

Błażej Kochański*

20+ years of Polish residential real estate prices – a house price index proxy

Introduction

Trends in house prices are followed by governments and private sector analysts as well as households for various reasons, including, inter alia, economic growth assessment, shaping monetary policy, estimation of wealth. In many economies house price indices have been available for many years. In Poland, the official index recently introduced by the Central Statistical Office (GUS) goes back in time only to 2010.

The aim of this paper is to propose a house price index proxy going back further to history – the quarterly series of the proposed index goes back to 2006 and the series with yearly frequency goes back to 1995. In order to attain this goal various data sources are gathered – some of them are unfortunately fragmented and methodology/assumptions behind them are not always clear. However, as they show quite similar trends, it is possible to use them to propose an index (or, at least, a “proxy” of an index), which may be improved when additional data are found or collected.

In the first section of the paper current practices in the area of house prices measurement are shortly discussed; in the second section current indices for Poland are presented. Next, the available time series on Polish residential property prices are described. Fourth section contains a proposal for the house price index proxy and shows that it fits well to the “cloud” of available data. Fifth section discusses two “false trails”, which may be mistakenly taken as time series representing trends in Polish residential real estate prices.

1. Residential property price indices – current practices

Investors, financial institutions, governments, regulatory bodies as well as households and academic analysts are interested in house prices changes in time. Residential real estate price indices are constructed all around the world as an aid in tracking the trends of house prices. Such indices have many uses including economic growth assessment, aid in shaping monetary policy/financial stability policy, household wealth estimation,

* PhD, Department of Economic Science, Faculty of Management and Economics, Gdańsk University of Technology, ul. Gabriela Narutowicza 11/12, 80-233 Gdańsk, bkochanski@zie.pg.gda.pl

deflator in the national accounts, inter-area and international comparisons. [Handbook, 2013, p. 16]. Individual citizens look at the indices when making decisions about buying/selling houses and flats or taking mortgages. Banks use such indices to assess portfolio credit risk and perform stress tests [Schuermann, 2014]. It is difficult to make optimal economic decisions regarding real estate and household budget management and it is impossible to understand real estate and credit market without summarized information on tendencies in house prices.

Variety of approaches and data sources are used to construct residential price indices. Data on house prices come from brokers, registers, newspapers, real estate agents, online intermediaries, mortgage lenders, lawyers, notaries or land registers. The indices may be based on transaction price, but also on initial or final asking price, the offer price or an expert valuation. Various methods are used to construct a summarising information: starting from simple measures of central tendency (mean or median) with stratification/mix adjustment methods through hedonic regression methods, repeat sales methods (with a famous Case-Shiller index as a most prominent example) and methods based on appraisal data. Also the index may cover combination of land, flats or houses, newly built or existing, stock of residential real estate or stream of houses/flats being sold. An informative summary on all of above aspects is provided by Eurostat [Handbook, 2013].

2. Indices currently available in Poland

Currently in Poland there are two main residential indices publicly available:

- a Central Statistical Office (GUS) House Price Index (HPI) covering the whole territory of Poland, published first in 2015, going back to 2010,
- NBP hedonic index, covering big cities whose data go back to the third quarter of 2006.

In the case of Polish Central Statistical Office index, the data come from administrative source: the Register of Real Estates Prices and Values established in all 350+ powiats (counties) in Poland. The methodology and details are described by R. Rechnio [2016]. The calculations of the index are based on the information on flats (single family houses are excluded). Data are compiled quarterly on the basis of transaction prices as specified in the notarial deeds, covers both newly built houses as well as transactions between households. The transaction prices include the value of land. Only market prices are taken into account, non-market transactions are excluded from the calculation. GUS obtains its values for the country as a whole, NUTS 2 regions and separately for the biggest cities. The new

and existing flat indices are available along with the total index. The HPI is a chain-linked Laspeyres-type price index; in order to control for changes in the mix, the stratification method is used. The choice of this method was dictated by the availability of data – the lack of sufficiently detailed description of properties made hedonic approach impossible.

Interestingly, the HPI is not part of standard set of macroeconomic variables available at GUS webpage at the moment. The most reliable and up-to-date source for this index is Eurostat database [<http://appsso.eurostat.ec.europa.eu/nui>, accessed: 22.09.2017].

NBP's hedonic index is based on hedonic methodology and is based on the BaRN database created by the National Bank of Poland. The data on transaction prices from the secondary housing market are gathered on voluntary basis from intermediaries and developers. The BaRN database covers both existing and new dwellings, and stores two kinds of prices (offer and transactional) for 17 cities. There are 80+ data series showing average prices per square metre available at the NBP's webpage [<http://www.nbp.pl/home.aspx?f=/publikacje/rynek>, accessed: 22.09.2017]. The house price index based on transaction prices was built with use of hedonic regression for the seven biggest cities [Widłak, 2013].

3. Poland. Going back further with data

The officially quoted Polish HPI from the Central Statistical Office (GUS) goes back only to 2010. It means it covers neither the outbreak of the global financial crisis (2008–2009) nor the time of housing market boom in Poland (2005–2007). NBP data start mid-2006 (NBP), so the boom period is covered only partially and the preceding period is not covered at all. This creates problems for some uses of the indices, when time series required need to be longer. For example the series are too short to use them as a deflator for the prices in longer term econometric analysis or to apply them in a bank's portfolio stress testing (which would need the boom, the preceding period and the crisis data).

Analysts or investors in need for longer time series may turn to some other data sources. Those sources are, however, quite limited, partial (cover just several years), the methodology behind them is not always clear, the underlying data and assumptions are not disclosed.

Table 1 summarizes information on available data on house prices including the frequency of the data (data points may be monthly, quarterly and yearly) and period covered; several other aspects are discussed in the remarks section.

AMRON/SARFiN report is the report prepared in the Centre of Banking Law and Information created by Polish Banks Association. This quarterly

report contains information on average transaction prices per square metre in several cities (including Warszawa, Białystok, Katowice, Wrocław, Gdańsk, Kraków, Poznań, Łódź). For further calculations the index based on the simple average of these time series will be used.

Expander is a financial intermediary and mortgage broker company in Poland. Regular report on house prices prepared by Expander in cooperation with szybko.pl real estate listing website and Metrohouse real estate agency has been regularly published on the Web. Data frequency is monthly. The report contains average offer prices in several cities based on mortgage and real estate intermediaries data going back to 2005. Also, transaction prices are available starting in 2011.

Before official introduction of official Polish House Price Index, information on Polish house prices was published on Eurostat webpage as part of the framework of “alert mechanism” within macroeconomic imbalance procedures of EU. The data are not available online anymore, but it was available at European Commission page [ec.europa.eu/economy_finance/indicators/economic_reforms, accessed: 9.09.2013] and kept by the author. The data was available with yearly frequency for years 2005–2012.

Unfortunately, none of the sources enumerated above covers the period before 2005. The time series going back before that year are much more fragmented and less documented. For example, M. Żeliński [2007] prepared, based on the data available to him from Reas and Rednet consulting companies, a time series showing average per square metre house price in six biggest Polish cities and a resulting weighted price. Another such example is a report prepared by a representative of a real estate appraisal agency on taksator.pl [Zarzycki, 2007]. It contains average transaction price per square metre from Wrocław area calculated based on the data from commercial database built based on collected data from notaries. AD Drągowski, a real estate agency, was also trying to fill the gap resulting from lack of house price index. In the report published on their webpages in the past [Drągowski, 2007], they shared their indirect “index”, based on information about average intermediary commission in real estate transactions. The geographical area covered is unclear, most probably the data come mainly from Warsaw.

Another source covering period before 2007 was the data presented in NBP’s publication [Łaszek et al., 2009], where one of the charts presented average market price per square metre in Warsaw. According to the authors the series was “based on GUS, NBP and PONT Info data”.

Table 1. Sources of data on Polish house prices trends

Data source	Data frequency	Period covered	Remarks
GUS (Central Statistical Office)	quarterly	since 2010	Stratification method, based on government real estate prices register.
NBP (National Bank of Poland)	quarterly	since 3 rd quarter of 2006	Hedonic index based on the secondary market data (7 cities).
AMRON-SARFiN (report by the Polish Banks Association)	quarterly	since 1 st quarter of 2006	Average transaction prices in several Polish cities based mainly on Polish interbank data.
Expander offer prices (Expander/ szybko.pl/ Metrohouse report on real estate prices)	monthly	since 2005	Average offer prices in several cities based on mortgage and real estate intermediaries data.
Expander transaction prices	quarterly	since 2011	Average transaction prices in several cities based on mortgage and real estate intermediaries data.
Eurostat – experimental index, data were available as SB_A_NOMHOUSE variable in an “Alert Mechanism Framework”	yearly	2005–2012	No explanation regarding methodology, not available online at the moment.
Reas/RedNet – data collected from consulting companies reports by M. Żeliński	yearly	2000–2007	Data on average prices of square metre in newly built flats.
Taksator.pl – analysis prepared by real estate appraisal agency representative – D. Zarzycki	quarterly	1 st quarter 2004 – 2 nd quarter 2007	Average transaction prices in Wrocław agglomeration from commercial register of notary data.
AD Drągowski – real estate price index prepared by real estate agency	yearly	1992–2007	Index based on information on average intermediary commission in real estate transactions, probably mainly in Warsaw.
Research paper by Łaszek/ Widłak/ Augustyniak – Average prices in Warsaw [Łaszek et al., 2008, p. 39]	yearly	1995–2007	Average market price per square metre in Warsaw (“based on GUS, NBP and PONT Info data”), no further details available.

Source: Own elaboration.

4. House Price Index proxy construction

The data described in previous section and in Table 1 may be used to derive a house price index proxy. Assumptions behind the proposed proxy are following:

- starting point would be existing House Price Index presented by Eurostat/GUS for period starting in the first quarter of 2010, this also means that index=100 would represent average prices in 2010¹
- available information from other sources will be used in order to go back in history as far as to 1995.

Such an index would have to be called a “proxy” as it would be based on fragmented and not fully compatible data.

First step to build an extension of existing GUS index is possible thanks to the hedonic index proposed by NBP. In order to rescale the latter to fit the former, linear regression with zero intercept is used (period 2010–2016 was used). This is practically equivalent to shifting the NBP index so that it fits average GUS index. Thanks to this move the quarterly GUS index can be extended back in time to cover the period starting in the third quarter of 2006. Similar approach may be used to further augment the index proxy back to the beginning of 2006 using AMRON/SARFiN data. With those two uncomplicated steps, we are able to arrive at an index proxy of quarterly frequency covering period of 11 years. The results of such procedure are shown in Table 2.

Table 2. HPI and HPI proxy – quarterly data

Quarter	Index	Quarter	Index	Quarter	Index
2006Q1	62,92**	2010Q1	99,05	2014Q1	91,99
2006Q2	66,29**	2010Q2	100,25	2014Q2	94,02
2006Q3	69,21*	2010Q3	100,39	2014Q3	93,42
2006Q4	81,93*	2010Q4	100,32	2014Q4	93,63
2007Q1	91,80*	2011Q1	100,25	2015Q1	93,79
2007Q2	104,75*	2011Q2	100,90	2015Q2	95,10
2007Q3	109,82*	2011Q3	99,80	2015Q3	95,28
2007Q4	108,75*	2011Q4	99,34	2015Q4	94,57
2008Q1	107,05*	2012Q1	98,00	2016Q1	94,69
2008Q2	106,45*	2012Q2	97,35	2016Q2	95,48
2008Q3	104,35*	2012Q3	96,02	2016Q3	97,27
2008Q4	105,13*	2012Q4	94,96	2016Q4	98,34
2009Q1	99,75*	2013Q1	92,51		

¹ Please note, that Eurostat changed the basis of their index recently, now 2015 being the base (index=100) year. The proxy index may be rescaled accordingly.

Quarter	Index	Quarter	Index	Quarter	Index
2009Q2	98,18*	2013Q2	92,33		
2009Q3	99,31*	2013Q3	92,26		
2009Q4	99,73*	2013Q4	92,31		

Legend: *proxy based on extrapolation using regression based on NBP index

**proxy based on further extrapolation based on AMRON data

Source: Own elaboration.

Unfortunately, the data available for the years before 2006 are in most cases of yearly frequency, that is why it is not possible to provide a quarterly proxy. The proxy for years 1995–2005 will be thus available only with yearly frequency. The proxy was constructed as follows: 1) yearly time series were produced from quarterly proxy obtained so far, 2) available time series described in Table 1 were adjusted to produce a fixed-base indices, 3) individual fixed-base indices were shifted so that their 2007 value is equal in each case to the value of the proxy index for that year, 4) a simple average was taken from all indices which were available for the given year.

The proxy calculated in such a process is presented in Table 3.

Table 3. HPI and HPI proxy – yearly data

Year	Index	Year	Index	Year	Index
1995	29,80**	2003	49,23**	2011	100,07
1996	35,33**	2004	51,49**	2012	96,58
1997	38,73**	2005	57,10**	2013	92,35
1998	40,35**	2006	70,09*	2014	93,27
1999	40,61**	2007	103,78*	2015	94,69
2000	43,38**	2008	105,75*	2016	96,45
2001	44,17**	2009	99,24*		
2002	45,76**	2010	100,00		

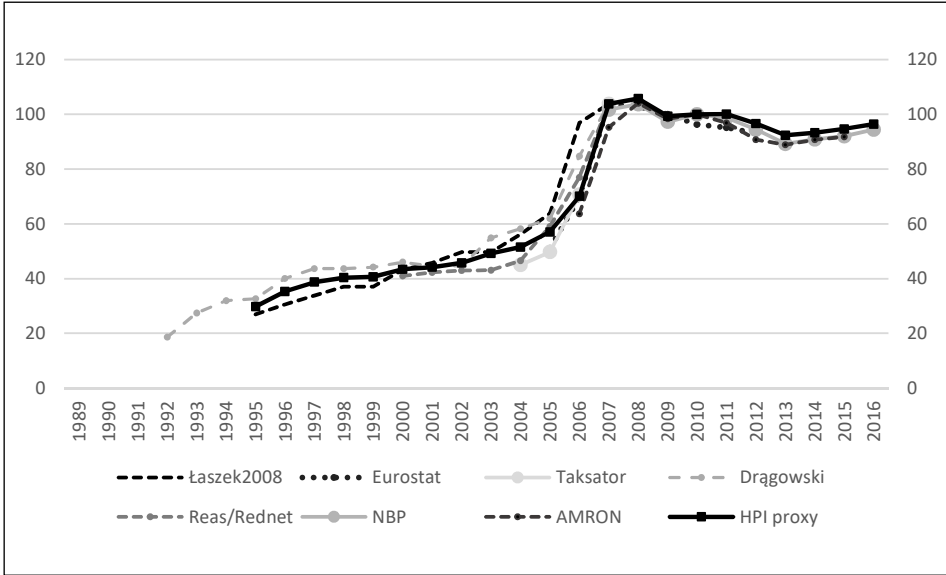
Legend: * proxy based on extrapolation using regression based on NBP and AMRON index

** proxy based on further extrapolation based on other data from Table 1.

Source: Own elaboration.

Figure 1 presents a proposed yearly HPI index proxy plotted against source data. It should be noted that all the data on the chart have been translated to the form of fixed-based indices and rescaled adequately. As it can be intuitively read from the chart, the proposed index proxy fits quite well into the “cloud” of available data.

Figure 1. Proposed HPI proxy against source indices



Source: Own elaboration.

5. Polish residential real estate data – “false trails”

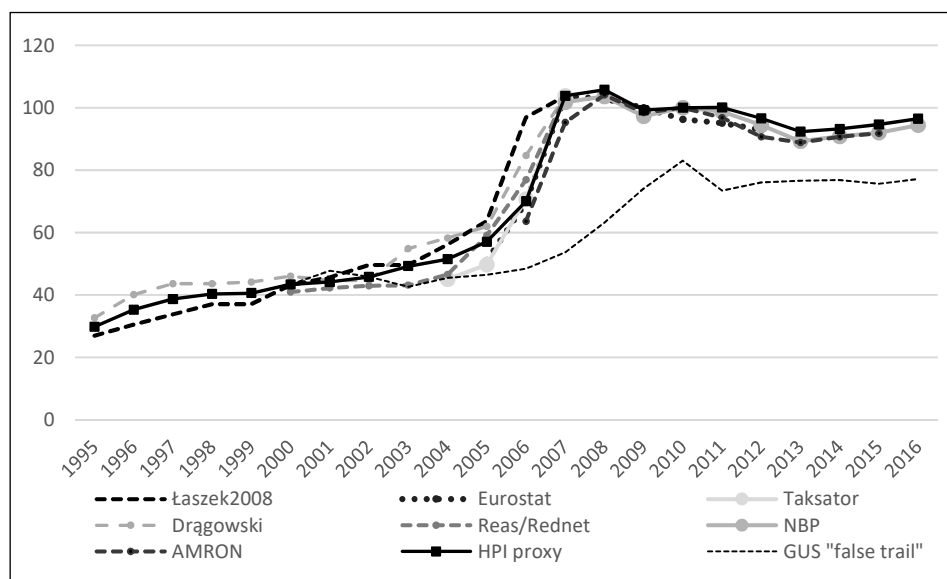
An analyst or researcher looking for data on Polish house prices can easily stumble on data that resembles a house price index, but is inconsistent with majority of other sources. Indices based on such data will be called a “false trail” for the purposes of this paper.

One of such “false trails” is the information on “the price of a square meter of usable floor space of a residential building” available on webpages of the Central Statistical Office (GUS). This times series seems quite appealing: the name suggests it could be treated to derive a simple house price index and – even more importantly – the series goes back in time as far as to the fourth quarter of 1998.

Unfortunately, GUS themselves warn that this series “cannot be used as a price of square metre of usable floor space of residential buildings completed or for analysis such prices offered in housing market” – it cannot constitute a basis for a house price index. As it is claimed on their webpage the data should be understood as “as average outlays for the whole country incurred by investors for the construction of multi-dwelling buildings per 1 square metre of the usable floor space of a building”. This means that the time series, despite the name under which it appears on the official statistical internet site, does not represent the prices, but rather the construction expenses.

As it can be seen on Figure 2, the GUS construction cost follows quite a different path than all the other data on house prices. This should also reinforce the claim that it cannot be used for a house price analysis. Still, some researchers may mistakenly use this data as Polish house prices indicator, an example could be Favilukis et al. [2013].

Figure 2. Illustration of “false trail 1” – GUS construction cost



Source: Own elaboration.

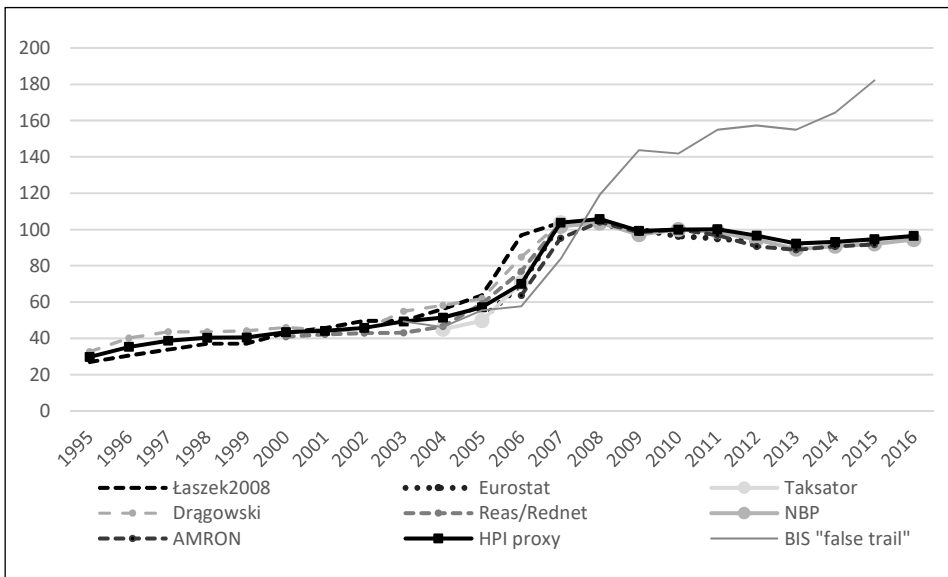
Another notable example of “false trails” are some of time series presented at the webpage of the Bank of International Settlements from Basel. As part of their statistics gathering effort, the Bank collates data on house prices for various countries. The database contains more than 300 price series for more than 50 countries [Scatigna et al., 2014]. In case of Poland, it reports – inter alia – the data on house prices and the house price indices from GUS and NBP. However, there are some data series reported for Poland in the data base whose source is not exactly clear. This is the case for the time series with yearly frequency – there are six of them, allegedly coming from the Central Statistical Office, but the link given in the database results in an error and suggests a document from 2008 while the latest data point is from 2015.

The series covers single-family houses and flats for the whole country, urban and rural areas. As a note in the database says, “a series on prices of residential buildings are not very representative, as the market of residential buildings is still quite narrow”. Indeed, the series on houses as well

as the one on flats on rural areas, are quite erratic. But the two series on flats (for the urban areas and for the whole country) seem consistent (and similar). However, the confrontation of any of them with the data gathered from other sources show they are incompatible – so this is, most probably, another “false trail”. Figure 3 illustrates the problem. The dynamic growth of years 2005–2007 seems to be delayed in these data (which may be explained, as a note in the database says, by a lag in registration in notary acts for newly built dwellings). More worryingly, the growth continues after 2009 when other time series flatten out. The reason may be the mix of reported transactions.

As the BIS database seems to be widely used for the real estate price analysis there is a risk that “false trails” from this database are also mistakenly taken as correctly representing the trends in the Polish market. As in the previous case, using them may seem appealing: the time series starts in 2003, several years earlier than GUS/NBP indices.

Figure 3. Illustration of “false trail 2” – BIS database time series



Source: Own elaboration.

Conclusion

The index proposed in this article may be useful for analysts looking for time series on Polish real estate prices going back in time further than 2006–2010.

The proxy index may be improved when new data on house price history, especially from before 2006, become available. It is possible that

institutions that internally store and process data on house prices (banks, notary registers, other) will be willing to share their data with the public. Also, systematic effort of gathering the data dispersed in paper sources like notary acts or banking transactions documentation could also help develop better basis for the reliable index.

The derivation methodology of this proxy index is not sophisticated and one may have legitimate objections regarding the data sources and their compatibility. However, the proxy seems to be better than its alternatives. In case of lack of such index an analyst or researcher has an option to abandon the research idea or exclude Poland from the research (which does not seem to be a constructive solution) or follow above mentioned "false trails" (which, in turn, may result in unreliable results and wrong conclusions).

References

- Detailed data set on nominal residential property prices*, Bank of International Settlements, www.bis.org/statistics/pp/pp_detailed.xlsx, accessed: 22.09.2017.
- Dragowski L. (2009), *Wskaźnik zmian cen na rynku nieruchomości*, http://www.dragowski.pl/strona/wskaznik_zmian_cen, accessed: 28.11.2012.
- ec.europa.eu/economy_finance/indicators/economic_reforms/api/data.cfm?application_name=mip&timeSeries=&group=SBA&country=&year=&format=excel&FC=1&L=1&LY=1&x=0&v=L, accessed: 9.09.2013.
- Favilukis J., Kohn D., Ludvigson S.C., Van Nieuwerburgh S. (2013), *International capital flows and house prices: theory and evidence*, in: E.L. Glaeser, T. Sinai (eds.), *Housing and the Financial Crisis*, National Bureau of Economic Research, University of Chicago Press.
- http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=prc_hpi_q, accessed: 22.09.2017.
- http://www.nbp.pl/home.aspx?f=/publikacje/rynek_nieruchomosci/index2.html, accessed: 22.09.2017.
- Handbook on Residential Property Prices Indices (RPPIs)* (2013), Eurostat Methodologies & Working papers, <http://ec.europa.eu/eurostat/documents/3859598/5925925/KS-RA-12-022-EN.PDF>, accessed: 22.09.2017.
- Łaszek J. (2004), *Sektor nieruchomości mieszkaniowych w Polsce: stan i perspektywy rozwoju*, Szkoła Główna Handlowa, Warszawa.
- Łaszek J., Augustyniak H., Widłak M. (2009), *Euro a ryzyko bąbli na rynku nieruchomości mieszkaniowych*, „Materiały i Studia”, nr 238, Warszawa.
- Rechnio R. (2016), *The Polish experience in developing House Price Index*, Meeting of the Group of Experts on Consumer Price Indices, Geneva, http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.22/2016/Session_5_Poland_The_Polish_experience_in_developing_HPI.pdf, accessed: 22.09.2017.
- Scatigna M., Szemere R., Tsatsaronis K. (2014), *Residential property price statistics across the globe*, „BIS Quarterly Review”, September 2014.
- Schuermann T. (2014), *Stress testing banks*, „International Journal of Forecasting”, Vol. 30.

- Widłak M. (2013), *The hedonic house price index for Poland – modelling on NBP BaRN data*, Narodowy Bank Polski International Workshop, Zalesie Górne, https://www.nbp.pl/badania/konferencje/2013/realestateworkshop/pdf/hedonic_house_price_index_for_poland.pdf, accessed: 22.09.2017.
- Zarzycki D. (2007), *Analiza rynku wtórnego mieszkań na terenie miasta Wrocław – styczeń 2004 r. – wrzesień 2007 r.*, <http://taksator.pl/8-ze-starej-strony/41-id49.html>, accessed: 22.09.2017.
- Żeliński M. (2007), *Cena metra kwadratowego mieszkania wg GUS*, <http://opinieekonomiczne.blox.pl/2007/11/Cena-metra-kwadratowego-mieszkania-wg-gus.html>, accessed: 22.09.2017.

20+ years of Polish residential real estate prices – a house price index proxy (Summary)

Information on house prices is often considered crucial when assessing developments in economy. However, in Poland for the long time house prices haven't been tracked in an organized manner.

Recent developments, most notably house price indices developed by Poland's national bank and by the statistical office do not go back more than 10 years, therefore data series are relatively short compared to those of other macroeconomic data.

In the paper a collection of publicly available data on Polish house prices from various sources is presented. House price index estimate is then proposed which goes back to 1995 and covers periods of housing boom and the financial crisis. The index should be treated as a proxy due to the fact that the data availability is limited and the source data are based on various, sometimes not clearly articulated, methodologies. Nevertheless this proxy index may prove useful as – to the knowledge of the author – there has been no other publicly available attempt at reconstructing the latest history of residential real-estate prices in Poland. Furthermore, some researchers used to take inadequate data, like residential construction cost, as a proxy for house prices, which may have led to wrong conclusions.

The index may be further improved when new data emerge on history of house prices before 2006 and more advanced methodologies are used.

Keywords

house price index, Poland, residential real estate prices