## **Cheap or Expensive Mortgages? A Case from the Czech Republic**

## Jan MAČÍ<sup>1,\*</sup>, Jarosław OLEJNICZAK<sup>2</sup>

- <sup>1</sup> University of Hradec Králové, Hradec Králové, Czech Republic; jan.maci@uhk.cz
- <sup>2</sup> Wroclaw University of Economics and Business, Wroclaw, Poland; jaroslaw.olejniczak@ue.wroc.pl
- \* Correspondence: jan.maci@uhk.cz

**Abstract:** Czech mortgage market currently experiences extraordinary period. Since the mortgage market was restored after the Velvet Revolution, interest rates have never been at such low levels as these times. From this point of view, mortgages have never been cheaper. On the contrary, property prices are significantly increasing and are at record high levels. Therefore, the aim of this article was to assess which of these two factors prevails. In other words, are mortgages cheaper or more expensive these times? In order to reach the main goal, we set a set of assumptions related to mortgage installments. The period examined was years 2009-2019. The data were collected from the Czech National Bank, Czech Statistical Office and Hypoindex.cz. Our results show that even if the property prices are approximately 1.5times higher in 2019 in comparison to 2009, the proportion of interest on the first installment is lower. From this perspective mortgages remain cheap even now; especially thanks to very low interests rates. However, thanks to the high principal, debtors are exposed to higher interest rate or refinance risks now. From the debtor's point of view, the most favorable periods were 2015 and 2016.

Keywords: interest rates; installment; mortgage; property prices; loan to value; debt to income ratio

JEL Classification: G21; G51; R21

#### 1. Introduction

People very often finance their housing needs by a mortgage. As with other products, the demand for mortgages is naturally influenced by the price of this financial instrument. And, as with other credit products, the price of a mortgage is also determined by interest rate, amount of principal and maturity period. This article describes more in detail issues of interest rates and property prices on the example of the Czech Republic. The maturity period will be considered as given.

Due to the divergent development of interest rates and property prices (interest rates are very low and property prices are very high (see chapter 2); and at the same time, these two variables have a contradictory effect on the price of the mortgage) the main aim of this article is to answer the research question **"Are mortgages cheap or expensive nowadays?"** And because the Great Recession might be considered as a major driver, the analysis is concentrated in 2009-2019.

In order to answer the research question, the paper is organized as follows. First, current state in the analyzed area supplemented with a brief literature review on interest rates and property prices in relation to mortgages is made in chapter 2. Chapter 3 describes the research methodology. Research results are presented in chapter 4. A discussion is made in chapter 5. The article concludes with a short conclusion.

# 2. A Current State in the Analyzed Area and Literature Review – Interest Rates and Property Prices in Relation to Mortgages

Interest rates in developed countries nowadays remain at very low levels. This state might be considered as a consequence of the Great Recession and the subsequent Debt Crisis in the European Monetary Union. Researchers and analysts all around the world are trying to reveal and estimate, if this

is a new normal, or if it is a temporary phenomenon. Anyway, this feature has different impacts and manifestations on different parts and actors of the financial market.

From the perspective of the Czech mortgage market, on which is this article focused on, interest rates remain rather low despite the fact that the Czech National Bank (CNB) already increased its basic interest rate (2W repo) several times from the minimum of 0.05% (effective from 11/2012 to 8/2017) to nowadays level of 2.00% (effective since 6/2019); see Figure 1. (CNB 2019)



**Figure 1.** The development of the Czech main interest rate (2W repo) and average mortgage interest rates in the years 2009-2019. Source: own based on the data from the Czech national bank and Hypoindex.cz

According to the "old normal", the rise of basic rate should lead to a noticeable increase in commercial interest rates, including mortgages. And this increase should reduce the demand for mortgages (see e.g. DeFusco and Paciorek 2017). However, as can be seen in Figure 1 that presents data for the last month of the quarter in years 2009-2019, at the end of 4Q 2012 average mortgage rate was 3.17%; nowadays (i.e. 09/2019) it is 2.47% (Hypoindex.cz 2019). So the fundamental reaction of commercial banks to central bank actions has not yet come.

This mismatch in the power of transferring the base interest rate to commercial, respectively to mortgage rates (see Figure 1 and compare the spread during the time) is in accordance with Gregor's study (Gregor 2018a); the study points out that interest rate pass-through efficiency for mortgages decreased after the global financial crisis. In addition, the same author in his another study (Gregor, 2018b) presents the conclusion that unlike Germany, in the Czech Republic there is at least "a significant long run relationship between the monetary policy rate and commercial bank lending rates". In the recent and current Czech banking environment, a shift in transparency and competition than reported by Hedvičáková and Soukal (2012) may be one of the reasons for the phenomenon described above.

Therefore, in terms of interest rates, mortgages remain cheap despite the CNB's monetary tightening. Thus it does not seem that the trend on mortgages reported by Hedvičáková and Svobodová (2016) should be significantly disrupted even now. However, let's take a look at property prices.

Regarding the property prices, unlike interest rates, after years without significant changes (2009-2013), property prices are increasing sharply. Real estate prices were slightly above 130% in 4Q 2018 in comparison to the year 2010 (CZSO, 2019b) and these prices increased even in 2019. The situation of older flats, which fits with our research aim (see the end of Introduction and Methodology) is captured in Figure 2. In this segment of the market the growth is even slightly higher.

Zhu, Betzinger and Sebastian (2017) on the evidence from the euro area, where the house prices are significantly rising as well, suggest that "a one-time monetary-easing shock can significantly trigger house price booms in countries with liberal mortgage markets". On the other hand, the same authors (Zhu, Betzinger and Sebastian 2017) claim that "more regulated mortgage market may reduce the

significance of monetary policy stance". Czech monetary authority (CNB) perceives potential future problems of such price-rising phenomenon in a longer term (see e.g. CNB 2019, March 27) and already set a set of recommendations and regulations in order to avoid future systemic problems (e.g. following ratios had been recommended by the CNB: loan to value (LTV) max. 90, resp. 80%, debt to income (DTI) max. 8, debt service to income (DSTI) max. 45%; see CNB (2019, December 3)). The justification why to set LTV in relation to mortgage defaults contains e.g. the work of Hatchondo, Martinez and Sanchez (2015) or Wu and Dofrman (2018).



**Figure 2.** Index of realized prices of second-hand flats (average of 2010 = 100). Source: Czech statistical office (2019b)

This chapter demonstrated that there is a divergent development regarding interest rates and property prices. At the same time, as mentioned in the Introduction, these two variables have a contradictory effect on the price of the mortgage. Therefore, the rest of this article seeks to answer the **main research question is: "Are mortgages cheap or expensive nowadays?"** 

#### 3. Methodology

First, considered period are the years 2009-2019, respectively 01/2009-09/2019 due to quarterly data availability. The year 2009 was designated as an initial observation because it is also the year when the consequences of the Great Recession were fully reflected in the international environment, including the Czech Republic.

Further, in order to reach the above mentioned goal we had to define the property that was being bought (especially location and price). For this purpose, we got involved average price per square meter reported by the Czech Statistical Office (CZSO) and average interest rates on mortgage reported by Hypoindex.cz.

The data from which the input variable (property price) was derived are presented in Table 1 below.

Region	Type of municipality	Type of a property	Size	Average price per m <sup>2</sup>
Hradec Králové	≥ 50,000 inhabitants	Flat	60 m <sup>2</sup>	CZK 27,204

Table 1. General parameters of the considered property in 2009

<sup>1</sup> Compiled based on the data from the Czech Statistical Office (2019a)

It is clear from Table 1 that the property under consideration is a flat and its purchase price of the year 2009 is (after a small rounding) **CZK 1,635,000** (= 60 \* 27,204). During the year 2009 housing prices

rather stagnated (see house price index reported by CZSO (2019c)), so it is possible to work with the average price for 2019.

In order to assess mortgage prices during the analyzed period, there was set a set of assumptions:

- Considered property is still the same as defined in Table 1.
- Quarterly data are used.
- Price development is derived from the statistics of CZSO (2019c) see house price index (2010 = 100).
- Interest rates are taken from Hypoindex.cz (3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> month of a year; www.hypoindex.cz).
- LTV = 100% (i.e. property price = the amount of the mortgage loan).
- Annuity repayment method.
- First installment and the absolute amount of interest within this first installment is considered.
- It is considered a 30-year maturity (360 installments).
- It is abstracted from the time value of money and further from, for example, wage growth.

Computations and result are presented in the following chapter.

### 4. Results

From the computations conducted two groups of results occurred. First, a structure of individual installments are compared during the analyzed period. We focused on the initial and terminal periods as well as the periods with the minimum/maximum interest rate, purchase price and the total amount of installment. Second, a comparison within the whole period regarding the interest rates and interests as well as a comparison of annuity installments, interests and repayments of principal are presented with the help of graphical analysis.

#### 4.1. Initial and final periods, maximum and minimum interest rate, purchase price or installment

Based on the assumptions stated in the Methodology, property prices, mortgage installments and interests were computed. After the computations, we derived minimum and maximum in terms of interest rates, purchase prices, installments and interest (see Table 2).

Special Feature	Month/Year	Property price (CZK)	Interest rate (% p.a.)	Installment (CZK)	Interest (CZK)
Initial obs., max IR	01/2009	1,635,000	<u>5.74</u>	9,531.03	<u>7,820.75</u>
Terminal obs., max PP	09/2019	<u>2,460,675</u>	2.47	9,684.30	5,064.89
Min IR	12/2016	1,937,475	<u>1.77</u>	6,940.51	<u>2,857.78</u>
Min PP	03/2013	<u>1,607,205</u>	3.17	6,924.28	4,245.70
Min INST	06/2015	1,706,940	2.05	<u>6,351.95</u>	2,916.02
Max INST	06/2019	2,413,260	2.76	<u>9,864.71</u>	5,550.50

Table 2. Initial, terminal and observations with the minimum/maximum interest rate, purchase price or installment

Note: obs. = observation; PP = property price; IR = interest rate; INST = installment; I = interest.

Maximum and minimum values in columns are in italics and underlined.

Table 2 shows that the mortgage market reached its minimum regarding the interest rate in 12/2016. This also corresponds to the lowest paid interest. From this point of view, in this period the mortgage was the cheapest although the price of the property was approx. 300 thousands of crowns higher than at the beginning of the monitored period (i.e. +18.5%). The explanation is the decline in interest rates in relation to the initial period (-3.97 p.p., i.e. -69.2%). From the point of view of the mortgage user's cash flow, however, this period is no longer the best (see 06/2015).

Today, or rather the recent state of the mortgage market (see 06/2019 a 09/2019 in Table 2) indicates that the demand on mortgage users is increasing. Total cash flow burden reached new maximum (06/2019). Compared to the 2016 minimum, the interest rate increased by around 40% as of 09/2019, and the interest paid increased by 77%.

From the above stated concludes that current mortgage prices – interests – are rather high in comparison to the past. However, as the 2W repo rate did not manage to transcribe more into commercial rates (cf. 2W repo<sub>2009</sub> = 2.25% vs. 2W repo<sub>2019</sub> = 2.00 while mortgage rate<sub>2009</sub> = 5.74 vs. mortgage rate<sub>2019</sub> = 2.47) it is rather possible to expect a further increase in mortgage interest rates. And since the amount of the total annuity installment has reached or exceeded the maximum at the beginning of the period under review, the risks of future refinancing are increasing. See next subchapter with the course of the variables in the graphs.

#### 3.2. Graphical analysis of variables dDevelopment

Several interesting graphs were created when working with data. The two most interesting ones are presented below. See Figure 3 that displays the progress of interests and average mortgage interest rates and Figure 4 that displays installments and their compositions within the monitoring period.



**Figure 3.** The amount of interest on the first installment (left y-axis; in CZK) and the average mortgage interest rate (right y-axis; in %) in the years 2009-2019.

In Figure 3, there is captured one interesting point. Approximately since the end of 2016, the curves have been diverging. Until that time, it is possible to observe quite a tight bond. What is more, leading Czech socio-economist in this field Martin Lux states that according to the computations of his team, property prices have been rising too much since about the middle of the year 2017 (Kain 2020, p. 16). It is therefore likely that the divergence of the curves in Figure 3 can be explained by an overestimated property market.

Figure 4 below provides an overview of the entire reporting period in terms of annuity installment, repayment of the principal and interest. The figure shows the growing trend of the principal repayment curve which is naturally caused by increasing property prices. Moreover, there can be seen what was stated in relation to Table 2; despite consistently low or only slightly higher rates, the demands on mortgage users are increasing since the end of 2016. The amount of annuity installment, that burdens the personal cash flow, already exceeded the then maximum from 2009. On the other hand, while the share of interest on the installment is rising, it remains rather favorable compared to previous development. For current mortgages, therefore, the challenge is not the amount of interest as the amount of the total installment.

According to the maxima and minima of Table 2 (see above), it was stated that the best period for mortgage users was 2015 and 2016. Referring to Figure 4, it is apparent that this period is characterized in that the principal repayments exceed the interest paid.



Figure 4. Mortgage annuity installments, repayments of principal and interests in the years 2009-2019.

#### 5. Discussion

A mortgage is a financial tool that is used by individuals as well as corporations and municipalities. Each of these three entities uses the mortgage for a different purpose and in different volumes (see e.g. Svobodová and Hedvičáková 2017). This article was focused on the price (actually on the interests) of mortgages for individuals who finance their housing needs in the years 2009-2019 in the Czech environment. In a broader context, one may assess the situation on the mortgage market as a sign of house price affordability (see e.g. Squires and Webber 2019). From their study results that based on their data from New Zealand there is no significant correlation between house price affordability and mortgage rates. In our contribution, there can be seen that, in terms of annuity installments, house price affordability decreases. In fact, it returned to the 2009 level (see Fig. 4). While in 2009 interest rates decreased house price affordability, nowadays it is a property price.

Anyway, since 2017 there is a growing trend in both components of the installment – repayments of principal and interests – which makes mortgages more expensive. On the contrary, until approximately mid-2016, the effect of falling interest outweighed the rise in property prices.

Therefore, in relation to the main research question, it can be concluded that today's mortgages are more expensive in comparison to the recent past. In line with the conclusion of DeFusco and Paciorek (2017) who quantified how rising interest rates hinder demand for mortgages on the case of U.S. market, there can be expected further decline in mortgage demand in the Czech Republic (Unfortunately, we do not have accurate data on the strength of dependence in the Czech Republic. We conclude this also for the Czech Republic mainly thanks to the general knowledge of the relationship between the interest rate and the demand for loans). Moreover, this decline would be underpinned by prudential policy of the Czech National Bank through the setting of LTV, DTI, and DSTI limits. According to the analyzed indicators, it is obvious that the growing trend in mortgages reported by Hedvičáková and Svobodová (2016) will tend to reverse.

Obviously, our contribution has some limiting factors. These are mainly determined by the assumptions set out in the methodology (see chapter 3). For example, we work with average interest rate values, which are influenced by a number of real variables (i.e. length of interest rate fixation, the actual value of loan to value ratio, etc.).

#### 6. Conclusions

From the perspective of the interest rates, mortgages remain quite cheap despite the Czech National Bank's rate hikes. In fact, final price of a mortgage is also influenced by the deductibility of interest paid from the tax base (on the possible impacts of the tax effect on mortgage demand see e.g. Slintáková and Klazar (2018)). However, a spread between interest rates and a share of interest on

mortgage installment increased (see Figure 3), which means a different than for this period otherwise standard development. This article signalizes that strongly rising property prices might be the main factor causing the spread difference. The correctness of this claim and potential issues resulting from this situation will be the future direction of our research interest.

Finally, thanks to the high principal, debtors are exposed to higher interest rate or refinance risks now. From the debtor's point of view, the most favorable periods were 2015 and 2016.

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