

# Estimation of Real Estate Bubble Growth in Ostrava

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## **Abstract**

*The paper explains and analyses housing market in Ostrava from the point of potential real estate bubble. There are analyzed the historical data from year 2004 up to 2017. In the article there are created some indicators to estimate the real estate bubble in Ostrava. To identify housing bubble, there are use P/I ratio, HC/I ratio and R/P ratio. The separate indicators are synthesized into new created SRi index, which shows the global stability of the real estate market in Ostrava. The SRi index was created especially in connection with the situation in financial crisis in 2008. The base of this analyses was taken from the partial researches of the Housing Economics course. In the paper you can find the information how the structure of the housing market was changed during last several years. There are presented the prices of flats as well as progress of the rate of capitalization in the past until the present. The results of survey show there is no potential real estate bubble in Ostrava.*

**Keywords:** rental housing, real estate market, real estate bubble, SRi index

**JEL Classification:** R15, R23, A11

## **1 Introduction**

The paper focuses on analyse of real estate bubble in Ostrava. Housing prices and housing bubbles are very popular topic in literature. It became very popular in connection with crisis in 2008. From the time up to now the economists make many of researches to explore potential risk of real estate bubble. Now in 2017 again many of papers are analysing the potential real estate bubble. Under condition of rising prices of homes and rising amount of mortgages there are some worries of Czech National Bank, that there can be some real estate bubble expected.

To identify the real estate bubble is not so easy. There are many of different view and factors how to identify the real estate bubble. Under the condition of Czech Republic there are several authors who analyse the situation of house prices in Czech republic. J Cadil (2009) tries to analyse the real estate bubble in Czech Republic using the R/I ratio and regression analysis. He states the price bubble is the expectation of price acceleration of particular asset, which results in higher demand and such increase in demand is pushing prices up. The self – reinforcing mechanism is working until bubble bursts.

There are some other authors who try to analyse the Czech real estate market from the point of real estate bubble. Hlavacek, Komarek (2010) define real estate bubble as residual of housing price growth that cannot be explained by the aforementioned “standard” factors. The main factors for increase of real estate prices in national economy they define as:

1. a process of catching-up with the usual level in developed economies combined with macroeconomic convergence,
2. a correction in relative prices,
3. the development of the Czech housing market and
4. the constantly expanding mortgage market in the Czech Republic.

They analyse the property prices using three alternative approaches – an approach based on simple indicators of housing price sustainability (price-to-income and rental returns) and two simple econometric models (a time series model and panel regression).

Zemcik and Mikhed (2009) in their paper investigate the situation of decreasing of U.S. real estate market after the beginning of the financial crisis. Thea use the regression analysis to explain the main fluctuations.

Many of sources use for identification of price real estate bubble the simple housing market indicators. There are mainly compared the historical levels of indicators with the current level of indicators. The most typical indicator using by accredited institutions (national and international financial institutions such as Goldman Sachs, Czech National Bank etc.) is P/I ratio. The comparison of P/I can indicate potential real estate bubble.

The main simple real estate indicators can be divided into the four separate groups:

1. housing affordability measures
2. housing debt measures
3. housing ownership and rent indicators

#### 4. housing price indexes

The main aim of the paper is to analyse the situation of Ostrava real estate market, using the historical data. There will be use the simple price bubble indicators to describe the situation of real estate market in Ostrava. The research question is:

*Is there a prerequisite for indicating a real estate bubble for the Ostrava real estate market?*

## 2 Material and Methods

To analyse the Ostrava real estate market the data from the year 2004 to the 2017 were from daily press collected. As the main source of data the internet advertisement portal as [www.sreality.cz](http://www.sreality.cz) was decided to use. Sreality is one of the most demanded internet portal, which provides all the necessary data. It allows to sort all the data into the separate groups, convenient for the research. The portal even cover the largest part of Czech real estate market. The data were collected by the students of the course Housing Economics and Technical Infrastructure. The data were collected during the first half of the each year from 2004 to 2017. The database includes around 4000 separate information describing each flat. For getting of some information which were not reachable, the data from Czech Statistical Office has taken.

The real estate market in Ostrava can be into three separate segments divided. From the point of view there is make the comparative analysis. There are inspected flats for sale, flats for rent. The flats for sale are separated due the kind of ownership into flats in home ownership and flats in cooperative ownership. The results are recalculated in their price per m<sup>2</sup>. The area of flats was in observed years different.

To analyse the real estate prices it was decided the next indicators will be use:

1. PI ratio
2. Housing Debt to Income ratio
3. Gross Rental Yields ratio

The separate results will be synthesized by the method of weighted average into SR index to get the global view on the real estate situation.

PI ratio.

The price to income ratio (see the formula 2.1) is the basic affordability measure for housing in a given area. It is generally the ratio of average house prices to average familial disposable incomes, expressed as a percentage or as years of income. This ratio, applied to individuals, is a basic component of mortgage lending decisions.

$$\text{PI ratio} = P/I \quad (2.1)$$

where

P..... Average price of flat

I..... Average net personal income

Housing Debt to Income Ratio.

The housing debt to income ratio (see 2.2.) or debt-service ratio is the ratio of mortgage payments to disposable income. When the ratio gets too high, households become increasingly dependent on rising property values to service their debt. A variant of this indicator measures total home ownership costs, including mortgage payments, utilities and property taxes, as a percentage of a typical household's monthly pre-tax income. For simplicity in the paper there will be calculate the mortgage for 20 years repayments, no deposit, actual mortgage interest in given year.

$$\text{HDIR} = \text{YMP} / I \quad (2.2)$$

where

YMP..... Year mortgage payments for average price of flat

I..... Average net personal income

Gross Rental Yields ratio.

Gross Rental Yields Ratio (2.3) is the ratio of rent payments to owner to value of the flat. It informs the investor what is the gross yield from the purchase of the flat. If the ratio is high it attract investors to buy the flats. On the other side, if the ratio is too low, the investor will be not willing to buy the flat. It is typical, that if the price of flat is too high, the ratio is too small and for investor not too attractive.

$$GRR = R / P * 100 \quad (2.3)$$

where

R..... Average year rent from flat

P.....Average price of flat

SR index.

To synthesized partial results the SR index (2.4.) will be created.

$$SR = (PI + HDIR + GRR) / 3 \quad (2.4)$$

where

PI..... PI ratio

HDIR..... Housing debt to income ratio.

GRR..... Gross rental yields ratio

### 3 Results and Discussion

The results of survey are presented in next tables. The price bubble analysis present, the bubbles can be determined when an increase in housing prices is higher than the rise in rents. Because of it there are presented in first two tables the levels of flat price and rents.

The basic indicator to identify the overvaluation is presented by rate of price increase. It is clear the prices of flats had risen rapidly from 2004 to 2008. The average price of Ostrava flats reached the peek with the price of nearly 1.4 million CZK in 2008. In pre-crisis period the prices had risen more than 10<sup>th</sup> of percent per each year.

In comparison to after crisis period, the price decrease was 22% in 2009. In after crisis period, the lowest price was reached in 2014, the table 1 shows. To compare the situation in last four years, the data indicate permanent increase of prices. The highest price is indicated in 2017 with the price of 1.1 million of CZK. The rate of price increase is not such as staggering with comparison of pre-crisis period. Between 2017 and 2016 there is indicated the rate of increase of 6.5%, table 1 shows.

**Table 1-** Flat price development in Ostrava in CZK

| Year        | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Price       | 510  | 468  | 649  | 1108 | 1393 | 1011 | 1022 | 1058 | 884  | 928  | 811  | 919  | 1045 | 1132 |
| Area in m2  | 57.5 | 58.9 | 62.9 | 60.0 | 64.3 | 60.0 | 57.5 | 65.0 | 60.7 | 60.0 | 58.7 | 59.1 | 59.1 | 59.1 |
| Price p. m2 | 8.9  | 7.92 | 10.3 | 18.4 | 21.6 | 16.8 | 17.7 | 16.3 | 14.4 | 15.5 | 13.8 | 15.5 | 17.7 | 19.1 |
| index       | 41.2 | 36.7 | 47.7 | 85.2 | 100  | 77.8 | 81.9 | 75.5 | 66.7 | 71.8 | 63.9 | 71.8 | 81.9 | 88.4 |

Source: Own survey

The second basic indicator (together with the price of flat) is a rent. The necessary part of month payments is service charge, which is typically paid together with rent. The table 2 shows the average levels of rent and average level of service charge. The survey shows the rents of flats had risen rapidly from 2004 to 2007. More less, it copied the development in flat prices. The peak of rents were reached in 2007 instead of 2008. The average level of rent in Ostrava flats reached the peek with the price of nearly 8.9 thousand CZK per month.

In comparison to after crisis period, the rent decreased of 13.4% in 2009. In after crisis period, the lowest level of rent was reached in 2013, the table 2 shows. To compare the situation in last four years, the data indicate stable development. The highest level of rent was indicated in 2016 with the level of rent at 9.1 thousand of

CZK per month. The rate of rent level increase is not obvious. Between 2017 and 2016 there is indicated the rate of decrease of 22.5%, table 2 shows.

**Table 2** – Rents development in Ostrava in CZK

| Year           | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016  | 2017 |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|
| Rent           | 3553 | 4598 | 4807 | 8911 | 8550 | N    | 7410 | N    | 6944 | 6418 | 6791 | 8254 | 9177  | 7251 |
| Service charge | 2470 | 1824 | 2793 | 3059 | 2888 | N    | 1729 | N    | N    | 2130 | 2343 | 1769 | N     | N    |
| Total          | 6023 | 6802 | 7467 | 8151 | 9101 | N    | 8873 | N    | N    | 7829 | 8261 | 8701 | N     | N    |
| Index rent     | 41.6 | 53.8 | 56.2 | 104  | 100  | N    | 86.6 | N    | 81.2 | 75.1 | 79.4 | 96.5 | 107.3 | 84.8 |

Source: Own survey

The price to income ratio is the basic affordability measure for housing in a given area. It is the necessary part of all reputable financial institutions. This ratio is a basic component of mortgage lending decisions and basic indicator to identify the overvaluation. It is clear the PI ratio had risen rapidly from 2004 to 2008. The PI ratio reached the peak with its level of 10.88 in 2008. In pre-crisis period the PI ratio had risen more than 10th of percent per each year.

In comparison to after crisis period, the price decrease was 27.5% in 2009. In after crisis period, the lowest level was reached in 2014, the table 3 shows. To compare the situation in last four years, the data indicate permanent increase of level PI ratio. The highest level of PI ratio was indicated in 2017 with its level of 6.58. The level of PI ratio increase is not such as staggering with comparison of pre-crisis period. Between 2017 and 2016 there is indicated PI ratio increase of 3.4%, table 3 shows.

**Table 3** – Development of Price to Income Ratio for Ostrava

| Year                | 2004 | 2005 | 2006 | 2007 | 2008  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017             |
|---------------------|------|------|------|------|-------|------|------|------|------|------|------|------|------|------------------|
| Price               | 510  | 468  | 649  | 1108 | 1393  | 1011 | 1022 | 1058 | 884  | 928  | 811  | 919  | 1045 | 1132             |
| Income <sup>1</sup> | N    | 104  | 109  | 118  | 128   | 128  | 133  | 135  | 140  | 142  | 145  | 157  | 164  | 172 <sup>2</sup> |
| PI index            | N    | 4.50 | 5.95 | 9.38 | 10.88 | 7.89 | 7.68 | 7.83 | 6.31 | 6.53 | 5.59 | 5.85 | 6.37 | 6.58             |
|                     | N    | 41.3 | 54.6 | 86.2 | 100   | 72.5 | 70.5 | 71.9 | 57.9 | 60.0 | 51.4 | 53.8 | 58.5 | 60.5             |

Source: Own survey, Czech Statistical Office

The housing debt to income ratio is the ratio (hereinafter HDIR) of mortgage payments to disposable income. When the ratio gets too high, households become increasingly dependent on rising property values to service their debt. For simplicity in the table 4 there is calculate the mortgage for 20 years repayments, no deposit, actual mortgage interest in given year (table 4, line 3). This ratio is a basic component of bubble price analysis to identify possible overvaluation.

HDIR had risen rapidly from 2004 to 2008, the results of table 4 shows. The HDIR reached the peak with its level of 0.92 in 2008. In pre-crisis period the HDIR had risen more than 10th of percent per each year. In comparison to after crisis period, the level of HDIR drop of 27.2% in 2009. In after crisis period, the lowest level was reached in 2014 and 2015, the table 4 shows. To compare the situation in last four years, the data indicate permanent gradual (not rapid) increase of level HDIR. The highest level of HDIR ratio was indicated in 2017 with its level of 0.40. The level of HDIR ratio increase is not such as staggering with comparison of pre-crisis period. Between 2017 and 2016 there is indicated HDIR ratio increase of 2.2%, table 4 shows.

**Table 4** – Development of Housing Debt to Income ratio for Ostrava

| Year                   | 2004 | 2005 | 2006 | 2007 | 2008  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------------------------|------|------|------|------|-------|------|------|------|------|------|------|------|------|------|
| Price                  | 510  | 468  | 649  | 1108 | 1393  | 1011 | 1022 | 1058 | 884  | 928  | 811  | 919  | 1045 | 1132 |
| Hyp. int. <sup>3</sup> | 4.77 | 3.62 | 4.14 | 4.67 | 5.63  | 5.66 | 4.84 | 4.14 | 3.59 | 3.00 | 2.72 | 2.08 | 1.84 | 2.06 |
| Mortgage payment       | 40.1 | 33.3 | 48.4 | 86.4 | 117.9 | 85.7 | 80.9 | 78.9 | 62.7 | 62.3 | 53.0 | 56.7 | 62.9 | 69.6 |
| HDIR                   | N    | 0.32 | 0.44 | 0.73 | 0.92  | 0.67 | 0.60 | 0.58 | 0.44 | 0.43 | 0.36 | 0.36 | 0.38 | 0.40 |
| index                  | N    | 34.7 | 47.8 | 79.3 | 100   | 72.8 | 65.2 | 63.0 | 47.8 | 46.7 | 39.1 | 39.1 | 41.3 | 43.5 |

Source: Own survey

<sup>1</sup> The income is presented by median net personal income. The source of data comes from regular statistics, issued by Czech Statistical Office for each year.

<sup>2</sup> Expert estimation.

<sup>3</sup> Hypothec interest was from [www.hypoindex.cz](http://www.hypoindex.cz) taken.

The gross rental yields (hereinafter GRY) is the ratio of rent payments to owner to value of the flat. It informs the investor what is the GRY from the purchase of the flat. If the ratio increase it attract investors to buy the flats. On the other side, if the ratio is too low, the investor will be not willing to buy the flat and seek another alternative investment. The overview of GRY is in table 5 shown.

GRY had fallen rapidly from 2004 to 2008, the results of table 5 shows. The GRY reached the lowest level 7.4 % in 2008. In pre-crisis period the GRY ratio had fallen of 12.6% per each year in average. In comparison to after crisis period, the level of GRY increased of 15% in 2010 (the results for the year 2009 are not available). In after crisis period, the highest level was reached in 2014 (10.8%) the table 5 shows. To compare the situation in last four years, the data indicate permanent gradual (not rapid) decrease of level GRY. The lowest level of GRY ratio was indicated in 2017 with its level of 7.7%. From that point of view, generally it is not recommended to investors to purchase the flat.

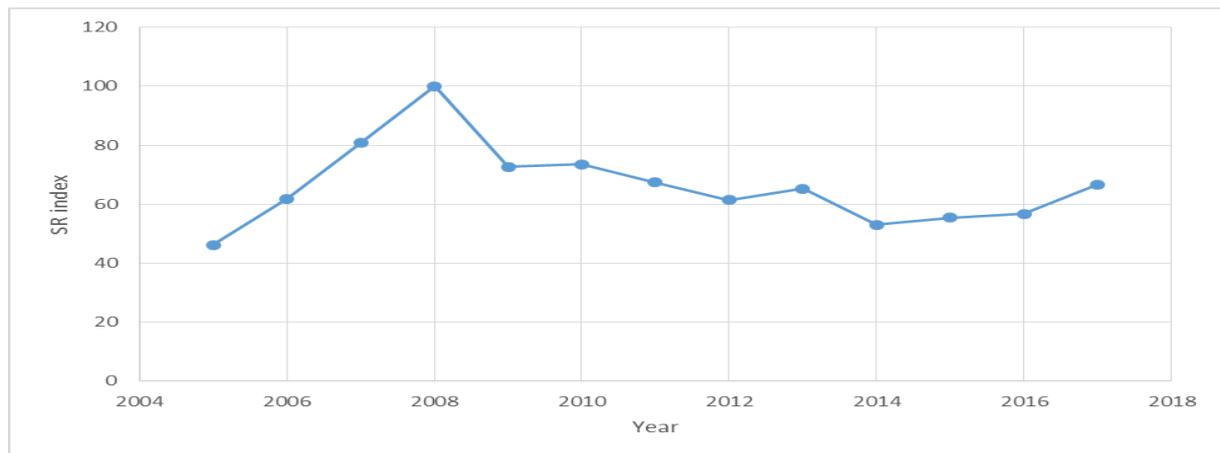
**Table 5** – Development of Gross Rental Yields ratio for Ostrava

| Year  | 2004 | 2005 | 2006 | 2007  | 2008  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016  | 2017 |
|-------|------|------|------|-------|-------|------|------|------|------|------|------|------|-------|------|
| Price | 510  | 468  | 649  | 1108  | 1393  | 1011 | 1022 | 1058 | 884  | 928  | 811  | 919  | 1045  | 1132 |
| Rent  | 42.6 | 55.2 | 57.7 | 107.0 | 102.6 | N    | 88.9 | N    | 83.3 | 77.0 | 81.5 | 99.0 | 110.1 | 87.0 |
| GRR   | 8.3  | 11.8 | 8.9  | 9.6   | 7.4   | N    | 8.7  | N    | 9.4  | 8.3  | 10.8 | 10.1 | 10.5  | 7.7  |
| index | N    | 62.7 | 83.1 | 77.0  | 100   | N    | 85.0 | N    | 78.7 | 89.1 | 68.5 | 73.3 | 70.4  | 96.1 |

Source: Own survey

To summarize all the partial findings there was created the SR index, which would describe the general situation in flat real estate market. It simply implement the findings, using the method of weighted average. All the indexes in presented years are summarise in to the new created SR index. The results are in figure 1 shown.

**Figure 1** – SR index



Source: own processing

The development of SR index (SRI) clearly documents the situation in past 13 years. SRI had increased rapidly from 2004 to 2008, the figure 1 shows. The SRI reached its highest level in 2008. In pre-crisis period the SRI had increased of 17.9% per each year in average. In comparison to after crisis period, the level of SRI decreased of 27.35 % in 2009. In after crisis period, the lowest level was reached in 2014 (53%) the figure 1 shows. To compare the situation in last four years, the data indicate permanent gradual (not rapid) increase of SRI level.

#### 4 Conclusion

The results made by simple indicator analysis show still relative low level of SRI. The level of SRI in condition of Ostrava real estate market is 66.7% in comparison to the state of 2008 year. To answer the research question in chapter 1, there are no prerequisite for indicating a real estate bubble for the Ostrava real estate market in the first half of the year 2017. There is still the 33.3% difference to reach the situation in 2008. From the view of the most stable real estate environment in after crisis period, the most stable was the year 2014, the figure 1 shows. Though, the situation is stable at the moment, the latest data from 2017 may indicate the acceleration of increase, which has started in 2014. Currently there are no worries the Ostrava real estate market is threatened by price bubble.

The model of SRI shows possible weaknesses of real estate market, which can be generalised not only to Ostrava real estate market.

They are:

1. increase of mortgage interest,
2. increase of flat prices, which is not supported by increase of personal income,
3. decrease of rents.

It seems, the most important step, which can be expected in nearest future is the increase of mortgage interest. The lowest level of mortgage interest was registered in 2016. In case the increase of mortgage interest is not supported by decrease of flat prices, it would be an initial step for future acceleration of real estate prices, which could cause into real estate bubble.

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