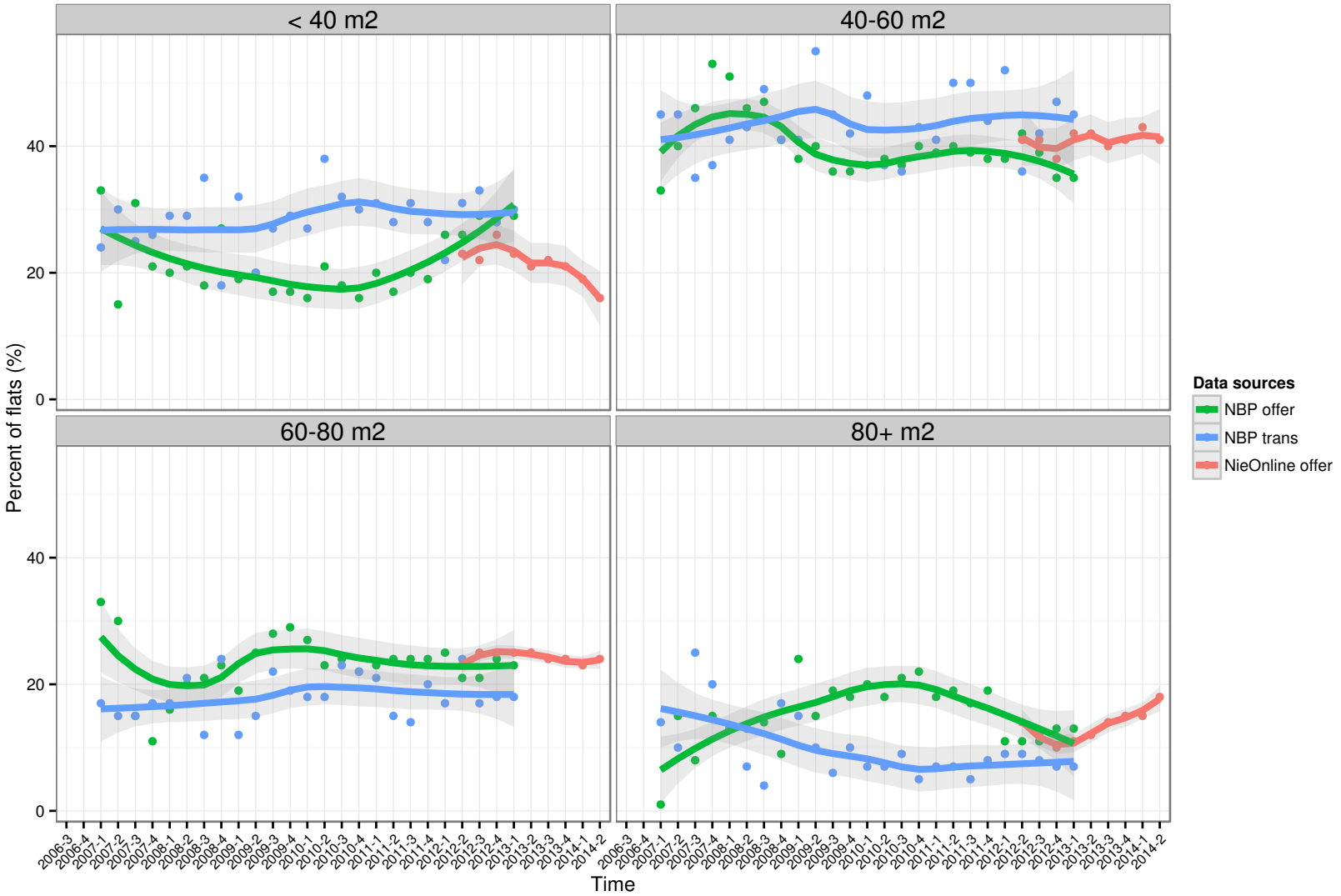
First results - Price m2 in Poznań, Poland



First results - Rooms in Poznań, Poland



First results - Surface in Poznań, Poland



Comments

- Selectivity is visible between portals,
- Undercoverage of small flats (<40 m2),
- Differences between offer prices reported by NBP and one of the portals (nieruchomosci-online.pl),
- Further assessment and comparison to other two datasets is needed,
- Data from 2013 is still not available ...

Thank you for your attention!

Contact

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