Iryna Garanska
Assistant Professor
Odessa I.I. Mechnikov National University
e-mail: igv123@rambler.ru

Sergey Yakubovskiy
Doctor of Economic Science, Professor
Odessa I.I. Mechnikov National University
e-mail: sergey_yakubovskiy@yahoo.com

THE RELATIONSHIP BETWEEN HOUSING PRICES AND MORTGAGE CREDIT: FORECAST FOR HUNGARY AND UKRAINE

Summary. In this article, we analyze the relationship between mortgage credit and house prices. We make prediction of the future behavior in the relationship between house prices and mortgage credit for Hungary and Ukraine with the help of VAR and VEC models. We propose vector correction mechanism to bring both markets to the equilibrium in the forecasted period.

Key words: house prices, mortgage credit, real estate market, mortgage market, VEC, VAR.

Introduction of the topic. According to George Soros [1], one of the main causes of the global financial crisis — unrealistic expectations about the real estate market in the future. In order to avoid crises in the future, it is important to make predictions for the future. It is of great advantage for the scientists to have forecasts that can predict future shortcomings and downfalls. Hungary and Ukraine experience similar difficulties in real estate and mortgage markets and therefore we decide to make analysis of these markets for both countries. The relationship between house prices and mortgage credits is still not completely clear and therefore there is room for future research in this field.

Analysis of publications. The relationship between house prices and mortgage credits has been analyzed by many economists, among them are Santiago Valverde, Francisco Fernandez, Bernanke, etc. Research conducted by these scientists is of great importance in understanding the relationship between these two markets, nonetheless these researches concentrate on the past data and not on predictions of the future. The closest research to ours has been conducted for the countries of the European Union by Sophie Tahiri and Jean-Michel Six, but the authors lack forecast for Hungary and nothing similar has been done for Ukraine as well [2]. The lack of predictions for these markets provide us with an opportunity to make our own forecast for Hungary and Ukraine based on the current data.

The main purpose of the article is to describe the relationship between house prices and mortgage credits for Hungary and Ukraine in the short-run and long-run, make a forecast with the help of VAR and VEC models.

The results. Relationship between real estate market and mortgage market is not defined yet. Whether house prices impact mortgage interest rates or the other way around is not clear and requires additional research for chosen markets. We choose to analyze and make predictions for Hungary and Ukraine due to similarities of both markets. In our previous work, we have come up with models that correspond to the actual data and tested these models for both countries in static conditions up to 2012 [3]. In this article we continue our analysis and test our models in dynamic conditions, compare with actual data and based on the results, make a forecast until 2020. First part of the article we dedicate to Hungary, and the second one to Ukraine. We use monthly data from the official websites of national banks and bureaus of statistics for both countries.

We begin our analysis with Hungary and first of all, we graph house prices trend, real interest rate and nominal mortgage rate for the period 2002-2012 [4,6]. Beginning from 2002, we see house prices gradually increase. In 2003-04, we see a sharp increase which explains government subsidies for house purchases. An increase of house prices in 2008 is not sharp, as can be expected due to the global crisis, yet there is a drop in prices after 2008, prices return to the 2004 level. We can make a prediction that prices will continue gradually increasing up until 2020. We will check our hypothesis and will make our forecast based on our results.
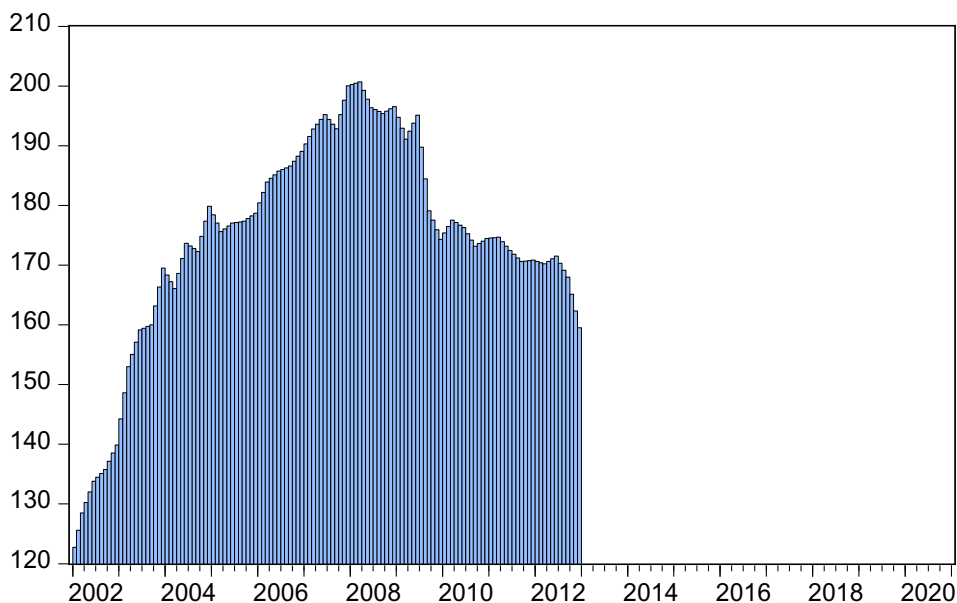
Graph 1. FHB price index 2002-2012

Graph 2. Mortgage interest rate and real interest rate 2002-2012

Graph 2 shows nominal mortgage and real interest rates, both rates reach peak in 2003-04 and at the beginning of the global crisis in 2008. Mortgage rate started increasing in 2010 which explains introduction of restrictions on mortggaes in foreign currency. The economy of Hungary is still in recession, so we can hypothise that in the period between 2013 and 2020, real interest rate and mortgage rate will be gradually increasing. We use the following endogenous variables: FHB price index, GDP per capita, real interest rate, nominal interest rate. And the following exogenous variables: salary for employee, inflation and mortgage credit per inhabitant [4,5]. We use VEC model and check similarities between actual data and our modeled results in dynamics, we see the results on the graph.
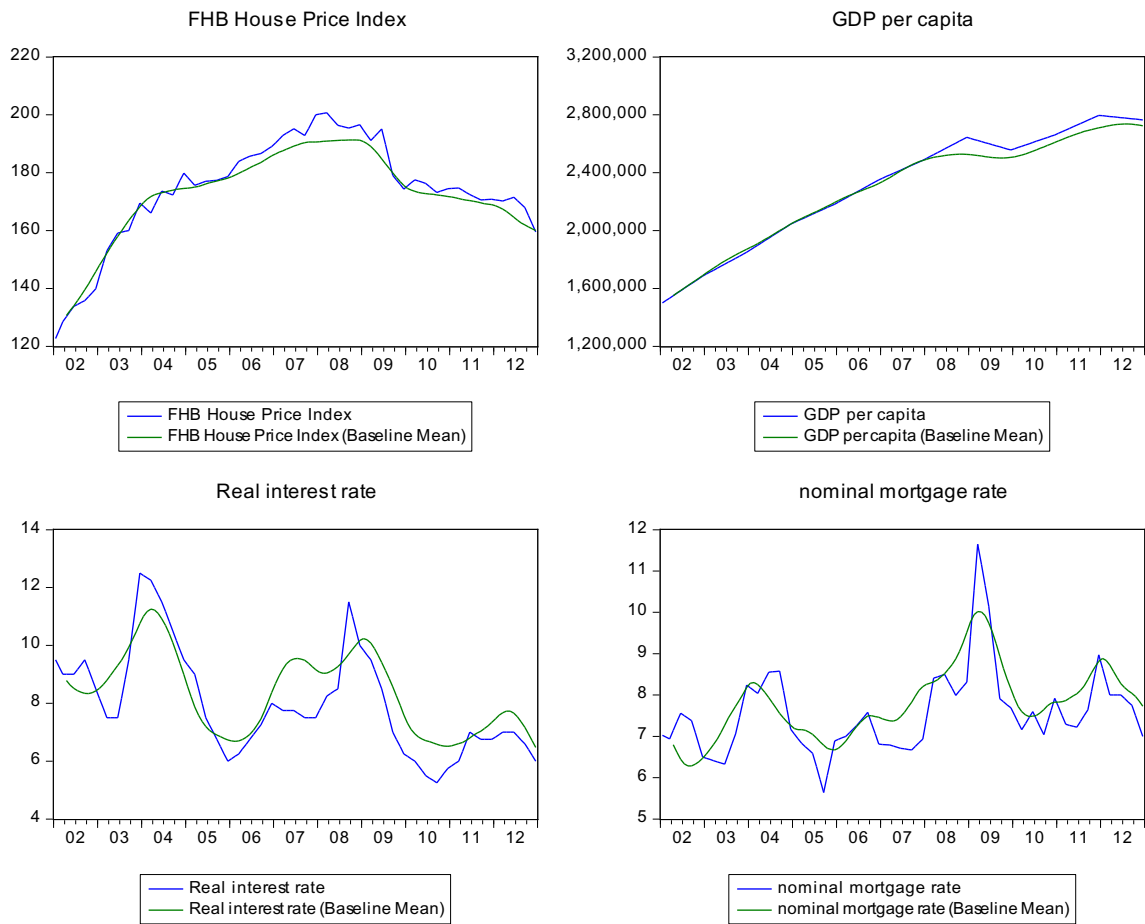
Graph 3.
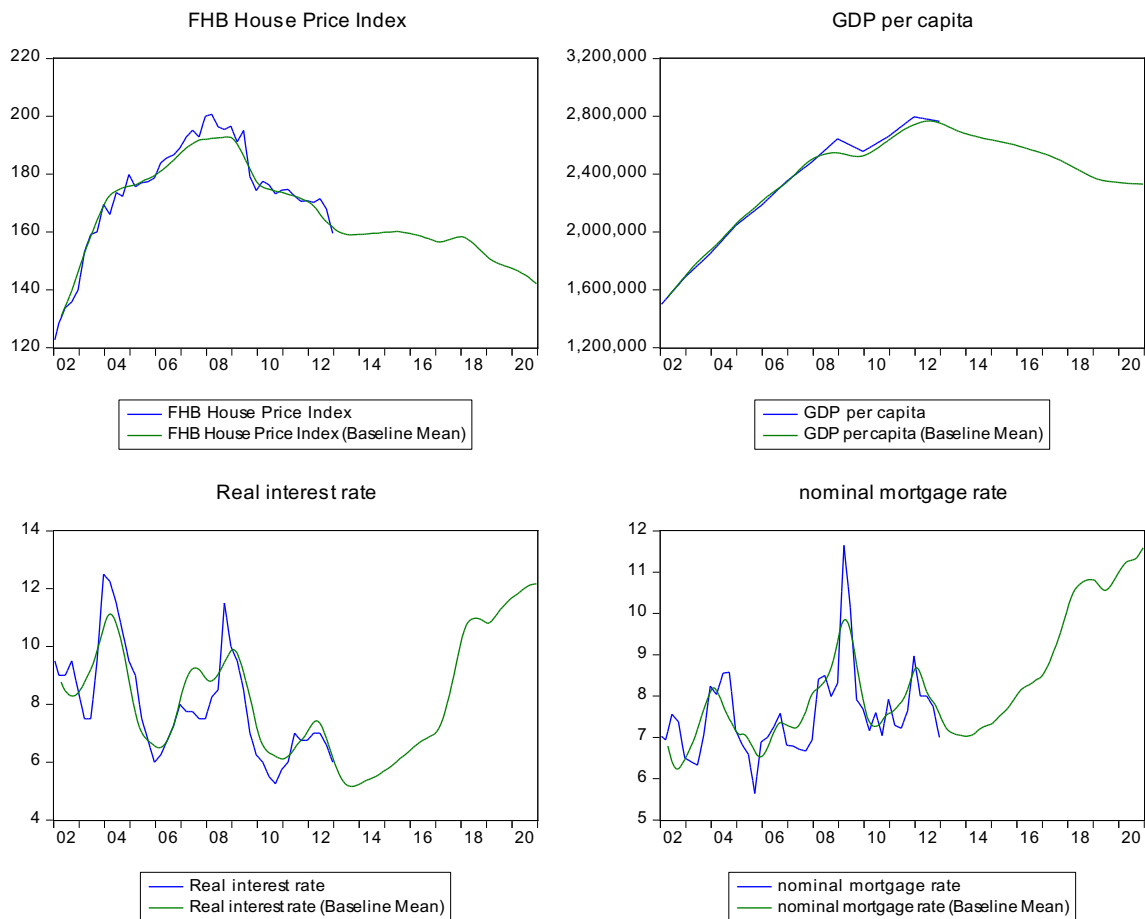
Graph 4.

In the future period, we see an increase in prices by 2016 and then a decrease in 2017-18 and then again an increase. We make a prediction that in 10 years from the last global crisis there will be another crisis in Europe, because later on we see a decrease in house prices until 2020, but the prices are lower than in pre-crisis period. GDP per capita increases until 2017 and then sharply decreases. Nominal mortgage rate increases from 2014, in 2017 it almost reaches the 2007 level and then decreases in 2018. Real interest rate decreases in 2014 almost to the 2010 level which is an aftermath of the tight monetary policy of EU. Real interest rate increases sharply by 2018. All main changes for the endogenous variables take place in 2017-2018 which lets us assume that there will be another crisis in these years in Hungary or in EU countries. In order to check the long-run relationship between house prices and mortgage credit we conduct a cointegration analysis for the forecasted period.

The results of cointegration test point to the existence of 3 cointegration relationships. Based on these results we construct cointegration vectors and describe mechanisms that will bring the markets to equilibrium in the future. The elasticity of real interest rate to FHB price index is -42,124 and the elasticity of nominal mortgage rate to price index is 31,762. Adjustment rates measure the dynamics of return to the long-run equilibrium [7]. In order to correct price index in the future, there will be a need to increase prices by 0,4%, also real interest rate by 0,2% and decrease nominal mortgage rate by 0,1% and increase GDP per capita by 2,2%. Elasticity of mortgage rate to real interest rate is 2,754 and 0,001 to GDP per capita. To correct real interest rate, there is a need to decrease real interest rate by 10,1%, decrease mortgage rate by 1,5% and decrease GDP per capita by 6,9%. To reach equilibrium in mortgage market, mortgage rate needs to be decreased by 0,8%. We present the results in table 2. To finish our analysis we conduct Granger-Causality test to check the relationship in the short-run. We propose a hypothesis that nominal mortgage rate does not cause FHB price index when $p \geqslant 0,05$. If $p \leqslant 0,05$, we reject our hypothesis and declare existence of the relationship. Based on the obtained results, mortgage rate has an influence on price index ($p=0,023$), but price index does not cause mortgage rate ($p=0,704$).

According to our analysis, mortgage interest rates cause a change in housing prices in Hungary. According to our forecast, a country will experience a crisis in 2017-18 due to some changes in the real estate market.

The second part of our research concentrates on mortgage market and real estate market of Ukraine. Our data is monthly and starts in 2004 with the development of mortgage market in Ukraine. We begin by graphing the actual data that we use from official website of National Bank of Ukraine [8] for house prices, for this country we use logged house prices instead of price index. Graph 5 shows that house prices increase by 2008 and sharply decrease afterwards. Only by 2010 the prices return to the 2006 level and continue to be on the same level until 2013. We choose to use mortgage rate in national and foreign currencies, because before the global crisis most of the mortgages have been in national currency. On graph 6, we see that interest rate in national currency is much higher than in foreign currency which explains increased demand for mortgages in foreign currency prior to crisis.

Table 1
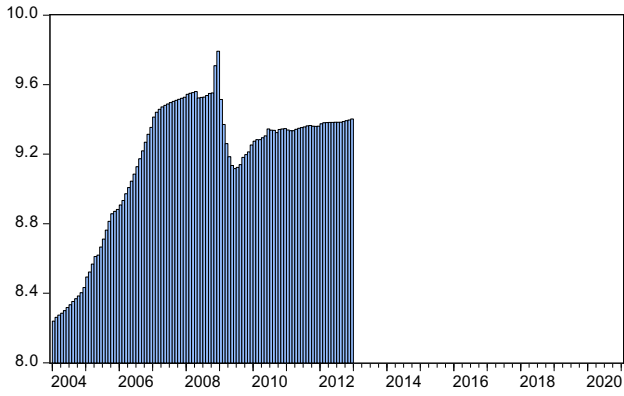
Johansen's cointegration test

H₀:	Trace statistics	P=0.05
r =0	747,921**	47,856
r⩽1	418,846**	29,797
r⩽2	141,391**	15,494
r⩽3	0,396	3,841

*Cointegration exists at 10% significance; ** Cointegration exists at 5% significance; *** Cointegration exists at 1% significance
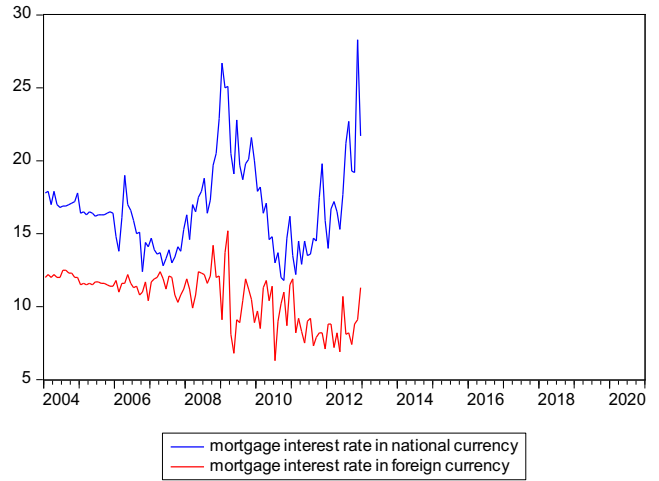
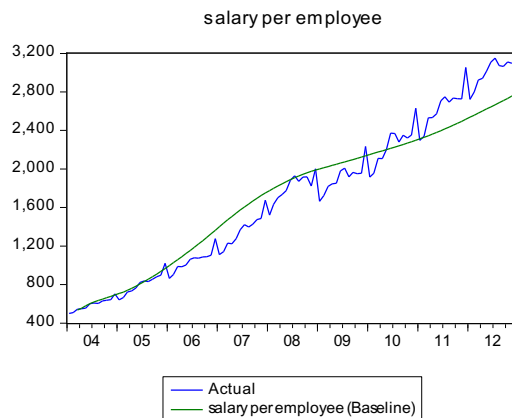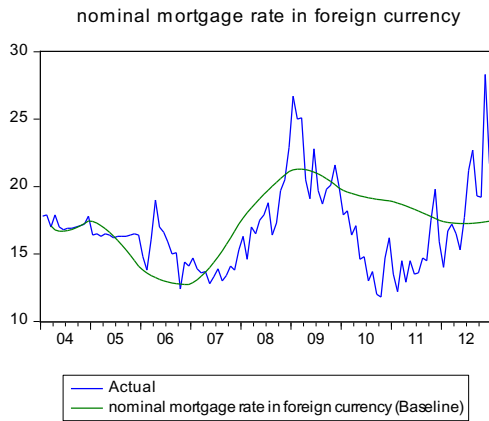*Table 2*

Coefficient vectors (β) and adjustment rates (α)

	β	α	β	α	β	α
FHB price index	1	0,004 (0,001)	-	-	-	-
Real interest rate	-42,124 (2,832)	0,002 (0,001)	1	-0,101 (0,003)	-	-
Nominal mortgage rate	31,762 (6,708)	-0,001 (0,001)	2,754 (0,281)	-0,015 (0,005)	1	-0,008 (0,001)
GDP per capita	-0,001 (0,001)	0,022 (0,144)	-0,003 (0,002)	-0,069 (0,047)	-0,006 (0,009)	-0,049 (0,200)

Graph 5. House prices in Ukraine 2004-2012

Graph 6. Mortgage rates 2004-2012

GDP per capita

house prices

nominal mortgage rate in national currency

nominal mortgage rate in foreign currency

salary per employee
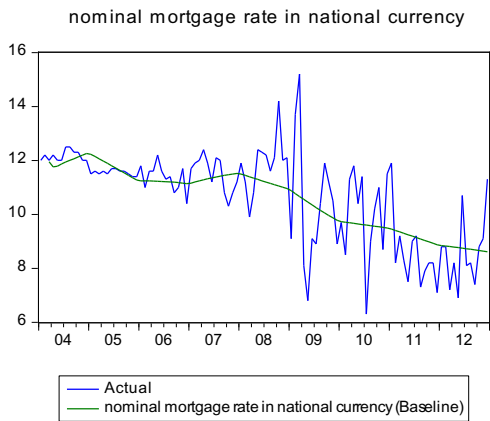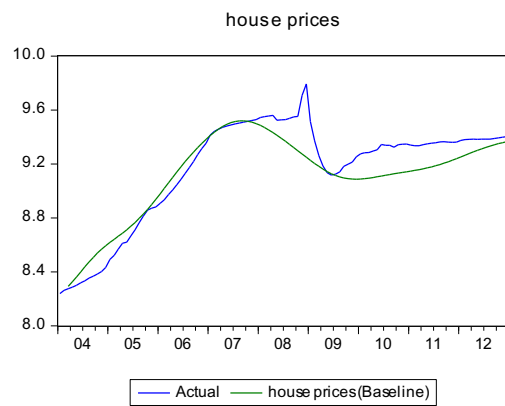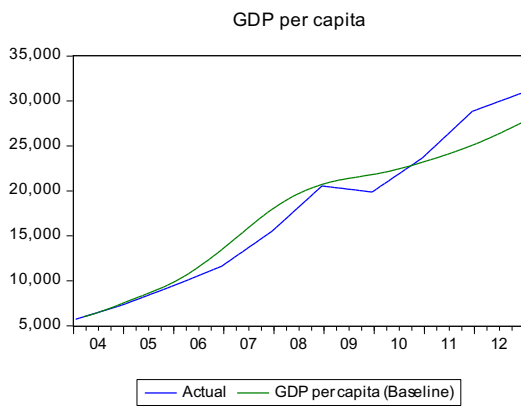
Graph 7

We see that our model predicts housing prices well enough, an increase is not as sharp as in actual data during the pre-crisis period, nonetheless it follows the pattern. Both mortgage rates follow the general trend and therefore we accept our model and make our forecast for 2013-2020, we show the results on graph 8.

On graph 8, we see that house prices decrease until 2016 and then we see an increase until 2020. As for the salary per employee, there is a gradual increase which looks stable on our graph. We expect GDP per capita to slightly decrease until 2017 and then increase until 2020. Mortgage rate in national currency keeps increasing until 2016, we expect government interference and a fall in rates after 2016. Mortgage rates in foreign currency have decreased in volume after the latest crisis and we see that the rate decreases, there is a chance that government will put limits on mortgages in foreign currency. In order to check the long-run relationship between house prices and mortgage credit we conduct a cointegration analysis for the forecasted period.
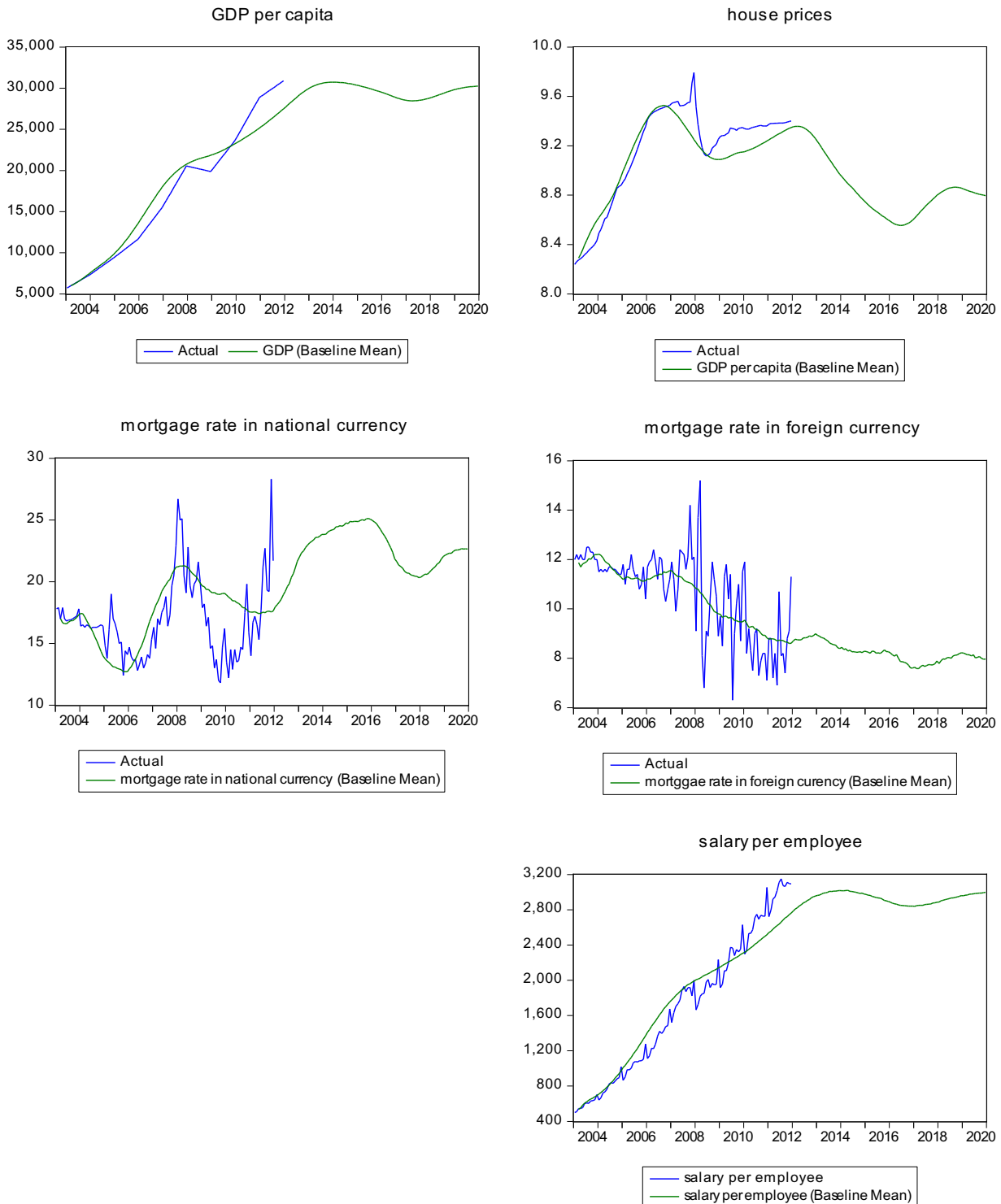
Graph 8.

Cointegration test shows 4 cointegration relationships in the long-run. To see how we can reach the equilibrium in the long-run, we check coefficient vectors and evaluate adjustment rates in table 4. Elasticity of house prices to GDP per capita equals 4,693; nominal mortgage rate in national currency to GDP per capita is -7,179; in foreign currency is -1,736 and salary per employee is -0,016. To correct GDP per capita, there is a need to increase this coefficient has by 0,2%, house prices by 0,8%, mortgage rate in national currency by 0,7%, in foreign currency by 0,1% and salary by 0,4%. Elasticity of mortgage rate in national currency to house prices equals to -1,385, in foreign currency to -0,238 and elasticity of salary to house prices is 0,002. To correct house prices in the forecasted period, there is a need to increase house prices by 0,5%, to decrease mortgage rates in both currencies by 0,7% and to increase salary by 8,2%. Next we describe elasticity to nominal mortgage rate in national currency: mortgage rate in foreign currency is -0,499 and salary per employee is 0,003. To correct mortgage rate in national currency in the future, there is a need to decrease rate in national currency by 0,5%, in foreign currency by 4% and increase salary by 8,5%. Elasticity of salary per employee to nominal mortgage rate in foreign currency is -0,003. To correct rate in foreign current there is a need to decrease the rate by 5,1% and to increase salary by 10,4%.

To finish our analysis we conduct Granger-Causality test to check the relationship in the short-run. We propose a hypothesis that nominal mortgage rate in national and foreign currencies do not have impact on house prices when $p \geqslant 0,05$. If $p \leqslant 0,05$, we reject our hypothesis and declare the impact.

We use the same hypothesis to check influence of house prices on mortgage rates. Our results show that house prices influence mortgage rate in foreign currency ($p=0,00005$), but there is no reverse relationship. We can state that during pre-crisis and in post-crisis periods the change in house prices led to change in mortgage rates in foreign currency in Ukraine, unlike in Hungary where mortgage rate impacts house price index.

Conclusion. The relationship between house prices and mortgage credit exists in both economies. FHB price index has an impact on mortgage credit in Hungary, while house prices have an influence on mortgage rate in foreign currency in Ukraine. In Hungary, we expect a gradual decrease in house prices over the forecasted period, increase in mortgage rate in national currency and increase in real interest rate. We also expect a shock from the real estate market in this country in 2017-18. As for Ukraine, mortgage rate in national currency will continue increasing in the forecasted period, and decreasing in foreign currency, house prices are expected to slow down until 2020.

Table 3.

Johansen's cointegration test

$H_{0:}$	Trace statistics	P=0.05
r =0	274,151**	69,819
r⩽1	180,271**	47,856
r⩽2	109,840**	29,797
r⩽3	58,444**	15,495
r⩽4	20,484	3,841

*Cointegration exists at 10% significance; ** Cointegration exists at 5% significance; *** Cointegration exists at 1% significance

Table 4

Coefficient vectors (β) and adjustment rates (α)

	β	α	β	α	β	α	β	α
GDP per capita	1	0,002	-	-	-	-	-	-
House prices	4,693	0,008	1	0,005	-	-	-	-
Nominal mortgage rate in national currency	-7,179	0,007	-1,385	-0,007	1	-0,005	-	-
Nominal mortgage rate in foreign currency	-1,736	0,001	-0,238	-0,007	-0,499	-0,040	1	-0,051
Salary per employee	-0,016	0,004	-0,002	0,082	0,003	0,085	-0,003	0,104

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Гаранская И. А., Якубовский С.А. Взаимоотношение между ценами на жилье и ипотечными кредитами: прогноз для Венгрии и Украины.

Аннотация. в статье исследовано взаимоотношение ипотечных кредитов и цен на жилье. Произведены прогнозы касательно будущего взаимоотношения данных показателей на рынках Венгрии и Украины с помощью VEC и VAR моделей. Предложены механизмы корректировки для приведения рынков в равновесие в будущем периоде.

Ключевые слова: цены на недвижимость, ипотечное кредитование, рынок недвижимости, ипотечный рынок, VEC и VAR модели.

Гаранська І. А., Якубовський С.О. Взаємовідносини між цінами на житло та іпотечними кредитами: прогноз для Угорщини та України.

Анотація. У статті досліджено взаємовідношення іпотечних кредитів і цін на житло. Зроблені прогнози відносно майбутніх співвідношень для даних показників на ринках Угорщини та України за допомогою VEC і VAR моделей. Запропоновано механізми коригування для приведення ринків в рівновагу в майбутньому періоді.

Ключові слова: ціни на нерухомість, іпотечне кредитування, ринок нерухомості, іпотечний ринок, VEC і VAR моделі.