MYKOLAS ROMERIS UNIVERSITY
IN COOPERATION WITH MIDDLESEX UNIVERSITY
BUSINESS AND MEDIA SCHOOL

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IDENTIFICATION OF KEY INDICATORS IN RESIDENTIAL REAL ESTATE PRICE FORECAST

A master's thesis

Supervisor
Prof. dr. D. Jurevičienė

VILNIUS, 2015

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A master's thesis on financial markets
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Relevance of the research

Real estate market is changing in ways that cannot perfectly reflect the past while the future is mostly uncertain. Since the financial crisis of 2007 – 2008, the fundamental question of the causes of real estate price fluctuations has been researched numerous times; however, the surprising lack of consensus still exists.

Residential real estate price fluctuations influence not only business cycle dynamics, but also the whole financial system, having a major impact on the performance of financial institutions. A possibility to predict these changes may be a key point in the overall financial stability.

Assets linked to residential real estate represent an important component of the portfolio of financial intermediaries. Investment in residential real estate is considered the largest household expenditure category. In Lithuania, the main single asset of most households own is an apartment. Although the growth is not constant in the whole country, apartment segment growth surpasses the private house sector. In addition, the largest apartment supply is recorded in Vilnius.

The financial crisis has shown the damage that irresponsible lending and borrowing can have on consumers and lenders, on financial system and on the whole economy. Since 2008, the European Commission has proposed different legislative measures to build new rules for the financial system to establish a safe, responsible and growth increasing financial sector in Europe. With recently updated Responsible lending regulations, the Bank of Lithuania shows its determination to ensure that such practices are not repeated in the future as it is very likely that currently low interest rate will increase. It is expected that the updated version will decrease the risk of over-indebtedness and will prevent customers from underestimation of their ability to pay the loan. The outcome can have both positive and negative impact on real estate market and become a reason to create an alternative service for those, who will not be able to satisfy requirements based on updated Responsible lending regulations.

A recent focus on monitoring economic indicators was proposed in order to identify those, which contain useful information on future real estate prices forecasting. In numerous empirical studies, different economic indicators and legislative factors are being examined. Nevertheless, a particular combination of indicators, which shows a trend the market will be following, has not been identified yet. Key indicators identified in this work can be used to forecast the future tendency of real estate market, which can have impact on the financial and economic stability and growth.

Problem of the research

The problem of this research work is to identify key indicators, influencing residential real estate price forecast.

Object of the research

The objects of the research are economic indicators and legislative factors.

Aim of the research

The aim of the research is to identify indicators, with the strongest relationship with apartment price, after the statistical analysis of lagging, coincident and leading economic indicators and quantitative analysis of legislative factors impact on real estate market dynamics.

Tasks of the research

1. To analyze theoretical aspects of economic indicators and their influence on real estate market dynamics;
2. To overview the concept of Responsible lending regulations as a precaution of over-indebtedness;
3. To design the research methodology for assessment of the dependence of economic indicators and apartment prices and to accomplish it;
4. To appraise past mortgage credit data applying recent Responsible lending regulations changes;
5. To identify the key indicators for forecasting future real estate prices.

Methods of the research

1. Systematic analysis of scientific research, legal acts and frameworks;
2. Correlation and regression analysis of statistical data;
3. Exploratory research of mortgage data.

Significance and novelty of the research

This research work studies economic indicators and legislative changes, and assesses their possible influence on the real estate price. Previous studies proposed different indicators for an efficient real estate price forecasting; the present work extends previous studies by evaluating lagging, coincident and leading indicators, and determines the key indicators for the real estate price forecast.

1. REAL ESTATE PRICE FORECAST

Decisions to purchase a residential real estate are considered to be the largest among all household expenditures, which often depend on availability, price and possibility to receive a mortgage loan, since major residential real estate transactions involve bank financing.

The short-term forecast of price changes in all investable assets is considered to be hardly possible. It is explained as if investment returns were substantially forecastable it would be possible to trade those forecasts (Shiller R., 2013). Under certain conditions if prices are not unpredictable then simple trading schemes could bring limitless profits, which are not possible in real life. Short-term is considered a period of time under one year and the idea of impossible short-term forecast of price changes in real estate market is hardly acceptable.

There is no particular research on real estate market efficiency, although real estate markets are considered inefficient all over the world (Shiller R., Weiss A. N., 1999). The efficient market hypothesis states that asset prices fully reflect all available information. If real estate market would be considered efficient, all economic changes, which are shown in economic indicators, would be replicated in real estate prices. Even though the real estate market is widely accepted as inefficient, research on most economic indicators are made in order to prove that there may be key factors in real estate price forecast.

In Shiller and Weiss (1999) research the efficiency of single-family home market was tested. The sales were found infrequent and different indexes, such as repeat sales home price index, were created. Even though these indexes are considered as those, which may be used in forecasting real estate prices change there is a limitation of this approach, since it excludes the new construction. Shiller (2007) tried to identify other factors, influencing market fluctuation. He believed that stock market investors do not pay attention to fundamental indicators of prices, though prices reflect sociology and social psychology, and anticipated future changes in government policy.

Residential real estate market segments development dynamics is influenced not only by the economic situation in particular country, but has historical and cultural background on the choice the households are making. Private houses and apartments segments can develop similarly following the overall market trend or differently, depending on above mentioned factors. Private houses segment can react to legislative changes, like changes in law on land or law on the leasing of land, while apartment segment can stay less affected by these changes.

There are 3 apartment classes: economic, middle, and luxury class or A, B and C class, where A is considered as luxury, B – the middle and C – the economy class apartments. There is a price range of each class, determined by location, construction costs, specifications of the building and

other determinants. There are no classes which could be immune to real estate market price fluctuations, though the demand of these classes is different, and the reaction to price changes differs depending on what factors have caused price adjustments.

Residential real estate markets go through different periods, where prices can rise or fall, while the liquidity of the assets on the market can go up or down. If the value of a residential real estate changes by a certain amount the price of the residential real estate should change by the same amount, although real estate market does not perform this way. When residential real estate values decline prices tend to remain constant for a period of time, sale time increases and the volume of transactions declines. On the other hand, when prices tend to grow, but the growth is not fast enough, increase in transactions can arise.

Andersson et al. (2007) suggest that residential real estate values fluctuate over time and over different states of the economy. Variation in interest rates, unemployment and other macroeconomic indicators are causing variation in real estate value and most economic theories tries to predict that fluctuations, since changes in fundamentals should be reflected in prices (Balazs E., Dubravko M., 2007).

1.1. Economic indicators in real estate price forecast

Economic situation can be described by different economic indicators and they should not be analyzed separately due to their relation to each other, i.e. changes in one indicator may or may not cause changes in the other. These relationships between different indicators were analyzed in various studies.

The study of Apergis N., Rezitis A. (2003) analyzed the dynamic effects of specific macroeconomic variables, like housing loan rates, inflation, employment, and prices of new houses sold. The study performed by Chui L., Chau K. (2005) examined the lead-lag relationships between real estate prices, real estate investments, and economic growth. Admindins D., Zvanitajs J. (2011) examined the influence of factors like income, employment, crediting, demographic situation, government's policy and tax policy on the dwelling space market. Glindro T. et al. (2011) studied the determinants of house price dynamics in two steps, where in the first step house price fundamentals were determined by country-specific demand and supply factors. Secondly, the characteristics of house price cycles were further explored.

Though it is obvious that the relationship between different economic indicators exists, not all indicators provide signals for longer term trends (Miller N. G., Sklarz M. A., 2006), furthermore, only few indicators can be applied for real estate market price forecasting.

Economic indicators are classified in three categories: lagging, coincident and leading indicators. Lagging indicators reflect the historical performance of the economy and can be identified only after an economic trend or pattern has already begun. Coincident indicators show the current state of economic activity within a particular area. Leading indicators change before large economic adjustments and can be used to predict future trends. As shown in Table 1, each indicator can have a positive or negative influence on real estate prices, i.e. increase in one indicator can be followed by price increase, or price decrease, depending on the origin of the indicator (Ling D. C. et al, 2015).

Table 1. Economic indicators influencing real estate market prices

Demand				Supply	
Time →					
Lagging		Coincident		Leading	
Indicator	*Correlation between the indicator and RE prices*	*Indicator*	*Correlation between the indicator and RE prices*	*Indicator*	*Correlation between the indicator and RE prices*
Rent price	Positive	**Monthly income after taxes**	Positive	**Building permits**	Negative
Amount of sales transactions	Indefinite	**GDP per capita at current prices (GDP)**	Indefinite	**Useful floor area of dwellings for which building permits were granted**	Negative
Nominal interest rate	Negative	**Unemployment**	Negative	**Number of dwellings completed**	Negative
Interbank offered rate	Negative	**Population**	Positive	**Construction work carried out at current prices**	Positive
Loans issued	Positive	**Consumer price index (CPI)**	Indefinite	**Consumer confidence indicator (CCI)**	Positive

Source: compiled according to Ling D. C. et al., 2015

Real estate market has its own dynamics, and price and construction levels are determined on an asset market. The pricing of real estate depends on the demand and the supply of real estate assets brought into the market (Levitin A. J., 2012). The quantity of the demand for different assets and the possibility to pay for those assets can be explained by the performance of the economy and the rent situation. Often the price of real estate can be partly determined by the rental income asset owners can receive from renting the assets.

Andersson A. et al. (2007) suggests that the construction market is a major supplier of new real estate assets and the revenue of real estate and the cost of new construction can actually explain the activity in the whole real estate market.

The value of real estate depends on the economy itself. Generally the economic situation can be measured by major economic indicators such as GDP, unemployment, CPI and etc. Broadly speaking, when the economy is inactive, the real estate market follows the trend and do not show significant activity and price change (Studzienė A., 2015).

Interest rates have an important impact on the real estate markets, since major transactions are financed by the banks. Long-term market rates are determined by the supply and demand for long-term funds. Changes in interest rates can have a significant impact on household's ability to purchase a property (Zhang J. et al., 2011). The reason is that when the interest rates fall, the cost to obtain a mortgage to purchase real estate asset decreases, which creates a rising demand for real estate, what is followed by rising real estate market prices. On the other hand, when interest rates rise, the cost to get a mortgage increases, and the demand and prices of real estate are decreasing.

However, Quigley J. M. (1999) stresses the importance to know which part of the cycle of the economy is present and being aware that different segments of real estate react differently on the changes economy is facing.

Current economic situation is represented by coincident economic indicators. These indicators are part of the demand side of residential real estate. Monthly income after taxes (household income), GDP per capita at current prices (GDP), unemployment rate, population change and consumer price index (CPI) are major economic indicators, which can identify the demand of residential real estate at current moment.

GDP is considered the most important indicator of the economy's current state. An increasing GDP indicates the strengthening economy and usually it is followed by similar steps in businesses, such as increase on inventory expenditures, payrolls and different investments (Balej M., Cellmar R., 2014). Although, GDP like all indicators has its own limitation, because GDP can be deceptive, due to programs like Quantitative easing or excessive governmental spending. GDP growth is released with a considerable delay and simply shows the state of the economy, and the causes of

this state have already happened in past. Despite this fact, GDP is a key indicator to show whether the country is going into recession or not and when the GDP decreases for more than two quarters it may indicate that the recession is present.

Demand for residential real estate is often considered to be income elastic, since real estate is considered as a luxury good, which is purchased with increasing income. Personal income levels are significant in the valuation of real estate (Carr D. et al., 2003). Rising income leads to a possibility to spend more on real estate or to obtain a better conditions and options to receive a mortgage. Hwang M., Quigley J. M. (2006) explains the demand for residential real estate by growing income, since new construction becomes profitable, therefore inducing supplier activity. Correspondingly when recession is present, decreasing income indicates that households can't afford to purchase a real estate, the possibility to receive mortgage or to make payments falls and the real estate sales transaction decrease.

Unemployment is related economic growth and when the rate of unemployment is raising the amount of people with a possibility to purchase a real estate drops significantly. This indicator has a significant psychological impact on purchase decisions, since the fear of unemployment may encourage people to start saving, stop spending and not enter the real estate market, while these doubts in future are present.

Demographic indicators help to explain residential real estate price appreciation (Takats E., 2010). It shows the basic economic equation that the higher demand on residential real estate generates higher prices. Although population must be apprised carefully, since not always growing population is an indicator of growing demand. Deeper research on demographic influence was performed by Green R. K., Handershott P. H. (1993), where they evaluated more variable and more specific year-on-year growth of population, since it is important to identify age, at which individuals are likely to find a family, start an independent life and become a household, who will increase a real estate demand in the market.

CPI shows the increased cost of living, or simply inflation. A high rate of CPI may be followed by decrease in consumer purchasing power and the average standard of household living falls. CPI can affect other indicators, such as unemployment and GDP. However, CPI increase cannot be considered as a negative indicator, it is noted that followed by increasing income it may have positive impact on the economy Barrutia J. M. (2014):

1. It encourages spending and investing, which can cause economy growth, followed by real estate market development;
2. It keeps interest rates at high level, which encourages investment;
3. It can't lead to depression and stop real estate market activity.

Decreasing CPI is and indicator of deflation, which indicates the decrease in cost of living. Deflation is an indicator of poor economy which usually is followed by rapidly growing real estate market. Deflation is present, when consumers decline spending and is often caused by a reduction in the supply of money. This is followed by lower prices in residential market as well, which is the outcome of lower demand.

The coincident indicators mirror the current market situation, although the trend is established and the real estate prices should follow it. GDP and CPI are major indicators, which should be evaluated carefully, since there are other determinants which may cause different outcome of their dynamics. With growing population and rising income people are able to spend more on real estate, what increase demand and push up residential real estate prices.

Lagging indicators show how economy performed in recent past and may be able to show a pattern or trend. Although the present, which is a result of past and past itself may be confused and sometimes coincident indicators are not subtracted from lagging indicators. Lagging indicators on demand side have their own group consisting of rent price (rent), amount of new sales transactions (transactions), nominal interest rate (interest rate), interbank offered rate (interbank rate) and loans issued (loans).

The rent price is often used not as a single indicator, but as a component of price-to-rent ratio, which shows an appraisal between owning and renting real estate (Granziera E. et al., 2012). The ratio uses the average real estate price with average yearly rent. The price-to-rent ratio is calculated by dividing the average price of real estate by the average yearly rent price of the same real estate; usually the price is calculated showing the price of 1 sq. m. and the ratio meaning is considered as follows (Graham E. et al., 2006):

- 1 to 15 – better to buy than rent;
- 16 to 20 – usually better to rent than buy;
- 21 or more – much better to rent than buy.

Transactions of new residential real estate assets show the number of newly constructed real estate assets, which are sold each month. An increase in new real estate transactions is a positive sign for the market, while a decrease is negative. An excess of unsold new assets is also a bad indicator.

Interest rates influence the cost of mortgage payments. A long period of growing interest rates increases the mortgage payments and become a cause of low demand on residential real estate. Levišauskaitė K., Varanauskienė J. (2013) observed negative relationship between mortgage short-term interest rate demand and income level, while further they proved that residential real estate

price growth pattern is related with real income pattern and have negative relationship. As a result, high interest rates make renting more attractive.

Interbank offered rates – Euribor and Libor are part of interest rates offered by the banks. Current situation with low interbank offered rates is replicated in mortgage interest rates and is followed by increased lending, which causes an increase in residential real estate demand. Before the recent financial crises, the amount of loans issued was high and caused a demand for residential real estate, since more households were able to purchase (Bank for International Settlements [BIS], 2004). Since the financial crisis, the banks followed the recommendations set by The European Central Bank (ECB) and the bank of Lithuania and created strict requirements to obtain a mortgage. This has reduced the availability of mortgages and demand for the residential real estate has decreased.

The supply side in residential real estate market is presented by leading indicators, which change before the economy or real estate market reacts. These indicators, representing the supply side can be named as those, which can be essential in real estate price forecast. Major indicators are provided by real estate market: building permits, useful floor area of dwellings for which building permits were granted (useful floor), number of dwellings completed (dwellings completed), construction work carried out at current prices (construction prices), CCI (Car M., 2009).

Building permits provide information regarding the level of future residential real estate construction activities. Building permits are issued for the whole building, which is not indicating how many apartments will be brought to the market. Building permits show the future real estate supply levels. A growing amount of permits indicates that real estate construction industry will be active, which is followed by employment and increase in GDP and income.

On the other hand, the more residential real estate assets are built the more consumers are willing to buy. The excess in the market must be compensated by declining prices and in the end not only new residential real estate market reacts, but the whole market is following the price fall trend.

Useful floor and dwelling completed track the number of units finished and brought to the market. This number is more precise in measuring the supply.

Construction prices directly and indirectly influences real estate prices. The land costs, costs for construction supplies, such as wood, concrete, steel and indirect costs for carrying construction works, such as building permit fees, are influencing the price of the overall costs. Construction plays a significant role in economic growth and may be a key indicator of economic and real estate market conditions. The performance and growth of the construction sector has impact in general economic conditions and has a big influence on the employment.

CCI is an indicator determining if individuals are willing to purchase or take the risk of taking a mortgage or not. It may be able to show if individuals have fears and what kind of expectations they have towards the real estate market (Meulen Ph. Et al., 2014). Rudzkienė V., Azbainis V. (2012) state that sudden changes can be the cause of significant consumer expectations, which can have an impact on market volatility. If it is expected that prices are going to decrease, the transactions will fall and vice versa.

For many European countries, construction sector development has varied greatly before and after the recent financial crisis. Construction sector increased during the boom period, until 2008. The deep recession has been accompanied by a collapse in construction activities and a severe decline in construction sector.

Construction businesses, which traditionally rely on bank loans for their financing needs, are stimulated by the low interest rates. After the financial crises, due to falling residential real estate prices, and banks becoming more risk averse, construction business found difficulties to obtain loans due to their insufficient collateral. Recently the situation has changed and the cheap loans and mortgage were followed by the slight increase in residential real estate prices.

Lagging and coincident economic indicators represent market demand on real estate. These indicators show the performance of the whole economy and current market situation. Leading indicators are mostly provided by the real estate market itself and represent the real estate supply. The supply changes before the market reacts to any changes, which makes leading indicators most valuable in price forecast. The above implies that all economic indicators have a relationship with the real estate prices, but their types, strengths and impact varies. Residential real estate market has an ability to respond and create signals, which implies that these signals must be identified and monitored in order to forecast the real estate prices.

1.2. Legislative factors in real estate price forecast

Just before the financial crisis stroke, borrowers and lenders acted on the assumption that the economic and market situation will not change. By 2015 the interest rates reached significantly low almost zero percent level, which made the loans extremely attractive to the borrowers.

Central banks usually set the price of money using official interest rates to regulate the economy. They affect the cost of loans paid by companies, the cost of mortgages for households

and the return on saving money. Higher interest rates make borrowing less attractive because loans become more expensive. Lower interest rates have the opposite effect.

Currently low and close to zero interest rates can cause the increase in lending and if the interest rates will rise, it may have a negative impact and be followed by the over-indebtedness.

1.2.1. Measures of over-indebtedness

There is no single generally accepted measure of over-indebtedness. The World Bank (2013) examined and compared measures of over-indebtedness identifying the following four common features, shown in Fig. 1:

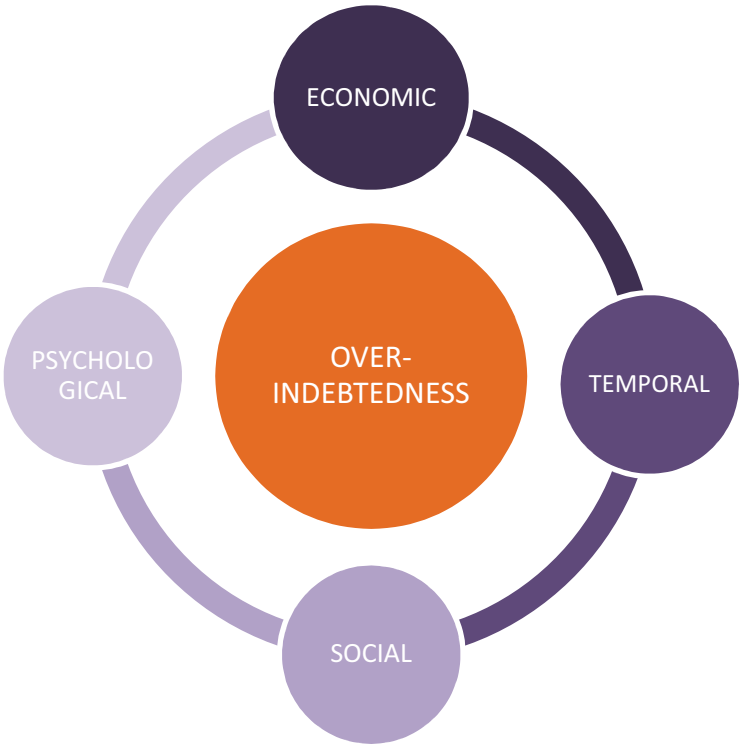

Fig 1. Common features of over-indebtedness
Source: compiled according to The World Bank, 2013

Each feature depends on certain characteristics:

1. Economic – amount of credit to be repaid;
2. Temporal – the maturity of the credit;
3. Social – the necessary expenses that have to be made;
4. Psychological – the stress caused by over-indebtedness.

Several criteria are applied to evaluate whether a person is over-indebted or not. European Commission study (2010) intended to develop a common over-indebtedness definition across the EU that would be applicable in different economic circumstances within the EU and could be useful in other countries. Based on the analysis of information provided by the EU member states on their national policies it was proposed that a household is considered over-indebted when its resources are deficient and cannot meet financial obligations it has without decreasing its standard of living (European Comission, 2010). To empirically measure the level of possible over-indebtedness, the study performed by Viimsalu (2010) has identified the following set of criteria:

1. The unit of measurement – the household, considering that all incomes can be calculated together;
2. Indicators need to cover all financial commitments, including consumer credit, utility bills, rent, mortgage payments etc.;
3. Over-indebtedness cannot be solved by borrowing more.

The explanation of consumer over-indebtedness, which depends on life-cycle-permanent-income (LC-PI) model is unexpected adverse shocks to the consumer's expenditure requirements and total resources, particularly future income streams (G. Betti et al., 2007). In the real world, both positive and negative unexpected events occur to employment, interest rates, the value of household financial and fixed assets, health, family structure, and hence to both household resources and basic expenditure requirements. There are a number of mechanisms that exist to protect a consumer from becoming over-indebted once negative shocks occur. Such mechanisms typically include (Keese, 2009):

1. Self-insurance through precautionary saving;
2. Market insurance through debt-financing and debt-rescheduling schemes;
3. Consumer's participation in market-provided insurance schemes against unemployment and long-term illness;
4. Social safety network;
5. Informal insurance mechanisms such as inter-generational transfers and family support.

According to Disney et al. (2008), due to uncertainty, moral hazard and information problems, such mechanisms is incomplete for accommodating the impact of negative shocks. Lusardi et al. (2009) proposed that over-indebtedness is arising from the consumer's consumption and saving plan. However, alternative theories of consumer behavior allow for the possibility of the consumer's consumption and saving plan to be unsustainable, due to various factors including consumer perception problems, limitations to rationality or irrational behavior of consumers or market imperfections (Anderloni and Vandone, 2010).

There is no general model that explains the mechanisms of over-indebtedness arising from these factors and it is not clear in what way the implied consumption and saving path would differ from the smooth path associated with the LC-PI model (Yin J. et al, 2013).

Although the existence of a liquidity constraint may lead to under-borrowing when income is expected to rise, it can also increase the debt problem when negative shocks occur as the consumer's potential ability to consumption is reduced. If one or more of these factors is present, individual consumers' consumption saving plans may be non-optimal and credit risk may occur (BIS, 2010).

Over-indebtedness can arise, when the consumer's current assets are no longer sufficient to offset the present value of future debts. In such a situation, the fixed consumption path is no longer sustainable and the consumer would be forced to lower his consumption, what could mean a severe disruption to the established standard of living. Over-indebtedness could be regarded as a natural phenomenon that unavoidably touches a proportion of the population at any time and in any economic circumstance (Betti et al., 2010). An over-indebted consumer could still manage to meet debt-servicing obligations but only by suffering a substantial shock to the established normal level of consumption. Debt can lead to economic growth or crisis and over-indebtedness and it is difficult to define the outcome. Cecchetti, et al. (2011) finds that beyond a certain level, debt is bad for growth, when the total household debt breakdown threshold appears to be around 85 percent of GDP, although the impact is very difficult to estimate accurately.

1.2.2. Credit risk assessment

Credit risk is defined by the Basel Committee on Banking Supervision (BIS 1999, p. 4) as "the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms." It is usually associated with loans and securities that generate interest income, thus being the primary source of bank revenue.

Credit risk has been one of the most active areas of recent financial research. The recent financial crisis has raised interest in regulation of bank risks in general and of market risks in particular. Most countries require banks to hold extra capital to protect against unforeseen financial disasters. Banks with riskier loans must hold more capital than those with safer loans. A set of international banking standards allows banks to measure a loan's risk in different ways: some banks make their own judgments, others use outside agencies (Bielecki and Rutkowski, 2012). The recent

financial crisis encouraged banks to reconsider these methods, due to banks having failed to perceive the high level of risk inherent in securitized mortgages.

Credit risk is referred to default risk, performance risk or counterparty risk and can cause foreclosure. This refers to the same failure to keep up mortgage credit payments. According to Hillairet and Jiao (2012) credit risk management is the process of controlling the potential consequences of credit risk. The process follows a standard risk management framework, which identifies measures and manages the risk. These means that the risk has to be identified, the extent of the risk has to be measured and decisions on how this risk will be managed have to be made.

Banks must gain a reward by accepting the risk that the mortgage credit may default. Alternatively nothing is hazarded if credit is refused. Since most banks have to take risks to earn a return, the decision is slightly more complex (Guo et al., 2009).

Two different types of error can arise while evaluating a credit decision. The type I error occurs, when "bad client", the client, which is most likely will not be able to repay the credit, is classified as "good client", the one which is most likely to be able to repay his credit. The type II error occurs, when "good client" is misclassified as "bad client", as shown in Fig 2:

Fig 2. The credit assessment problem
Source: Brown and Moles, 2014, p. 23

In practice, the credit analyst will devote more time to avoiding type I errors that is, assessing bad clients as good ones. The financial consequences of accepting bad risks that have mistakenly been classified as good ones are greater than if some good risks are mistakenly rejected. Due to deficient credit assessment the client is identified as good.

Each bank is responsible for the risk management procedure individually, although regulations are supervised by the central banks of each country. The internal control, as a system of organizational measures, actions and internal procedures, ensures effective and efficient operations compliance with laws and regulations, assessment and control of risks and reliability of financial and non-financial information (Floreani et al., 2015). Banks evaluate, accept and manage the risk or combinations of risks they are exposed to. According to Hainaut and Robert (2014), in uncertain cases banks follow principles of precaution, conservatism and prudence. The aim of risk management is assuring an acceptable profitability and return on equity pursuing the conservative policy of risk management. While implementing a sound risk management policy the focus is not only on minimizing potential risk but also on improving pricing and achieving efficient capital allocation (Tajik et al., 2015).

Credit risk is dominant in the banks risk structure. The risk management processes are continuously being improved. In order not to face the risk of non-performing loans, client defaults and foreclosures, banks must follow the laws and regulations, which are applicable to them.

1.2.3. Responsible lending regulations

The financial crisis has had a significant impact on the European Union citizens. When borrowers have found their loans unaffordable, defaults and foreclosures have risen. These problems were not noted in one or several member states but were found present in the whole EU.

In July, 2011 the European Central Bank received a request from the Bank of Lithuania for an opinion on a draft resolution of the Board of the Bank of Lithuania on Responsible lending requirements (RLR). The main purpose of the resolution was to create the responsible lending requirements that would be valid to credit institutions providing credit to households. The main purpose of the resolution was “to reduce the systemic risk in credit institution sector, imbalances in the development of the real estate market, risks related to the rapid growth of credit portfolios and to provide consumers with protection from accumulating excessive financial liability.” (European Central Bank [ECB], 2011).

Therefore, the resolution should have helped to contribute to the overall stability of the financial system. The RLR established in the draft resolution include (ECB, 2011):

1. Rules to assess the borrower's ability to meet financial liabilities in relation to the credit offered;
2. Maximum acceptable loan-to-value ratios for pledged assets;
3. Maximum debt-to-income ratios;
4. Maximum credit maturity;
5. Rules relating to the lending process and conditions, including the information, to be provided to the borrower.

The first RLR come into effect on 1 November, 2011. RLR became mandatory for all credit institutions operating in the country and were applied to new credits issued to households. The Board of the Bank of Lithuania aimed at protecting the population against an imprudent assumption of the financial liability and reducing the probability of shocks of the financial system and national economy as a whole (The Bank of Lithuania [TBL], 2011).

According to Mar (2015) the regulation of consumer credit tends to respond to issues that emerge from market controls, which can be judged in both ways – over liberal, or over protective.

Major disclosure requirements, which were applied after RLR came into force in 2011, were a move away from the liberal approach, recognizing that a consumer may not possess all information (ECB, 2012). Banks have to address information asymmetries accompanying failures that can exist in the market, by ensuring that consumers will receive quality information before entering a contract. It is considered, that fully informed consumers will make rational choices that are in line with their preferences, and will be able to select the best credit choice based on information, when creditors will compete to gain their favor (Hubbard-Soli, 2013). Fully informed consumers acting voluntarily will increase the well-being of both consumer and creditor.

The opposite assumption is behind over protectiveness, which states that there are times when consumers make choices which decrease their well-being. Over protectiveness can be viewed in this sense as law that has the goal of changing consumer behavior in order to increase consumer well-being. It will either encourage a consumer into a choice that promotes a benefit or limit consumer's liberty.

Responsible lending regulations restrict liberty, and are a form of over protectiveness, although they do not insist on a complete ban on loan, but they severely restrict a consumer's freedom of choice to receive a loan (Erina J., Erins I., 2013). This governmental intervention is based on approach that government knows better than consumers what is in their best interests.

Despite this, disclosure requirements cannot be viewed as over protectiveness. Their goal is to provide information to better allow consumers to make choices in line with their own preferences, rather than force them to make choices perceived by the government to be in their best interests (ECB, 2014).

Behavioral economics doubt on the efficacy of this measures of consumer protection. Evidence suggests that consumers do not always act rationally and with self-interest. According to Santis and Surico (2014), consumers are overly optimistic, inconsistent in their decision making, and make poor use of information. Over-optimism leads to mistakes when assessing the risk of taking on a loan. Consumers believe that it is not likely to lose a job and overconfidence may cause underestimation of the exponential growth of unpaid interest.

RLR contains a mixture of both over protective and liberal regulations. After recent financial crisis regulations are supported by all banks mandatory, some of the banks have modified and increased measures to evaluate customers and credit risk.

The challenge is to evaluate whether updated in 2015 RLR are over protective or not and will they have negative impact on real estate market or will protect customers from the credit risk and the whole economy from another financial crisis

The wider impacts of debt are both practical and emotional. Practical consequences include the inability to meet food, transportation and health needs, or an inability to engage in what might be considered normal activities, leading to social isolation. Emotionally, debt can impact negatively on mental wellbeing, leading to depression and straining relationships with family. The impacts of debt are not limited to the borrower, affecting entire families and their children, with children growing up in an environment where adults operate under considerable stress (Donatein and Robert, 2014).

The 2011 RLR have established that the loan-to-value of pledged assets ratio of credits for the acquisition of assets cannot exceed 85 percent of the market value or price of pledged assets. More strict requirements were applied for the second and following credits given to the same credit client, for loans issued for the acquisition of real estate located in the non-European economic area. Moreover, by applying the loan-to-value of pledged assets ratio the banks become obliged to assess the currency risk. In certain cases the maximum loan-to-value of pledged assets ratio were allowed to be raised up to 10 percent.

According to the 2011 RLR, the maximum loan-to-value of credits given for the acquisition of agricultural plots, excluding some exceptions could exceed 40 percent of the price or market value of the acquired plot, although banks were not likely to pledge agricultural land plots. The maximum amount of the monthly credit repayment and interest contribution of the credit

beneficiary were not more than 40 percent of the entity's income recognized as sustainable, and the maximum credit maturity could not exceed 40 years (The Bank of Lithuania [LB], 2011).

The RLR obligate the banks to provide information to their customers about probable risks in taking loans in a more comprehensive and responsible way. When preparing the regulations, the Association of Lithuanian Banks, the Lithuanian Real Estate Development Association, other market participants, the European Central Bank were consulted. A substantial part of proposals received was taken into consideration.

The major reason to update 2011 RLR was record-low interest rates due to which the risk of over-indebtedness of residents have increased. The updated RLR come into effect on 1 November, 2015.

It is stated that in updated regulations the equilibrium was reached and the adjustments will reduce the risk of enduring over-indebtedness of residents and will increase their flexibility to likely interest rate shocks without negatively affecting total lending volumes (LB, 2015).

Under the updated in 2015 RLR, the maximum amount of a borrower's monthly credit repayment and interest, as to date, cannot be above 40 percent of sustainable monthly income. However, in assessing customers' applications for a housing loan, credit institutions have to check whether the customer would be financially able to withstand likely jumps in interest rates. For the calculations, the actual interest rate, but not below 5 percent, will have to be used. At this interest rate, the total amount for covering the obligations will have to not exceed 50 percent of a customer's monthly income.

In extending a credit at a fixed interest rate for the entire loan term, only the actual fixed interest rate will have to be applied for calculating a customer's income-to-liabilities ratio, i.e. in assessing a customer, application of an increase in mortgage lending rates will not be compulsory.

The RLR also provide for an exception, which give more freedom to credit institutions in the assessment of the possibilities for part of customers to be issued a credit. Where a bank or a credit union will estimate that a customer, seeking a housing loan, will be solvent even when sparing 60 percent of his monthly income, it will be possible to grant him a housing loan. It will not be possible for such loans to exceed 5 percent of the amount of new housing loans issued by a credit institution over a year.

In order to prevent the risk of over-indebtedness and based on the good practices of other countries, it has also been established that the maximum maturity of credit will not exceed 30 years, i.e. will be 10 years shorter than it was allowed in 2011 RLR. Analysis of the Bank of Lithuania shows that a longer loan maturity is also related to more frequent delays in loan repayments. In

addition, shortening of the loan term entails a sharp decline in the overall amount of interest paid over the entire loan period (TBL, 2015).

The RLR regulations are focused on the insurance that all households purchasing real estate are protected against all possible risks and over-indebtedness. Subsequently, all loans to consumers to purchase real estate will undergo these regulations (European Commission, 2015).

New regulations are relevant currently, when record-low interest rates may cause wrong expectations and overestimation of possibilities to repay debts. It is essential to ensure that consumers purchasing a real estate and taking a loan secured by their property informed about all possible risk.

This RLR goal is to ensure that all consumers who purchase a property or take out a loan secured against their home are adequately informed and protected against the risks. Therefore, the proposal covers all loans made to consumers for the purpose of purchasing a real estate as well as all loans to consumers that are guaranteed by collateral.

The major aim is to create a competitive market for consumers, creditors and credit intermediaries with a high level of protection and to build financial stability, focusing on responsible lending (Constancio, 2015).

The Bank of Lithuania (2015) states that the amendments will only marginally affect the possibilities for residents to borrow a required amount and purchase the desired housing and if the approved amendments to the regulations had been effective in 2014, 99 of 100 customers would have obtained the entire required amount. The forecasted stability in real estate market was made prior to the Banks of Lithuanian announcement of the changes in the RLR. After the updated RLR version was introduced the projections were made and the possible outcomes were forecasted. First of all it is likely that the restrictions will reduce an ability of young or middle-income families to afford housing. It is notable, that ECB policy is to increase borrowing, what will increase inflation and boost economy.

The RLR should be able to improve consumer confidence and reduce the risk for over-indebtedness, with no risk of consequences like default or asset foreclosure. Above all, consumer confidence should be increased by clear and affordable information on mortgage terms, better assessments the ability to repay the credit. For consumers, the consequences of the recent financial crises were severe – difficulties with making the payments, defaults on debts and loss of their real estate. The RLP may have negative impact and tightening rules may slow down borrowing and economic growth. The RLR will oblige banks before granting loans, to assess whether the borrower person or household will be able to repay the loan without any major difficulties if interest rates will

rise. It is noted, that these actions were obligatory from 2011, so the changes which came into force in November, 2015 introduced minimum standards. Main changes will be the assessment of the person, whether he will be able to repay the loan if interest rates increase by at least 5 percent. The second change will be the decrease of loan period by 10 years. These may cause disability of young families to receive a loan.

1.2.4. Alternative service – rent-to-own

A major reason for households to borrow is the need to have steady living conditions over the years. Since income generally increases at the beginning of a person's active economic life and decreases in the period following retirement, debt is the way that allows households to smooth their expenses over their lives (Anderson and Jaggia, 2012). Young families expect their future income to grow and spend more than they earn, accumulating debts that they plan to repay when they are more mature and their income is higher. However, many households tend to accumulate more debt than they can afford, becoming over-indebted (The World Bank, 2013).

The alternative option to young families to owe a real estate is rent-to-own option which was introduced to The Bank of Lithuania in recent years. The Bank of Lithuania has evaluated the rent-to-own alternative when a service provider or a construction company gives customers a possibility, after the lease contract termination to acquire the rented real estate and receive a credit, while the rent will be accounted as a part already paid. This service is not yet controlled by the Bank of Lithuania regulation and in 2015 was offered by only one company. This service may become a solution to recently updated regulations or a risk to consumers.

The Bank of Lithuania (2015) states that the rent-to-own service and the RLR requirements would not be penetrated if two conditions would be held:

1. No advance obligation by a credit institution to grant a loan for the acquisition of the real estate can be present, i.e. there must not be any preliminary contract regarding a loan for the acquisition of the real estate leased.

2. The minimum initial contribution required by the RLR can be paid as a rent, although prior to granting a loan for the acquisition of the real estate, the assessment in accordance with RLR requirements must be performed. There must be a guarantee that all rent contributions have been paid from the consumers own finances and the valuation of the real estate must be performed in the end of lease contract.

The ability to receive loan and pay must be evaluated in accordance with all existing regulations so that customers would not lose the lease contributions paid, which were designated for the accumulation of the initial contribution (Jaggia and Patel, 2015).

Due to increasing oversupply on the housing market and tightening requirements for responsible lending real estate market participants are forced to search for alternatives to conventional home purchase and sale transactions. Rent-to-buy or rent-to-own option has been recently reintroduced to the real estate market. According to this scheme, a tenant rents housing from a real estate developer over a period of several years during which the rent is paid, and after expiration of the lease period the rent is credited towards a down payment required in obtaining a housing loan from a bank (Anderson, 2015).

Although isolated transactions of such type are regularly taking place, the last active attempt to offer and popularize the rent-to-own option was in 2009, when real estate developers tried to boost residential property sales that had been affected by the economic downturn. According to the terms and conditions then offered, a tenant was required to make a down payment, which as a rule was 20 percent of the total price of the housing, while the balance of the price was spread over nearly a two year period of lease at the end of which the tenant paid the balance of the price of the housing to become the owner (Angelini, et al., 2014). It is likely that on the housing market where buyers have more limited access to borrowing to finance their real estate acquisitions, with the market structure remaining unchanged, the supply of residential property remaining at a high level and the requirements for responsible borrowing getting tighter, real estate developers will offer an increasingly larger number of options for real estate acquisitions, with rent-to-own undoubtedly being among the most attractive.

Rent-to-own is an arrangement between a tenant and a landlord based on which on expiration of the lease period or payment of the full contractually determined price title to the leased property will pass to the borrower as the owner. According to Bourassa (2014) it is particularly important here for tenants as future owners of homes or other property to realize and note that throughout the rent to own period a normal lease relationship exists between the tenant and the landlord.

A tenant who intends to buy a home or other property through the rent-to-own scheme signs a written lease contract with the landlord, pays the rent at a determined rate and has possession over the property as specified in the contract; in its own turn, the owner of the real property has ordinary rights and duties as a landlord. In the cases where the original lease contract does not provide for an option to repurchase, the tenant and the landlord may agree to that effect at a later point. Current legislations enables signing a supplementary contract to a loan contract containing a repurchase clause and providing for other matters, e.g. whether or not payments of rent effected prior to the

date of signing of such contract will be credited towards the repurchase amount. At all events, whether a repurchase clause is made part of the body of the lease contract, or a contract to repurchase is concluded later, the parties – the landlord and the tenant – must explicitly agree on the terms of repurchase: time of repurchase, execution of a deed confirming repurchase, registration of the rent-to-own contract itself and of title, as well as other matters. In the absence of a clear understanding the tenant runs the risk of not retaining the property, losing the payments and potentially needing to bring a dispute to a court of law (LB, 2015).

When there are plans to rent and purchase real estate the construction of which is not complete, other legal options should be considered, e.g. hire purchase of a real property item. As rent-to-own is a variety of lease, a relevant point here is also the rent charge which is significant not only for the tenant's right to rent the property, but also the transfer of title to such property and the consequences of termination of the contract.

The Bank of Lithuania (2015) suggests that the main rule to be followed by the parties is providing a clearly defined rent charge calculation and payment procedure. Unless the tenant and the landlord stipulate the procedure for the calculation and the rate of the rent charge, both parties risk to incur financial losses, because where the parties to the lease fail to agree on such charge, at the request of the parties it is determined by a court. In the latter case, if an application is made to a court, a relevant circumstance would be not only the normal rate of rent on the market, but also the market value of the residential property, which possibly would be different compared to the expectations that the parties had when they entered into the rent-to-own contract.

Particularly relevant is a risk that parties to the rent-to-own contract may face probability that the contract will be treated not as a rent-to-own contract, but rather a purchase contract. In the cases where the rent charge payable in case of rent-to-own is substantially higher than the market rent charge and is linked not to payment for using the property, but payment for acquisition of title to the property (ECB, 2014).

If a contract is recognized as a purchase contract in respect of a real property item, it is subject to other requirements than are applicable to lease, so even if the requirement for notarial certification has been met, other grounds may arise leading to invalidity of such contract (Bourassa, 2010). For this reason, the parties must take into account and evaluate the purpose for which the rent charge is paid and also whether it matches the fair market price.

In performing a rent-to-own contract the issues of operation of the leased property are also relevant. It would not be reasonable to consider that by entering into a rent-to-own contract the tenant does not seek, after a certain period of time, to gain full title to the rented property, and it is

therefore relevant to stipulate the extent to which the tenant will be entitled to modify the rented property.

Although it is common practice that responsibilities towards real estate are generally shared between the parties, with the tenant being responsible for current repairs of the property, and the landlord being responsible for major repairs, taking into account the above circumstances as the tenant's intention to possess the property as its own, it is recommended that the tenant should be given powers to alter the condition of the property.

However, this should not become landlord's kindness to the tenant. It is worth determining that material improvements to property or significant repair works and conditions for compensation for them must be pre-negotiated with the landlord rent-to-own contract can serve as an ideal means to acquire real property and as a means to secure long-term income from rent, because it creates clearly defined and limited obligations, ensures a long-standing lease relationship and binds both the tenant and the landlord to act in a responsible and good faith manner towards each other (Anderson, Jaggia, 2012). However, at the same time, if transaction documents are poorly drafted, obligations and responsibilities of the parties are not properly stated, rent-to-own can lead to very painful consequences.

A customer's solvency, the maximum ratio of a loan's monthly instalment and monthly revenue, and the required minimum amount of the initial contribution are evaluated preliminarily based on the regulation applicable during the conclusion of a lease contract and taking into account the customer's financial situation, however, the credit institution would only take a decision on granting a loan upon the expiry of the lease term (Donatein and Robert, 2014). The financing conditions during the lease term may change substantially and the acquisition of the housing by the customer may become impossible.

With a change in the price of the housing being leased, depending on the lease terms and conditions, a consumer may be obliged to pay more of his own funds than was projected at the beginning of the lease term. As a result, the consumer may be financially incapable of buying the housing he had leased.

A consumer may also be subjected to other risks unrelated to credit conditions, housing prices or legislative changes, so it is recommended to closely assess all terms and conditions of contracts being concluded. Such additional risks may be related to the fall of a lessor's financial standing or the service provider's violation of the right of the termination of a lease contract.

The rent-to-own housing option is usually implemented during real estate market downturns, such as the recent financial crisis. Rent-to-own might be worth considering depending on the

situation. Rent-to-own housing options become more common when the market is slow for two reasons: slow market makes it difficult for homeowners to sell their homes and when the market is slow, more people struggle with low credit and saving up for a down payment. On the other hand, these deals are not as popular when the market is up. Rent-to-own contracts involve increased risks for both sellers and buyers, so that sellers are less likely to bother with a rent-to-own contract if they can just sell the house.

The scheme's popularity has arisen in USA and UK in recent years as high house prices, strict mortgage lending and the need for deposits made it difficult for families to buy a home outright. After RLP will come into force rent-to-own may become the only possibility for young families and people with low income to become real estate owner.

1.3. Lithuanian real estate market review

In Lithuania apartment segment growth in third quarter of 2015 was 3 times bigger than private house sector. Although the growth was constant in the whole country, the largest apartment supply with 93 percent of all new apartments brought into market was in Vilnius (JSC Inreal, 2015).

Lithuanian economy and real estate review showed that comparing with the second quarter of 2014, economy has grown and the positive change of GDP allowed avoiding formal recording of recession (The Bank of Lithuania, 2015). Domestic consumption played a significant role in economic growth and its increase was a result of growing household income and employment rate. At the same time saving was not increasing and household expectations stayed positive. Furthermore, the demographic situation was in favor for the consumption to grow.

In 2015 ECB launched Quantitative easing program to stimulate the economy. Although the economic growth in the euro area was insubstantial, interest rates were showing positive forecasts for economy to grow. First part of 2015 was sluggish in the Lithuanian real estate market, although the situation changed and one of the reasons was the RLR announcement. In the end of 2014 it was forecasted that the amount of apartment sale transactions will decrease and the demand for private houses will remain quite strong (JSC Inreal, 2015).

Active construction sector indicated that supply will react to the positive market situation. The real estate market in Lithuania has seen a significant increase in the first half of 2014, although the second half of the year followed with a significant decrease (The Bank of Lithuania, 2015). The developers of real estate were not reducing pace, and imbalance between the demand and supply was formed in the market, especially in Vilnius. Despite the increasing supply of new apartments,

the prices were not decreasing, since the liquidity rate in the market remained high. In 2014, the fastest growth in the real estate market was recorded in the residential real estate sector. However, construction pace of private houses and apartments went in different directions during the past few years (JSC Inreal, 2015).

Construction boom in Lithuania boosted the real estate market, although the process has upturned itself after the financial crisis. The economic recovery, growth of purchasing power and the euro adoption are behind the post-crisis construction boom. Statistically, around 200 apartments are sold every month in the Lithuanian capital. The demand and supply mismatch should stop developers, although the current economic situation encourages constructing, even though the excess of apartments are present.

Vilnius residential real estate market represented by different class apartments plays a major role in the Lithuanian real estate market. Real estate price change in Vilnius is followed by the whole country residential real estate market and the causes of new trends establishment in the capital city may be appraised to understand the whole real estate market dynamics. Although the forecast cannot be based on the combination of macroeconomic indicators various studies prove that different indicators monitoring can take a significant part in real estate price forecasting process.

2. RESEARCH METHODOLOGY

2.1. Correlation and regression analysis of economic indicators

Following the framework developed by (Capozza D. R. et al, 2002) to investigate the long-term and short-term indicators of real estate price dynamics, the short-term dynamics of residential real estate prices were determined by the pattern of price movements characterized by correlation coefficients. In addition to these calculations regression analysis of key indicators was applied.

The Capozza et al (2002) framework was followed by Glindro et al (2011) where in addition to fundamental indicators the impact of institutional factors was analyzed. In this work it was chosen to analyze the impact of governmental policy and the evaluation of recent changes in Responsible lending regulations was made.

It is assumed that in each period and area, there is a fundamental value of real estate, which is determined by economic indicators and governmental policies:

$$P_{at} = f(X_{at}); \qquad (1)$$

Here: P_{at} – the log of the fundamental value of real estate prices in area *a* at time *t*;

$f(.)$ – a function;

X_{at} – a vector of economic and governmental variables that determine real estate price.

Period of 2005 – 2015 was chosen for the empirical research and data collected on apartment prices in Vilnius was used. Three modules of explanatory variables based on theoretic reasoning were chosen:

1. The first module of explanatory variables are demand-side factors consisting of lagging indicators, including sales transactions, amount of sold and unsold apartments, rent prices, household loans, household housing loans, interest rates of household loans, interest rates of housing loans (fixed for less than 1 year and longer than 1 year), Euribor (3, 6, 12 months) rate and Libor (3, 6, 12 months) rate.
2. The second module of variables are also demand-side factors consisting of coincident indicators, including monthly income after taxes, GDP per capita at current prices, unemployment rate, population and consumer price index.

3. The third module of variables are supply-side factors, consisting of leading indicators, including building permits, useful floor area of dwellings for which building permits were issued, number of dwellings completed, construction work carried out at current prices and consumer confidence index.

First, correlation assessment to identify determinants of residential real estate prices in overall apartment sector and three apartment classes, which include economic, middle and luxury apartment classes, was made. It was started by including the whole list of possible explanatory factors to investigate their relationship with real estate prices.

Second, only strongly correlated indicators were determined as possible key factors and multiple linear regression analysis to determine their strength influencing real estate price was run. Variables were determined as significant if correlation coefficient was 0.500 or larger.

The prediction of real estate price was accomplished by the following equation:

$$PP_a = r_0 + r_1X_1 + r_2X_2 + \ldots + r_nX_n + \varepsilon; \qquad (2)$$

Here: $PP_a -$ the predicted real estate price in area a;

r_0 – constant;

$r_n -$ regression coefficient;

$X_n -$ fundamental price indicator;

ε – prediction error.

Only the significant relationship between real estate prices and indicators were considered, the ones with the highest amount of influence were the ones with highest regression coefficients.

In the multiple linear regressions, the size of the coefficient for each fundamental indicator gave the size of the effect that indicator has on real estate price, and the sign on the coefficient (positive or negative) gave the direction of the effect. These coefficients were used as determinants of real estate price tendency to increase when that independent indicator increases by units, in which they were measured, holding all the other independent indicators constant.

In different studies different evaluation of regression coefficients are applied, only coefficients with strong and moderate relationship, determined by Evans (1996) which is shown in Table 2, were evaluated as those, which can determine key fundamental factors.

Table 2. Regression coefficients evaluation range

Value of r	Strength of relationship
-1.0 to -0.8 or 0.8 to 1.0	Very strong
-0.79 to -0.6 or 0.6 to 0.79	Strong
-0.59 to -0.4 or 0.4 to 0.59	Moderate
-0.39 to -0.2 or 0.2 to 0.39	Weak
-0.19 to 0.0 or 0.0 to 0.19	None or very weak

Source: Evans, 1996, p. 146

Although the dependence of rent prices and real estate prices was calculated, price-to-rent was taken into account as an indicator of a decision the households are making – whether to rent or buy. The price-to-rent ratio was calculated using the following equation (3):

$$Price - to - rent\ ratio\ = \frac{Apartment\ price}{Annual\ rent\ price} \quad (3)$$

Here: Apartment price – Apartment price per sq. m.

Annual rent price – Annual rent price per sq. m.

Lastly, the stress test was applied. For stress test purpose historical data provide a good base of modeling, although the assumption behind the data may not be repeated. As Evans et al (2000) suggests the stress test was used as a part of a forward looking approach to possible price analysis. The highest real estate price during the observed period was determined and the difference between highest and current price calculated. Next, the difference between indicators was calculated and the predicted price following the possible changes in indicators was calculated. Overall stress test showed the possible changes in prices if previous indicators highs would be reached (BIS, 2001).

If the estimates of real estate price fundamentals were not efficient and included a non-fundamental indicator, it was considered that prediction errors in the analysis were present. Both correlation and regression models were applied specifically to minimize the relevance of these concerns. For example, only housing loan factor and 3 months Euribor rate was chosen, as indicators, which have the same trend among all substitution indicators. Moreover, linear regression

was used in stress test to estimate real estate price fundamentals, in the hope of revealing the general relationship between real estate price fundamentals and economic indicators.

Fig. 3 shows all steps of research performed on economic indicators, where the result of the process is an identification of key indicators for real estate market forecast:

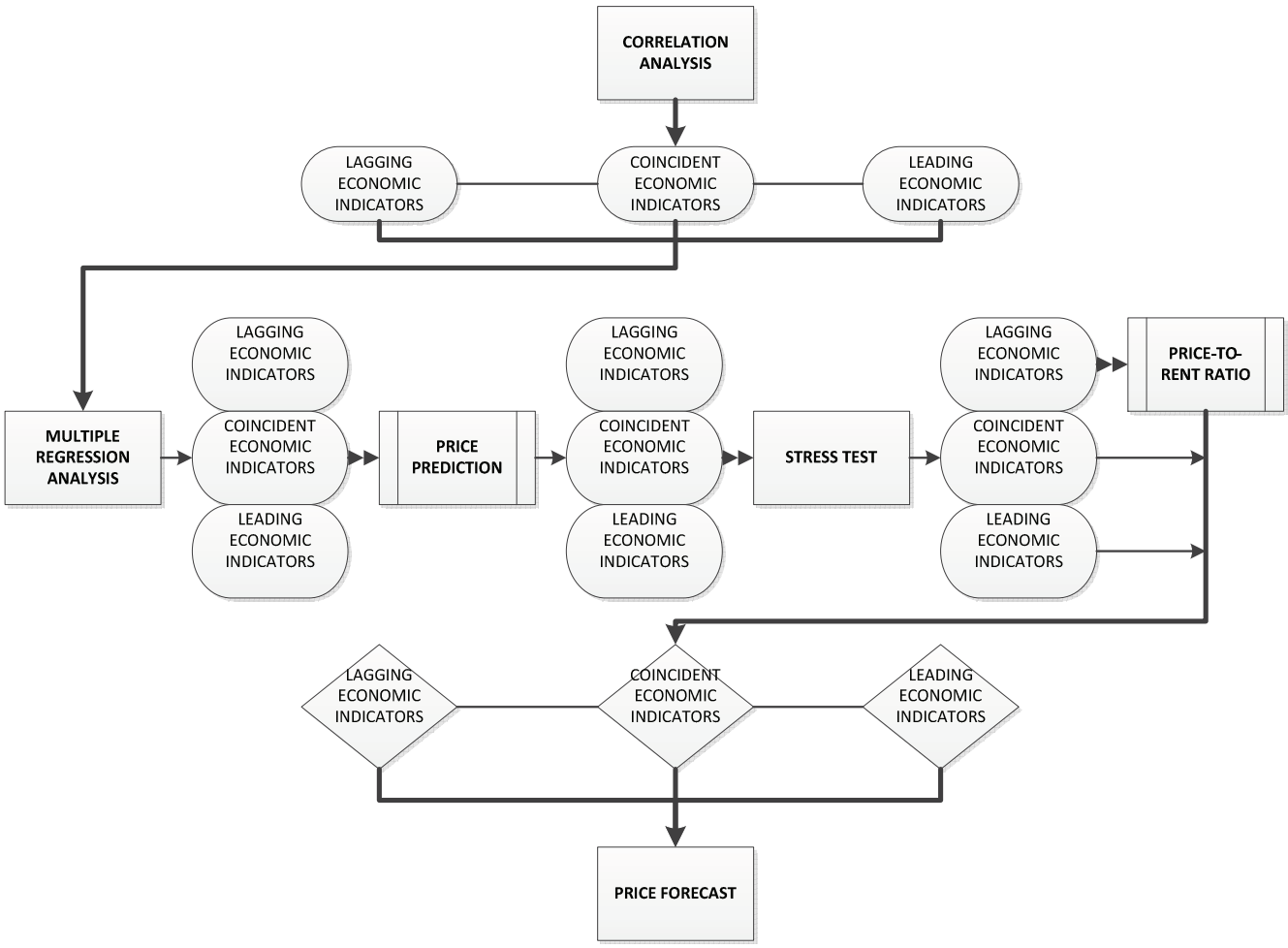

Fig. 3. Economic indicators evaluation and key indicators identification process
Source: compiled by author

2.2. Quantitative analysis of Responsible lending regulations changes

In the second part of empirical research, quantitative analysis of responsible lending policy changes influence on real estate prices was made. Data was collected during the exploratory research, where information on credit and credit owner was obtained.

First of all, major change in loan maturity was evaluated. Secondly, since there were no changes in loan-to-value ratio, this ratio was calculated on the collected data and evaluated in respect to loan maturity changes.

Loan-to-value equation:

$$Loan\ to\ value = \frac{LV}{MV}; \qquad (3)$$

Here: LV – Loan value;

MV – Real estate asset market value.

If loan-to-value ratio was 80 percent or more, this loan was considered as the one, which would be rejected after Responsible lending regulations changes would come into force.

Dynamics of price changes with sales transactions and loans issued were appraised during the period of years 2005 – 2015 and possible influences of the RLR implementation in 2011 and announcement of changes in 2015 were assessed.

There were certain limitations of the second part of empirical research. Responsible lending policy changes were announced in July, 2015 and implemented in November, 2015. The most significant changes could be registered in October, 2015, although on the moment this research was performed no data of loans issued during September, 2015 and October, 2015 was present.

Fig. 4 shows the assessment process of mortgage data:

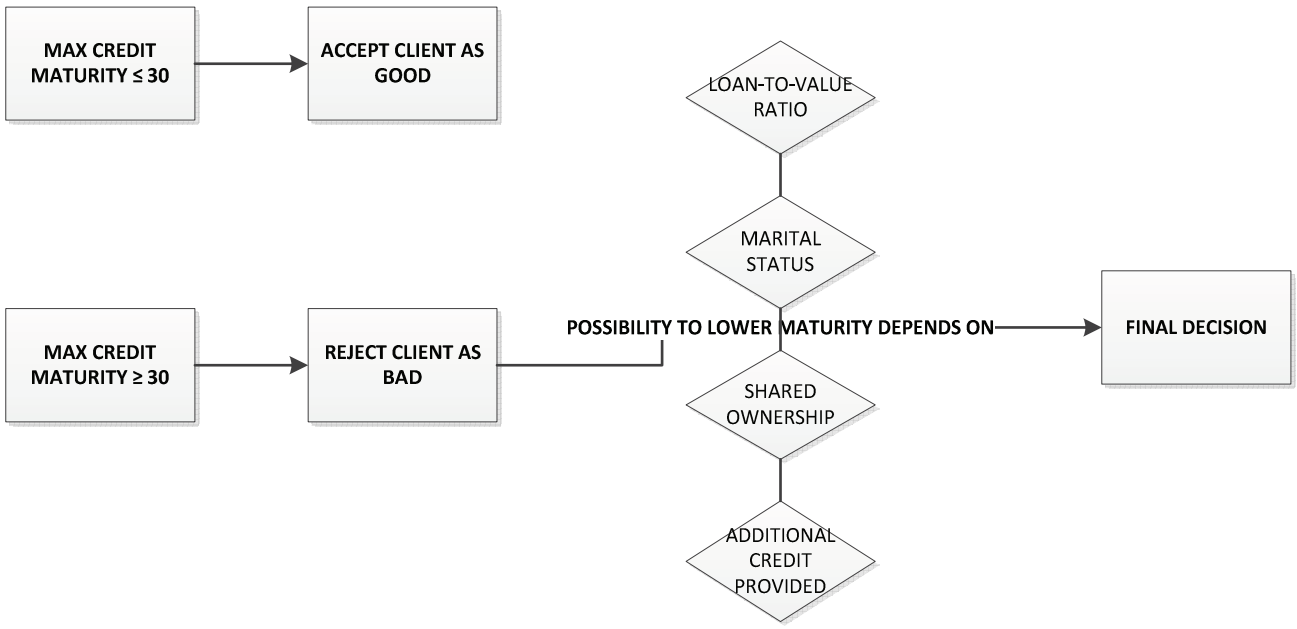

Fig. 4. Client assessment based on Responsible lending regulation changes
Source: compiled by author

The above empirical methodology was used to identify key indicators of short-term real estate price changes. The methodological part outlines the empirical research steps, data selection specifications for the correlation, regression and quantitative analysis.

3. DATA DESCRIPTION AND EMPIRICAL FINDINGS

3.1. Correlation and regression analysis of economic indicators

Correlation and regression analysis was used to evaluate fundamental indicators and their impact on real estate market prices. Before the regression calculations were performed, to identify the fundamental indicators influencing residential real estate market prices, linear correlation was calculated. In (Appendix 1) correlation coefficients of all three module indicators are shown, where the existence of relationship between variables was tested. Variables, which had shown small linear correlation were rejected, possibility that they have strong nonlinear relationship was not considered. Correlation of similar indicators e.g. interest rates with different periods had similarly high correlation with real estate prices, although variables only with the highest correlation among them were determined as those having the strongest linear relationship.

The regression model was used to identify the strength of the effect that chosen fundamental indicators have on residential real estate market prices. Secondly, it was used to forecast impacts of changes and show how much the real estate market price change when one or more fundamental indicators change. Thirdly, regression analysis was used to predict the trend and future residential real estate prices.

3.1.1. Correlation and regression analysis of lagging indicators

According to the correlation coefficient table (see Annex 1), sales transactions in Lithuania and sales transactions in Vilnius had no fundamental influence on dependent variable as they have shown a coefficient of 0.241 and 0.339. Sold amount of new apartment had shown negative relationship of only -0.053, where unsold amount of new apartment number had visible relationship in all real estate classes and only 0.095 in the middle and 0.494 in luxury apartment classes. All financial indicators, such as loan amount, loan interest rate and interbank offered interest rates were significantly correlated from 0.630 to 0.902. Since the composition of the indicators and their features are the same and relationship with the residential real estate market price is significant only household loans and 3 month Euribor were chosen. Rent price among market indicators as predicted had significant correlation of 0.788. From the lagging indicators module three fundamental indicators: rent price, household loans and 3 months Euribor were chosen and tested for the

residential real estate market price changes when each of these indicators is varied, while the other are held fixed. The results are summarized in Table 3.

Table 3. The lagging indicators influence on apartment sales price

Variables	Coefficient by real estate classes			
	All	Economy	Middle	Luxury
Intercept	1028,69	415,30	666,16	1794,94
Rent prise per sq.m.	45,47	105,62	138,04	96,44
Household loans, M EUR	0,182	0,046	-0,026	0,004
Euribor 3	26,37	10,68	71,99	187,72
Adjusted R^2	0,838	0,746	0,787	0,663

Source: compiled by author, based on data collected from UAB Nt Spekuliantai, The Bank of Lithuania, Centre of Registers

The linear equations of the predicted apartment price in different real estate classes predicted by the lagging indicators are:

$$PP = 1028,69 + 45,47*RP + 0,182*HL + 26,37*E;$$

$$EPP = 415,3 + 105,62*RP + 0,046*HL + 10,68*E;$$

$$MPP = 666,16 + 138,04*RP - 0,026*HL + 71,99*E;$$

$$LPP = 1794,94 + 96,44*RP + 0,004*HL + 187,72*E;$$

Here and further: *PP* – predicted price of apartments in all classes;

EPP – predicted price in economy apartment class in EUR;

MPP – predicted price in middle apartment class in EUR;

LPP – predicted price in luxury apartment class in EUR;

RP – apartment rent price per sq. m. in EUR;

HL – household loans in million EUR;

E – 3 months Euribor rate.

It is noted that luxury real estate class predicted price is affected less by the rent price change than the other two classes and significantly affected by Euribor rate change, where 1 percent of

change in the rate adds additional 187,72 EUR to the price. Middle real estate class predicted price is decreasing with every additional 1 million EUR household loans, although only by 0,03 EUR.

From the reasoning stated above and the fact that Euribor rates are affecting household loans it is suggested to choose **Rent price** and **Euribor rate** as the key lagging indicators.

The Table 4 below shows the additional amount, which could be possibly added if the indicators would reach year 2007 level. Respectfully delta shows the difference between these years.

Table 4. The possible apartment sales price change influenced by lagging indicators

Indexes	Δ 2007, 2015	Price change in apartment classes, EUR			
		All	Economy	Middle	Luxury
Rent price per sq. m.	1	56	130	170	119
Household loans, M EUR	1254	228	58	-32	4
Euribor 3	4	96	39	263	685

Source: compiled by author, based on data collected from UAB Nt Spekuliantai, The Bank of Lithuania, Centre of Registers

Rent prices had almost reached 2007 level and it would cause additional 56 EUR in apartment prices if these assumptions were right. Middle real estate class would be affected mostly by rent price changes, although additional 1254 million EUR of household loans would decrease this class prices by 32 EUR. Euribor rate should dramatically increase by 4 percent, and this is an exact assumption made by Responsible lending policy changes, this would have a major impact on middle and luxury real estate classes.

Price-to-rent calculations suggest that overall it is better to rent, although in Economic class it was always, but in 2010 and 2011, better to buy, as shown in Fig. 5:

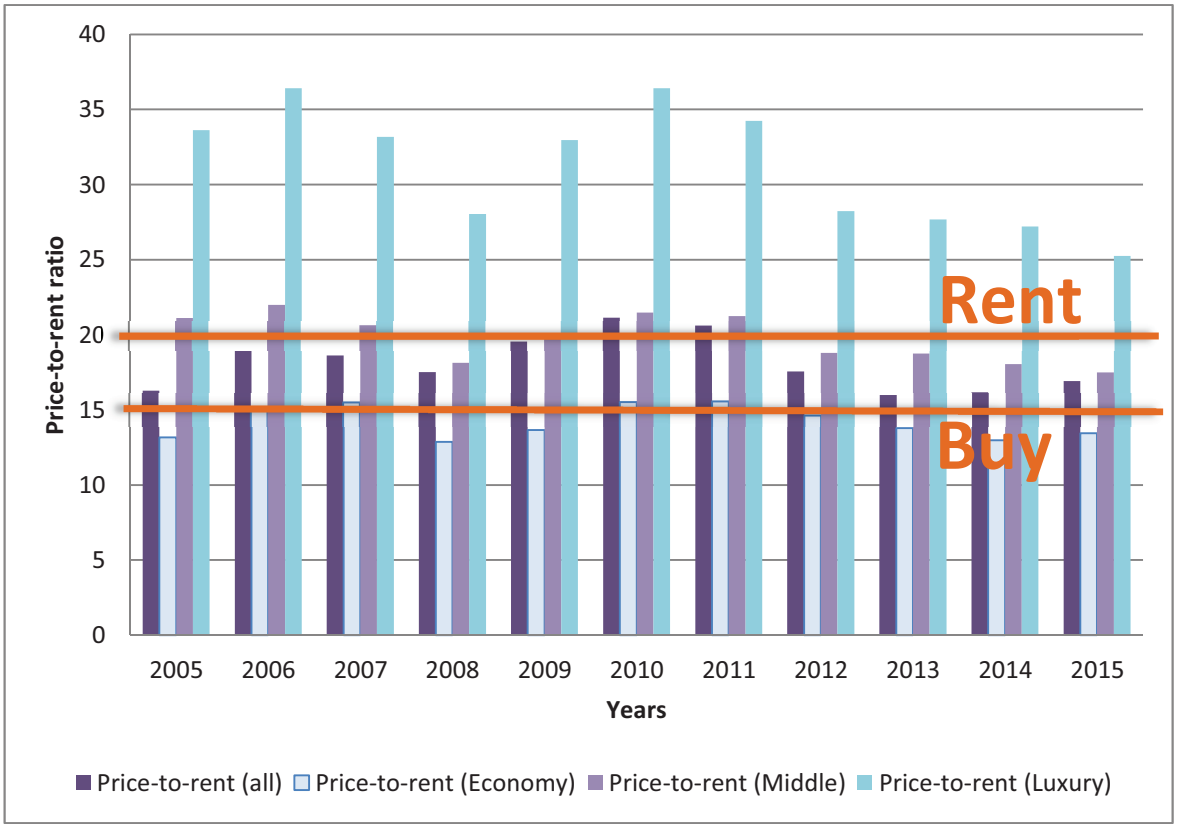

Fig. 5. Price-to-rent ratio by apartment classes
Source: compiled by author, based on data collected from UAB Nt Spekuliantai, Centre of Registers

Middle and Luxury class apartment ratios show that these classes with prices of the decade were worth renting than buying.

3.1.2. Correlation and regression analysis of coincident indicators

Coincident indicators module was tested second and in accordance with the correlation coefficient table (Appendix 1) it was noted that there is no significant relationship between apartment prices and population in Vilnius, the one noted was between -0.042 and -0.016 in separate apartment classes. It may be explained by the slight change in population of Vilnius, which maximum change was in 2011, when the population decreased by 1.3 percent and increased by the same 1,3 percent in 2013. On the other hand population of Lithuania has strong positive relationship of 0.506 with the price change. Another positively and strongly correlated indicator is CPI, which has 0.722 relationship with the market prices.

GDP was the only variable in this module which was negatively and weakly correlated to residential real estate market price with 0.218 in overall classes and only -0.147 in economic class.

Fig. 6 presents how apartment sales prices and GDP changed in period of 2005 – 2015. It is noted that negative correlation was identified, but GDP index was evenly growing during the period of 2009 – 2014 and at the same period sales price were not constant and fluctuation was noticed.

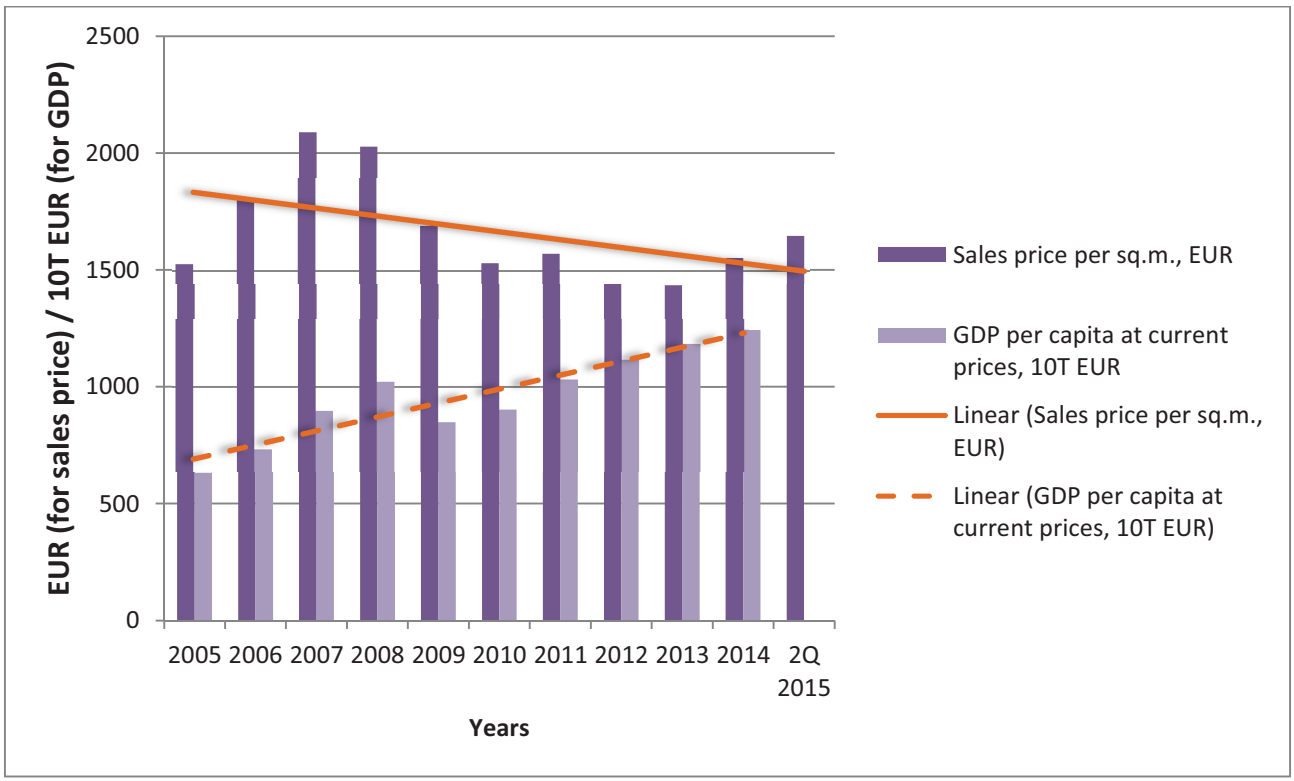

Fig. 6. Trend of apartment sales prices per sq. m. and GDP per capita at current prices
Source: compiled by author, based on Centre of Registers, Statistics Lithuania

Unemployment and monthly income shows strong negative relationship with the real estate market prices. Although monthly income has not strongly correlated with the price in all classes, it has significant negative correlation of -0.529 and -0.662 in middle and luxury real estate classes, which is shown in Fig. 7 below:

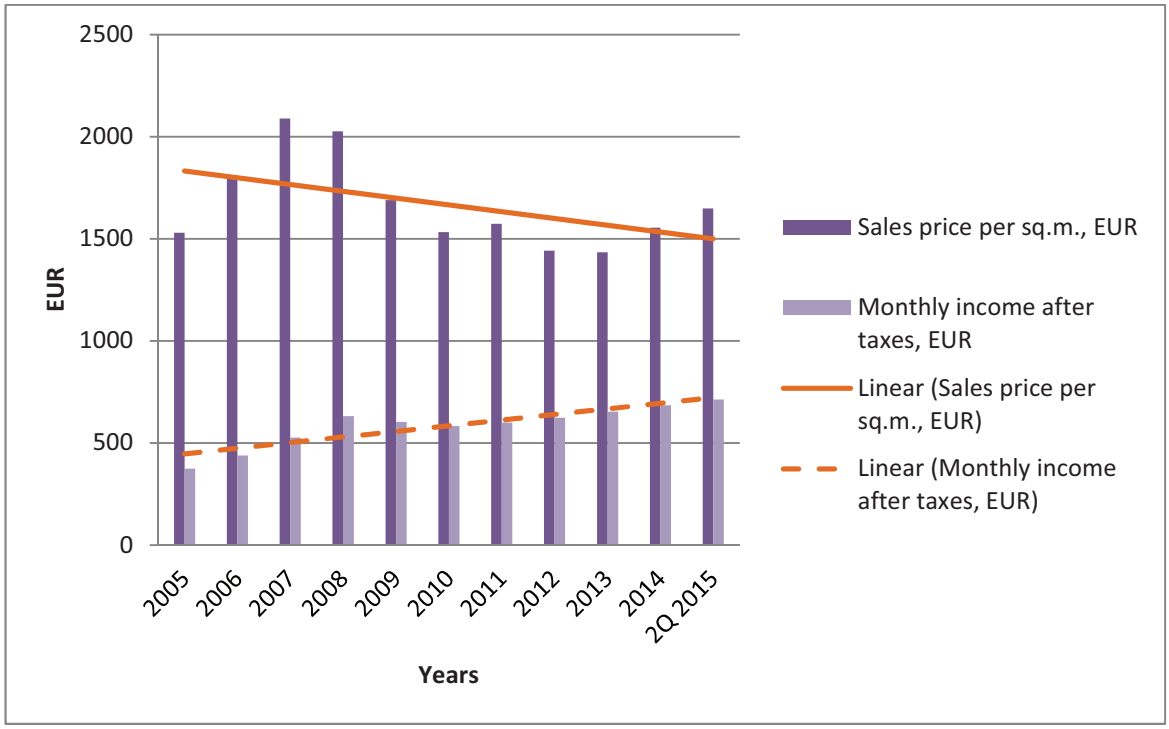

Fig. 7. Trend of apartment sales prices per sq. m. and monthly income after taxes
Source: compiled by author, based on Centre of Registers, Statistics Lithuania

Five coincident indicators were tested with linear regression. Although GDP and real estate market price had weak correlation it was chosen for the linear regression test on behalf of being considered as one of the most significant indicators in economic analysis and important factor in over-indebtedness measurement. The results are summarized in Table 5.

Table 5. The coincident indicators influence on apartment sales price

Variables	Coefficient by real estate classes			
	All	Economy	Middle	Luxury
Intercept	-5125,25	-1730,56	-4551,27	-11309,40
Monthly income	2,76	1,52	2,03	3,23
Unemployment, Vilnius	-0,01	-0,01	-0,02	-0,02
Population, Lithuania	0,002	0,001	0,002	0,004
CPI	0,805	-12,600	-29,920	-49,510
GDP	*-0,010*	*0,001*	*0,008*	*0,025*
Adjusted R^2	0,596	0,426	0,806	0,746

Source: compiled by author, based on data collected from UAB Nt Spekuliantai, Centre of Registers

The linear equations of the predicted prices in different real estate classes predicted by the coincident indicators are:

*PP = -5125,25 + 2,76*MI - 0,01U + 0,002*PO + 0,805*CPI - 0,01*GDP;*

*EPP = -1730,56 + 1,52*MI - 0,01U + 0,001*PO - 12,6*CPI + 0,001*GDP;*

*MPP = -4551,27+2,03*MI - 0,02U + 0,002*PO - 29,92*CPI + 0,008*GDP;*

*LPP = -11309,4+3,23*MI - 0,02U + 0,004*PO - 49,51*CPI + 0,025*GDP;*

Here: *MI* – Monthly income in EUR;

U – Unemployment in Vilnius;

PO – Population in Lithuania;

CPI – Consumer price index;

GDP – Gross domestic product;

From the linear equations above it is noted that 100 EUR change in monthly income will cause from 152 EUR to 323 EUR change in price per sq. m. in different classes, population decrease by 100 000 people would decrease the price by 200 EUR in all apartment classes and consumer price index change would have biggest influence on luxury class.

Unemployment, population and CPI in 2007 were the highest during the observation period, although monthly income and GDP reached their highs in 2014-2015. The Table 6 below shows that the extremes of these indicators would have a significant influence on luxury real estate class

and overall the fall in income and growth in population would have respectfully major impact on the price.

Table 6. The possible apartment sales price change influenced by coincident indicators

Indexes	Δ 2007, 2015	Price change in apartment classes, EUR			
		All	Economy	Middle	Luxury
Monthly income	-188	-518	-285	-381	-606
Unemployment, Vilnius	-25700	257	257	514	514
Population, Lithuania	328721	592	263	592	1315
CPI	7	5	-82	-194	-322
GDP	2948	-29,48	2,95	23,58	73,69

Source: compiled by author, based on data collected from UAB Nt Spekuliantai, Centre of Registers

From the made calculations and indicators comparisons it is suggested to consider **monthly income, CPI** and **GDP** as the key coincident indicators.

3.1.3. Correlation and regression analysis of leading indicators

Third and the most influencing module of leading indicators was tested and, as it was predicted building permit index has the biggest effect on overall apartment prices in the market. Although when each apartment class was analyzed separately it was noted that apartment prices by real estate classes' dynamics differs from the overall apartment sector (see Annex 1). CCI has shown the weakest relationship in overall classes as well.

During the regression analysis it was noted that only dwelling completed index increase has positive relationship with the price in overall market and each real estate class of apartments separately. It is noted that building permits have strongest negative relationship with the prices in both economy and luxury real estate classes. Useful floor has negative influence on the price in overall prices and economy class and positive in middle and luxury classes. The CCI is also

showing a significant impact on economy and luxury real estate classes. The results observed in linear regression test and discussed above are shown in the Table 7.

Table 7. The leading indicators influence on apartment sales price

Variables	Coefficient by real estate classes			
	All	Economy	Middle	Luxury
Intercept	1205,39	1053,37	1442,97	2011,44
Building permits	0,84	1,80	-0,87	-2,33
Useful floor area	-0,07	-0,30	0,80	2,98
Dwellings completed	0,04	0,06	0,05	0,04
Construction costs	0,20	0,04	0,04	-0,13
CCI	0,06	6,19	2,23	-10,29
Adjusted R^2	0,548	0,831	0,857	0,698

Source: compiled by author, based on data collected from UAB Nt Spekuliantai, Centre of Registers

The linear equations of the predicted prices in different real estate classes predicted by the leading indicators are:

$$PP = 1205,39 + 0,84*BP - 0,07UFA + 0,04*DC + 0,2*CC + 0,06*CCI;$$

$$EPP = 1053,37 + 1,8*BP - 0,3UFA + 0,06*DC + 0,04*CC + 6.19*CCI;$$

$$MPP = 1442,97 - 0,87*BP + 0,8UFA + 0,05*DC + 0,04*CC + 2,23*CCI;$$

$$LPP = 2011,44 - 2,33*BP + 2,98UFA + 0,04*DC + 2,23*CC - 10,29*CCI;$$

Here: BP – Building permits, units;

UFA – Useful floor area, sq. m.;

DC – Dwellings completed, units;

CC – Construction costs, millions EUR;

CCI – Consumer confidence index;

From the linear equations above it is noted that 100 additional building permits issued will cause from 84 EUR to 233 EUR change in price per sq. m. in different classes. A significant impact has consumer confidence index, which additional 1 point is causing 10 EUR drop per sq. m. in luxury class and 6 EUR increase in economy class.

Due to this if the indicators would reach these limits the impact on the price level would be enormous. As shown in Table 8, building permits would lower the prices by 418 EUR in luxury real estate class and increase economy real estate price by 322 EUR. Useful floor area would lower economy class prices and construction costs increase would lower luxury class. The highest ever observed consumer confidence index would also have negative influence on the luxury real estate prices.

Table 8. The possible apartment sales price change influenced by leading indicators

Indexes	Δ 2007, 2015	Price change in apartment classes, EUR			
		All	Economy	Middle	Luxury
Building permits	179	151	322	-156	-418
Useful floor area	602	-44	-178	479	1795
Dwellings completed	4000	178	222	207	157
Construction costs	1368	267	56	60	-184
CCI	11	1	68	24	-113

Source: compiled by author, based on data collected from UAB Nt Spekuliantai, Centre of Registers

Considering all the calculations made it is suggested to consider **building permits**, **useful floor area**, **dwellings completed, construction costs and CCI** the key leading indicators.

3.2. Quantitative analysis of Responsible lending regulations impact on real estate market prices

Responsible lending policy changes were first time implemented in November, 2011. Their main role was to obligate banks to fully assess the ability of borrowers to return loans and prevent over-indebtedness. Significant changes were made in the policy, which came into force in November, 2015. It was predicted that these changes will have an impact and increase amount of loans issued in the period between the announcement and implementation of the policy.

Exploratory research was conducted and data collected from the bank X branch during the period of 9 months – January-September, 2015 (see Annex 2). It is noted that loans issued before

the RLR changes came into force could have 40 years maturity. The observed bank X branch issued 26 loans for the total value of 1,33 million EUR. Average maturity of these loans was 24 years, although as it is shown in the Fig. 8, there were 8 loans, which exceeded 30 years maturity.

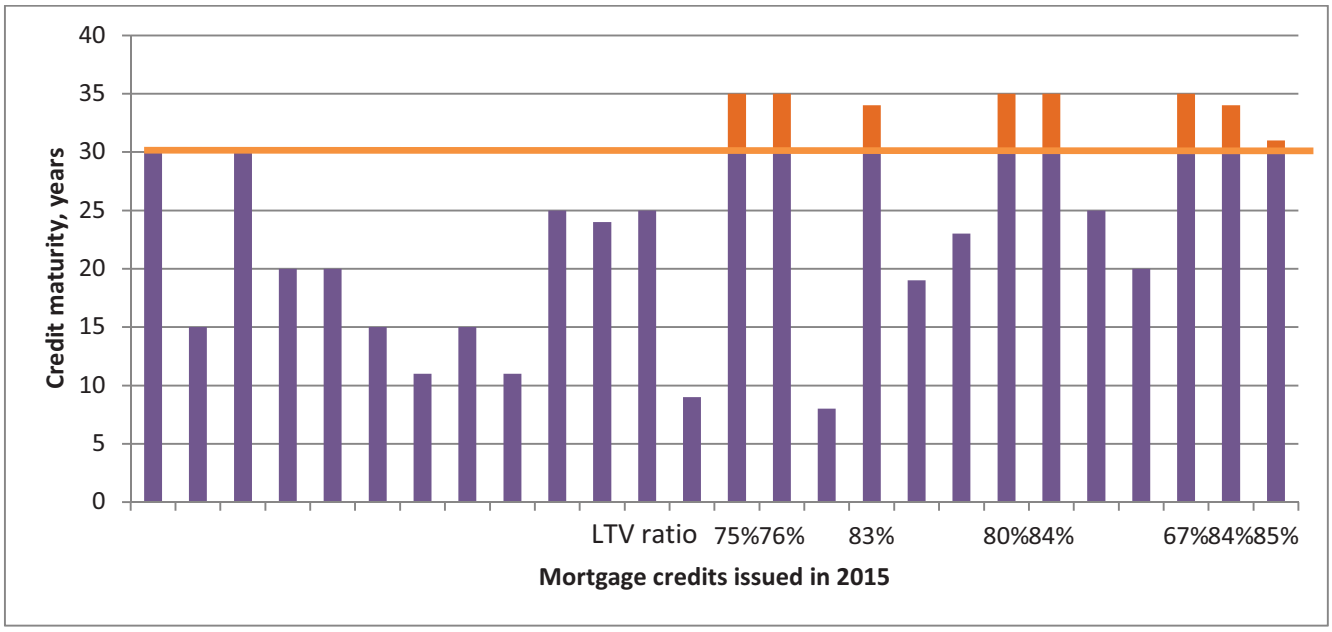

Fig. 8. Maturity of issued loans
Source: compiled by author, based on collected data from bank X

5 of 8 loans, or 20 percent of all loans had high loan-to-value ratio of 80-85percent. The total collateral market value was priced for 1,9 million EUR and loans were issued for the average 1,39 percent interest rate. Although the majority of all maturity rates were lower than allowed by the 2015 RLP, the average age of the client, when the loans will be repaid would be 62 years. All the loans had a floating interest rate where the periodicity of changing variable component was chosen almost equally between 3 and 6 months. The other important data on loans was marital status, since married individuals may have a shared ownership and in this case the income of two individuals to cover the mortgage may be calculated. The mortgage payment is calculating taking into account all necessary expenditures, such as supporting a child and paying other credits, if those are present.

RLP were implemented in Lithuania two times in November 2011 and November 2015. Both were reasoned by the recovery of the economy which was followed with recovering real estate market and stable growing sales transactions amount, which is showed in the Fig. 9 below.

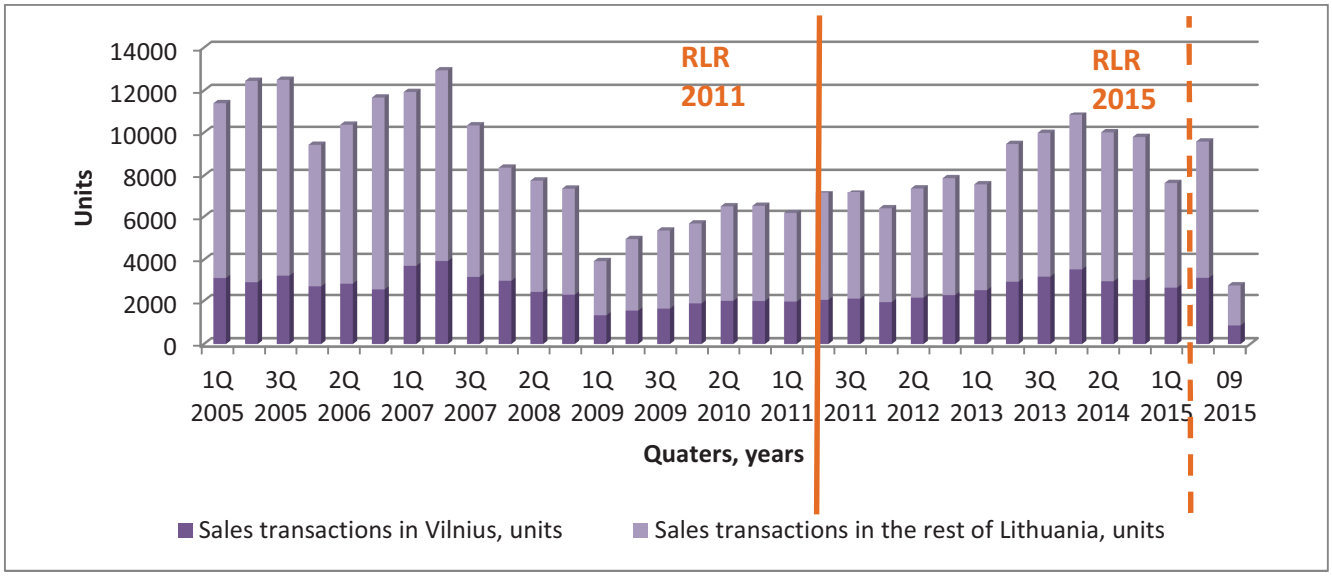

Fig. 9. Dynamics of sales transactions in Vilnius and Lithuania in 2005 - 2015
Source: compiled by author, based on Centre of registers data

Although the implementation of RLP in 2011 haven't caused a significant increase in sales, the more drastic changes, as predicted had an impact on sales grow in 2Q 2015, when 6520 sales of newly constructed apartments were registered.

Growing level of sales was caused by the assumptions that predictions of the growing interest rate will come true and the newly assed risk will lower the amount of issued loans, what will cause the decrease in demand and increase in real estate market prices. Fig. 10 shows the development of newly constructed apartment prices in 2014-2015:

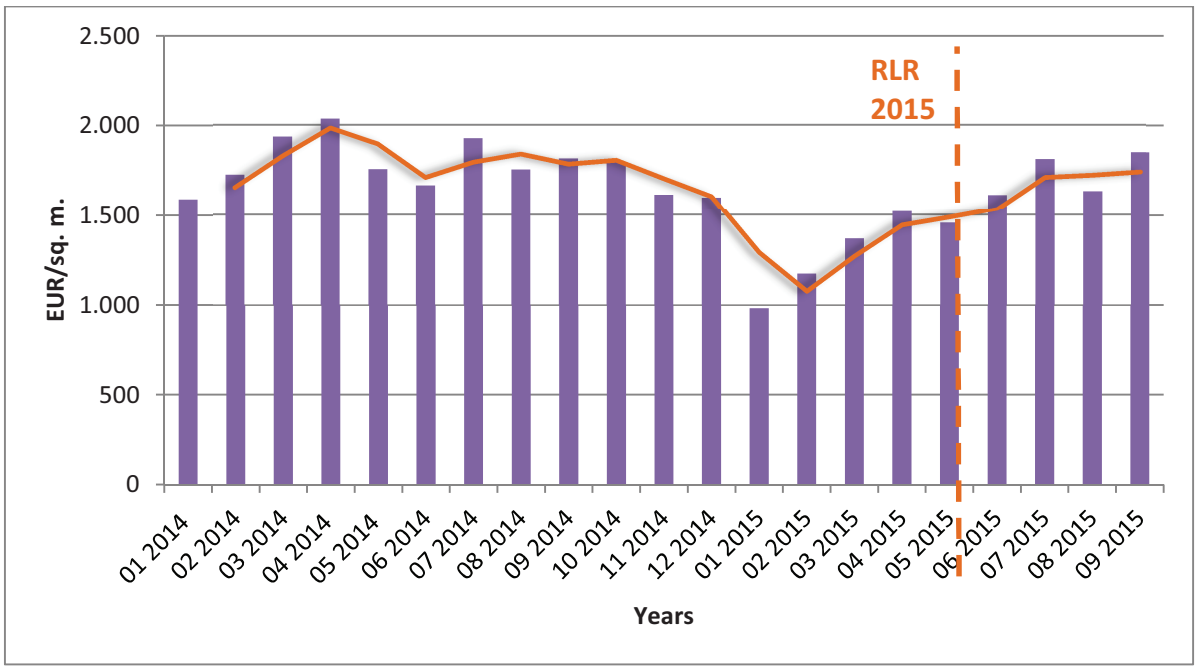

Fig. 10. Newly constructed apartment price dynamics 2014-2015
Source: compiled by author, based on Centre of registers data

An announcement of new RLR changes was made in June, 2015. The increase in prices was noticed in early 2015, although it could be explained as both – constructors knowledge of governmental policy changes and seasoning sales.

Significant part of newly constructed apartments transactions are financed by the banks. Fig. 11 shows the dynamics of apartment price changes and loans issued during 2005 – 2015:

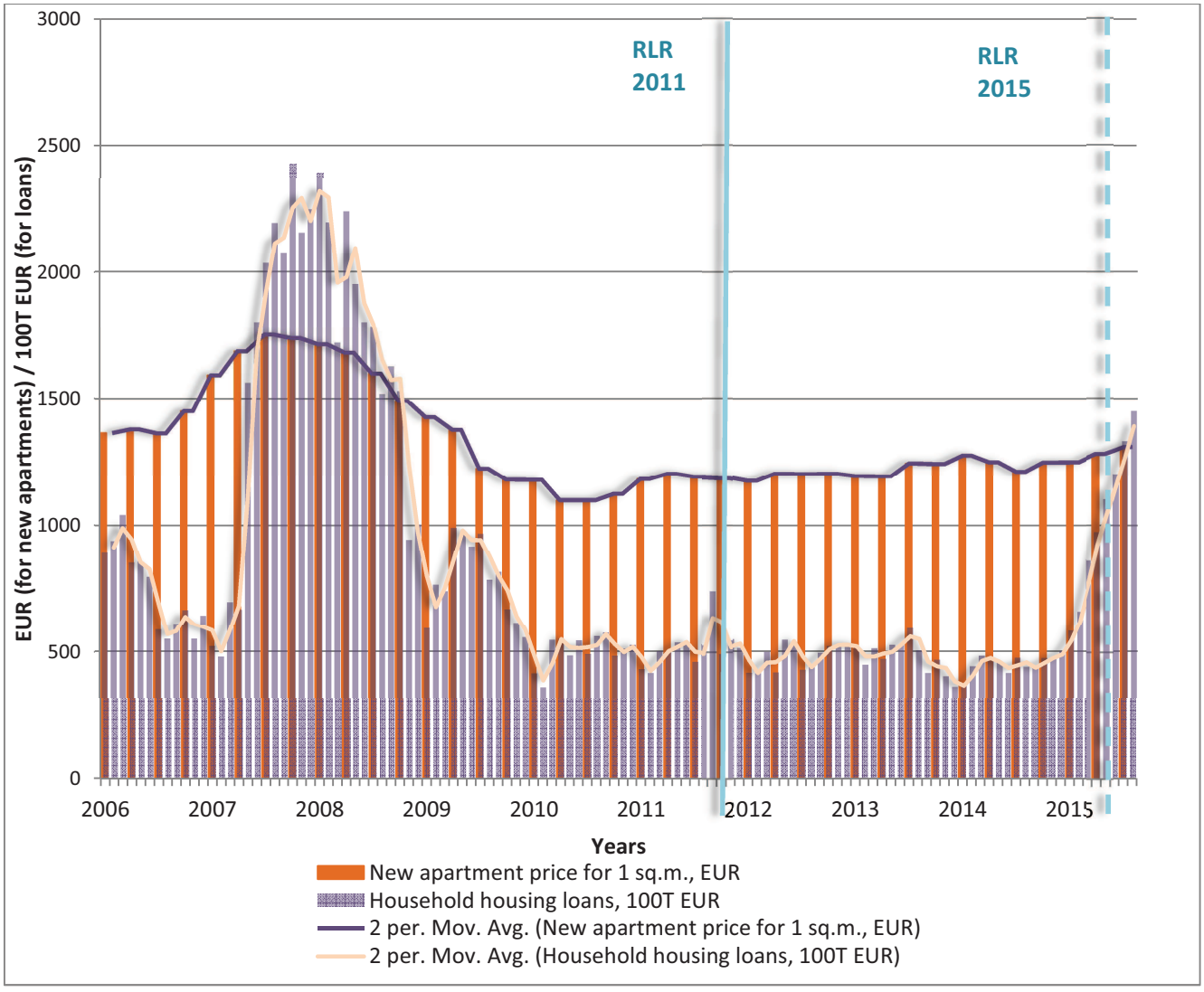

Fig. 11. Price and loan dynamics 2005 – 2015
Source: compiled by author, based on data collected from UAB Nt Spekuliantai, The Bank of Lithuania

It is noted that starting from 2011 real estate market recovered, prices stabilized and the fluctuation was never as dramatic as in 2007-2009. There were some signs of growing loans but never as significant as it was noted in 2007-2008. The loan grow was stable until the interest rates dropped significantly and loans amount started to grow substantially. RLR was announced as a risk assessment tool due to the fact that low interest rates may cause over-indebtedness. Although their

announcement may have caused loan grow it is more possible that the growing trade is a reaction to interest rates, a discussed possible key fundamental price indicator, and not to governmental policy change.

Considering the fact that data of loans issued in September, 2015 and October, 2015 was not available during this research was performed and the prices of apartments have not risen yet it is proposed that the RLR can be considered as a key indicator, but only in long perspective, when it is possible to evaluate all data needed.

The correlation and regression analysis performed on fundamental indicators and quantitative analysis made to evaluate the RLR changes suggests that among all factors tested these are the key indicators, which have significant impact on residential real estate prices: rent price, Euribor rate, monthly income, GDP, CPI, building permits, useful floor are, dwellings completed and construction costs. Considering the origin of these indicators it is noted that rent prices and Euribor rate is changing when the economy itself is following the particular trend, which may be considered as factors, which are following the real estate price trend and not influencing them. Monthly income, GDP and CPI is showing the current economy state and prices of real estate are already influenced by these indicators and only leading indicators: building permits, useful floor are, dwellings completed and construction costs can significantly determine the future price change in real estate market.

The building permit index, measures the flexibility of supply to demand conditions. In the long run, an increase in built permit tends to bring down real estate prices. Building permits do not indicate the volume of apartments to be built, where volume of apartments does not state what amount of the useful floor will be brought into the market. Due to this useful floor area and dwellings completed are considered as key indicators on their own.

Last but not least are the construction costs which determine the change in predicted prices substantially.

CONCLUSIONS AND RECOMMENDATIONS

The residential real estate sales and purchase decision process involves dynamic and uncertain elements. Real estate price trends show number of constant and systematic relationship with different economic indicators and are influenced by legislative changes. Most economic indicators of changing residential real estate demand and supply provide signals for longer term trends. Many real estate market participants such as banks, real estate brokers, developers and appraisers, would be able to benefit if short term price tendencies could be easily forecasted.

This paper identifies key indicators, which may be significant in residential real estate price forecast. The research was carried out analyzing three groups of economic indicators – lagging, coincident and leading. Real estate market trends can be related to available data of demand and supply factors. On the demand side all factors are represented by lagging and coincident economic indicators, and on the supply side it is represented by leading economic indicators.

All indicators were chosen after a theoretical analysis of previously performed research. The research was conducted using correlation and regression analysis. First, correlation analysis was used to investigate and test if there is any relationship between economic indicators and apartment prices in Vilnius in the past decade. Second, multiple regressions analysis was applied to test the impact of changes of economic indicators on apartment prices. Finally, the mortgage data of bank X brunch was evaluated applying new Responsible lending regulations to examine the possible impact on individual's ability to be accepted or rejected as a client to receive a mortgage loan.

The results show that there is a strong relationship between lagging, coincident and leading economic indicators. The regression coefficients show that the decrease in rent price, Euribor rate, monthly income, GDP and CPI is representing the current uptrend of residential real estate prices. These indicators are proposed to be specified as key indicators of the current trend in residential real estate market. The key leading indicators, which tend to change prior to the residential real estate market reaction, are: building permits, useful floor area of dwellings for which building permits were granted, number of dwellings completed, construction work carried out at current prices and consumer confidence indicator. Major part of leading indicators is direct representative of real estate market conditions. It is proposed to monitor separately building permits and useful floor area of dwellings for which building permits were granted, since the last one has negative influence on price development.

Other findings obtained from exploratory research show that real estate market and residential real estate prices are sensitive to legislative changes, even before any actual changes come into force. It is predicted that current Responsible lending regulations will have negative impact on

abilities to receive a mortgage loan, and, depending on the amount of rejected mortgage loans, may be followed by price decrease in residential real estate market. On the other hand, alternative solutions like rent-to-owe may become relevant and this may have its own impact on the market performance.

The results obtained during exploratory research study were undertaken with considerable limitations. RLR came into force in November, 2015 and there is no data on how many mortgage loan applications have been actually declined. Although there was no data confirming the predictions made, it was possible to predict only likely rejections.

The scope of this paper was confined to identify key indicators, which are significant in apartment price forecast. The study has limitations, since the analysis was narrowed to apartment segment and all the data used for the research was narrowed by Vilnius apartment real estate market data.

Moreover, it is proposed to monitor the amount of the rejected mortgage loans in order to evaluate the real impact RLR had on the real estate market. Further detailed research on the reasons of these rejections should be done.

The research performed shows that all economic indicators have a relationship with residential real estate prices. However, the major implication of this paper is that only key economic indicators should be monitored and used to forecast residential real estate price.

REFERENCES

1. Admindins D., Zvanitajs J. Factors affecting the dwelling space market prices in Latvia // *Intellectual economics*. – Vilnius: Mykolas Romeris university, 2011, Vol. 5, No 4, p. 513-525. – Access on the Internet: https://www3.mruni.eu/ojs/intellectual-economics/article/view/704, [viewed on 15-09-2015]
2. Anderloni L., D. Vandone. Risk of overindebtedness and behavioural factors // *Working paper*. – University of Milan, 2010, No. 25. – Access on the Internet: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1653513, [viewed on 12-09-2015]
3. Andersson A. et al. *European matropolita housing markets*. - Springer-Verlag, Berlin, Heidelberg, 2007. – 347-348 p. – ISBN 978-3-540-70513-0
4. Anderson M. H. An economic investigation of rent-to-own agreements // *Chicago-Kent Law review*. – 2014, Vil. 89, Issue 1, p. 236-243 – Access on the Internet: http://scholarship.kentlaw.iit.edu/cklawreview/vol89/iss1/7/, [viewed on 18-09-2015]
5. Anderson M. H., Jaggia S. Return, purchase, or skip? Outcome, duration, and consumer behavior in the rent-to-own market // *Empirical Economics*. – 2012, Vol. 43, Issue 1, p. 313-334. – Access on Internet: http://link.springer.com/article/10.1007/s00181-011-0461-4, [viewed on 19-09-2015]
6. Angelini V. et al. The dynamics of homeownership among the 50+ in Europe // *J Popul Econ*. – 2014, Vol. 27, Issue 3, p. 797-823. – Access on the Internet: http://link.springer.com/article/10.1007/s00148-013-0477-5, [viewed on 18-09-2015]
7. Apergis N., Rezitis A. Housing prices and macroeconomic factors in Greece: prospects within the EMU // *Applied Economics Letters.*- Routledge, 2003, Vol. 10, p. 799-804
8. Avery R. B. Credit risk, credit scoring, and the performance of home mortgages // *Federal Reserve Bulletin*, 1996. – http://www.federalreserve.gov/pubs/bulletin/1996/96index.htm, [viewed on 18-09-2015]
9. Balazs E., Dubravko M. Determinants of house prices in central and eastern Europe // *BIS Papers*. – 2007, No. 236. – Access on the Internet: http://www.bis.org/publ/work236.htm, [viewed on 11-09-2015]
10. Marrying the macro and microprudential dimensions of financial stability // *BIS Papers*. – 2001, No. 1. – Access on the Internet: https://www.bis.org/publ/bppdf/bispap01.htm, [viewed on 12-09-2015]
11. Over-indebtedness in Britain // *BIS report*. – 2010. 0 Access on the Internet: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/36990/10-830-over-indebtedness-second-report.pdf, [viewed on 08-09-2015]
12. Principles for the management of credit risk // BIS Papers. – 1999. – Access on the Internet: http://www.bis.org/publ/bcbs54.pdf, [viewed on 17-09-2015]
13. What drives housing price dynamics: cross-country evidence // *BIS Quarterly Review*. – 2004, p. 65-78. – Access on the Internet: https://www.bis.org/publ/qtrpdf/r_qt0403.htm, [viewed on 12-09-2015]
14. Financial stability review // *The Bank of Lithuania*. – Access on the Internet: http://www.lb.lt/financial_stability_review_2015, [viewed on 18-06-2015]
15. The rent-to-own service for housing may pose significant risks to buyers // *The Bank of Lithuania*. – Access on the Internet: https://www.lb.lt/the_rent-to-own_service_for_housing_may_pose_significant_risks_to_buyers, [viewed on 18-06-2015]
16. Responsible Lending Regulations // *The Bank of Lithuania*. – Access on the Internet: https://www.lb.lt/responsible_lending_regulations, [viewed on 18-06-2015]

17. Responsible Lending Regulations: strengthening the resilience of borrowers to adverse interest changes // *The Bank of Lithuania*. – Access on the Internet: http://www.lb.lt/responsible_lending_regulations_strengthening_the_resilience_of_borrowers_to_adverse_interest_changes, [viewed on 18-06-2015]
18. Betti G. et al. Consumer over-indebtedness in the EU: measurement and characteristics // Journal of Economic Studies. – 2007, Vol. 34, Issue 2, p. 136-156. – Access on the Internet: http://www.emeraldinsight.com/doi/abs/10.1108/01443580710745371, [viewed on 18-06-2015]
19. Opinion on certain conditions on granting loans (CON/2012/102) // *The European Central Bank*. – Access on the Internet: https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2012_102_f_sign.pdf, [viewed on 21-09-2015]
20. Opinion on lending to natural persons (CON/2011/74) // *The European Central Bank*. – Access on the Internet: https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2011_74_f_sign.pdf, [viewed on 21-09-2015]
21. Opinion on measures to encourage long-term lending (CON/2013/55) // *The European Central Bank*. – Access on the Internet: https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2013_55_f_sign.pdf, [viewed on 21-09-2015]
22. Opinion on responsible lending requirements (CON/2014/44) // *The European Central Bank*. – Access on the Internet: https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2014_44_f_sign.pdf, [viewed on 21-09-2015]
23. Barrutia J. M. Consumer expertise matters in price negotiation: an empirical analysis of the determinants of mortgage loan prices in Spain prior to the financial crisis // *European Journal of Marketing*. – 2014, Vol. 48, No. 11/12, p. 1962-1985
24. Principles for the management of credit risk // *Basel Committee on Banking Supervision*. – Access on the Internet: http://www.bis.org/publ/bcbs54.pdf, [viewed on 11-06-2015]
25. Belej M., Cellmer R. The effect of macroeconomic factors on changes in real estate prices – response and interaction // *Oeconomis*. – 2014, Vol. 13, Nr. 2, p. 5-16
26. Betti G. et al. Consumer over-indebtedness in the EU: measurement and characteristics // *Journal of Economic Studies*. - Emerald Group Publishing Limited, 2007, Vol. 34, Issue 2, p. 136-156. – Acess on the Internet: http://www.emeraldinsight.com/doi/abs/10.1108/01443580710745371, [viewed on 11-06-2015]
27. Bielecki T., Rutkowski M. *Credit risk: modeling, valuation, and hedging* / New York: Springer, 2012. – 326 p. – ISBN 978-3-662-04821-4
28. Bourassa S. C., Hoesli M. Why do Swiss rent? // *The Journal of Real Estate Finance and Economics*. – 2010, Vol. 40. Issue 3, p. 286-309. – Access on the Internet: http://link.springer.com/article/10.1007/s11146-008-9140-4, [viewed on 17-09-2015]
29. Brown K., Moles P. *Credit risk management* / 2nd ed. – Edinburgh Business School, 2014. – Access on the Internet: https://www.ebsglobal.net/documents/course-tasters/english/pdf/h17cr-bk-taster.pdf, [viewed on 11-06-2015]
30. Capozza D. R. et al. Determinants of real house price dynamics // *Working paper of National Bureau of Ecconomic Research.* – 2002, No. 9262. – Access on the Internet: http://www.nber.org/papers/w9262, [viewed on 10-10-2015]
31. Car M. Selection of factors influencing the residential property prices in Slovakia // *Biatec*. - The central bank of the Slovak Republic, 2009, Vol. 17. – Access on the Internet:

http://www.nbs.sk/en/publications-issued-by-the-nbs/monetary-policy/2009, [viewed on 17-09-2015]
32. Carr D. et al. *Mastering real estate appraisal*. - Kaplan Publishing, 2003. – ISBN-13: 978-0793161133
33. Cecchetti S. et al. The real effects of debt // *BIS Papers*. – 2011, No. 52. – Access on the Internet: http://www.bis.org/publ/othp16.pdf, [viewed on 10-09-2015]
34. Chui L., Chau K. An Empirical study of the Relationship between Economic Growth, real estate prices and real estate investments in Hong Kong // *Surveying and Built Environment*. – 2005, Vol. 16, No. 2, p. 19-32. – Access on the Internet: http://hkis.org.hk/ufiles/200512-lhtchui.pdf, [viewed on 19-07-2015]
35. Constancio V. Strengthening macroprudential policy in Europe // The European Central Bank. – Access on the Internet. – Access on the Internet: https://www.ecb.europa.eu/press/key/date/2015/html/sp150703.en.html, [viewed on 21-09-2015]
36. D'Alessio G., Iezzi S. Household over-indebtedness: definition and measurement with Italian data // *Bank of Italy*. – 2013, No. 149. – Access on the Internet: http://www.bancaditalia.it/pubblicazioni/qef/2013-0149/QEF_149.pdf, [viewed on 07-09-2015]
37. Disney R. et al. Drivers of over-indebtedness // *Report to the department of business, enterprise and regulatory reform*. – University of Nottingham, 2008. – Access on the Internet: http://www.nottinghamknowledge.com/economics/cpe/publications/berrsep08.pdf, [viewed on 17-09-2015]
38. Donatein H., Robert C. Y. Credit risk valuation with rating transactions and partial information // *International Journal of Theoretical & Applied Finance*. – 2014, Vol. 17, Issue 7, p. 1-44. – Acess on the Internet: http://web.b.ebscohost.com.skaitykla.mruni.eu/ehost/detail/detail?sid=f49ae5a4-9dea-4ce2-b6cf-9af4bbee0689%40sessionmgr113&vid=0&hid=102&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=bth&AN=99974135, [viewed on 17-09-2015]
39. Erina J., Erins I. Responsible lending in banks of the Baltic States // *Journal of Systemics, Cybernetics and Informatics*. – International Institute of Informatics and Cybernetics, 2013, Vo. 11, No. 8, p. 37-45
40. Opinion on responsible lending requirements for credit institutions (CON/2011/67), Lithuania, 26.8.2011) // *The European Central Bank*. – Access on the Internet: https://www.ecb.europa.eu/ecb/legal/1353/1330/html/index.en.html, [viewed on 18-06-2015]
41. Over-indebtedness: new evidence from the EU-SILC special module // *European commission*. – 2010, research note 4/2010. – Access on the Internet: http://ec.europa.eu/consumers/financial_services/reference_studies_documents/docs/part_2_synthesis_of_findings_en.pdf, [viewed on 18-08-2015]
42. Evans O. et al. Macroprudential indicators of financial system soundness // *International Monetary Fund Occasional paper*. – 2000, No. 192 – Access on the Internet: http://www.imf.org/external/pubs/ft/op/192/op192.pdf, [viewed on 21-09-2015]
43. Floreani J., et al. Credit quality, bank provisioning and systematic risk in banking business // *International Journal of Management Cases*, - 2015, p. 88-101. – Access on the Internet: http://convegni.unicatt.it/meetings_Floreani_Polato_Paltrinieri.pdf, [viewed on 17-09-2015]
44. Glindro T. et al. Determinants of house prices in nine Asia-Pacific economies // *BIS Papers*. – 2011, No. 52. – Access on the Internet: https://www.bis.org/publ/bppdf/bispap52.htm, [viewed on 15-09-2015]

45. Golob K. et al. Analysis of impact factors on the real estate market: case Slovenia // *Engineering Economics.* – Kaunas: Kaunas University of Technology, 2012, Vol. 23, No. 4, p. 357-367
46. Graham E. et al. *Handbook of Economic Forecasting* / 1st ed. - North Holland, 2006. – 437-438 p. – ISBN-13: 978-0444513953
47. Granziera E., Kozicki Sh. House price dynamics: fundamentals and expectations // *Bank of Canada Working Paper*, 2012 – Access on the Internet: http://www.bankofcanada.ca/2012/04/working-paper-2012-12/, [viewed on 18-09-2015]
48. Green R. K., Handershott P. H. Demographic factors and real house prices // *Working paper of National Bureau of Ecconomic Research.* – 1993, No. 4332. – Access on the Internet: http://www.nber.org/papers/w4332, [viewed on 10-10-2015]
49. Guo H. et al. Credit risk models with incomplete information // *Mathematics of Operations Research*. – 2009, No. 34, p. 320 – 332. – Access on the Internet: http://www.ieor.berkeley.edu/~xinguo/papers/II.C.2.pdf, [viewed on 08-09-2015]
50. Hainaut D., Robert C. Y. Credit risk valuation with rating transactions and partial information // International Journal of Theoretical and Applied Finance. – 2014, Vol. 17, No. 7, p. 1-30. – Access on the Internet: http://www.crest.fr/ckfinder/userfiles/files/pageperso/dhainaut/PaperPartialInformationV9.pdf, [viewed on 17-09-2015]
51. Hillairet C., Jiao Y. Credit risk with asymmetric information on the default threshold // *Stochastics*. – 2012, No. 84, p. 183 – 198. – Access on the Internet: http://isfaserveur.univ-lyon1.fr/~jiao/recherche/infoproba.pdf, [viewed on 27-09-2015]
52. Hoxha V., Temeljotov A. Fundamental economic factors that affect housing prices: comparative analysis between Kosovo and Slovenia // *Management*. – Slovenia, 2014, Vol. 9, No. 4. – Access on the Internet: http://econpapers.repec.org/article/mgtyoumng/v_3a9_3ay_3a2014_3ai_3a4_3ap_3a323-348.htm, [viewed on 07-10-2015]
53. Hubbard-Soli J. *Responsible lending: an international landscape*. – Consumer international, London, 2013. – Access on the Internet: http://www.consumersinternational.org/media/1412472/ciresponsiblelending_finalreport_06-11-13.pdf, [viewed on 24-09-2015]
54. Hwang M., Quigley J. M. Economic fundamentals in local housing markets: evidence from U.S. metropolitan regions // *Journal of regional science.* – 2006, Vol. 46, No. 3, p. 425-453
55. Lithuanian economic and real estate market report 2014-2015 // *JCS Inreal*. – Access on the Internet: http://www.inreal.lt/media/editor/inreal/rinkos-apzvalgos/2015/INREAL_RLN_2014-2015_REmarketReport_EN.pdf, [viewed on 18-06-2015]
56. Lithuanian economic and real estate market report 2015 Q1 // *JSC Inreal*. – Access on the Internet: http://www.inreal.lt/media/editor/priemiestis/rinkosapzvalga_EN_Q1_2015.pdf, [viewed on 10-09-2015]
57. Jaggia S., Patel P. Rent-to-own housing contracts under financial constrains // *California State Polytechnic University*. – 2015. – Access on Internet: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2576485, [viewed on 17-09-2015]
58. Keese M. Triggers and determinants of severe household indebtedness in Germany // *SOEP papers.* – 2009, No. 239. – Access on the Internet: https://ideas.repec.org/p/rwi/repape/0150.html, [viewed on 17-09-2015]
59. Levišauskaitė K., Varanauskienė J. Macroeconomic factors‘ influence on mortgage rate type demands // *Applied Economics: Systematic Research*. – Vytautas Magnus University, 2013, No. 7/2, p. 101-112. – Access on the Internet: http://vddb.library.lt/obj/LT-eLABa-0001:J.03~2013~ISSN_1822-7996.V_7.N_2 [viewed on 18-09-2015]

60. Levitin A. J., Wachter S. M. Explaining the housing bubble // *The Georgetown Law Journal*. – 2012, Vol 100, p. 1177-1257. – Access on the Internet: http://georgetownlawjournal.org/files/2012/04/LevitinWachter.pdf, [viewed on 28-08-2015]
61. Ling D. C. et al. Explaining house price dynamics: isolating the role of non-fundamentals // *Journal of Money, Credit and Banking*. – Blackwell Publishing, 2015, Vol 47, Issue S1, p. 87-125. – Access on the Internet: [viewed on 18-09-2015] http://onlinelibrary.wiley.com/doi/10.1111/jmcb.12194/abstract,
62. Lusardi A., P. Tufano. Debt literacy, financial experiences and overindebtedness // *National Bureau of Economic Research*. – 2009, No. 14808. – Access on the Internet: http://www.nber.org/papers/w14808, [viewed on 18-09-2015]
63. Mar V. What is responsible lending? The EU consumer mortgage credit directive in the UK and the Netherlands // *Journal of Consumer Policy*. – 2015, Vol. 38, Issue 4, p. 411- 430. – Access on Internet http://link.springer.com/article/10.1007/s10603-015-9301-9, [viewed on 21-09-2015]
64. Meulen Ph. et al. Forecasting real estate prices in Germany: the role of consumer confidence // *Journal of Property Research*. – 2014, Vol. 31, No. 3, p. 244-263. – Access on the Internet: http://www.tandfonline.com/doi/abs/10.1080/09599916.2014.940059?journalCode=rjpr20, [viewed on 11-08-2015]
65. Miller N. G., Sklarz M. A. A note on leading indicators of housing market price trends // *The Journal of real estate research*. – 2006, Vol. 1, No. 1, p. 100-109. – Access on the Internet: https://www.researchgate.net/publication/5141840_A_Note_on_Leading_Indicators_of_Housing_Market_Price_Trends, [viewed on 11-08-2015]
66. Quigley J. M. Real estate prices and economic cycles // *International real estate review*. – 1999, Vol. 2, No. 1, p. 1-20. – Access on the Internet: http://urbanpolicy.berkeley.edu/pdf/Q_IRER99PB.pdf, [viewed on 10-09-2015]
67. Rudzkienė V., Azbainis V. Relationship between customers expectations and houing prices in transaction economies // *Business systems and economics*. – Vilnius: Mykolas Romeris university, 2012, No 2, p. 61-77. – Access on the Internet: https://www3.mruni.eu/ojs/business-systems-and-economics/article/view/496, [viewed on 17-09-2015]
68. Santis R. A., Surico P. Bank lending and monetary transmission in the Euro area // ECB Working paper, 2013, No. 1568, Access on the Internet: https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1568.pdf?95fe7eee33224a1109d850881b871710, [viewed on 21-09-2015]
69. Shiller R. *Irrational Exuberance* / 2nd ed. – Princeton University Press, 2005. – 47 p. - ISBN: 9781400865536
70. Shiller R. Speculative asset prices // *Nobel Prize Lecture*. – 2013, No. 1936 – Access in the Internet: http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2013/shiller-lecture.html, [viewed on 10-09-2015]
71. Shiller R. Understanding recent trends in house Prices and homeownership // Working paper of National Bureau of Ecconomic Research. – 2007, No. 13553. – Access on the Internet: http://www.nber.org/papers/w13553, [viewed on 10-10-2015]
72. Shiller R., Weis A. N. Evaluating real estate valuation systems // *Journal of Real Estate Finance and Economics*. – 1999, Vo;. 18, No. 2, p. 147-161. – Access on the Internet: http://aida.wss.yale.edu/~shiller/pubs/p0983.pdf, [viewed on 09-06-2015]
73. Stundžienė A. Prediction of GDP based on the lag economic indicators // *Engineering Economics*. – Kaunas: Kaunas University of Technology, 2015, Vol. 26, No. 2, p. 185-195. – Access on the Internet: http://www.inzeko.ktu.lt/index.php/EE/article/view/7003, [viewed on ą9-06-2015]

74. Tajik M. et al. House prices and credit risk: evidence from United States // *Economic Modelling*. – 2015, Vol. 51, p. 123-135. – Access on the Internet: http://web.b.ebscohost.com.skaitykla.mruni.eu/ehost/detail/detail?sid=bbc8b84f-7b0d-4fbc-b495-ff8cb0cb08d9%40sessionmgr113&vid=0&hid=102&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=bth&AN=110576285, [viewed on 17-09-2015]
75. Takats E. Ageing and asset prices // *BIS Papers*. – 2010, No. 318. – Access on the Internet: http://www.bis.org/publ/work318.htm, [viewed on 11-09-2015]
76. Responsible lending overview of regulatory tools // *The World Bank*. – 2013 – Access on the Internet: http://documents.worldbank.org/curated/en/2013/10/18639527/responsible-lending-overview-regulatory-tools, [viewed on 18-06-2015]
77. Viimsalu S. The over-indebtedness regulatory system in the light of the changing economic landscape // *Juridica International*. – 2010, Vol. 17. – Access on the Internet: http://www.juridicainternational.eu/public/pdf/ji_2010_1_217.pdf, [viewed on 12-08-2015]
78. Yin J. et al. *Study on real estate credit risk based on system dynamics*. – Berlin Heidelberg, 2013. – 1193 p. – ISBN 978-3-642-32054-5
79. Zhang J. et al. Dynamic impact of interest rate policy on real estate market // *Asian Social Science*. – The Canadian Center of Science and Education (CCSE), 2011, Vol. 7, No. 10. – Access on the Internet: http://ccsenet.org/journal/index.php/ass/article/view/10697, [viewed on 12-08-2015]

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ABSTRACT IN LITHUANIAN

Magistro baigiamajame darbe įvertinti ir identifikuoti pagrindiniai rodikliai, siekiant prognozuoti gyvenamojo nekilnojamojo turto kainas. Pirmajame skyriuje pateikiami mokslininkų atlikti tyrimai, jų nuomonės nagrinėjant nekilnojamojo turto rinką įtakojančius veiksnius ir pristatoma Atsakingojo skolinimo nuostatų samprata. Antrajame darbo skyriuje, remiantis įvairių autorių požiūriu, trijų grupių ekonominiai rodikliai – atsiliekantys, sutampantys ir orientuojantys – atrenkami tolimesniam tyrimui; pristatoma proceso metodologija vertinant atrinktų rodiklių bei Atsakingojo skolinimo nuostatų pakeitimo įtaką gyvenamojo nekilnojamojo turto rinkos dinamikai. Trečiajame skyriuje pateikiami tyrimo rezultatai ir identifikuojami pagrindiniai rodikliai, įtakojantys gyvenamojo nekilnojamojo turto kainų prognozę. Ketvirtajame skyriuje pateikiamos darbo išvados ir rekomendacijos tolimesniems tyrimams, siekiant įvertinti pagrindinių rodiklių efektyvumą gyvenamojo nekilnojamojo turto kainų prognozėje.

Pagrindiniai žodžiai: gyvenamoji nekilnojamojo turto rinka, nekilnojamojo turto rinkos rodikliai, nekilnojamojo turto kainos prognozė, Atsakingojo skolinimo nuostatai

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ABSTRACT IN ENGLISH

This master thesis identifies and conducts research on the key indicators for the residential real estate price forecast. In the first part of the thesis, previously performed studies are analyzed and the concept of Responsible lending regulations is introduced. The second part of the research paper deals with the discussion on the three groups of economic indicators, i.e. lagging, coincident and leading; with the introduction of the methodology on evaluating the relationship between economic indicators and apartment prices; and with the examination of the process of a possible impact of Responsible lending regulations changes on residential real estate market dynamics assessment. In the third part of this work, research findings are presented and the key indicators are identified. In the fourth part, conclusions and recommendations on further research to evaluate the efficiency of key indicators' impact on the residential real estate price forecast are proposed.

Key words: residential real estate market, real estate price indicators, real estate price forecast, Responsible lending regulations.

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SUMMARY IN LITHUANIAN

Finansų rinkų magistro baigiamojo darbo tema yra aktuali visiems nekilnojamojo turto rinkos dalyviams: nekilnojamojo turto pirkėjams ir pardavėjams, bankams, brokeriams, nekilnojamojo turto vertintojams ir nekilnojamojo turto rinkos investuotojams. Daugelis mokslininkų savo tyrimuose, išnagrinėję ekonominių rodiklių ir teisės aktų pakeitimų poveikį gyvenamojo nekilnojamojo turto kainų prognozei, siūlo bendrą išvadą, kad galimybė prognozuoti kainų pokytį gali būti esminis veiksnys, įtakojantis bendrą finansinį stabilumą.

Esminė problema yra pagrindinių rodiklių, kurie turi įrodytą poveikį gyvenamojo nekilnojamojo turto kainų prognozei, identifikavimo stoka. Įvairiuose tyrimuose nagrinėjami skirtingi rodikliai, tačiau jų efektyvumas trumpalaikėje kainų prognozėje išlieka nežinomas.

Darbo objektas yra ekonominiai rodikliai ir teisiniai veiksniai. Pagrindinis šio tyrimo tikslas yra identifikuoti pagrindinius rodiklius, turinčius įtaką gyvenamojo nekilnojamojo turto kainų prognozei. Pagrindiniai tyrimo uždaviniai yra: pateikti teorinę ekonominių rodiklių ir jų įtakos nekilnojamojo turto rinkos dinamikai analizę; pristatyti Atsakingojo skolinimo nuostatus, kaip perteklinio įsiskolinimo mažinimo priemonę; sukurti tyrimo metodologiją ir pagal ją nustatyti ekonominių rodiklių ir butų kainų priklausomybę; įvertinti ankstesnio laikotarpio būsto kredito duomenis, taikant naujus Atsakingojo skolinimo nuostatus; identifikuoti pagrindinius rodiklius nekilnojamojo turto kainų prognozėje.

Magistro baigiamojo darbo metodika: mokslinės literatūros ir teisinių dokumentų analizė, koreliacinė ir regresinė analizė. Žvalgomojo tyrimo tikslas – įvertinti Atsakingojo skolinimo nuostatų pakeitimų galimą poveikį galimybei gauti būsto paskolą ir prognozuoti tų pakeitimų poveikį nekilnojamojo turto rinkos kainoms. Koreliacijos analizė parodė, kad visi ekonominiai rodikliai turi sąsają su butų kainų pokyčiais, priklausomai nuo butų klasių, tačiau tik dešimt rodiklių buvo įvardinti pagrindiniais. Regresijos koeficientas parodė, kad nuomos kaina, EURIBOR, mėnesinės pajamos, vartotojų pasitikėjimo rodiklis ir BVP atspindi esamą nekilnojamojo turto kainų augimo tendenciją. Siūloma šiuos rodiklius laikyti pagrindiniais rodikliais, parodančiais esamą nekilnojamojo turto rinkos padėtį. Pagrindinai orientuojantys rodikliai, kurie kinta anksčiau nei spėja sureaguoti nekilnojamojo turto rinka yra: išduoti statybos leidimai, baigtų statyti butų

naudingasis plotas, baigtų statyti naujų gyvenamųjų pastatų skaičius, šalyje atlikti statybos darbai to meto kainomis ir Vartotojų pasitikėjimo rodiklis.

Magistro baigiamojo darbo pabaigoje pateikiamos išvados ir siūlymai dėl pagrindinių rodiklių efektyvumo įvertinimo prognozuojant gyvenamojo nekilnojamojo turto kainas.

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SUMMARY IN ENGLISH

The master thesis on financial markets is significant for all real estate market participants: RE buyers and sellers, banks, real estate brokers, appraisals and real estate market investors. Many researchers investigating economic indicators and the impact of legislation changes on residential real estate prices argue that possibility to predict price changes may be the key point in the overall financial stability.

The major problem is the lack of key indicators that have a proven impact on the residential real estate price forecast. In different research, different indicators are apprised; however, their efficiency to make short-term predictions of price changes remains unknown.

The object (of this master thesis is economic indicators and legislative factors. The main aim of this study is to identify key indicators in the residential real estate price forecast. The main tasks of the study are: to analyze theoretical aspects of economic indicators and their influence on real estate market dynamics; to overview the concept of Responsible lending regulations as a precaution of over-indebtedness; to design the research methodology for assessment of the dependence of economic indicators and apartment prices and to accomplish it; to appraise past mortgage credit data applying recent Responsible lending regulations changes; to identify the key indicators for forecasting future real estate prices.

The methodology of the master thesis includes scientific literature and legal documents analysis, and correlation and regression analysis. Exploratory research was performed with the goal to evaluate possible impact of RLR changes on the ability to receive a mortgage and the capacity to predict likely influence on real estate market prices. The correlation analysis revealed that all the researched indicators have relationship with apartment price changes, depending on apartment classes; however, only ten indicators were identified as the main ones. The regression coefficients show that the decrease in rent price, Euribor, monthly income, CPI and GDP is representing the current uptrend of residential real estate prices. These indicators are proposed to be specified as the key indicators of the current trend in residential real estate market. The major leading indicators, which tend to change prior to the residential real estate market reaction, are the following: building

permits, useful floor area of dwellings for which building permits were granted, number of dwellings completed, construction work carried out at current prices and Consumer confidence indicator.

The final part of the master thesis deals with conclusions and suggestions on the key indicators in the residential real estate price forecast.

ANNEXES

ANNEX 1

The correlation matrix of selected factors influencing the residential property prices

Indicator	Dwellings classes			
	Total	Economic	Middle	Luxury
Building permits, units	0,672	0,817	-0,695	-0,684
Useful floor area of dwellings for which building permits were granted, thousand sq. m.	-0,717	-0,898	0,922	0,871
Number of dwellings completed, units	0,816	0,726	0,795	0,758
Construction work carried out at current prices, MEUR	0,861	0,861	0,866	-0,788
Consumer confidence indicator in urban area, points	0,226	0,597	0,567	-0,419
Sales transactions of dwellings in Vilnius, units	0,339	0,653	0,675	0,537
Sales transactions of dwellings in Lithuania, units	0,241	0,550	0,684	0,598
Rent price per sq. m.	0,788	0,847	0,835	0,654
Amount of unsold new dwellings, units	0,535	0,612	0,095	0,494
Amount of sold new dwellings, units	-0,053	0,263	-0,164	0,235
Monthly income after taxes, EUR	0,168	0,224	0,529	0,662
GDP per capita, at current prices, TEUR	-0,218	-0,147	-0,364	-0,364
Unemployment in Vilnius, people	-0,655	-0,780	-0,909	-0,818
Population in Lithuania, people	0,506	0,402	0,693	0,832
Population in Vilnius, people	-0,071	-0,016	-0,042	-0,180
Consumer price index, percentage	0,722	-0,519	-0,570	-0,589
Interest rate of household loans, percentage	0,838	0,562	0,520	0,587
Household loans, millions EU	0,902	0,765	0,791	0,750
Household housing loans, millions EU	0,813	0,607	0,661	0,756
Interest rate of household housing loans, MEUR	0,880	0,795	0,844	0,782
Interest rate of housing loans fixed <1 year, percentage	0,846	0,655	0,721	0,798
Housing loans fixed <1 year, MEUR	0,741	0,675	0,858	0,812
Interest rate of housing loans fixed >1 year, percentage	0,630	0,345	0,353	0,523
Housing loans fixed >1 year, MEUR	0,854	0,763	0,646	0,581
Euribor 3 months, percentage	0,827	0,670	0,772	0,794
Euribor 6 months, percentage	0,823	0,654	0,749	0,791
Euribor 12 months, percentage	0,815	0,654	0,741	0,789
Libor 3 months, percentage	0,718	0,802	0,934	0,954
Libor 6 months, percentage	0,711	0,785	0,928	0,953
Libor 12 months, percentage	0,688	0,753	0,911	0,948

ANNEX 2

The correlation matrix of selected factors influencing the residential property prices

Credit date	Loan-to-value ratio, %	Credit period, months	Fixed interest rate period, months	Client age, when credit returned	Marittal status	Childr en	Shared ownership	Does the client have additional credit	Additional credit type
2015 01	59	30	6	60	married	0	no	no	
2015 01	85	15	3	73	divorced	0	yes	no	
2015 04	84	30	6	58	single	0	no	no	
2015 05	80	20	3	65	married	0	yes	no	
2015 05	57	20	6	47	single	0	yes	no	
2015 06	80	15	6	64	married	0	yes	yes	Mortgage
2015 06	50	11	6	66	widowed	0	no	yes	Consumer loan
2015 06	77	15	6	58	married	0	yes	yes	Consumer loan
2015 07	67	11	3	68	divorced	0	no	no	
2015 07	63	25	3	67	married	1	yes	no	
2015 07	85	24	3	54	married	0	yes	yes	Consumer loan
2015 07	85	25	6	47	single	0	no	no	
2015 07	16	9	3	65	married	0	yes	no	
2015 09	75	35	6	61	married	0	yes	no	
2015 08	76	35	6	66	single	0	no	no	
2015 08	28	8	3	62	widowed	0	no	no	
2015 08	83	34	3	65	single	0	no	no	
2015 08	85	19	3	65	divorced	1	yes	yes	Consumer loan
2015 08	80	23	3	58	single	0	no	no	
2015 08	80	35	3	65	single	0	no	yes	Mortgage
2015 08	84	35	6	60	married	0	yes	yes	Consumer loan
2015 08	40	25	6	63	married	2	yes	no	
2015 09	85	20	3	46	single	0	no	no	
2015 09	67	35	6	65	single	0	no	no	
2015 09	84	34	6	65	single	0	no	no	
2015 09	85	31	6	65	divorced	1	no	yes	Leasing, consumer loan