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ANALYSIS OF THE AVAILABILITY OF HOUSING IN SELECTED COUNTRIES

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Abstract
The Czech Republic is a country with the highest growth of real estate's prices in Europe. The paper is focused on the analysis if this long-term growth of real estate's prices influences the availability of housing, i.e., if the price growth is in balance with the growth of households income and what is the situation in the Czech Republic in comparison to other European countries. Hence, the objective is to analyse the availability of housing in the Czech Republic in relation to selected European countries and to make a comparison of the situation based on the main ratios. The basic price statistics, which is related to the prices of real estates, will be presented in the paper. It will be especially focused on the growth or decline of prices and possible specifics of particular markets with real estates in these markets. The availability of housing will be find out based on the selected ratios, which will be derived from the prices of apartments, rents, household incomes, mortgages and interest rates. The standard ratios of housing availability, e.g., Price/Income ratio, Rent/Income ratio and other availability ratios, will be compared. Possible imbalance in the markets of ownership and rent housing will be explored with rent balance (imbalance) indicator, which can be a signal of overvaluation or undervaluation of these housing segments. The indicators will be analyzed using the statistical methods. The structure of real estate markets in selected countries will be also analyzed and the quality of housing based on the main statistical indicators wil be find out. The relation between the number of flats and houses and the number of inhabitants of the particular country will be also presented. The comparison of the availability of housing in the selected countries will be done based on the statistical analysis of the above mentioned indicators.

Keywords
housing, price/income ratio, rent/income ratio, mortgage/income ratio, real estate market.

JEL classification
R30, P50

1   Introduction

Many countries in the world have been experiencing boom in house prices for a couple of years, and the European countries are no exception. However, one of the main causes of the global crisis in the late 2000s was the bursting of the housing bubble in the United States (Hattapoglu and Hoxha, 2013). The burst caused the values of securities tied to U.S. real estate pricing to plummet, resulting in vast losses of many institutions and businesses and leading to the "Great Recession" (Financial Crisis Inquiry Commission, 2011). Therefore, it is very important to carefully analyse the housing market and adequately react to possible signals of the housing bubble formation because of the lately experienced fallout of its bursting.

This paper is related to the increasing literature, which focuses on the empirical investigation in housing market. The main goal of this paper is to make an analysis of the situation in the housing market in selected European countries. Using the main housing ratios, which are often used as indicators of overvaluation of housing prices, we will examine the reasons of their overvaluation or undervaluation.

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2   Literature review

Recently, there has been a lot of articles and papers dealing with the housing market and related indicators and models. For example, Gallin (2008) constructed an error correction model and found out that that the rent-price ratio is a valid indicator of valuation in the housing market. Campbell et al. (2009) used the Campbell-Shiller formula to decompose the price-rent ratio in the US regional data into the present discounted values of expected housing market fundamentals (i.e., rent growth, real interest rate and risk premium for housing asssets), and found that housing risk premium accounts for a significant part of rent-price ratio volatility. Kim and Lim (2014) examined the fundamental sources of variations in price-rent ratio in the Irish housing market over the period 1976 to 2012. Using the Campbell-Shiller present value formula, they found out that expected housing premium is the principal source of variation in price-rent ratio. Over the whole period, their results indicate that variation in expected housing premium accounts for nearly 500% of variation in price-rent ratio, while expected rent growth and real interest rate explained far less. Morover, they found that the correlations among the three components of the rent-price ratio (i.e., rent growth, real interest rate and risk premium for investing in housing) considerably depress fluctuations in the rent-price ratio. In particular, the correlation between real interest rate and expected future premium was negative, and it lowered variation in the ratio by more than 400 %. Also, the positive correlation between rent growth and expected housing premium was found large enough to lower the volatility in the ratio by about 350% (Kim and Lim, 2014).

Hattapoglu and Hoxha (2014) examined the behaviour of people regarding the price appreciation in housing market as an important factor in the housing price appreciation, which can lead to housing bubbles. They found that that people's appreciation expectations are based on the percentage change in prices, which provides evidence for price instability. In connection with this topic, there is a few articles and papers focused on the price bubbles in the housing market in different countries of the world. The situation in China is well described by Dreger and Zhang (2013) and by Zhang et al. (2017), in the U.S. by Clark and Coggin (2011), in Denmark by Abildgren, Hansen and Kuchler (2018), in Israel by Arestis and Gonzales-Martinez (2017), in Spain by Fernandez-Kranz and Hon (2006), in Kenya by Kibunyi et al. (2017) and in the Czech Republic by Zemcik (2011). Gomez-Gonzales et al. (2018) studied the existence and international transmissions of housing market bubbles, using quarterly information of twenty OECD countries for the period from 1970 to 2015. They found that housing bubbles were present in all the countries included in their sample. They also found that the transmissions (mostly to European countries) had origin in the US housing bubble preceding the subprime crisis.

3   Methodology and data

The analysis of the housing market in the selected European countries will be made using the following main ratios: price-to-rent ratio (P/R ratio), price-to-income ratio (P/I ratio), price-to-GDP ratio (P/GDP ratio), price-to-wage ratio (P/W ratio) and mortgage-to-income ratio (M/I ratio).

The P/R ratio is the ratio that measures the current home prices to annualized rent in a given location. It is often used as a benchmark to estimate whether it is cheaper to rent or own a house. However, the P/R ratio does not say anything about the affordability of buying or renting in a given housing market. Cities where both renting and buying are very expensive, such as London or Prague, can have the same price-to-rent ratio as a small town in Albania where both homes and rents are relatively cheap. What is important for the housing market analysis is the fact that the significant increase in the P/R ratio can be an important signal for the housing bubble. There is an online residential real estate website Trulia (Trulia, 2018) in the United States that is used to produce a price-to-rent ratio called the "Trulia Rent vs. Buy Index" that compares the totals costs of homeownership with the total cost

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of renting a similar property. Trulia's price-to-rent ratio is calculated by dividing the average list price by the average yearly rent price, as follows:

$$\frac{P}{R} ratio = \frac{average\ list\ price}{average\ monthly\ rent \times 12} \tag{1}$$

Trulia established the following thresholds for the P/R ratio: less than 15 indicates it is much better to buy than rent; from 15 to 20 indicates it is typically better to rent than buy; and 20 or more indicates it is much better to rent than buy. The average Trulia P/R ratio was around 15 before the housing bubble and subprime meltdown. The ratio rose to 24.50 in 2007, before falling and bottoming out in 2012 (Investopedia, 2018).

The price-to-income ratio (P/I ratio) is generally the ratio of average house prices to average familial disposable incomes. The P/I ratio measures the affordability of housing in a given area. The idea is clear: increases in housing prices cannot deviate indefinitely from growth in the incomes of house buyers. If the appreciation of housing prices outpaces the growth of incomes for a considerable time period, households will no longer afford to buy houses, which brings housing prices back to the long-term growth of incomes. Therefore, the forecasting of P/I ratio is of importance both for academics and policy-makers (Chen and Cheng, 2017).

The price-to-GDP ratio (P/GDP ratio) is very close to the P/I ratio. The ratio is calculated as the portion of the cost of a typical upscale housing unit of 100 square metres, compared to the country's GDP per capita. The formula is:

$$\frac{P}{GDP} ratio = \frac{price\ per\ square\ metre}{GDP\ per\ capita} * 100 \tag{2}$$

The P/I and P/GDP ratios are closely monitored by the IMF, as another indicators of possible housing bubble formation. The dramatic increase in the ratios can be a signal for the housing bubble.

Mortgage-to-income ratio (M/I ratio) calculates the percentage of person's gross income required to cover their mortgage. In other words, if you pay €1,000 each month in expenses because of your mortgage and you make €4,000 each month, your M/I ratio is 25%: Quarter of your monthly income is being used to pay mortgage.

4   Empirical results

The results of survey are presented in next tables. For the better description the countries are from the highest to lowest value sorted. For the main analysis the indicators mentioned in previous chapter were used. There were used P/I ratio, P/GDP ratio, P/W ratio, M/I ratio, P/R ratio and for the aggregation of results the combination of some of them (P/I, P/GDP, P/W and P/R).

It has been found, that different data sources refer to different numbers for the same time. The annual net wages for the latest period 2018 were presented as different by the Eurostat and by www.numbeo.com for instance. The reason of these differences consists in different methodology. Since the www.numbeo.cz determines the average monthly net salary after tax as an average of data contributed by the contributors, Eurostat presents the official data received from the national statistical agencies. To make it more objective, if necessary to count the comparative indicators there has been used the average of these numbers.

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The GDP per capita was taken from the World Bank's statistical survey. Such variables were important to determine P/GDP ratio comparative indicator. In some cases it is more objective to use P/GDP ratio (even some sources presents only the P/GDP ratio in their housing statistics instead of maybe less informative P/I ratio) instead of P/I ratio. While net Income in P/I ratio indicator captures more of the employees' situation, the GDP per capita in P/GDP ratio may capture the economic situation of traders and other entities whose income does not depend on dependent activity (as in case of employee). To make it more objective, if necessary to count the comparative indicators there has been used the averages of P/GDP ratio and P/I ratio.

The levels of prices and rents were from www.numbeo.com taken. Other sources of prices were found but due to incompleteness or insufficient form (Eurostat presents only indexed prices) I decided for the www.numbeo.com source. The method used to determine housing prices and rents was derived from the average prices entered into the system by individual contributors.

Some of values of indicators describing the real estate market of selected countries as M/I ratio, P/I ratio and P/R ratio was recorded directly from www.numbeo.cz source.

The basic values of indicators are presented in the next table 1.

Table 1- The basic values of indicators and the ranks of countries, 2018

Country	P/I value	P/I rank	P/GDP centrum value	P/GDP centrum rank	P/W centrum Value	P/W centrum rank	M/I value	M/I rank	P/R centrum value	P/R centrum rank
Albania	14,5	2	7,27	5	29,58	1	124,61	2	23,78	13
Austria	9,82	17	6,84	8	14,15	22	59,93	21	29,3	3
Belgium	7,04	28	4,80	22	11,31	28	43,59	28	19,52	23
Bulgaria	8,81	22	3,78	29	17,46	12	66,12	14	18,14	25
Croatia	11,32	9	6,05	13	17,79	10	89,83	4	29,19	4
Cyprus	6,35	30	3,46	30	7,46	30	46,48	27	16,92	27
Czech Republic	**14,14**	**3**	**6,68**	**11**	**27,47**	**3**	**87,33**	**5**	**28,3**	**7**
Denmark	7,04	29	6,68	10	9,91	29	43	30	22,85	16
Estonia	9,17	20	5,27	17	16,95	15	58,62	22	22,84	17
Finland	7,5	26	7,17	7	12,29	25	43,45	29	27	8
France	11,72	7	9,50	1	18,20	9	70,52	12	35,79	1
Germany	8,48	24	6,84	9	14,78	21	50,93	25	28,9	5
Greece	9,83	16	3,99	28	11,83	27	76,15	6	24,25	12
Hungary	13,16	4	5,21	18	23,18	4	107,4	3	23,53	14
Ireland	8,06	25	4,39	25	12,57	24	57,81	23	15,94	29
Italy	9,69	18	7,26	6	15,34	20	60,94	19	28,43	6
Latvia	9,9	14	4,48	24	16,22	17	63,8	16	21,69	19
Lithuania	11,92	5	4,91	20	22,09	5	72,82	8	23,33	15
Luxembourg	11,87	6	5,63	16	19,00	8	71,61	10	24,74	11
Malta	10,1	10	4,85	21	19,72	6	71,47	11	16,21	28
Netherlands	7,42	27	5,68	14	13,82	23	47,21	26	19,66	22
Poland	10,06	11	4,71	23	17,22	14	71,92	9	20,24	21
Portugal	11,71	8	6,12	12	19,59	7	75,85	7	19,23	24
Romania	9,94	12	4,19	26	17,41	13	69,08	13	21,22	20
Slovakia	9,94	13	4,07	27	17,50	11	60,01	20	17,79	26
Slovenia	9,29	19	4,91	19	15,42	19	63,82	15	25,81	9
Spain	8,76	23	5,66	15	12,08	26	54,9	24	21,89	18
Sweden	9,89	15	8,13	2	15,86	18	63,32	17	34,08	2
Ukraine	15,25	1	8,08	3	29,13	2	319,66	1	15,49	30

| United Kingdom | 9,05 | 21 | 7,60 | 4 | 16,28 | 16 | 61,6 | 18 | 24,85 | 10 |

Source: Own survey, www.numbeo.com, Eurostat 2018, World Bank 2018

The three basic indicators P/I, P/GDP, P/W looks to be analogical. P/I and P/W show the third position of the Czech Republic with its value 14,14 and 27,47 respectively. By other words the price of flat is equal to 14,14 or 27,47 multiple of average employee income. This basic indicators point to overvalued housing prices in Czech Republic (ranks 3). The other most expensive countries are Ukraine (rank 1, rank 3 respectively) and Albania (rank 2, rank 1 respectively)

If we compare these indicators with P/GDP ratio the Czech Republic position seems to be better. P/GDP ratio for the average prices of flats situated in the centrums of Czech cities is equal to 6.68 which represents the eleventh position from selected European countries. P/GDP ratio may be more general indicator in some cases because it include not only dependent employee position. That situation leads me to an opinion, that worst situation is indicated in the segment of employees instead of segment of traders and self employed entities. In case of falling flat prices the segment of employees will be in more risky situation than the segment of traders and self employed entities.

The worst P/GDP ratio level represents France with its value 9.50 which is 42% above the level of Czech Rrepublic. From that point of view the cheapest countries are Cyprus (rank 30), Bulgaria (rank 29) and Greece (rank 28).

The M/I ratio by www.numbeo.com represents Mortgage as Percentage of Income ratio of the actual monthly cost of the mortgage to take-home family income. It assumes 100% mortgage is taken on 20 years for the house (or apt) of 90 square meters which price per square meter is the average of price in the city centrum and outside of city centrum. The level of M/I ratio in Czech Republic is equal to 87.33 % with the rank 5, which seems to be high for the Central Bank analysts. According to the latest information from the Czech Central Bank (July 2018) there will be implemented two new changes in mortgage affordability. The monthly cost of the mortgage must not be higher than 40% of net monthly income the Czech Central Bank presents as first restriction. As the second restriction, the level of mortgage (including the other credits) must not be higher than 8 multiple of net annual income.

The other limits for mortgage which has already been implemented by Czech Central Bank is maximum of 80% value of flat market price to be provided as mortgage by commercial banks. It is essential to save at least 20% of the funds to cover the purchase of flat. In previous period the Czech Central Bank increased interest rates, which should restrict overvaluation of Czech real estate market.

To compare M/I ratio the worst levels are representing by Ukraine (319.6, rank 1), Albania (124.61, rank 2) and Hungary (107.4, rank 3). On the other side the best results are shown in Denmark (43, rank 30), Finland (43.45, rank 29) and Belgium (43.59, rank 28).

The last presenting ratio is P/R ratio (developed by www.numbeo.com) which is analogical to gross rental yields. Lower values suggest that it is better to buy rather than rent, and higher values suggest that it is better to rent rather than buy.

The Czech Republic with its value of P/R ratio 28,3 represents the seventh position. The highest values of P/R ratio you can find in cases of France (35.79, rank 1), Sweden (34.08, rank 2) and Austria (29.3, rank 3). The opposite countries shown in the table are Ukraine (15.49, rank 30), Ireland (15.94, rank 29) and Malta (16.21, rank 28).

The data taken from the Table 1 will be transformed into the aggregate results by the methodology described in previous chapter. To calculate possible overvaluation or undervaluation the indicators of P/I, P/GDP, P/W and P/R ratios are going to be used. The results are in percentage shown and valid for centrum areas and outside of centrum areas as well as average value of values for centrum and outside of centrum areas. The rank is assigned to the countries according to their average value. The results are in next Table 2 shown.

Table 2- Overvaluation and undervaluation of flat prices in %, July 2018

Country	Average

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	Overvaluation, undervaluation in % city center areas	Overvaluation, undervaluation in % outside of center	value	rank
Albania	22,75	3,23	12,99	6,00
Austria	13,06	18,96	16,01	5,00
Belgium	-21,53	-10,03	-15,78	26,00
Bulgaria	-16,28	-12,59	-14,44	24,00
Croatia	18,32	25,42	21,87	4,00
Cyprus	-35,57	-30,30	-32,94	30,00
Czech Republic	**31,75**	**32,55**	**32,15**	**2,00**
Denmark	-12,89	-10,13	-11,51	21,00
Estonia	-2,60	0,84	-0,88	15,00
Finland	2,66	-5,18	-1,26	16,00
France	39,99	33,01	36,50	1,00
Germany	11,88	13,04	12,46	7,00
Greece	-6,24	6,72	0,24	14,00
Hungary	10,75	0,56	5,66	12,00
Ireland	-29,34	-31,82	-30,58	29,00
Italy	12,50	2,88	7,69	11,00
Latvia	-6,87	-10,44	-8,65	20,00
Lithuania	7,60	10,73	9,16	9,00
Luxembourg	7,69	15,13	11,41	8,00
Malta	-16,87	-18,91	-17,89	28,00
Netherlands	-16,77	-17,18	-16,97	27,00
Poland	-9,24	-6,68	-7,96	19,00
Portugal	-6,62	-16,87	-11,75	22,00
Romania	-6,70	0,87	-2,91	17,00
Slovakia	-16,22	-7,92	-12,07	23,00
Slovenia	3,38	13,22	8,30	10,00
Spain	-12,04	-17,54	-14,79	25,00
Sweden	29,71	24,37	27,04	3,00
Ukraine	0,09	-9,68	-4,79	18,00
United Kingdom	3,61	3,74	3,68	13,00

Source: Own calculations, www.numbeo.com, Eurostat 2018, World Bank 2018

The overvaluation and undervaluation is calculated due to the deviation of average values counted from the given parameters. The methodology of calculation is presented in previous chapter.

The results from Table 2 show the overvaluation of flats in Czech Republic. The price overvaluation of flats is 32.15% above the average value for the file of presented countries. The rank assigned to the country is 2. The Czech Republic is the country with one of the most overvalued flats in Europe. The most overvalued flats in Europe you can find in France with the rank 1, where the level of overvaluation exceeds 36%. The rank number 3 belongs to the Sweden with its overvaluation of 27.04%.

On the other hand the most undervalued prices of flats are Cyprus (-32.94%, rank 30), Ireland (-30.58%, rank 29) and Malta (-17.89, rank 28). It is assumed the increase of price flats in the future in these countries.

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From the Table 2 it is seen even the difference between overvaluation/undervaluation of flat prices in city centrum areas and overvaluation/undervaluation of flat prices in outside city areas. The difference between overvaluation of city centrum areas and outside of centrum areas is -0,80% in case of Czech Republic. It imply there is nearly no difference between cities and rural areas. The demand covers all the areas equally.
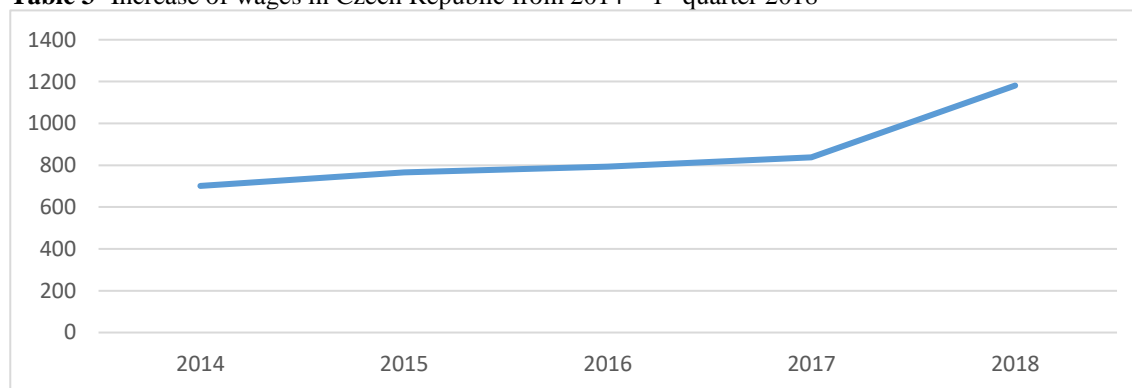
The highest difference is indicated for Albania (+19.52%). While the overvaluation in cities there is indicated at the level of 22.75%, the situation in outside of central areas indicates the overvaluation only +3.23%. The next country with the high difference is Belgium (-11.49%). Undervaluation of central city areas is equal to -21.53% which is more than in outside of city areas (-10.03%). The third position belongs to the Portugal (10.25%). Its city centrum areas are undervalued by -6.62% while the outside city centrum areas are undervalued by -16.87%.

Likely the Reasons for Overvaluation in Czech Republic

The prices in Czech real estate market seems to be overvalued. The analysis of basic indicators push the Czech Republic to the high positions in comparison with other 30 countries. Even the other analysis confirm the indicated overvaluation of Czech real estate market (CNB). The concurrence of some circumstances support the price increase:

1. mortgage interests looks to be favourably. The latest average data shown by www.hypoindex.cz presents 2.49% p.a., which even dropped from 2.51% p.a. in comparison with previous month. On the other side the Czech Central Bank announced increase of interests in next one year, which can help to cool down the price overvaluation.

2. increase of wages. In the last decade, the strongest wage growth has been recorded. The data of Czech Statistical Office (www.czso.cz) announced, the monthly wages reached 1181.30 EUR in 1st quarter of 2018, which supports demand on Czech Real Estate Market. See the progress in next Table 3.

Table 3- Increase of wages in Czech Republic from 2014 – 1st quarter 2018

Source: www.czso.cz

3. demographical aspects. The increase of single households is a typical trend of the last decade not only in Czech Republic, but in other European Countries as well. The latest data of Eurostat has shown the increase of single member households since 2007. While in 2007 there were 25.5 % of single member households in Czech Republic, in 2017 the share reached 30.4%. For easier imagination, the highest share of single member households was reached in Sweden (52%).

4. impact of monetary policy of central bank. The monetary policy of Czech National Bank is reflected in Czech Real Estate Market. It seems the policy of cheap currency from 2013 – 2017 affected the price increase in real estate market. The price increase of flats is the most

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evident in Prague where the concept of share economy is the most developed. In fact the concept of share economy allows to "export" the real estates (which in typical economical model is impossible) abroad. The cheap currency policy attract not only the typical Czech good producers, but the tourists as well. Because of it the owners of flats in high tourist attractive areas move the flats from long term rent market segment to the short term rent market segment. It causes the increase of prices. The real estate analysists of Komeční Banka show the increase of short rent segment in Prague from 1500 of ads in 2013 to 11500 ads in 2017, which represents 25% of all the add offers in Prague.

5   Conclusion

The results made by simple indicator analysis show the overvaluation of real estates in Czech Republic. The overvaluation was indicated by the P/I ratio, P/GDP ratio, P/W ratio and P/R ratio. Even the other ratio indicators certify the overvaluation (M/I ratio indicator). To compare the situation of the Czech real estate market with the other European countries the Czech Republic occupies the second position, just behind France and Sweden (see the table 2).

The likely reasons for the steep increase of real estates are:
1.   the mortgage interest,
2.   increase of wages,
3.   demographical aspects
4.   impact of Central Bank Monetary Policy.

The housing affordability after the analysed indicators is low in comparison with the other comparative states.

To increase the housing affordability it is assumed the most important step, which can be expected in nearest future is the increase of mortgage interest.

6   Acknowledgement

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