

## THE ECONOMIC FACTORS INFLUENCE ON REAL ESTATE MARKET DEVELOPMENT

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**Abstract:** The real estate market has a significant impact on the development of any country's economy. However, there is also a reverse effect - economic growth leads to inevitable changes in the real estate market. The author's analysis of scientific literature shows that the real estate market is influenced by the same macro and microeconomic factors that affect the entire economy and social environment. These are general indicators reflecting the state of the economy or its sector, which may be affected by demand, consumer expectations, declines in government grants for a particular region, or other negative factors. These negative factors lead to a fall in the profitability of regional branches of economy, which also affects the overall economic situation. This article examines the impact of the income gap of a specific region on the real estate market and regional development.

**Keywords:** economic growth, development, real estate, real estate market.

### Introduction

Real estate is an important part of the country economic potential constituting a big part of national wealth the role of which in economy influences many spheres of activity related with the development of country economics. Changes of the market value of real estate are important for all the sectors of economic activity related with real estate: construction – for forecasting the construction costs and profitability of the projects, banking – for establishment of the proportions of loans, possible risks and bond, production – for evaluation of the production costs, future demand for articles intended for construction and the possessed long term property, state – for evaluation of the property administered by the state and establishing of the real estate taxes. The market of real estate is dynamic and constantly changing. Striving for correct and reasoned forecasts its constant observation and analysis are necessary. Till present much research and many studies of the real estate market had been conducted, however, they insufficiently reveal the present and forecasted changes in the real estate market in Lithuania. So taking into consideration the significance of this sector of economy for the country economics it is necessary to identify all the possible factors which influence both the present changes and the development prospects of this market supposing the changes of these factors and their influence on the real estate market.

The results of the forecasts of real estate market based on research can be relevant to investors, sectors of finance, construction and all the residents. These results of research must offer opportunities for weighing the possible risks and plans of future activity. The performed analysis and drawn conclusions will be useful for the participants of real estate market in evaluating the probable changes of real estate market, their forecasting in the future and passing decisions related with the acquisitions of real estate.

With a knowledge of the present economic situation of Lithuania and forecasting its future it is useful to analyse one of the most important sectors of economy – real estate market and to evaluate its changes and the factors determining these changes. For the evaluation of the real estate market of Lithuania there is lack of reliable statistical information and its analysis. The present sources of information often present only the statistical data of real estate market without taking into consideration their ties with the changes of the factors acting in this market. It should be noted that the influence of economic factors on the

prices of real estate of different sorts is not necessarily the same. The dynamism of real estate market and constant changes in it ought to be emphasized. Due to this reason striving for correct today's conclusions and forecasts of the nearest future it is necessary to observe this market constantly and conduct new research employing the newest macro and micro economic indicators of real estate market and today's economics.

### 1 Factors Influencing the Real Estate Market

Factors of economic growth influencing the rates of growth of economy are closely interrelated. Six major factors which determine the changes of the growth of economics are singled out. Four of these factors had been grouped as supply factors: natural resources, means of production, human resources and technologies. The remaining two are productivity and demand. All these mentioned factors have direct effect on the value of goods and rendered services (Boldeanu, Constantinescu, 2015). According to authors L. Kauškale, I. Geipele (2014) the development of real estate market is inseparable and interrelated with the development of the whole economy. According to the authors the real estate market is distinguished for certain lags of reacting to the changes in economy. Therefore, the forecast of the changes of real estate market is a very important factor for the evolution of economy.

Real estate is an important sector of industry. Real estate can be employed for trade, production, rendering of services as investment or business. Attention ought to be drawn that real estate market is very important for every country due to both ensuring construction and infrastructure necessary for life and work and its strong multiple influence on the evolution of the economy of the whole country. The tendencies of real estate market are a strong indicator of the tendencies of all the economics (Golob, et al., 2012). The industry of housing real estate can be named as a special market which is directed towards people and the satisfaction of their social needs.

Macroeconomic country development influences real estate market in various aspects. Due to the increase of the local and foreign demand the number of the registered buildings is growing. The development of real estate market and macroeconomic environment also determines the earning power ratio of rent and the profit of real estate businessmen (Kauškale, Geipele, 2014). Although the formation of the prices of real estate is a complicated process, during the analysis of literature the following factors influencing housing prices can be singled out (Ting Xu, 2017; Belas, et al., 2016):

- Growth of GDP;
- Income;
- Employment;
- Interest rates;
- Government policy.

The factors influencing the real estate market had also been investigated by Psunder (2009). He has established that impact factors were accompanying the growth of real estate market. The following impact factors influencing the growth or reduction of real estate market can be named (Golob, et al., 2012; Srovnalíková, Karbach, 2016):

- Household income;
- Demographic and social indicators;
- Offered and financed expenses;
- State impact.

The development of real estate market and acquisitions in real estate market are essentially related with the purchasing capacity of the residents, revenue sharing and, in the course of time, with the formation of social strata and other factors which are very

important in forming economic prerequisites (thoughts) (Kauškale, Geipele, 2016; Ciarniene, et al., 2017).

The variety of factors influencing the dwelling market is very wide. As Cohen and Karpavičiūtė (2016) state dwelling is one of



Fig. 1. Interconnection between government policies, national economy development and real estate market (Source: L. Kauškale; I. Geipele (2016)

the most important goods in the economic relations of the country. Real estate market is related with many other markets (construction, furniture, interior, landscape gardening and others). „Dwelling market is the major part of all the real estate market as well, so it is a rather reliable indicator of both real estate market and all the economy of the country. The principal factors such as interest rate, real estate supply and demand, construction costs, demographic situation, economic state of the country are named as the fundamental factors. Real estate market and herewith the factors influencing it are different even in the countries which are equally developed. In the countries of transitional economies to which Lithuania can be attributed as well additional (derived) factors appear, „these are the rise of ownership right, regulation of land market, expectations of the consumers (both rational and irrational), increasing volume of loans and others“ (Skackauskiene, et al, 2015; Cohen and Karpavičiūtė, 2016). The tendencies of impact and structures investigated in separate countries are not always applicable in another country. In Lithuania the investigations of fundamental and derived dwelling price factors are scarce, depending on the investigation period their results are contradictory.

It is vital to note that significant damage to construction sector and construction market can be inflicted by bigger inflation (bigger financing expenditure), due to which the demand for the real estate decreases and effect on the prices is produced (Golob, et al., 2012; Srovnalnikova, 2015). The reduction of the investment attractiveness of property (due to the reduction of possible monetary flows, growth of risks, reduction of liquidity) is the principal factor which is described by various macro and microenvironment factors (Simanavičienė, et al., 2012; Raslanas, et al., 2005; Zubrecovas, 2010; Virglerova, et al., 2016; Reilly, 2013 and others). The analysis of a great variety of macro and micro economic factors enables to establish the influence of the changes of these factors on the prices of real estate.

Authors L. Tupėnaitė and L. Kanapeckienė, (2009) in their article have investigated that following the GDP indicator it can be affirmed that in the Baltic countries the changes of the dwelling prices have essentially coincided with the economic growth of the countries. As the countries' economics, income and purchasing capacity of the residents was growing, more and more residents were able to acquire a dwelling and after the beginning of economic depression the prices stopped rising or even dropped. However, mention may be made that in 2004-2006 the growth of dwelling prices was 4-5 (and sometimes also 6) times bigger than the growth of GDP. Consequently, the prices of dwelling market were booming much more than the countries' economics. That indicates that dwelling during this period was overvalued. Authors K. Golob; M. Bastic; I. Psunder (2012) have established that positive correlation between the reducing interest rates, bigger prices and increasing real estate transactions exists.

Seeking to forecast the changes of real estate prices in Lithuania the ratio of GDP, income and dwelling prices and other indicators are also analyzed.

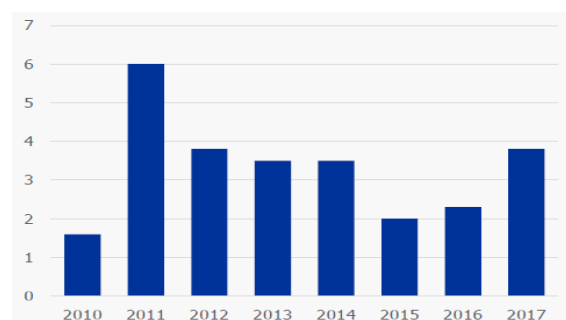


Fig. 2. Annual GDP growth in Lithuania, % (Source: A. Antanavičius (2018).

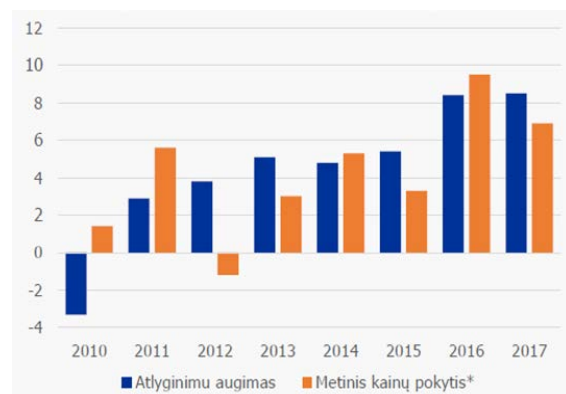


Fig. 3. Change in salaries and housing prices in Lithuania, % (Source: A. Antanavičius (2018)

Since the introduction of the euro the savings of natural persons and legal entities in the banks increased by 2.48 billion EUR, however, the portfolio of the loans granted to them grew by 3.33 billion EUR. The people have become not in the least richer, they have become more debt-laden, but bigger amount of money in circulation creates the illusion of richness. At a high rate the market is approaching maximal debt consolidation. The author also presents a clear dependence of loan fund on the change of dwelling prices, so he forecasts that in our market the dwelling prices will be determined not by the expectations of the residents, even not by the balance of demand-supply, but by the amount of money in the market.

The growth of economics or real estate market can be evaluated following such principal indicators as GDP, inflation, wages, unemployment rate. After reviewing the conducted investigations and the presented statistical information on the state of economics and real estate market, in the further chapter the authors by their investigation will aim to analyse and identify the economic factors influencing the changes of the housing real estate prices through a broader lens.

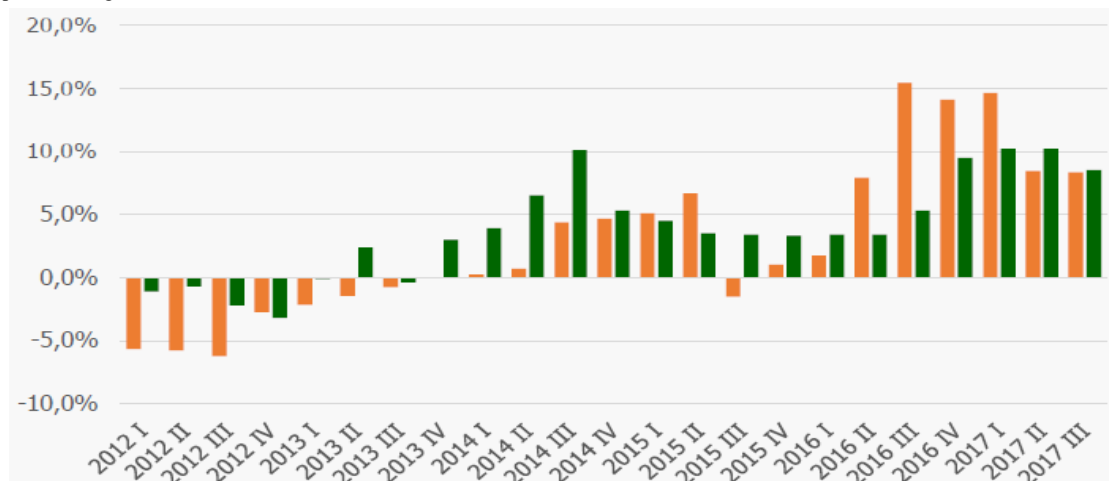


Fig. 4 Changes in Household Loan Fund and Housing Prices in Lithuania, % (Source: A. Antanavičius (2018))

The regional macroeconomics mostly analyses the comparative economical characteristics of different regions in the country's economy. The regional macroeconomics tackles the problems related with comparable growth of economics, differences of employment rate of the region and movement of production factors between the regions. While on the subject of regional macroeconomics, certain econometric models which essentially are similar to the models of national economy have been prepared. Instead of interrelations of different countries they pay attention to the interrelations of the regions (Kačar, et al., 2016).

The factors influencing the economic level of the regions have been investigated by K. Durkova; L. Čabyova; E. Vicensova (2012), the authors have singled out the following factors acting on the economic level:

- The localization of enterprises in the region, their incidence, structure of the affiliates, economic stability, intensity of regional economic relations, types of organizational forms;
- The quantitative and qualitative characteristics of the residents and their movement;
- The technical and social infrastructure taking into consideration the complexity, quality and quantity;
- The available natural resources and the level of their exploiting;
- The direct and indirect impact of the state economic policy.

## 2 The impact of macroeconomic factors on the residential housing market

For statistical analysis, MS Excel, Python 3.6 and Tensorflow-GPU 1.10.0 were used. During the analysis data on the transactions of apartments in 2008 – 2018 years (total 85.531 transactions) from the State Register was collected, which were assigned 24 variables, of which 8 categories variables such as gas or heating type, sewerage, etc.

At the next stage, regional macro indicators from the Lithuanian Department of Statistics were taken:

1. Turnover of the economy by place of business (non-financial enterprises) by economic activity
2. Number of completed apartments
3. Number of newly built non-residential buildings completed, pcs

4. Housing price indices (2015 - 100), H1 Housing purchase
5. Wages and salaries (monthly), EUR
6. Number of employees
7. Emigrants
8. Births
9. Education of the population | thousand, total by education
10. Population density at the beginning of the year per km<sup>2</sup>
11. Immigrants
12. Dead
13. Deadly babies
14. Unemployment rate
15. Permanent population as of July 1, City and Village
16. Regional GDP per capita at current prices, thsd. EUR
17. Regional GDP at current prices, mln. EUR
18. Expenditure on municipal budgets thsd EUR, Total
19. Revenues from municipal budgets thsd EUR, Total revenue
20. Territory (land area) at the beginning of the year km<sup>2</sup>
21. Foreign direct investment at the end of the period million EUR
22. Number of registered fires
23. Fees paid by enterprises and residents thsd EUR, Total fees
24. Interest rate on housing purchase
25. Consumer price developments calculated on the basis of the
26. Consumer Price Index percent,

Some indicators have been provided quarterly, part provided monthly, but most of the data is provided at annual intervals. Therefore, macro indicators were interpolated by quarter and predicted by 2018.

In the next step, macro indicators were assigned to each transaction in accordance with the zone classification of the registry center and the date of the transaction.

As the main predictive variable, the unit price, which is obtained by dividing the area of an apartment from the amount, was chosen. However, the distribution of data reflected exponential distribution. Some data was rejected, which showed very low prices or very high, i.e. it was chosen to take quartiles from 5% to 95% (76.212 transactions left). It was also chosen to transform the data according to the log (1 + x) transformation (see Figure 5).

In addition, a shapiro wilk test with a P value of 0.929 was performed. These adjustments completely converted the distribution of the main predictive variable to the normal one.

The next step was to convert all the categorical variables to dummy variables, i.e. to make columns that indicate whether the transaction meets the criteria or not (Yes = 1, No = 0). In this case, the zones were removed and left only the districts: Alytus, Šiauliai, Utena, Kaunas, Panevėžys, Vilnius, Tauragė, Marijampolė, Klaipėda, Telšiai.

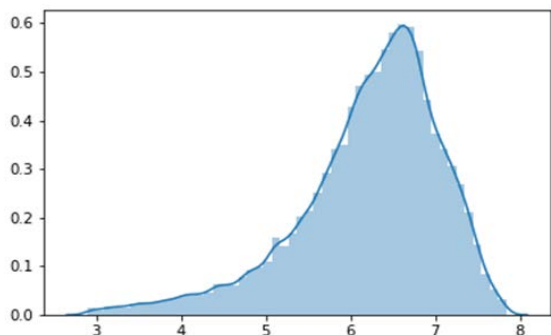


Fig. 5 Forecast variable histogram, unite price

Missing values were restored using MICE package (Azur, et al., 2011). The LightGM algorithm, which is the solution tree integration with the gradient search, was used to predict (Ke, et al., 2017). In the next step, the main criteria were selected (32 variables in total), applying them were optimized hyper parameters. The correlation between the predicted variable and the independent variables was then checked, all independent variables were transformed or left to original values based on the maximum correlation between the unit cost and the analysed independent variable.

With the compiled model, a unit price forecast was made, the accuracy of which is based on the “Mean absolute error”, R2 and the correlation between the predicted unit price and the true (see Table 1).

Parameter	Meaning
Mean absolute error	163.75%
R2	0.48%
Pearson Correlation	0.70

Table 1. Assessment of model accuracy

From the table 1, we see that the overall average error is 163%, due to the fact that the properties of the same characteristics are

sold at very different prices, but part of the valuation of prices falls into the lines. This problem is also seen in the evaluation of R2, which shows how much data is presented in terms of mean

change, the data obtained in this case explains 48% of the change, which requires the development of a methodology and the collection of more information or more detailed information. Despite the potential expansion, the correlation coefficient between the forecasted price and the real price shows a 70% dependency, which defines price prediction objectively, but in order to expand the module, in order to assess more exemptions, it is necessary to expand the methodology and the amount of information to be collected.

The model obtained in the last stage is interpreted using the SHAP package and identifies the main variables affecting the cost of the property (see Figure 3).

On the basis of the graph 6, we can see that the main variables affecting prices are the number of inhabitants per square kilometre, which directly coincides with places like large cities. The employment of the population, i.e., the number of employees in the region, has a great influence, as residents without economic activity cannot afford to buy housing. The following criteria relate to housing characteristics such as purchased area, housing area, high number. It is also important to emphasize the fact that the birth of new born families is also influenced by the purchase of housing. Based on this fact, estimates could be made for assessing births, i.e. determining the period during which the population tends to create new families. Also important are the interest rate and housing price indices that relate to preferential loans. This study showed the possibility of expanding the development of real estate valuation methodology, which would allow more objective introduction of data-based assessment in practice, and not just a comparative method.

This information can be used to evaluate the price of real estate or to improve the mass real estate valuation methodology. This access would allow you to estimate the price of an immovable property in an area in which previously the object of this type would not be sold. At present, the cost of such objects is evaluated on a comparable basis, but in the absence of historical transactions, the price is difficult to estimate. Based on this methodology, it is possible to leave the housing variables and change the macro indicators according to the zone in which the new object is sold. Validation of this access requires further research.

### 3 Conclusions

The analysis of scientific literature indicates that the prices of real estate market are influenced by many and various factors which according to their effect are singled out to macroeconomic and microeconomic and according to their nature – to objective and subjective factors. The analysis has revealed that the real

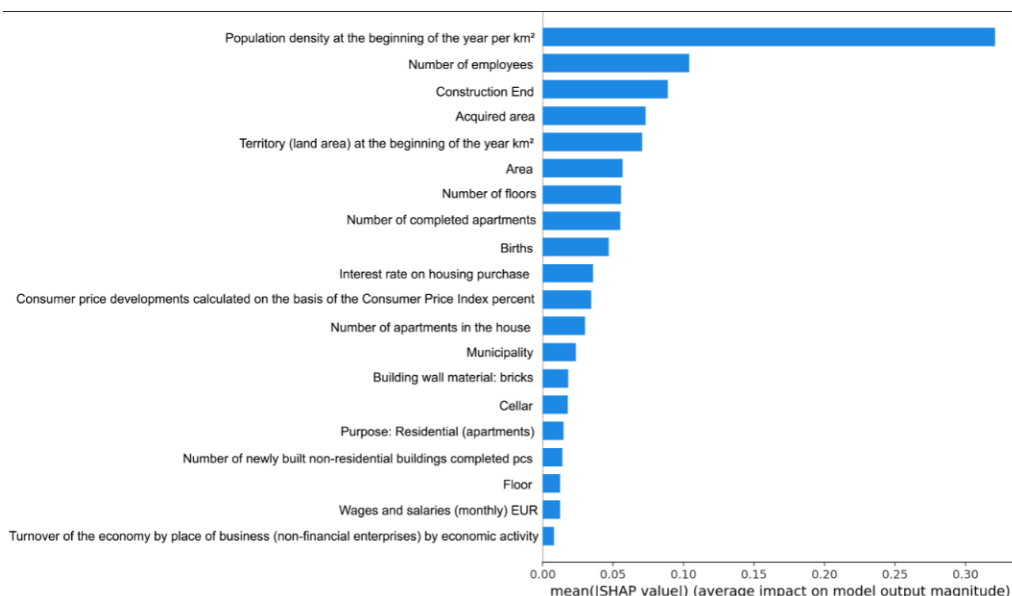


Fig. 6 Visualization of the influence of the main variables on prices

estate markets are very dynamic and the changes of the situation in a real estate market are most often represented in the segment of the market of housing real estate (dwelling). The number of the property items transactions of this sort is the greatest and that offers the opportunities for the analysis of the development tendencies of all the real estate market.

The investigation has indicated that the influence of not all the factors can be assessed with the help of quantitative methods. Taking into consideration this factor correlation – regression analysis which has enabled to assess the influence of the changes of analysed factors exerted on the changes of the prices of real estate market in quantitative values and mathematical formulas was chosen.

Calculations have indicated that the most significant factors which in 2008 - 2018 influenced the prices of Lithuanian real estate market were as follows: changes of GDP, changes of the residents' income.

The results of the conducted investigations have indicated that the dependences of factors indicators and changes of dwelling prices expressed in mathematical formulas in practice can be used for the forecasting of the changes of the prices of real estate in the near future.

It should be noted that the principal problem related with the analysis of the factors influencing real estate market is insufficient data base of the comparative transactions, the country's real estate market having short history. Another problem is the lack of methods substantiated by expert investigations appropriate for small developing markets in the literature of both Lithuanian and foreign scientists. Aiming to work out an appropriate methodology of analytical evaluation it is necessary to analyse the approaches employed abroad, to repeat an analogical investigation in Lithuania and to work out the methodology of evaluation of analytical approach on the basis of the results of the investigation.

The study revealed that population density, employment, and so on have a significant impact on the market, i.e. the number of employees in the region, as people without economic activity cannot afford to buy housing. The following criteria relate to housing characteristics such as purchased area, housing area, high number. It is also important to emphasize the fact that the purchase of housing is influenced by the birth, i. e. the creation of new families. Based on this fact, estimates could be made for assessing births, i.e. determining the period during which the population tends to create new families. Also important are the interest rate and housing price indices that relate to preferential loans. Information from this survey can be used for real estate valuation, forecasting price changes and improving the methodology of mass real estate valuation. This access would allow us to assess the price of an immovable property in a region in which such an object was not previously sold. Based on this methodology, it is possible to leave the housing variables and to change the macro indicators according to the eligible zone in which the assets are sold. Validation of this access requires further research.

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**Secondary Paper Section: AH**