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# DIVERSIFIED PRICE DYNAMICS IN SOME SUB-SEGMENTS OF THE HOUSING MARKET

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## Abstract

The observation of price movements on the real estate market is an extremely difficult task as we have to face problems belonging to two spheres. The first of them is the specific nature of real estate as marketable objects and of the real estate market itself. The second one is the character and quality of data on real estate transaction prices. In this article the author, based on an empirical study, attempts to prove that even in a single segment of a local real estate market the prices in individual sub-segments can fluctuate with different intensity. The range of price movements can be so vast that it seems pointless to apply a single averaged price index for the whole segment, and usually that is what analysts do.

**Keywords**: real estate market, real estate price indices.

**JEL classification:** R20.

## Introduction

An accurate estimation of price indices for the needs of the residential real estate market is an essential feature of real estate research (Clapp, Giacotto, 1992). Many organizations and individuals, such as financial institutions or house owners, are interested in house price movements (Francke, 2010). Yet, the observation of price movements on the real estate market is an extremely difficult task as we have to face problems belonging to two spheres:

1. The specific nature of real estate as marketable objects and of the real estate market itself.
2. The character and quality of data on real estate transaction prices.

The specific nature of real estate being an object of trade has been widely discussed in the literature dealing with the functioning of the real estate market. This specificity is manifested by a long list of such real estate features as its immovability, long-term usability, diversity, relative scarcity, close relation of its potential and value with its location, interrelation with other real estate, high prices and capital intensity, its capability to satisfy specific needs or to generate economic benefits and, last but not least, a number of related legal regulations including government controlled property registers such as land and mortgage registers or the registers of land and buildings, etc. (Dasso, Ring, 1989; Hozer et al., 2006; Brzeski et al., 2007). As a result of this unique nature of real estate, the real estate market differs from other markets of goods and services or capital markets. What distinguishes this particular market from others is its inhomogeneity (different kinds of property are traded, e.g. flats, commercial space, farming land), imperfection (it fails to meet the so called perfect market principles), poor elasticity of supply and demand, local character, the need for specialized services, low effectiveness (prices do not reflect the values of property) and others (see e.g. Kucharska-Stasiak, 1997; Zachodnie rynki…, 2004).

Difficulties in analysing changes in real estate prices which result from the character and quality of data on transaction prices lie mainly in (see e.g. Kokot, Pęchorzewski, 1999; Foryś, Kokot, 2001):

- poor availability of information about transaction prices (they are not published and whether a researcher can get access to notarial deeds/sales contracts or not depends on an official's arbitrary decision),
- expensive data acquisition (high cost of data or arduous self-study),
- limited reliability of prices contained in notarial deeds that happen to be, for various reasons, under- or overestimated,

– no data standardization (e.g. some sales contracts refer to useful floor area, the others – to footprint area or building volume),
– inhomogeneous data – each transaction represents a different building,
– transaction prices are an effect of buyers' subjective view of the property attributes (e.g. a buyer can pay a high price for an undistinguished property because it is located close to their workplace or their parents' home),
– a small number of transactions in short spans of time.

A separate problem is the methodology of research into the real estate price changes as we do not have here the classical time series where individual time spans, or moments in time, are attributed with specific values of the observed variable. Instead, we have a set of real property transaction prices with transactions being concluded at different times and involving different properties. The fundamental problem lies in transaction data scarcity for index estimation (Ebokhari, Geltner, 2010). The relative scarcity of transactions means that, even on not very small local markets, using a mean monthly price brings misleading results because in subsequent periods of time we obtain mean price values differing so much that the assumption that these differences result from real estate market fluctuations is obviously wrong. The research has proven that, under the present circumstances, in such Polish cities as Szczecin we can base the analysis on mean real estate prices calculated for spans of at least six months (Kokot, Bas, 2013). This is why in practice specific methods of analysing price dynamics on the real estate market have been developed. There are three commonly used methods of constructing price indexes. The first simply computes an average or a median price over all transactions, without any attempt to control the heterogeneity of sold houses. A more advanced index of that sort is computed for a specific housing type, such as, for example, a semidetached house of a certain size and quality. But the finer the partition, the greater the data requirements. The advantage is the ease of computing. However, the big drawback is that the selection of houses being sold may vary endogenously. The second commonly used index is the repeat sales index. It is estimated based on the price changes of the same house between subsequent transactions that are then weighted across houses. The index may produce biased estimates if the selection of houses that transact frequently is atypical; for example, if such houses tend to be of a higher quality than the general housing stock. The third index is the hedonic price index. It views a house as a collection of priced services and sums up these prices to obtain the value of a house. This methodology has many advantages. One potential drawback is the need to collect information on the multitude of house attributes that influence the value of the house, and these data may be unavailable (Nicholas, Scherbina, 2013).

As it turns out another important problem is the diversified price dynamics in selected sub-segments of the market, which has been proven in this article.

## 1. The Research Concept

Further in the article the author attempts to prove by way of an empirical study that even in a single segment of a local real estate market the prices in individual sub-segments can fluctuate with different intensity. The range of price movements can be so vast that it seems pointless to apply a single averaged price index for the whole segment. Earlier research has shown that housing prices change differently depending on the local market (Kokot, 2014). In this study the local housing market in Szczecin has been divided into three sub-segments:

- the sub-segment of flats in old pre-war tenement buildings covering almost entirely the area of the city centre – Sub-segment 1,
- the sub-segment of owner-type cooperative flats of the 1970s and 1980s located in the districts of Gumieńce, Krzekowo-Bezrzecze, Pogodno, Świerczewo, Pomorzany, Zawadzkiego – Sub-segment 2,
- the sub-segment of tenement buildings newly built by real estate developers in the suburban districts of Osów and Warszewo – Sub-segment 3.

The author of the study applies the former of the above mentioned methods of building real estate price indices, i.e. the indices based on average housing unitary prices. He uses the median unitary prices as the average prices attributed to individual time spans. In contrast to the arithmetic mean, the median is not sensitive to peak values, particularly to outliers which could significantly blur its value being the measure of a mean level of the observed phenomenon. The real estate market does not give grounds for us to expect that its price distributions were regular. Therefore, the median should be regarded as more secure, or more likely to reflect accurately the average level of transaction prices. The median unitary prices are determined for one-year spans of time, giving that they will ensure the representativeness of the observed prices because, due to a large number of transactions, the risk of the median being distorted by random factors is minimized. As it has been mentioned above, some research indicates that this effect can already be observed in the case of six-month periods. In this study the author has decided to determine median unitary price for longer, 12-month periods in order to guarantee that the data are fully reliable and that the study objective does not make it necessary to determine price change indices for shorter periods of time.

## 2. Sets of Statistical Data

The study uses data about real prices observed in Szczecin in transactions concluded between individuals from 2005 to the first six months of 2014. The ten-year observation allowed for grasping changes in prices in the specified above sub-segments of the local housing market in varying market situations as during that period the housing industry experienced a dynamic rise in prices in 2005–2008 to be followed by a gradual downtrend from 2009 associated with the economic crisis. Since 2012 the market has been stagnant. Table 1 shows the number of transactions registered annually in individual sub-segments.

Table 1. Number of transactions in individual housing market sub-segments in Szczecin in 2005–2014

| | Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014* |
| Sub-segment 1 | 160 | 445 | 417 | 417 | 362 | 425 | 441 | 716 | 774 | 413 |
| Sub-segment 2 | 217 | 546 | 472 | 585 | 613 | 715 | 640 | 696 | 795 | 358 |
| Sub-segment 3 | 15 | 90 | 161 | 140 | 217 | 284 | 241 | 232 | 139 | 66 |

* First half of 2014.

Source: author's own data base of transactions.

## 3. Empirical Study and Discussion of Results

In the study the author determined yearly median unitary prices of flats in the individual sub-segments and calculated the following kinds of indices:

1. the chain indices of flat prices in 2006–2014 calculated by means of the formula:

$$i^p{}_t = \frac{M^p{}_t}{M^p{}_{t-1}} \tag{1}$$

where:

$M^p{}_t$ – the unitary offer price median in the interval for which the index is determined in the sub-segment $p$,

$M^p{}_{t-1}$ – the unitary offer price median in the interval preceding the one for which the index is determined in the sub-segment $p$.

2. the fixed-base indices of flats in 2005–2014 calculated by means of the formula:

$$I^p{}_t = \frac{M^p{}_t}{M^p{}_T} \tag{2}$$

where:

$M^p_t$ – the unitary offer price median in the interval for which the index is determined in the sub-segment $p$,

$M^p_T$ – the unitary offer price median in the basic interval of 12 months in 2005 in the sub-segment $p$.

The results are presented in the figures.

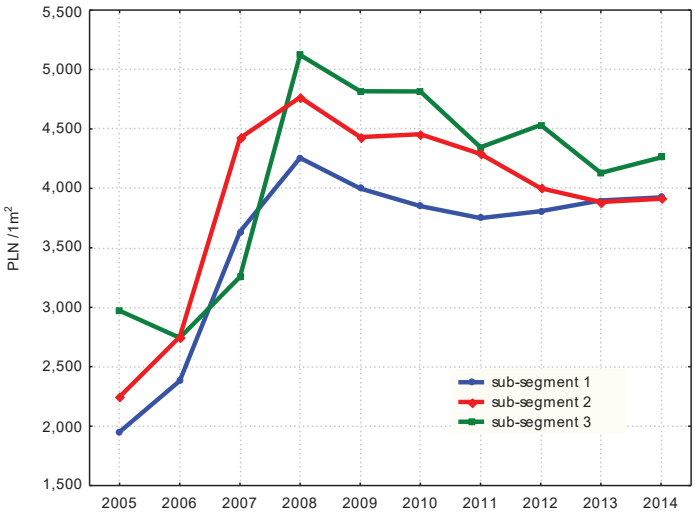


Fig. 1. Yearly unitary flat price medians in individual sub-segments of the housing market in Szczecin from 2005–2014

Source: own study.

Figure 1 shows the medians of unitary flat prices in three sub-segments of the Szczecin housing market. The fact that the prices do not differ significantly is hardly surprising and should be regarded as a natural phenomenon since various types of flats (in this study assigned to adequate market sub-segments) can be seen by buyers as more or less attractive, which eventually translates into the prices they agree to pay. It is interesting; however, that in the period of a strong upward trend in 2005–2008 we observed 'other' price surges in those sub-segments. Generally speaking, the least attractive and, in consequence, the cheapest were the properties in sub-segment 1 – low standard flats in pre-war tenement buildings. Sub-segment 2 contained slightly more better priced flats in the prefabricated large-panel housing estates, while sub-segment 3 consisted of the highest-standard and most expensive housing units built

in the 1990s and in the first decade of the 21st century. Such a price structure could still be seen in 2005 when the average price in sub-segment 1 was a little below 2,000 PLN/1m$^2$, and in sub-segment 3 – around 3,000 PLN/1m$^2$. In the face of pressing demand it was the prices of the cheapest flats (sub-segments 1 and 2) that started to rise first to reach in 2007 the average levels higher than those in sub-segment 3. Not until 2008 was the right proportion restored among the average prices in the individual sub-segments. What followed was the phase of slowly decreasing prices of flats in which we could see how the average price levels in the sub-segments were getting closer, especially between sub-segments 1 and 2 because flats in centrally located old tenement buildings were becoming more and more attractive. The trend has become strong enough to make the prices grow gradually from 2012. At the same time the prices of flats in the prefabricated large-panel housing estates have been falling, which is an effect of a steady supply of new projects that are relatively not much more expensive. As a result, the relationships among the prices in the sub-segments are constantly changing. From an objective point of view, these changes can be considerable as it can be seen in Figure 2 which shows the

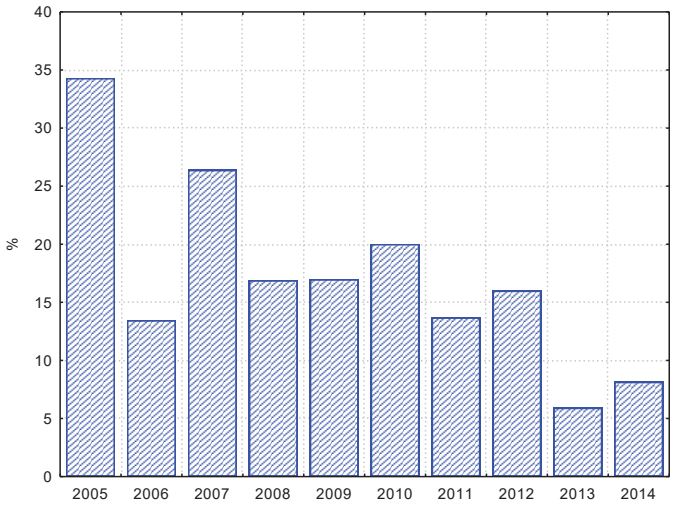


Fig. 2. Maximum differences among unitary price medians in percentage terms

Source: own study.

maximum relative differences between the average unitary price levels determined by means of the formula:

$$RM_t = \frac{M_t^{\max} - M_t^{\min}}{M_t^{\max}} \times 100\% \tag{3}$$

where:

$M_t^{max}$ – the median which is the largest among the ones determined for the analysed sub-segments in a given year (interval t),

$M_t^{min}$ – the median which is the smallest among the ones determined for the analysed sub-segments in a given year (interval t).

Apparently, in some periods (2005) the maximum differences in average prices across the sub-segments exceeded 30%, while in the others (2013) they barely reached 6%. Such vast differences in the relationships among prices will result in the highly differentiated values of price indices calculated for the sub-segments of this otherwise unified market.

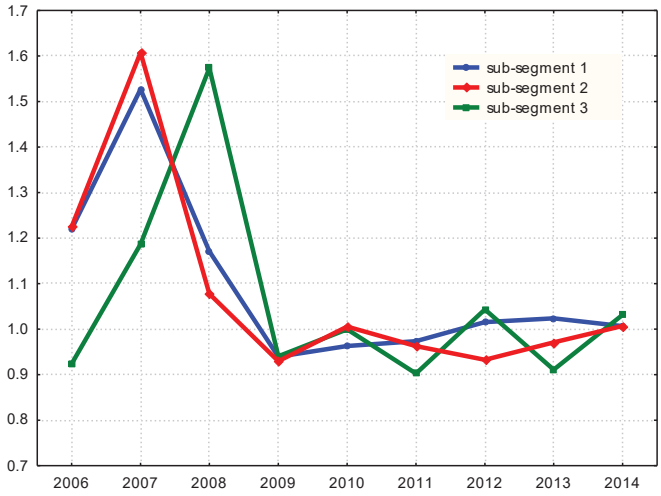


Fig. 3. Chain indices of the medians of annual unitary flat prices in individual sub-segments of the housing market in Szczecin from 2006–2014

Source: own study.

Figure 3 illustrates the chain indices determined for the observed sub-segments of the housing market in Szczecin. The indices provide information on how the average unitary flat prices were changing year to year. Generally speaking, the price movements in individual sub-segments were similar – the curves depicting the index values run according to a similar pattern. On the other hand, this impression is rather deceptive. When we take into consideration the fact that the disparities in the index values could even reach 0.5 (although they were generally lower than 0.1), those differences turn out to be quite considerable. What is more, the diagram shows that sub-segment 3 responded with some lag to the soaring demand for flats observed

in 2005–2008. Having accumulated over a longer period of time, such differences eventually lead to large disparities in the levels of fixed-base indices which give information about price movements in relation to a one fixed interval (in this study it was 2005), which is clearly shown in diagram 4. Evidently, within a decade the prices of flats in sub-segment 1 rose by app. 100% (the index value being 2.01), in the sub-segment 2 – by almost 75% (the index value of 1.74) and in sub-segment 3 – by 40% (the value index of just 1.43).

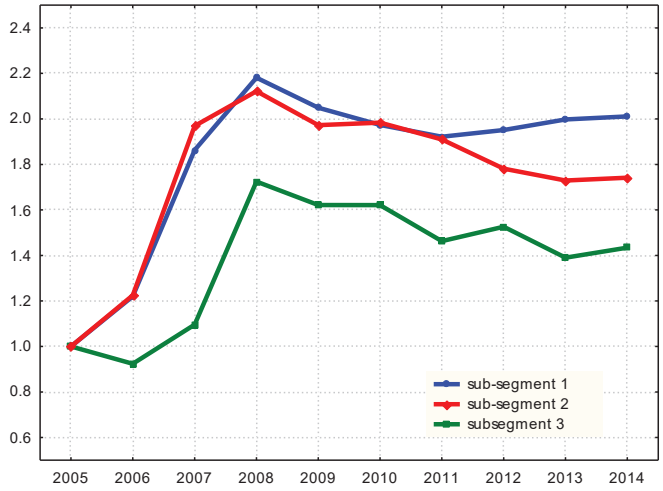


Fig. 4. Fixed-base indices of the medians of annual unitary flat prices in individual sub-segments of the housing market in Szczecin from 2005–2014

Source: own study.

In order to illustrate better the scale of the problem, in Figure 5 the author presents the maximum differences in the chain indices (slim, filled bars) and among the fixed-base indices (areas filled in with a hatching pattern under a thick line) in individual years. The differences were calculated by means of the following formulas:

1. maximum differences in the chain indices:

$$Ri_t = i_t^{\max} - i_t^{\min} \tag{4}$$

where:

$i_t^{\max}$ – the biggest chain index among all the chain indices determined for the observed sub-segments in a given year (interval t),

$i_t^{\min}$ – the smallest chain index among all the chain indices determined for the observed sub-segments in a given year (interval t).

2. maximum differences in the fixed-base indices:

$$RI_t = I_t^{\max} - I_t^{\min} \tag{5}$$

where:

$I_t^{\max}$ – the biggest chain index among all the chain indices determined for the observed sub-segments in a given year (interval t),

$Ii_t^{\min}$ – the smallest chain index among all the chain indices determined for the observed sub-segments in a given year (interval t).

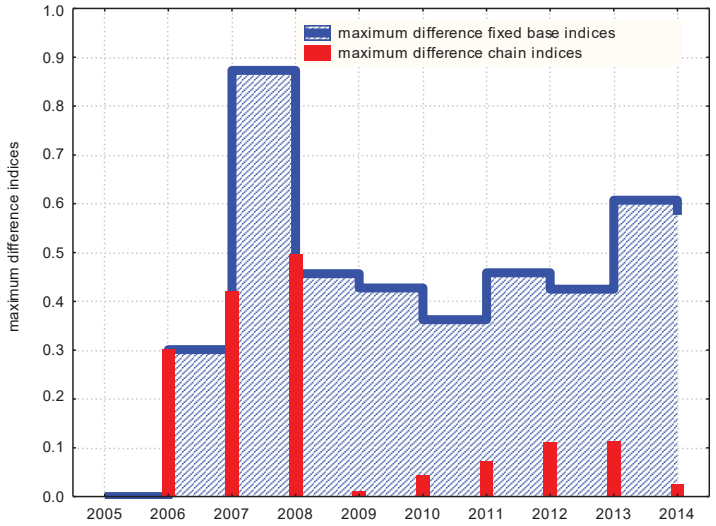


Fig. 5. Maximum differences in the fixed-base and chain indices

Source: own study.

Particularly strong price dynamics was characteristic of those sub-segments where prices went up rapidly. Then the differences in the values of chain indices ranged from 0.3 (in 2006) to 0.5 (in 2008). Although in the period of stabilisation and slight downward trends the price discrepancies were considerably smaller, they still should be regarded as large since they sometimes exceeded 0.1 (i.e. 10 percentage points). The accumulation of these differences over the years, even though their effect was alleviated by the shifts in the trend directions (the sub-segment where prices grew most dramatically saw the equally dramatic slump in subsequent years), led to a situation where over the 10-year observation the fixed-base indices in the analysed sub-segments differ by 0.6 (60 percentage points). What is equally important, in some

transition periods the differences could be even larger. Such a situation was reported in 2007 when the maximum differences among the fixed-base indices amounted to 0.87. It means that in comparison to 2005 in 2007 in one of the sub-segments (sub-segment 2) the unitary flat prices rose by 87% more than in another sub-segment (sub-segment 3).

## Conclusions

The above study has confirmed that the index values of real estate prices in individual sub-segments can vary, even if the sub-segments belong to the same local market. The above conclusion puts into question the reliability of real estate indices determined for the local market in general or even for its individual sub-segments. This may have wide-ranging consequences as in many cases, such as payments of compensation for nationalised property, returning of that property to an original owner or the estimation of cadastral value, the obligation to use these indices to calculate prices and the value of real estate coming from different periods of time is imposed by law. The application of one uniform index will result in to wrongly, or sometimes unjustly, established charges or taxes levied on the basis of prices that have been calculated by means of such an unreliable tool.

The study presented above does not exhaust the problem. Therefore the author suggests that further, more detailed and wider research should be continued.

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