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THE IMPACT OF LAND PRICE MOVEMENTS ON THE PROPERTIES IN CROATIA

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ABSTRACT

The Mediterranean countries of the European Union record diversions in real estate along the coast. Based on the hypothesis that land prices are playing a significant role in increasing housing prices, the goal of our research was to determine to what extent that factor is important in Croatia. The reason for price unsteadiness is most often examined through main macroeconomic aspects but very few researches are using land prices as the main assumption of this problem. The study is carried out using Davis and Heathcote (2005) for determining factors of home value. By observing the period from 2002 to 2017 and from the given results we were able to deliver prediction for future market movements until 2025 using the Double exponential smoothing model. The analysis showed that there is a positive correlation between financial crisis and fall of land price index in all parts of Croatia except the coastal region as research proposed initially. It is shown that real estate prices will continue to grow, but the index of land prices will not follow this growth in parallel. Rather other factors like cost of building will have bigger share in the overall price. The outcome provides an important opportunity to advance the understanding of housing market movements in Croatia by regions and might serve as guidance in future policy creation.

Contribution/Originality: This study is one of the very few studies which emphasize the importance of land prices in overall real estate prices and bring them into context with the geographical position of the Croatian regions.

1. INTRODUCTION

Market value and the price of the property are often anticipated as the same object. The price that the real estate has achieved cannot be perceived as a real value namely because is not including factors that need to be considered such as deadlines, properties mutual links and others (Kuburić *et al.*, 2012). Croatia has one of the most dynamic real estate markets in Europe. The turbulence that labeled the European economy in the last decade did not allow constructionists to develop market linearly; quite the opposite, it was traced by many curves. In addition, considering the functional development of cities, there is a strong differentiation between Croatian coastal area cities and the rest of the country, which often determines Mediterranean states and greatly affects the land prices. Thereupon we examine the emerging role of land prices in the context of the total value of housing prices. The aim of this research project is to establish what are the market movements in Croatia through the period of 2002-2017 and investigate the factors that have determined the home value through Davis and Heathcote method (Davis and Heathcote, 2005).

This study aims to contribute to a growing area of research by clarifying reasons for market trends which should also help in forecasting the future direction of market movement in Croatia. Trough Holt model or Double exponential smoothing model from 1957 we will bring a short-term prognosis of residential price index in Croatia by regions and share of apartment value accounted by the market value of residential land. Till the date, according to our knowledge, there was no such study in Croatia.

To engage in research, we will start with presenting published literature which provides a closer insight into the factors that affect the house and land prices in other countries and the policies that have influenced them. It is predominantly based on the evaluation of the two most influential currents in this area, the American and Chinese. The issue of housing and land prices has received considerable critical attention over price bubbles and economic crisis of housing market in America (Girdzijauskas and Dubnikovas, 2010) while the Chinese rise of research in this field was determined by housing reform from 1995 to 2005 (Chen *et al.*, 2011). Correspondingly what follows is a description on the overview of analyses that have been conducted in Croatia over the years.

Research is conducted through the Croatian Central Bureau of Statistics using databases like building permits issued, number and size of buildings for which permits were issued and a number of sold properties. The outcome of the research is bringing overview of housing market in Croatia only for primary housing market which includes data for newly built and sold flats and does not include previously existing stocks on the market.

2. LITERATURE REVIEW

The land is volatile and prices of the land change quite differently in the same period of time regarding the house prices. Even though many housing-market specialists sought to determine that house prices cannot overcome the parallel relationship of lowering or raising income, data often does not justify these allegations (Gallin, 2006). Using panel-data test for cointegration and three decades of national data in the United States, previously mentioned Galin proofs that income and housing prices are low cointegrated in the long run and that income has a small impact on housing prices (Gallin, 2006).

That leads to the fact that at the moment when prices of housing will outgrow the income of local citizens, housing will become less achievable for the ones who do not own any properties (Case, 1994). However, variables that affect the decision of buying vary from levels of education, job status to income status while the importance of property through time does not have such a great impact (Mirkatouli *et al.*, 2018).

Davis and Heathcote described how land prices in the USA before financial crises increased immensely over the last 50 years while house prices were following the direction but in very different proportions (Davis and Heathcote, 2007). There have been many longitudinal studies over price bubble that happened in a period of 2007-2009, describing powerful fall of the market caused by the gap between habitation price and the saturation curve (Girdzijauskas and Dubnikovas, 2010).

Besides American directions of studies over land prices and housing prices in recent years, Chinese researches have taken great momentum in the research of this area, examining lend policies related to housing reform 1995-2005 (Wen and Goodman, 2013); (Du *et al.*, 2011); (Chen *et al.*, 2011). Although the situation in China shows a great abasement, and often the lack of land, research found that between other factors like the number of rented particles, income proportions, floating population and others, the price of the land is still a much more significant factor that affects housing prices (Wang *et al.*, 2017).

However, if these two observed factors, housing price and land prices are taken separately, house prices would have a more significant impact on land prices than vice versa because the value of land has proven to be an important factor affecting the housing price only in coastal cities in China (Wen and Goodman, 2013). For the sea area one of the solutions proposed is establishing a bidding system- auction and listing for land so these changes on the market could be tracked and well planned (Zuqiu, 2017).

Although, depending on the countries policies and regulations the factors influencing housing and land prices are also changing. The results from Lithuania are showing that inflation, changes in the interest rate and migration of citizens are not positively related to the prices of housing. Among others, it is related to GDP, unemployment and the average price in previous periods (Cohen and Karpavičiūtė, 2017) Findings from OECD are showing how exposure to loans, increased borrowing and mortgage exponentially increase real house price volatility (Andrews *et al.*, 2011).

There is a concept that has recently been proposed by Johansen's Cointegration Method in which is shown that in a short term change in the price of properties in Croatia will be positively correlated with given loans for households, a number of new marriages and general inflation (Lovrinčević and Vizek, 2008). The effect of distance on real estate prices was largely ignored in Croatia's scientific and professional literature and practice (Slišković and Tica, 2016). This is a particularly important factor when it comes to the coastal towns and larger cities. Analyzing housing prices can be achieved on microeconomics and macroeconomic level. Macro models would imply observation of the price of housing as macroeconomic variables and bringing them into contact with other macroeconomic variables (Boras, 2013).

It was forecasted that Croatia's accession to the EU and liberalization of the market will significantly change the market. A significant increase in prices would lead to financial unavailability of local people to buy properties while foreigners would not have such inconvenience regarding their standards (Kovačević and Cveljo, 2007). However, these assumptions later have never been scientifically justified (Lovrinčević and Vizek, 2008).

3. METHODOLOGY

Various methods have been developed and introduced to measure factors that influence housing prices. Based on the hypothesis that land prices play an increasing role in total housing price in Croatia the goal of our research was to determine to what extent that factor is important. Correspondingly, research was conducted by adapting the procedure presented by Davis and Heathcote (2005) where ich_{rt}^{hp} represents index change of home prices in region (*r*) during a certain period of time (*t*) what is equal to weighted sum of the index change in construction costs and uniformly index change of land price ich_{rt}^{lp} in the same period (*t*).

$$ich_{rt}^{hp} = \omega_{rt-1}^{l} ich_{rt}^{lp} + (1 - \omega_{rt-1}^{l}) ich_{rt}^{cc}$$

The research data for this matter is drawn from the Croatian Central Bureau of Statistics which collects the data for newly built and sold flats, or only for the primary housing market which represents a problem in presentation of the general picture of a market as a whole (Posedel and Vizek, 2009); (Tica and Šimičić, 2010). Due to the data constraints, this paper cannot provide a comprehensive review of the total construction market in Croatia, and it is focused on the construction of buildings and dwellings. The reader should bear in mind that by referring to the housing market we are restricted to those two categories. Further text deliveres chronological research process.

Based on data of the housing price index given by The Croatian Bureau of Statistics (CBS) we calculated the index changes between two adjacent years. We got the extent to which the index has risen or fallen in the range of one year which we need to compute to the main formula.

Index change see Table 1 is calculated using the formula for all the years included in observation and for all regions. The year 2002 is excluded leading to the fact that the first data we can get for 2003 is the change of the index from 2002 to 2003. Housing prices index is only available for three regions: The Coastal region, the capital of Zagreb and the third category is called Others. On the same categorization, we based the index changes that previously were listed by counties.

$$\frac{index_t}{index_{t-1}} - 1$$

The next factor is the price of construction works see Table 2 in thousands of HKR per counties and years. The original data observed by CBS was divided by 22 counties and we have separated these counties in the three categories mentioned above, coastal region (7 counties), capital (City of Zagreb), and others (13 counties). Table A provides the downsize results obtained from the broaden preliminary analysis of construction works.

Table-1. Amount of construction works by region (in thousands of HRK).

Year	Zagreb	Coastal region	Other
2002	405734	528443	574235
2003	549957	774301	648021
2004	871606	910322	575527
2005	1109883	1082816	632596
2006	1562937	1165393	761519
2007	2324699	1518057	939513
2008	2933836	1589432	1193307
2009	1791251	1318317	980659
2010	1050827	1044724	639251
2011	1099730	1073499	549948
2012	817682	970140	374644
2013	644833	942139	320998
2014	478762	964685	464421
2015	607887	1120943	528980
2016	551469	1217244	492341
2017	846610	1371075	482339

Source: Croatian central bureau of statistics.

To obtain a more accurate measure than the total amount of construction works, we calculated the average price of construction works per square meter. Consequently, the desired number was one of the built dwellings and their squares.

The data was also divided by counties, so we needed to aggregate them by regions as before. Subsequently, the result was the size of the total area of built flats per region (in square meters). Eventually, developed data for construction works and the square meters of dwellings by the regions were divided to achieve the amount of construction work per square meter.

To normalize the data found, numbers were transmuted to index. For this equation, reference year is 2015 and index was conducted for each year separately.

$$\frac{price\ of\ construction\ work\ (t)}{price\ of\ construction\ work\ (2015)} \times 100$$

However, this equation does not result with the index itself but changes in the index which is going to be described in results. Finally, we have to get a share of the construction work price at the total price of apartments. For this, we divide the average price of the flats sold per square the average number of construction works per square meter for Croatia as a unity. Further data calculation is required to determine a share of the price of construction works in the total price of apartments. Once, that result was obtained, we immediately got the share of the land price because the Cost of land price = 1 - Price share of construction works. In order for the data to be entered in the initial equation, we need to perceive it in a way that:

$$ich_{rt}^{lp} = \frac{1}{\omega_{rt-1}^{l}}\left[ich_{rt}^{hp} - (1 - \omega_{rt-1}^{l})ich_{rt}^{cc}\right]$$

And further how to achieve the index

$$index_t = (indexchanges_t + 1) * index_{t-1}$$

Using the result from this equation, it was possible to show the image data of results and make the short-range approximation for next few years regarding the residential price index and share of apartment value accounted by the market value of residential land. To increase the reliability of measures, for this purpose we used Holt model from 1957 or Double exponential smoothing model that has the advantage of the additional parameter value to forecast the trend besides the alpha parameter (Gardner and Dannenbring, 1980). The relatively short existence of the country (after the secession from Yugoslavia in 1991) enabled the existence of bigger data set and the recent economic crisis that disrupted the market created a predisposition that would adversely affect the prognosis. so Therefore the Holt model is giving more accurate foresight of the market by adding the trend parameter and exponentially decreasing weight for the past observations. The initial parameters are described below where α represents smoothing level, β – smoothing slope or added trend, ϕ – damping slope and SSE – the sum of squared errors.

Table-2. Outcome of the double exponential smoothing model.

Parameters	Republic of Croatia	Zagreb	Other
α	0,789474	0,315789	
β	0,789477	0,315789	0,999995
ϕ	0,684211	0,842105	0,193513
SSE	0,007867	0,310549	0,013729

4. RESULTS

There is an overall perception that the Coastal Region properties are often perceived as luxurious ones and that they were not significantly affected by natural market movements. Further analysis showed that even tough land price index is significantly higher in the Coastal region it was deeply affected by the market fall during economic crises. From the peak period of 2008 to 2017 the land price index decreased by 25 percent in both the Coastal region and other parts of the country. What differentiates the Coastal region is the market recovery process which started in 2015 while we can observe from the data for other parts of the country where the land price index was still falling. If we compare final data from 2017 and the ones from 2003 we can observe that in the Coastal region see Figure 1 there is an increase in the land price index of 43% while comparing the same period in other parts of the country would show an increase of just 5%.

The single most striking observation is the one showing results from Zagreb where land price index during the last decade lost more than half of its value. However, the data set from Zagreb is the smallest one because it is observing market of just one city of 790 thousand inhabitants so the shift from the actual results can be expected as it is shown by sum squared error.
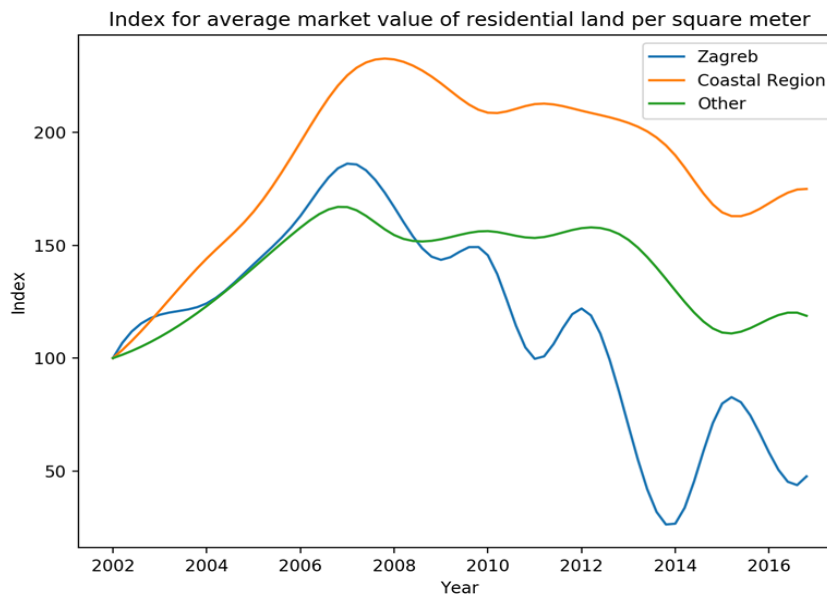
Figure-1. Changes in land index over the observed period.

Comparing the results from the Figure 1 and share of the residential land in the overall price Figure 2 we can observe that Land share of apartment value in the total market value of dwellings was significantly falling from 2002 in all parts of the country even though the land price index was rising. From the first observed data in 2002 upon 2017, falling of residential land in overall price for the Republic of Croatia was over 19% while in Zagreb that is counted for 43%. In the meantime share of the construction works in the total value was rising. For the Republic of Croatia in 2017 construction works were 32% of the total value while in 2008, before the crisis, that was 28%. In the capital Zagreb, in 2017, construction works counted more than half of whole value and in 2008 were counted for 31%. This can be interpreted not as an increase of the cost of labor and materials but as a product of lower price of the land in which case construction works automatically get a higher percentage in the share of total value.
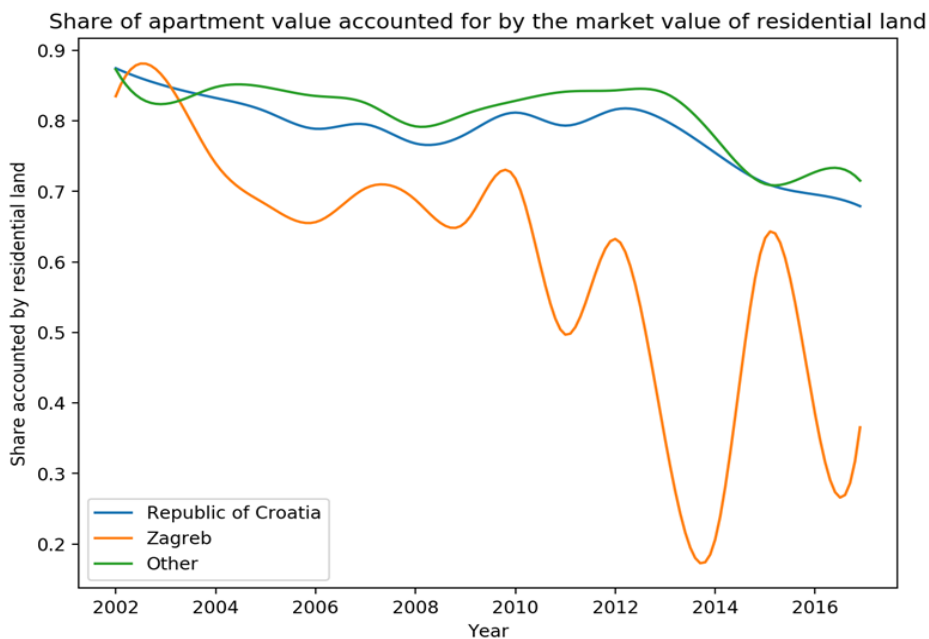

Figure-2. Share of residential land in overall price.

The full line is representing a real value of the residential land price index while the broken line is a smoothed value. From the graph we can see the market trends from 2002 to 2017, but also the projection of the future

movements which states that until the end of the projection, coastal area residential land price index will rise to the amount from 2008. These results do not suggest that the overall price in 2025 will be the same as in 2008, just to which extent land price index will be included in the overall price. The findings observed are justifying the hypothesis that a large share of land prices in the Croatian coastal area will continue to grow because of the residential land price index. The explanation of such results is likely to be hidden in the fact that there are fewer attractive locations along the coast and the fact that many built units were purchased as a secondary real estate. From the other side, the results for other parts of the country are showing that the land price index will be falling in the future, which again does not necessarily indicate that overall price will go down.
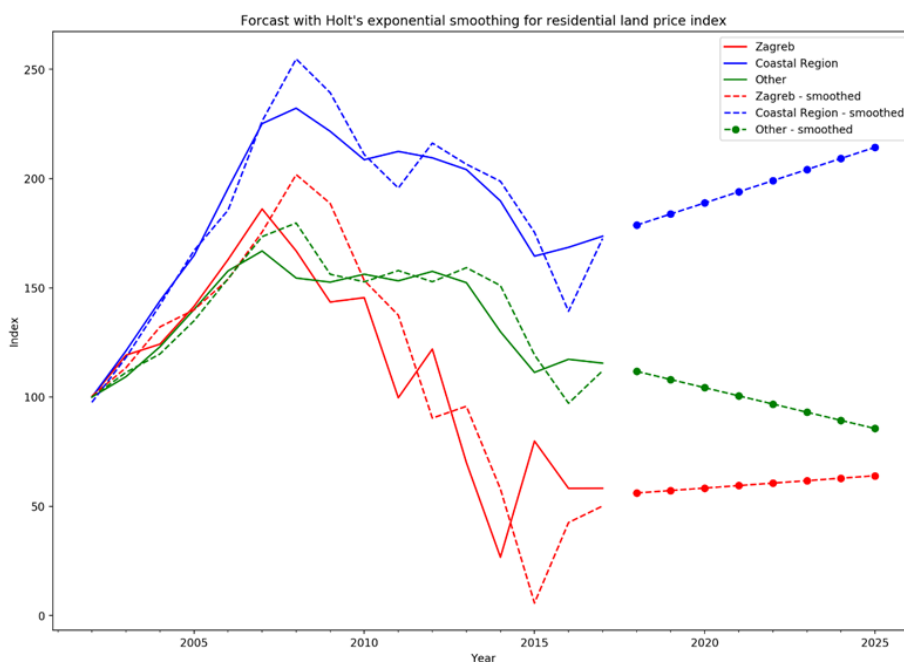

Figure-1. Anticipation of future movement of Land price index in Croatia.

The role of land price in the cost of housing over the observed time has been proven as the biggest factor, as it was expected. What is interesting is that the land factor has already experienced the largest increase before the crisis, and in the near future in Croatia we do not expect this factor to accelerate see Figure 3. It is apparent that it will be declining in all regions except the coastal region. Such an outbreak could also be expected because of the already existing belief that land prices in attractive locations have already reached a certain level that cannot be justified.

5. CONCLUSION

This project was undertaken to determine if the hypothesis that implies that land prices are playing a significant role in increasing housing prices in Croatia is justified and to examine to what extent that factor is important. The Mediterranean countries of the European Union are experiencing immense urban growth because of the increased number of tourists that are directly connected to real estate sectors. The urbanization process is managed without citizen participation and more recent attention has focused on environmental damages that might occur due to the mentioned problem (Orueta and Lourés, 2006). However, it is necessary to determine how the housing market responds in such situations and which factors are crucial to price determination. In this research, we are observing data from the housing market in Croatia in the period from 2002 to 2017.

The regions of observation were divided into three categories - coastal Croatia, Inland Croatia and city of Zagreb. These three categories are different in all research products. The outcome implies that in the coastal area growth of land price index is also expected in the future but not as high as it was before the crisis, in 2008.

Although the offer of attractive land is diminishing at the Coastal area, according to the results obtained, and it seems that the market inflow of land prices has reached its own limit of rapid growth.

In other parts of Croatia, the housing prices also overcame the fall of prices after the financial crisis started in 2008 and are raising now. Their enhancement is expected in the future but the land price index will not in parallel track this growth. That leads to the conclusion that other factors, like the cost of building, will have bigger share in the overall price.

For this study, the land price was determined as a value of all the factors that are not included in the construction price. The land price index by itself it is not presented in absolute numbers. In relation to that, it does not yield value in the currency of HKR, therefore the results obtained cannot be perceived as a price calculation.

Furthermore, the biggest limitation of this research occurs in small data sets that do not include the data for the cities in Croatia but offer statistics only for the counties. Consequently, it was not possible to determine exactly in which cities of the coastal area these changes will be the most significant. Even when data for certain cities is available, the data sets are extremely small which leads to an error occurred as it is shown in the case of the capital of Zagreb.

The logic of this research comes from Davis and Heathcote (2005) formula for determining housing indicators. The formula requires studying land prices as the main factor implicating that other factors like structures of buildings can be produced without much effort and following elasticity of the market, which is often not a case with land prices. This approach leaves the possibility of further research in which we would like to determine which factors are included in the price of the land other than location, land use, land rates, and similar attributes and how important each feature is in the Croatian construction market.

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APPENDIX

Table-A. Changes in Price Index 1.

Years	Zagreb	Coastal region	Other
2003	0,151678	0,22146	0,119903
2004	0,15996	0,155875	0,084659
2005	0,123545	0,141874	0,121714
2006	0,126125	0,164677	0,135921
2007	0,146811	0,153979	0,086588
2008	-0,00532	0,040989	-0,00441
2009	-0,06963	-0,03363	-0,03253
2010	-0,0886	-0,04354	-0,03987
2011	-0,00373	0,011976	-0,00495
2012	-0,01953	-0,01771	-0,0047
2013	-0,05832	-0,02961	-0,041
2014	-0,01285	-0,02038	-0,00782
2015	-0,02133	-0,0326	-0,02724
2016	0,0072	0,0132	-0,0082
2017	0,043288	0,043624	0,005545

Table-B. The price of the construction cost.

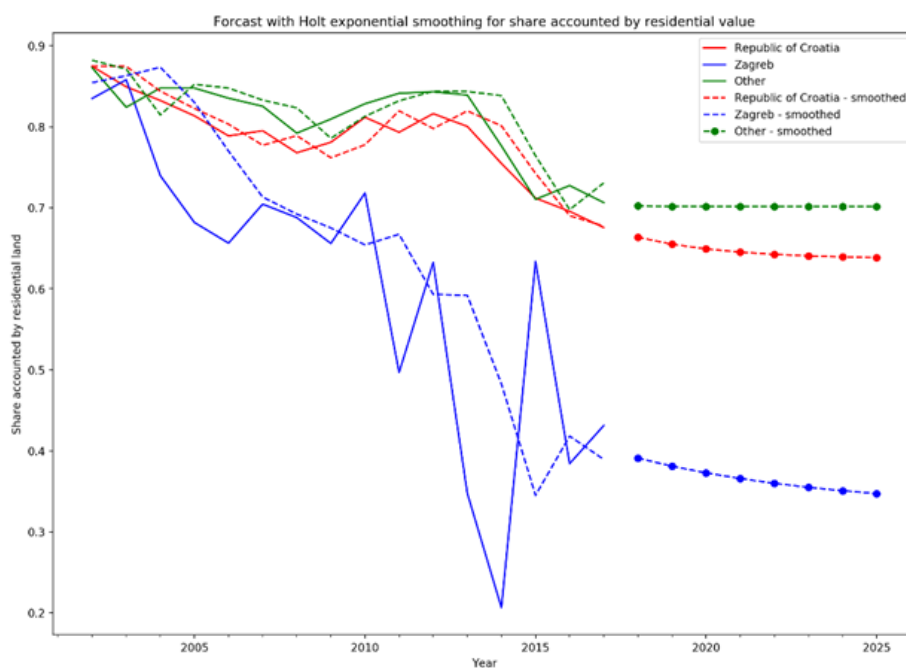| County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Republic of Croatia	1508412	1972279	2357455	2825295	3489849	4782269	5716575	4090227	2734802	2723177	2162466	1907970	1907868	2257810	2261054	2700024
Zagrebačka	19205	31023	54903	120568	170973	225232	271861	192024	118663	84517	68476	101728	133791	110848	127572	165954
Krapinsko-zagorska	9512	22352	14087	10991	19019	25670	29105	29873	17123	28523	34767	12041	13952	14925	12800	9085
Sisačko-moslavačka	94914	105010	58079	23772	33886	25809	42270	59312	16285	27703	17719	7656	7572	16739	34160	14415
Karlovačka	40318	43916	26222	33078	59966	55661	45387	35217	50974	31236	18481	16046	19595	17698	22387	19562
Varaždinska	32860	43679	48513	96582	99331	132759	227731	141748	74292	65760	39312	24202	42041	37247	42517	51727
Koprivničko-križevačka	5072	16660	19740	22652	16070	25915	18194	22718	13981	30308	16613	9682	16249	13823	16954	24117
Bjelovarsko-bilogorska	10180	20534	12088	13188	11468	21077	28973	37063	25415	17156	12914	10448	18030	21429	22559	13219
Primorsko-goranska	85427	144070	165729	184874	204629	306949	348141	284791	225620	210443	186085	193107	192255	258897	261504	248915
Ličko-senjska	30857	62982	74482	44109	38143	58551	67319	59412	37761	35861	26626	22398	23141	38205	41240	38724
Virovitičko-podravska	4251	12878	17660	9874	15118	17230	25181	10742	8941	12737	11106	5157	4699	9055	5186	15311
Požeško-slavonska	31355	58345	96589	46548	29259	14122	45804	10954	10678	10301	6046	2231	2971	4476	10959	18831
Brodsko-posavska	28775	32065	24236	20658	41728	46466	68489	43213	14412	12618	8167	4399	4039	5761	10468	9290
Zadarska	76820	121123	140458	155708	227610	210291	213261	183358	135139	146613	133639	76928	98027	124738	137291	182166
Osječko-baranjska	95430	82069	100253	127410	170198	213529	287755	247300	189987	147161	69625	45760	47243	47181	67673	67980
Šibensko-kninska	39939	53693	74434	65715	84124	123117	75376	61888	58913	65787	52315	67274	82122	72884	63996	75741
Vukovarsko-srijemska	186406	158956	91920	63223	46680	87299	55917	79291	47461	43865	31230	34754	119248	196359	68998	28831
Splitsko-dalmatinska	125952	115433	144222	234269	233852	293610	368741	321870	241099	273794	242659	249670	244397	290718	315228	373510
Istarska	133901	197075	205493	275252	249969	389510	372629	284485	210195	216059	197413	215223	204711	213406	249379	294603
Dubrovačko-neretvanska	35547	79925	105504	122889	127066	136029	143965	122513	135997	124942	131403	117539	120032	122095	148606	157416
Mečimurska	15957	20534	11237	44052	47823	48744	46640	71204	51039	38063	40188	46894	34991	33439	50108	44017
Grad Zagreb	405734	549957	871606	1109883	1562937	2324699	2933836	1791251	1050827	1099730	817682	644833	478762	607887	551469	846610

Figure-4. Forcast of share of land in total value of housing prices.

Table-C. Index changes of prices of apartments and buildings.

Years	Zagreb	Coastal Region	Other
2003	0,151678	0,22146	0,119903
2004	0,15996	0,155875	0,084659
2005	0,123545	0,141874	0,121714
2006	0,126125	0,164677	0,135921
2007	0,146811	0,153979	0,086588
2008	–0,00532	0,040989	–0,00441
2009	–0,06963	–0,03363	–0,03253
2010	–0,0886	–0,04354	–0,03987
2011	–0,00373	0,011976	–0,00495
2012	–0,01953	–0,01771	–0,0047
2013	–0,05832	–0,02961	–0,041
2014	–0,01285	–0,02038	–0,00782
2015	–0,02133	–0,0326	–0,02724
2016	0,0072	0,0132	–0,0082
2017	0,043288	0,043624	0,005545