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THE IMPACT OF GLOBAL FINANCIAL CRISIS ON HOUSING PRICES AND MORTGAGE MARKETS (CASES OF HUNGARY AND UKRAINE)

Summary. In the article the influence of global financial crisis on Europe is described. The relationship between housing prices and mortgage markets in cases of Hungary and Ukraine is proved with the help of the empirical research. The results of the suggested models show that housing prices and mortgage markets played an important role in the events of the global financial crisis

Key words: mortgage markets, mortgage lending, real estate market, global financial crisis

Introduction of the topic. The global financial crisis is associated with mortgage markets and real estate markets. The two markets had been impacted the most by the crisis. The U.S. subprime mortgage crisis that started at the end of 2007 rapidly emerged into the global financial crisis and impacted national economies of many European countries. The consequences of this financial crisis are still not fully understood by the economists worldwide. The crisis takes its roots in the real estate market of the United States, yet it had an influence on the European markets as well [1]. One of the problems in understanding the causes of the financial crisis is to understand the relationship between the real estate market and the mortgage market.

Analysis of publications. The global financial crisis has been analyzed by many economists, among them are Santiago Valverde, Francisco Fernandez [2], Alessandro Sciamarelli [3], Beck Thorsten, Katie Kibuuka, Erwin Tiongson [3]. Research conducted by these scientists is of great importance in understanding the causes and the consequences of the global financial crisis, nonetheless there is room for discussion of certain aspects. Most of the studies concentrate on the mortgage markets and the changes that these markets undergo due to the crisis. Other studies concentrate on the real estate bubble that burst in the midst of the crisis. Yet not many scientists concentrate on the relationship between housing prices and mortgage markets in European countries. The closest who gets to this analysis is Santiago Valverde who conducts an empirical study for Spain, based on this analysis we can pursue further and analyze such relationship in Hungary and Ukraine.

The main purpose of the article is to conduct an empirical research and to show the existence of the relationship between housing prices and mortgage markets in Hungary and Ukraine.

The results. The aim of the article is to analyze the impact of the global financial crisis in Hungary and Ukraine with the help of the empirical research. Hungary and Ukraine experienced increase demand in mortgage credit in foreign currency prior to the crisis. Mortgage lending started to grow significantly in Hungary after 2000 and in Ukraine after 2004. These two countries were chosen for this research due to the similarities of the problems in the aftermath of the crisis. Both countries experienced depreciation of the national currency during the peak of the crisis. In 2008, hryvna depreciated by 40% in Ukraine [5]. At the present moment, the outstanding amount of the loans exceeds the value of the collateral in both countries. After 2010, mortgages in national currency are prohibited. To better understand the problems of the mortgage markets in these two countries, we develop the models based on the following data for both countries: mortgage credit per inhabitant; nominal mortgage rate; real salary per employee; real interest rate; GDP per capita; housing prices (Ukraine); FHB House price index (Hungary).

A quarterly data is used for Hungary and a monthly data is used for Ukraine. All the historical for both countries is taken from the official websites of the National Banks and Official Statistical Bulletins [6; 7; 8; 9].

To begin our research, we first determine stationarity of our variables. To do this, we conduct

the Augmented Dickey-Fuller order test and Phillips-Perron test. The results for Hungary are shown in Table 1. The variables are stationary in the first difference, therefore in further research, we will be using the first differences of the variables. The same tests are performed for Ukraine and we achieve the best result in the first differences as well. The results of the ADF and PP tests for Ukraine are shown in Table 2. In order to determine the relationship between housing prices and mortgage markets we use Vector Autoregression Analysis (VAR). The results of the VAR analysis for Hungary are shown in Table 3 and Table 4 presents the results for Ukraine.

According to the results presented in the Table 3, we can make the following conclusion for Hungary: there is a positive relationship between housing prices and GDP per capita, which means that the increase in GDP per capita will lead to increase in housing prices; there is also a positive relationship between housing prices and real interest rate; a positive relationship between housing prices and real salary per employee; negative relationship between housing prices and nominal mortgage rate. Table 4 illustrates the results for Ukraine: a positive relationship between GDP per capita and housing prices; a change in real interest rate has a negative effect on the housing prices; negative relationship between real salary and housing prices; positive relationship between housing prices and nominal mortgage rate. To determine a long-term behavior or housing prices and mortgage rates we conduct a cointegration test for both countries.

Table 1.

Hungary Levels First Difference

	ADF	PP	ADF	PP
Mortgage credit per inhabitant	-1.951963	-1.993723	-6.326713*	-6.326713*
FHB House Price Index	-2.984055*	-2.918537*	-6.138671*	-6.372294*
Nominal mortgage rate	-3.063266*	-3.198016*	-6.330225*	-6.794522*
Real salary per employee	-0.788006	-1.607478	-2.666767*	-10.53261*
Real interest rate	-2.688399*	-1.991947	-4.658226*	-4.542382*
GDP per capita	-1.445824	-2.134175	-2.345750	-9.159523*

Table 2.

Ukraine Levels First Difference

	ADF	PP	ADF	PP
Mortgage credit per inhabitant	-0.3028	-2.7966	-7.7384**	-7.7807**
Housing Prices	-2.3964	-2.5288	-6.0250**	-6.1132**
Nominal mortgage rate	-3.1845	-2.7966	-7.7384**	-7.7807**
Real salary per employee	-0.9930	0.3360	-1.8065	-23.8494**
Real interest rate	-1.4175	-1.7912	-8.8986**	-9.1400**
GDP per capita	-0.7198	-0.6276	-10.7244**	-10.9878**
	-4.5158	-4.6168	-9.5183**	-16.5674**

*Rejection of the null hypothesis of unit roots at the 10% significance level
**Rejection of the null hypothesis of unit roots at the 5% significance level
***Rejection of the null hypothesis of unit roots at the 1% significance level

Table 3.

Hungary VAR analysis

	Log(FHB House price index)	Log(GDP per capita)	Log(real interest rate)	Log(real salary per employee)	Log(nominal mortgage rate)
C	1.094185 (1.00819)	1.482598 (1.46543)	2.291041 (4.34114)	0.088842 (1.74452)	-7.644847 (4.16915)
Log(FHB House price index) t-1	0.561747 (0.16098)	0.279876 (0.23398)	0.345906 (0.69315)	0.279316 (0.27855)	-0.033083 (0.66568)
Log(GDP per capita)t-1	-0.037486 (0.33116)	0.817746 (0.48135)	1.374540 (1.42593)	0.020171 (0.57302)	0.738571 (1.36944)
Log(real interest rate) t-1	0.012161 (0.03929)	-0.013061 (0.05711)	1.094490 (0.16918)	-0.069654 (0.06799)	0.248988 (0.16248)
Log(real salary per employee) t-1	0.075837 (0.28051)	-0.188571 (0.40773)	-1.343426 (1.20786)	0.595612 (0.48539)	-0.163758 (1.16000)
Log(nominal mortgage rate)t-1	-0.018040 (0.04693)	-0.008291 (0.06821)	0.259677 (0.20207)	-0.028073 (0.08120)	0.506228 (0.19406)
R^2	0.976967	0.973786	0.843270	0.971207	0.570617

Johansen's cointegration test

$H_{0:}$	Trace (statistical t)
r =0	67.98856**
r⩽1	23.95786**
r⩽2	9.472851

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

Table 4.

Ukraine VAR Analysis

	Log(Housing prices)	Log(GDP per capita)	Log(real interest rate)	Log(real salary per employee)	Log(nominal mortgage rate)
C	0.143252 (0.03684)	1.094854 (0.42862)	-0.283580 (0.38398)	-0.476854 (0.46263)	0.455482 (0.67490)
FHB (Housing prices) t-1	1.3225 (0.0964)	-2.5569 (1.1218)	-0.3329 (1.0050)	0.6614 (1.2108)	1.4256 (1.7664)
Log(GDP per capita)t-1	-0.0075 (0.0094)	1.1678 (0.1098)	0.0318 (0.0983)	-0.1858 (0.1185)	-0.2959 (0.1729)
Log(real interest rate)t-1	-0.0005 (0.0100)	0.0095 (0.1172)	1.0708 (0.1050)	0.1047 (0.1265)	0.4112 (0.1846)
Log(real salary per employee) t-1	-0.0031 (0.0086)	0.7644 (0.1002)	0.0919 (0.0898)	0.2387 (0.1082)	-0.2018 (0.1578)
Log(nominal mortgage rate)t-1	0.0046 (0.0059)	0.0552 (0.0689)	0.1032 (0.0617)	-0.0059 (0.0744)	1.0735 (0.1085)
R^2	0.9927	0.9919	0.9468	0.9926	0.8425

Johansen's cointegration test

H0:	Trace (statistical t)
r =0	53.9175**
r⩽1	30.4073**
r⩽2	12.6765

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

The results for Hungary are present in Table 5 and for Ukraine in Table 6. By conducting this test, we can determine the existence of common trends among the main variables. By using a cointegration test, we can determine the adjustment towards long-term housing price and mortgage equilibrium.

The trace test values indicate that cointegration relationships exist for both countries. Table 5 and Table 6 present cointegration vectors for each country, including the adjustment rate parameters.

Table 5.

Cointegration vectors for Hungary

	Vector	Adjustment rate	Vector	Adjustment rate
Mortgage credit per inhabitant	1	-0.2810877	-	-
FHB Price Index	-0.001343	-0.2757074	1	-0.082150
Nominal mortgage rate	11.96997	-0.033662	-0.022637	-0.038990
Real salary per employee	-1	-	0.058718	-

The results for Hungary show that the elasticity of mortgage credit to housing prices is -0.001, long-term elasticity of lending to interest rates is 11.96. The elasticity of mortgage credit to housing prices for Ukraine is -14,09, long-term elasticity is -0.63. The elasticity of housing prices to interest rates for Hungary is

-0.02 and elasticity of housing prices to the real salary per employee is 0.058. For Ukraine, these numbers result in -0.08 and 0.08 respectively.

The adjustment parameters measure the dynamics of the return to long-term equilibrium. When the mortgage credit per inhabitant lies above its long-term equilibrium level, its return to equilibrium on the market in Hungary occurs by reductions of 28,1% in mortgage credit, reduction of 27,5% in the housing prices and reduction of 3,3% in mortgage interest rate. Housing prices adjust by reducing actual prices by 8,2% and nominal interest rate by 3,8%. For Ukraine the numbers are different, return to equilibrium can occur by reduction of 3,5% of mortgage credit, reduction of housing prices by 0,1% and reduction of nominal mortgage rate by 2,6%.

Table 6.

Cointegration vectors for Ukraine

	Vector	Adjustment rate	Vector	Adjustment rate
Mortgage credit per inhabitant	1	-0.0351	-	-
FHB Price Index	14.0984	-0.0019	1	-0.0105
Nominal mortgage rate	-0.6393	-0.0266	0.0819	0.0143
Real salary per employee	-1	-	0.0080	-

Adjustment of housing pricing occurs by reduction of actual prices by 1% and increase of salary per employee by 1,4%. The results show the importance of the mortgage rate as a correction mechanism and prove the existence between housing prices and mortgage markets. Based on the acquired results we can come up with the models that can be solved to check the truthfulness of our findings.

Models for Hungary:

1) logfhb = 0.561747314249*logfhb(-1) + 0.404013622805*logfhb(-2) - 0.0374859962566*loggdp(-1) + 0.0493683758593*loggdp(-2) + 0.0121611597437*logr(-1) - 0.00178257845205*logr(-2) + 0.0758366923421*logs(-1) - 0.149351927383*logs(-2) - 0.0180395925254*logmr(-1) - 0.107878941224*logmr(-2) + 1.09418519141

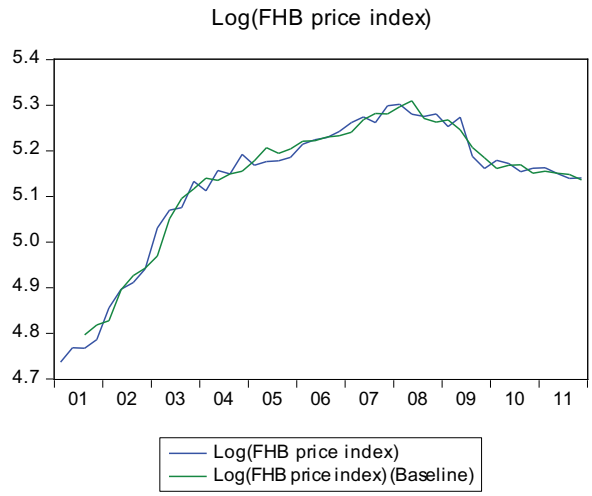
2) loggdp = 0.279875698932*logfhb(-1) - 0.213116659915*logfhb(-2) + 0.817745742002*loggdp(-1) + 0.0578627675139*loggdp(-2) - 0.0130611875801*logr(-1) - 0.0311795752783*logr(-2) - 0.18857088438*logs(-1) + 0.194237114633*logs(-2) - 0.00829081239266*logmr(-1) + 0.0266312664332*logmr(-2) + 1.48259784439

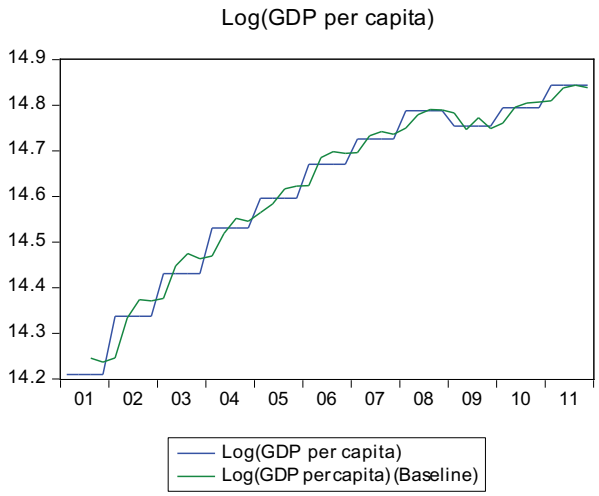
3) logr = 0.345906184485*logfhb(-1) - 0.178768757131*logfhb(-2) + 1.37454016351*loggdp(-1) - 1.25722993208*loggdp(-2) + 1.09448951715*logr(-1) - 0.42570497181*logr(-2) - 1.34342648288*logs(-1) + 0.975875095376*logs(-2) + 0.259676747995*logmr(-1) - 0.225855612417*logmr(-2) + 2.29104136209

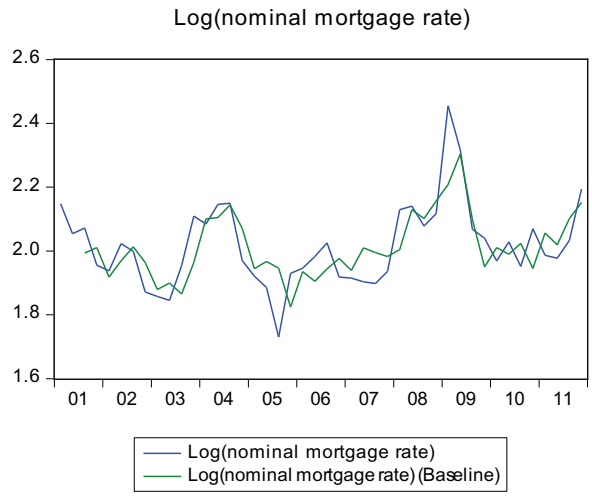
4) logs = 0.27931550003*logfhb(-1) - 0.293109586504*logfhb(-2) + 0.0201708664152*loggdp(-1) + 0.131369925245*loggdp(-2) - 0.0696535790507*logr(-1) + 0.0341948725655*logr(-2) + 0.595611912018*logs(-1) + 0.219156546197*logs(-2) - 0.0280734892371*logmr(-1) + 0.0300007056854*logmr(-2) + 0.0888421878073

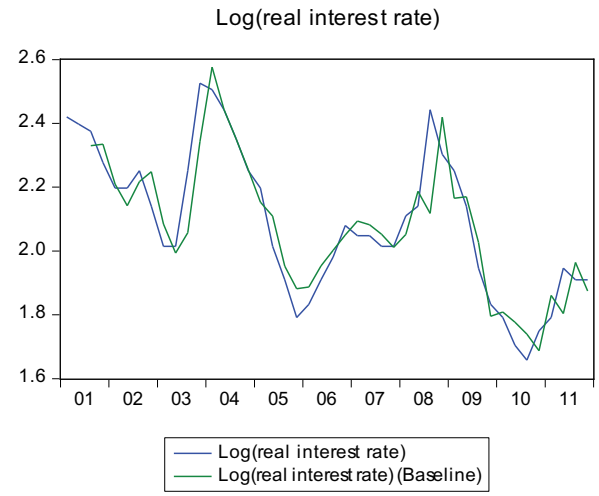
5) logmr = - 0.0330826751843*logfhb(-1) - 0.493928320122*logfhb(-2) + 0.738571481803*loggdp(-1) - 0.0432100746921*loggdp(-2) + 0.248988470229*logr(-1) + 0.139187121622*logr(-2) - 0.163758363252*logs(-1) + 0.25679840717*logs(-2) + 0.506228021669*logmr(-1) - 0.348931814834*logmr(-2) - 7.64484683139

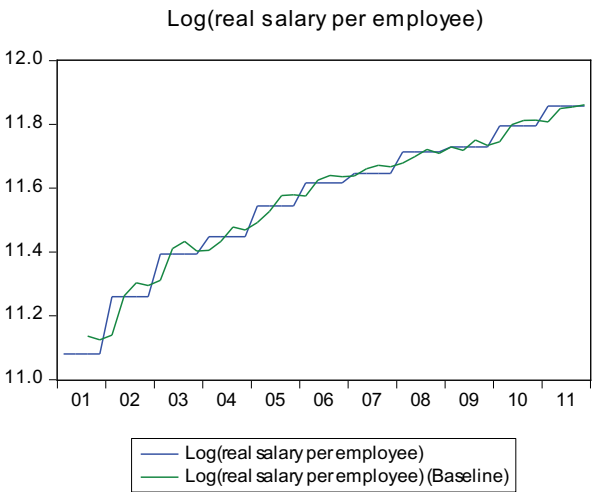
The solutions for these models are presented graphically:











The first model uses FHB house price index as an exogenous variable, which is dependent upon GDP per capita, real interest rate, real salary per employee and nominal mortgage rate. The second model determines the relationship between FHB house price index, real interest rate, real salary and mortgage rate. The graphical solutions to the models present two trends: a baseline and a trend generated by the actual model. The patterns of the trends in all models prove the truthfulness of the models. The author constructs similar models for real interest rate, real salary and nominal mortgage rate, where each of the variables stands as an exogenous variable in a model. The models for Ukraine follow the same pattern and are described below:

Models for Ukraine:

1) loghp = 1.32257587901 * loghp(-1) - 0.371682998369 * loghp(-2) - 0.00757308630289 * loggdp(-1) + 0.000898136997535 * loggdp(-2) - 0.00052147091742 * logr(-1) + 0.00612974409498 * logr(-2) - 0.00311645061846 * logs(-1) + 0.0100222508357 * logs(-2) + 0.00463146375128 * logmr(-1) - 0.0159246781768 * logmr(-2) + 0.143251759624

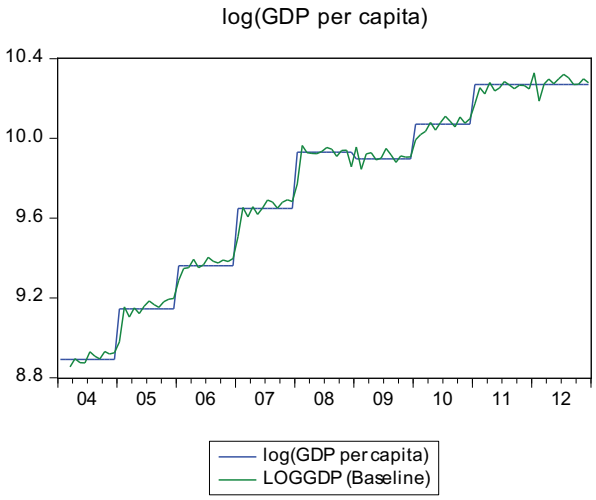
2) loggdp = - 2.55692110205 * loghp(-1) + 2.66856147522 * loghp(-2) + 1.16789596291 * loggdp(-1) - 0.512039185558 * loggdp(-2) + 0.00958978091254 * logr(-1) - 0.00182405767456 * logr(-2) + 0.764469705681 * logs(-1) - 0.477958176327 * logs(-2) + 0.0552070140634 * logmr(-1) - 0.0944248757709 * logmr(-2) + 1.09485419682

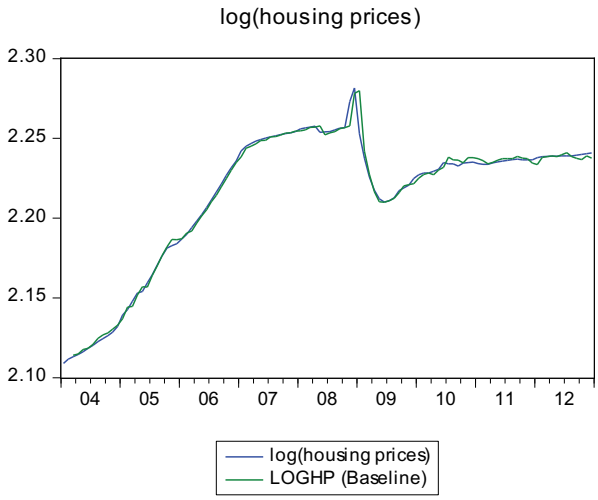
3) logr = - 0.332953494342 * loghp(-1) + 0.623169013695 * loghp(-2) + 0.0318732117602 * loggdp(-1) - 0.0580661827564 * loggdp(-2) + 1.07085419498 * logr(-1) - 0.139959382366 * logr(-2) + 0.0919610373218 * logs(-1) - 0.0987869117019 * logs(-2) + 0.103262147718 * logmr(-1) - 0.0691549437127 * logmr(-2) - 0.283580074789

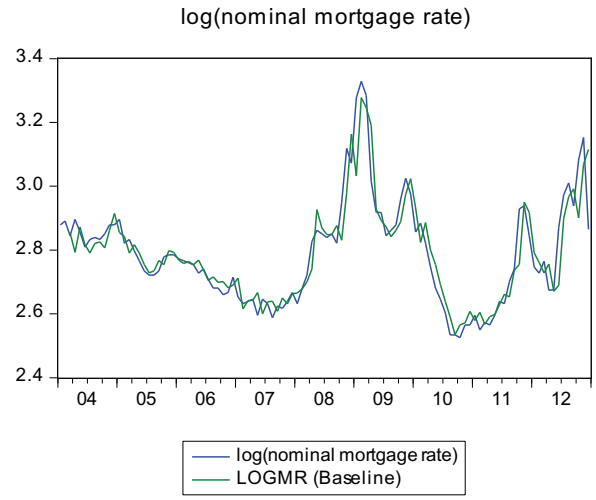
4) logs = 0.66149082466 * loghp(-1) - 0.764395149772 * loghp(-2) - 0.185840830172 * loggdp(-1) + 0.470300757683 * loggdp(-2) + 0.10479048599 * logr(-1) - 0.101712236494 * logr(-2) + 0.238760228826 * logs(-1) + 0.498101845653 * logs(-2) - 0.0059425657453 * logmr(-1) - 0.0338143530351 * logmr(-2) - 0.476853845815

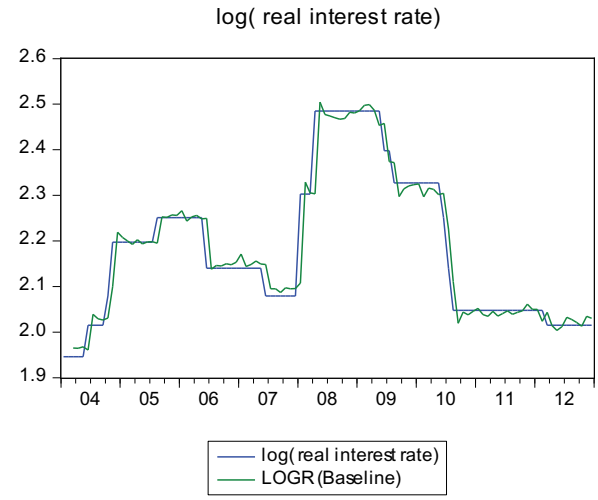
5) logmr = 1.42561604726 * loghp(-1) - 1.50173543945 * loghp(-2) - 0.295939982502 * loggdp(-1) + 0.270428108512 * loggdp(-2) + 0.411211365163 * logr(-1) - 0.342274012453 * logr(-2) - 0.201869064935 * logs(-1) + 0.237477530207 * logs(-2) + 1.07354784463 * logmr(-1) - 0.233396510979 * logmr(-2) + 0.455481655517

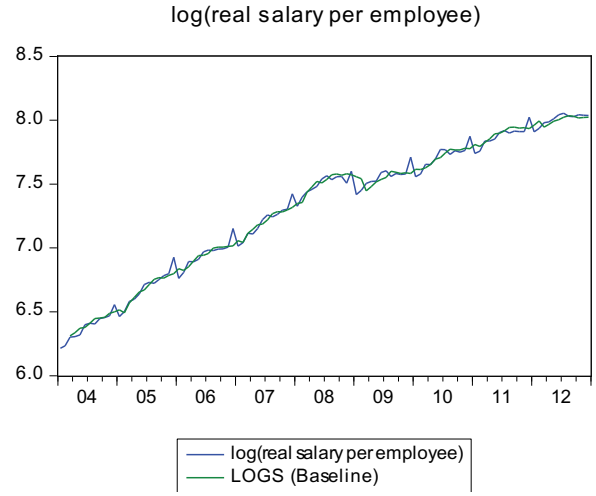
The results are presented graphically, as well.











Graphical results show that these models can be used for further analysis or forecasts of the future trends. The models are solved in the static state, which leaves plenty of room for analysis of these models in a dynamic state.

Conclusion. There is a long-term relationship between housing prices and mortgage markets in Hungary and Ukraine. Hungary and Ukraine experienced the same economic problems during the peak of the crisis and in the post-crisis period. Both countries experienced depreciation of the national currency and have a burden in a form of non-performing loans.

Bibliography

1. Bouyon, S. Study on Mortgage Interest Rates in the EU. European Mortgage Federation aisbl. - 2012
2. Valverde Santiago, Fernandez Francisco. The Relationship between mortgage markets and housing prices:does financial instability make the difference? University of Granada, 2009. —pp.1-33
3. Sciamarelli Alessandro Quarterly Statistics [Report] : Quarterly Review of European Mortgage Markets. - [s.l.] : European Mortgage Federation, 2011. - pp. 1-18.
4. Thorsten Beck, Kibuuka Katie, Tiongson Erwin Mortgage Finance in Central and Eastern Europe—Opportunity or Burden?//The World Bank. - Policy Research Working Paper. - 5202. - pp. 1-90.
5. Юшко Игорь Состояние и проблемы развития ипотечного рынка в Украине Круглый стол «Ипотечный рынок в Украине: состояние и перспективы развития». - Киев, 2010. - стр. 1-6.
6. Національний Банк України [Єлектронний ресурс]. - режим доступа http://www.bank.gov.ua.
7. Державна служба статистики України [Єлектронийй ресурс]. — режим
8. доступа.-http://www.ukrstat.gov.ua
9. Magyar Nemzeti Bank [Online resource].- http://english.mnb.hu/Monetaris_politika
10. Hungarian Central Statistical Office [Online resource].- http://www.ksh.hu/

Гаранская И.А., Якубовский С.А. Роль мирового финансового кризиса в формировании цен на недвижимость и состоянии рынков ипотечного кредитования (на примере Венгрии и Украины)

Аннотация. в статье исследовано влияние мирового финансового кризиса на страны Европы. С помощью эмпирического анализа доказана взаимозависимость между ценами на недвижимость и состоянием рынков ипотечного кредитования в Венгрии и Украине. Результаты предложенных моделей свидетельствуют о значительном вкладе цен на недвижимость и рынков ипотечного кредитования в развитие мирового финансового кризиса.

Ключевые слова: ипотечное кредитование, ипотечные рынки, рынок недвижимости, мировой финансовый рынок.

Гаранська І. А., Якубовський С.О. Роль світової фінансової кризи у формуванні цін на нерухомість і стан ринків іпотечного кредитування (на прикладі Угорщини та України)

Анотація. у статті досліджено вплив світової фінансової кризи на країни Європи. За допомогою емпіричного аналізу доведена взаємозалежність між цінами на нерухомість і станом ринків іпотечного кредитування в Угорщині та Україні. Результати запропонованих моделей свідчать про значний внесок цін на нерухомість і ринків іпотечного кредитування в розвиток світової фінансової кризи.

Ключові слова: іпотечне кредитування, іпотечні ринки, ринок нерухомості, світовий фінансовий ринок.