Assessment of the impact of macroeconomic factors on housing price level: Lithuanian case

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A R T I C L E   I N F O

A B S T R A C T

The aim of this article is to assess the impact of macroeconomic factors on housing price level in Lithuania over the period 2008–2015. The results of the research revealed statistically significant interdependence between aggregation of the major macroeconomic factors and the average annual housing price level in Lithuania over the researched period. Interest rate and availability of bank loans were established as the factors that have the most significant impact on housing price level in Lithuania.

1. Introduction

Underdeveloped housing rent market, high rent rates as well the lack of legislation to protect the interests of renters determines Lithuanian population's priorities to obtain and own housing. High demand for housing in the real estate market causes rapid growth of housing price level, especially in the largest Lithuanian cities such as Vilnius, Kaunas, Klaipėda. What is more, exaggerated interest and extra high demand for different types of housing create a favourable environment for manipulations with publically announced statistical data concerning the dynamics of housing price level. Hence, the research on the factors that influence housing price level in Lithuania is extremely purposeful.

Scientific literature is rather rich in the studies on housing price level. Macroeconomic and microeconomic determinants of housing prices were analysed by Landers (2012), Lee (2009), Manganelli (2014), Oktay, Karaaslan, Alkan, and Celik (2014), Rahadi, Wiryono, Koesrindartoto, and Syamwill (2015), Raslanas and Šliogerienė (2012) and others; the aspects of housing price estimation were studied by Aleknavičius (2008), Laukaitytė (2007), Simanavičienė, Keizerienė, and Žalgirytė (2012), Venclauskienė, Snieška, and Vasiliauskienė (2011) and others; the problems of cyclicality of real estate price bulbs were researched by Azbainis and Rudzkienė (2011), Pomogajko and Voigtlander (2012), Pumput and Šliogerienė (2014), Tupėnaite and Kanapeckienė (2009) and others; the impact of the availability of bank loans on housing price level was investigated by Ciarlone (2015), Hans (2008), McCord, McGreal, Berry, Haran, and Davis (2011), Pomogajko and Voigtlander (2012) and others. However, it should be noted that the biggest part of the studies focus on the research of the composite set of

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Table 1
Macroeconomic factors that have the impact on housing price level.

Author(s) (year)	Macroeconomic factors
Hott and Monnin (2008)	Interest rate, GDP (GNI), construction price, consumer purchase power
Zalieckaitė et al. (2007)	Average wage rate, GDP, inflation rate, availability of bank credits
Domingo and Fulleros (2005)	Interest rate, construction price, housing credit policy
Šečkutė (2014)	Interest rate, GDP, availability of bank credits, credit pay off terms
Post and Berkhout (2014)	GDP, employment rate, interest rate, inflation rate, average wage rate
Goddard and Marcum (2012)	Inflation rate, interest rate, environmental pollution, availability of mortgages, currency exchange rate
Lords LB Baltic Fund (2015)	The state of global and/or regional economics, tax rate, interest rate, availability of funding, inflation (deflation) rate, payment risk
Manganelli, 2014	GDP, interest rate, inflation rate, labour market indicators, tax rate
Oktay et al. (2014)	Inflation, public investment, interest rate, availability of housing loans, GDP (GNI), household income, employment rate
Lin et al. (2014)	Interest rate, mortgage availability, rent-income ratio
Lee (2009)	Mortgage rates, interest rates, inflation, population's income changes, construction costs, unemployment rate, equity prices
Ciarlone (2015)	Average wage rate, interest rates, risk-free interest rate, mortgage availability, employment rate, construction costs
Pomogajko and Voigtlander (2012)	GDP, convergence of business cycles, availability of credits
McCord et al. (2011)	Availability of mortgage, interest rate, income, liberalisation of finance markets

Source: Compiled by the authors.

macroeconomic and microeconomic determinants of housing price level or on the analysis of single determinants, whereas the impact of purely macroeconomic factors earns insufficient scientific attention, especially while analysing the situation in Lithuanian housing market. Hence, it is purposeful to conduct the research that would reveal the impact of the major macroeconomic factors on housing price level in Lithuania.

The aim of this article is to assess the impact of macroeconomic factors on housing price level in Lithuania over the period 2008–2015. The defined aim was detailed into the following *objectives:* 1) to analyse the theoretical literature on the macroeconomic factors that have the most significant impact of housing price level; 2) to select and present the methodology of the research; 3) to introduce the results of the empirical research on the impact of macroeconomic factors on housing price level in Lithuania over the period 2008–2015. *The methods of the research* include scientific literature analysis, correlation and regression analysis.

The objectives of the research determined the following structure of the article: in Section 1, with reference to the scientific literature, macroeconomic factors that have the most significant impact on housing price level have been analysed; in Section 2, the methodology of the research has been introduced; in Section 3, the results of the empirical research on the impact of macroeconomic factors om housing price level in Lithuania over the period 2008–2015 have been presented.

2. Macroeconomic factors that have the most significant impact on housing price level: theoretical background

While analysing the changes in housing prices, many authors (Manganelli, 2014; Rahadi et al., 2015; Raslanas & Šliogerienė, 2012 and others) note that sudden and sharp price rises and drops are hard to predict. Apart from microeconomic factors, which are referred to as a set of characteristics of local environment where housing is located and the characteristics of housing itself, macroeconomic factors also have a significant impact on housing price level since they determine the state of the overall economics in a country, influence the prices of products and services generated in all industries, and define the structure of the overall demand. The analysis of the scientific literature has enabled to identify the macroeconomic factors that have been acknowledged as the ones having the impact on housing price level (see Table 1).

The data in Table 1 shows that the authors note such major macroeconomic determinants of housing price level as GDP (GNI), inflation rate, interest rate and availability of funding (e.g. availability of bank credits/mortgages). GDP is related to the improvement of economic performance of this country. Improved economic performance, in turn, promotes the overall demand and drives prices, including the prices of housing, to rise (Hott & Monnin, 2008; Oktay et al., 2014; Šečkutė, 2014; Post & Berkhout, 2014; Zalieckaitė, Snieška, Vasauskaitė, & Remeikienė, 2007). The rise of inflation rate is considered to lead to the increase in housing prices alongside with the sustained increase in the general level of prices for goods and services (Goddard & Marcum, 2012; Lords LB Baltic Fund, 2015; Oktay et al., 2014; Zalieckaitė et al., 2007), while deflation, on the contrary, contributes to the decline of housing prices (Lords LB Baltic Fund, 2015; Zalieckaitė et al., 2007). Growth of interest rate means higher costs of funding that not only discourage potential buyers from acquisition of housing, but also reduce real estate market liquidity and extend the period of sales (Domingo & Fulleros, 2005; Goddard & Marcum, 2012; Hott & Monnin, 2008). Hence, high interest rates gradually drive housing price level down because rent of housing becomes a more attractive alternative (Ciarlone, 2015; Lee, 2009; McCord et al., 2011) and vice versa. Finally, availability of funding is one of the key determinants of housing price level since bank loans/mortgages serve as the main source of funding for acquisition of housing for the largest share of population (Ciarlone, 2015; Hans, 2008; McCord et al., 2011; Pomogajko & Voigtlander, 2012). As it was noted by Hans (2008), banks are inclined to ensure availability of loans/mortgages in order to avoid the

decline of their capital (e.g. the decline of the value of mortgages), which might be determined by the decline of real estate prices in the market.

Concerning the impact of such factors as employment rate, average wage rate and consumer purchase power, some scientists (Lee, 2009; Manganelli, 2014; Oktay et al., 2014; Post & Berkhout, 2014) note them as the determinants of housing price level, stating that employment serves as a generator of wages; it raises consumer purchase power and promotes demand for different types of purchases, including housing, which causes housing prices to rise. However, the other scholars (Ciarlone, 2015; Lin, Tou, Lin, & Yeh, 2014; Tsatsaronis & Zhu, 2004) argue that population's income (e.g. wages generated by employment or the increase of the average wage rate) may not determine significant changes in the dynamics of housing price rate because a small number of housing purchase transactions are funded from personal income or savings in comparison to the number of housing purchase transactions which are funded by employing a bank loan/mortgage. Hence, the factor of availability of bank loans can be considered to have more significant impact on housing price level than employment rate or average wage rate.

Construction price can be considered as a microeconomic factor of housing price level since construction costs compose the largest share of housing self-costs, i.e. higher construction prices determine higher self-costs of housing and this way raise the final price of housing. The factors of credit pay-off terms and payment risk can be attributed to the category of financial factors rather than to the category of macroeconomic factors of housing price level since they are related to the performance of financial settlements. Similarly, the factor of environmental pollution can be attributed to the category of environmental factors of housing price level since it is commonly linked to the surroundings in which a housing is located rather than to a general environmental situation in a country.

Hence, with reference to the results of scientific literature analysis, GDP, inflation rate, interest rate and availability of funding will be treated as the major macroeconomic factors of housing price level.

3. The methodology of the research

In order to fulfil the defined aim of the research, e.g. to assess the impact of the major macroeconomic factors on housing price level in Lithuania over the period 2008–2015, the methods of correlation and regression analysis were employed. For the establishment of which macroeconomic factors had the most significant impact on the housing price level in Lithuania over the period 2008–2015, correlation analysis was carried out (Pearson's correlation coefficient was calculated). The correlation analysis covered the following independent variables: GDP, inflation rate, interest rate and availability of funding.

The methods of correlation and linear regression analysis were employed for the research on what impact the selected macroeconomic factors had on the average annual price of one square meter of a two-room apartment in the largest Lithuanian cities (Vilnius, Kaunas and Klaipėda) over the period 2008–2015. The dynamics of the price of one square meter of a two-room apartment was selected as the basic measure of housing price fluctuation considering the results of previous scientific research, which show that the demand for two-room apartments in Lithuania is much higher in comparison to the demand for one-room, three-room, four-room apartments and private detached houses (Venclauskienė & Snieška, 2010; Venclauskienė et al., 2011). What is more, high level of demand determines that prices of one square meter of a two-room apartment remain comparatively high even during the periods of economic recession (Venclauskienė et al., 2011). The data on fluctuation of the prices of one square meter of a two-room apartment over the researched period was extracted from the databases of the Public Institution Centre of Registers (2015), SEB Bank (2015) and real estate agency Oberhaus Real Estate (2015).

4. The impact of macroeconomic factors on housing price level in Lithuania over the period 2008–2015

The results of the empirical research have revealed that annual GDP in Lithuania dropped by 17.6% from 2008 to 2009, while from 2009 to 2015 it kept gradually growing, the growth amounting to nearly 30%. The crisis of 2008 had the impact not only on GDP decline, but also on housing price level, which started dropping in 2008, and reached its lowest level in 2010. The trends of the dynamics of GDP rate corresponded to the dynamics of the price of one square meter of a two-room apartment in Lithuania over the period 2008–2015 (both rates started dropping at the beginning of economic crisis in 2008), which proposes that GDP rate fluctuations may have the impact on housing price level. The value of the coefficient of determination $R^2 = 0.0058$ shows that GDP explains variation of housing price level by 0.58% (see Fig. 1).

The equation of linear regression in Fig. 1 shows that the increase of GDP rate by 1 million EUR determines the average rise of housing price level by 0.0032 Eur.

Further in the research, the links between inflation rate and housing price level were analysed. Over the analysed period, inflation in Lithuania reached its peak of 8.5% in 2008. From 2008 to 2009, the inflation rate in Lithuania sharply dropped by 84.7%, while from 2010 to 2012 a gradual decline of the inflation rate can be observed. In 2013, the inflation rate sharply dropped again, and since 2014, it has been negative. Housing price level sharply dropped over the period from 2008 to 2010, but from 2010 to 2014, it showed insignificant changes. In 2015, housing price level started rising again under the negative value of the inflation rate. The value of the coefficient of determination $R^2 = 0.3935$ shows that variations of the inflation rate explain variations of housing price level by 39.35% (see Fig. 2).

As it can be seen from Fig. 2, linear regression $y = 34.968x + 1373.1$, which means that the increase of the inflation rate by 1% determines the average rise of housing price level by 34.968 Eur.
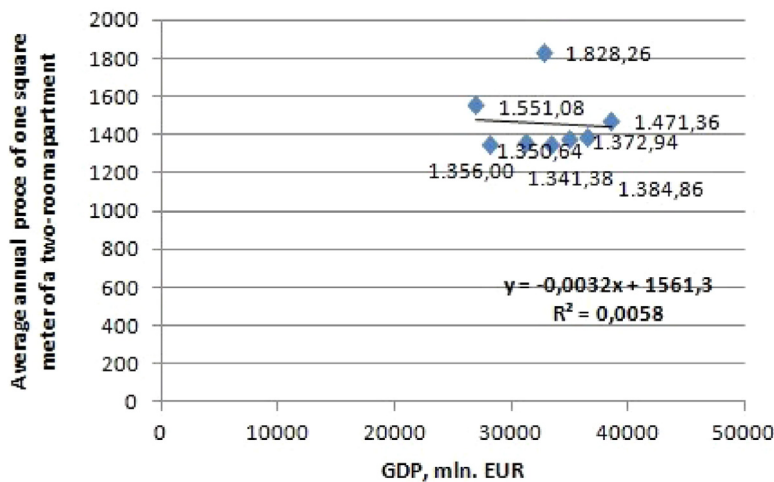
Fig. 1. Interdependence between GDP rate and housing price level in Lithuania over the period 2008–2015.
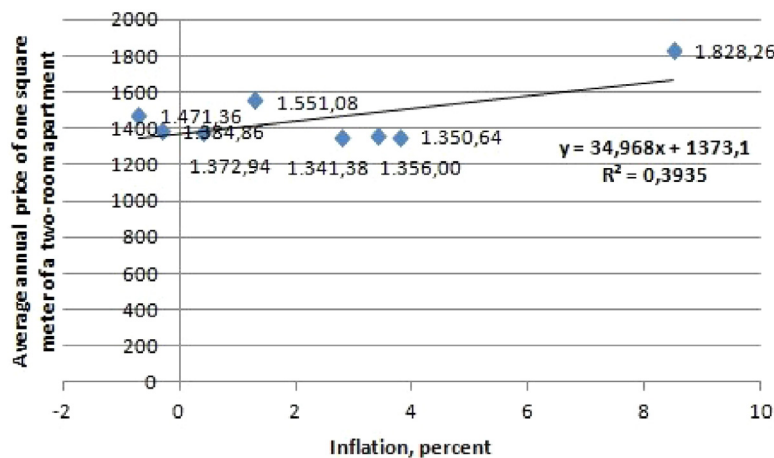*Source:* Compiled by the authors.

Fig. 2. Interdependence between the inflation rate and housing price level in Lithuania over the period 2008–2015.
Source: Compiled by the authors.

The analysis of the links between the dynamics of interest rate and housing price level revealed that over the period from 2008 to 2015, interest rate in Lithuania was gradually decreasing. Housing price level was also in its highest point in 2008, and started decreasing the following year. At present, interest rate in Lithuania is nearly 1.87%. Since 2008, it has decreased by 65.7%, which means that currently it is comparatively low. Following the results of the scientific literature analysis, low interest rates should promote potential buyers of housing to take bank loans/mortgages for acquisition of housing. The interdependence between interest rate and housing price level in Lithuania over the period 2008–2015 has been depicted in Fig. 3.

The value of the coefficient of determination $R^2 = 0.4923$ shows that variations of the interest rate explain variations of housing price level by 49.23%. The linear regression equation $y = 93.175x + 1147.9$ means that the increase of the interest rate by 1% determines the average rise of housing price level by 93.175 Eur.

The analysis of the links between availability of bank loans and housing price level in Lithuania over the period 2008–2015 disclosed that the largest amounts of bank loans for acquisition of housing were issued in 2008, e.g. in the year of pre-crisis, when the overall money turnover in financial markets was high, and bank loans/mortgages were easily available due to unrestrictive terms established for loan/mortgage contracts. At the same time (e.g. in 2008), high housing price level in Lithuania was determined by overconsumption and high inflation rate. In 2009, the amount of the bank loans, issued for acquisition of housing, dramatically dropped, and over the period 2010–2015 changed rather insignificantly. From 2014 to 2015, the amount of the bank loans, issued for acquisition of housing, dropped by 40.3%. According to the experts of the SEB Bank (2015), this drop is linked to introduction of euro in Lithuania in 2015 and the precaution of financial risks that potential buyers of housing may relate to new currency, in particular, over the initial period of adaptation. The
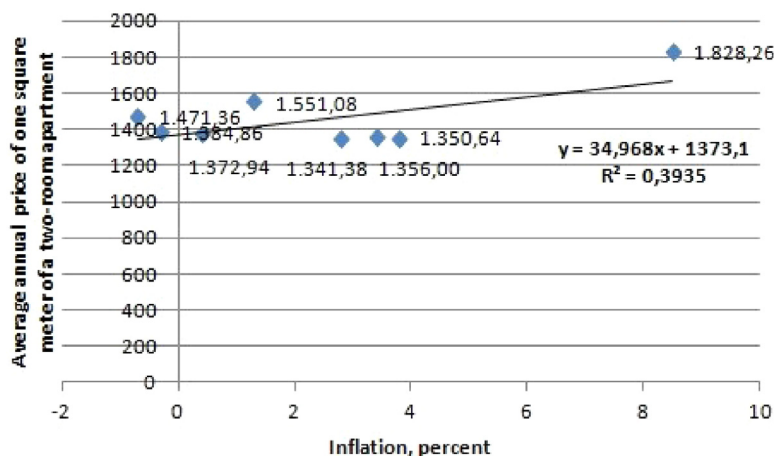
Fig. 3. Interdependence between the interest rate and housing price level in Lithuania over the period 2008–2015.
Source: Compiled by the authors.

Fig. 4. Interdependence between the amount of bank loans, issued for acquisition of housing, and housing price level in Lithuania over the period 2008–2015.
Source: Compiled by the authors.
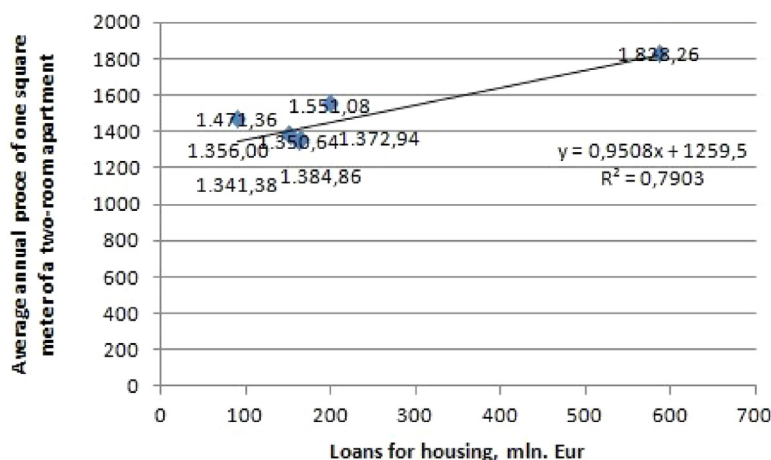
interdependence between the amount of bank loans, issued for acquisition of housing, and housing price level in Lithuania over the period 2008–2015 has been depicted in Fig. 4.

As it can be seen in Fig. 4, the value of the coefficient of determination $R^2 = 0.7903$ shows that variations of the amount of banks loans, issued for acquisition of housing, explain variations of housing price level by 79.03%. The linear regression equation $y = 0.9508x + 1259.5$ reveals that the increase in the amount of banks loans, issued for acquisition of housing, by 1 million EUR determines the average rise of housing price level by 0.9508 Eur.

While analysing linear interdependence between the aggregation of four major macroeconomic factors (GDP, inflation rate, interest rate and availability of bank loans) and the average annual price of one square meter of a two-room apartment in Lithuania over the period 2008–2015, regression coefficient $R^2 = 0.7903$ was estimated. This value of the regression coefficient indicates statistically significant impact of the aggregation of the major macroeconomic factors on housing price level in the country.

Summarising, it can be concluded that the dynamics of interest rate and availability of bank loans are the macroeconomic factors that have the most significant impact on housing price level in Lithuania, and they respectively explain variations of housing price level by 49.23 and 79.03%. Inflation rate and GDP have much less significant impact of the dynamics of housing price level in the country, and respectively explain variation of housing price level only by 39.35 and 0.58%. Aggregation of four major macroeconomic factors has the statistically significant impact on housing price level in the country.

5. Conclusion

The results of the scientific literature analysis propose that GDP, inflation rate, interest rate and availability of funding for housing acquisition can be treated as the major macroeconomic factors that have the impact on housing price level. The results of the empirical research have confirmed statistically significant interdependence between the aggregation of four major macroeconomic factors (GDP, inflation rate, interest rate and availability of bank loans) and the average annual price of one square meter of a two-room apartment in Lithuania over the period 2008–2015. The dynamics of interest rate and availability of bank loans are the macroeconomic factors that have the most significant impact on housing price level in Lithuania, and they respectively explain variations of housing price level in the country by 49.23 and 79.03%. Inflation rate explains variations of housing price level by 39.35%. Finally, GDP is the macroeconomic factor that has the insignificant impact on housing price level in Lithuania.

Considering prognostication of the experts (SEB Bank, 2015), comparatively low current level of interest rate should contribute to attractiveness of bank loans, and the demand for housing in Lithuania should stabilise. Nevertheless, since housing price level is influenced not only by basic macroeconomic, but also by the variety of other categories of factors (for instance, social, political, environmental, psychological, demographical, etc.), more comprehensive research on the impact of different categories of factors on housing price level would be purposeful. In addition, in order to obtain higher accuracy of the results, the period of the research could be expanded and bigger variety of research methods, for instance, Johansen co-integration or Granger causality could be employed.

Funding

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