

СТРУЧНИ РАДОВИ
WORKING PAPERS

2015



Народна банка Србије
National Bank of Serbia

Радови у оквиру ове серије представљају резултат тренутних истраживања аутора и објављују се у циљу иницирања дискусије и добијања корисних сугестија за даљи рад аутора.

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**Детерминанте цене станова новоградње у
Србији**

Иван Николић

Price determinants of newly built dwelling in Serbia

Ivan Nikolić

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Детерминанте цене станова новоградње у Србији

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Апстракт: Рад анализира детерминанте цена станова новоградње у Србији на панел подацима из 24 града у периоду 2011-2014. Резултати су показали да на цене станова новоградње првенствено утичу раст становништва и маса исплаћених реалних зарада као репрезент дохотка становништва, док са падом ефективне каматне стопе на стамбене кредите расте цена станова новоградње. Оцене осталих објашњавајућих променљивих, као што су ниво развијености градова, географска удаљеност од Београда или динамика привредне активности мерена кретањем реалног БДП-а, упркос очекиваном знаку, показале су се као статистички несигнификантне за цене станова новоградње.

Кључне речи: станови, цене, тржиште некретнина

Price determinants of newly built dwelling in Serbia

Ivan Nikolić

Abstract: This paper analyses the determinants of newly built dwelling prices in Serbia in a panel of 24 cities over the period 2011-2014. Results suggest that dwelling prices primarily tend to rise with populations growth and real total net wages as a proxy of household incomes, while declines in effective interest rate on housing are associated with higher dwelling prices. Additional explanatory variables, such as the level of development of observed cities, geographical distance from the capital, or real GDP dynamics in the country, even though the correct sign, didn't have statistically significance influence on the dependant variable.

Key words: dwelling, prices, real estate market

Table of Contents:

1. Introduction.....	1
2. Literature review	1
3. Methodology	2
4. Research results.....	6
5. Conclusions.....	8
References.....	9

1. Introduction

Buying a real estate (dwelling) for most people is their largest transaction in lifetime. Dwelling means the most significant component of households' expenses and, at the same time, their most valuable assets. But these data are not only essential to households and citizens, but also for economic and monetary policy makers. Data can serve them, for example, to monitor macroeconomic imbalances and risk exposure of the financial sector etc.

Soaring dwelling prices are often associated with periods of economic expansion while sliding dwelling prices often coincide with a slowing economy (Goodhart and Hofmann, 2007). Some studies confirm that all the biggest banking crises in advanced countries since the mid 1970s were correlated with the exploding of a housing bubble (Reinhart and Rogoff, 2009). Basically, dwelling prices are taken as a leading indicator although there is some debate about whether dwelling price change is a leading, lagging or coincident economic indicator (EUROSTAT, 2014).

Emphasize the importance of this subject made us analyse the determinants of newly built dwelling prices in Serbia in a panel of 24 cities over the period 2011-2014.

Serbia's housing market is slowly recovering after the bubble burst during of 2011, despite meagre economic growth. Prices slumped by 11,7% in 2012 compared with 2011. Below, we will analyze the possible factors for this trend. Unfortunately, this paper is not comparable with the others, because similar studies have not been conducted in Serbia. Hence, provides important findings on the determinants of dwelling prices in the country.)

2. Literature review

In the literature we can find different econometric approaches as a tool of modelling numerous factors that have an impact on the housing markets. For estimating fundamental dwelling prices based on regional data, in particular.

Empirical studies on the housing market distinguish three main types of drivers: macroeconomic drivers, institutional/geographic factors and funding arrangements. Econometric models can be used to compute the "fundamental" price, as determined by demand (derived on the basis of factors such as real disposable income, real interest rates and demographic developments) and supply (derived from factors influencing the available housing stock).

Measured by the longer-term demographic and economic determinants in the attractive large German cities (survey data included 125 towns and cities, 99 of which are in west Germany) from 2004-2014. some authors have shown that household incomes was the long-term common "anchor" of prices and the affordability of housing in recent years has benefited from interest rate reductions. Explanatory variables they used to derive an equation

for determining house prices are the housing stock at the beginning of period, real mortgage rates and survey-based growth expectations for real GDP. District-specific demographic and economic factors which may have an impact on housing demand include current real per capita income, population density, the fraction of the population aged between 30 and 55 and unemployment. The results suggest that the effects of demographic variables such as the population's middle-aged groups and population density are quantitatively significant. Per capita income has only a moderate impact on property prices in the shorter estimation period while no statistically significant effect is evident over the longer horizon (Deutsche Bundesbank, 2013).

Many authors have studied the relationship between demographics and the housing market. An increase in the number of newborns (baby booms) has a small short-term effect on the housing market but it increases demand for new houses twenty years later. A decrease in the number of births or an increase in the average age of population has a strong influence on demand and on the housing prices. (Mankiw and Weil, 1989).

The strong relationship between GDP, income and the housing market has been examined in the literature, too. Iacoviello and Neri examine the response of GDP to housing market fluctuations (Iacoviello and Neri, 2008). Mikhed and Zemcik concluded that in USA a decline in home prices affected negatively the consumption and GDP (Mikhed and Zemcik, 2009). Adams and Füss noticed that the GDP growth has an increasing impact on the housing market. (Adams and Füss, 2010).

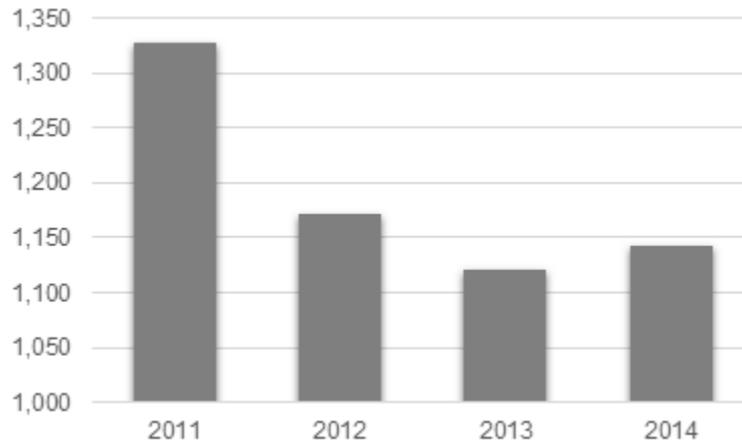
When the interest rate is rising, the cost of borrowing is also rising and the potential buyers are getting discouraged. As a result housing demand is falling. Andrews argues that the correlation between house prices and the loan interest rate is negative and depends on the degree of competition in the banking sector (Andrews, 2010). Cross-country panel results from Iossifov, Čihák and Shanghavi showed that the short-term interest rate, and hence monetary policy, has a sizable impact on residential housing prices (Iossifov, Čihák and Shanghavi, 2008).

The role of geographical factors on dwelling prices is investigated more in detail in studies on data disaggregated by region or city, such as (Garmaise and Moskowitz, 2004), (Green, Malpezzi. and Mayo, 2005) or (Himmelberg, Mayer and Sinai, 2005).

3. Methodology

In order to estimate the price determinants of newly built dwelling in Serbia a panel analysis will be used to noticed how the data for each observed cities changed over time. Data analysis will be carried out in STATA v.13 statistical package.

Figure 1. Prices of dwellings in new construction in Republic of Serbia from 2011 (EUR, per sq. m.)



Source: SORS; authors' calculations

We start our analysis with a commonly analyzed set of 24 cities in the Republic of Serbia, for which data on an of newly built dwelling prices are available over a period 2011-2014 in the basis of the National Statistics Office (SORS, 2015).

Table 1. Observed cities in the Republic of Serbia

Grad Beograd	Sombor	Vršac
Grad Novi Sad	Subotica	Zrenjanin
Valjevo	Šabac	Čačak
Kragujevac	Leskovac	Čuprija
Grad Niš	Ruma	Pirot
Grad Vranje	Loznica	Jagodina
Pančevo	Sremska Mitrovica	Kraljevo
Paraćin	Vrnjačka Banja	Kruševac

Source: authors' calculations

We assessed the equation:

$$price_{it} = \alpha + x_{it}'\beta + \gamma_i + \varepsilon_{i,t} \quad i = 1, \dots, 24; \quad t = 2011, \dots, 2014 \quad (1)$$

where variable $price$ is defined as prices of dwellings of new, i is (one of) 24 observed cities in the Republic of Serbia, α is constant, x is vector including independent variables (see Table 2 and Table 3), β is vector of corresponding coefficients, \square is time period, in this case 2011-2014, and γ is the effect specific for each cities and it does not change over time. In our case, these are variables dev and $dist$. $\varepsilon_{i,t}$ represents an error term, which is subject to the assumption of strict exogeneity.

We opted for the method of stochastic, i.e. random effects in the panel, which enables evaluation of γ_i effects, by assuming that γ_i has distribution with 0 mean value and constant standard deviation. Even though the advantages of the method of random effects vs. fixed effects model are obvious, the method can be used on the major assumption that unobserved features of the respective cities are always the same (Baltagi, 2013; Hill, Griffiths, & Lim, 2011).

To test for the presence of random effects we use the Breusch-Pagan test statistic.

$$LM^2 = \frac{NT}{2(T-1)} \left\{ \frac{\sum_{i=1}^N (\sum_{t=1}^T \hat{\epsilon}_{it})^2}{\sum_{i=1}^N \sum_{t=1}^T \hat{\epsilon}_{it}^2} - 1 \right\}^2 \quad (2)$$

If the null hypothesis $H_0: \text{Var}(u) = 0$ is true, there are no random effects. The original LM test due to Breusch and Pagan used LM^2 with the distribution under H_0 as $\chi^2_{(1)}$. (Breusch & Pagan, 1980).

The choice of explanatory variables reflects the consensus in the reviewed literature that in the short run dwelling prices are primarily determined by fundamentals affecting aggregate demand. Housing demand typically reflects households' economic situation and prospects as well as financial parameters and demographic conditions.

The variables used in the following regression models are defined in Table 2.

Table 2. The variables used in the regression models

Variable	Definition	Source
price	Prices of dwellings of new construction in the Republic of Serbia observed by cities per square metre in EUR, for period 2011-2014.	Statistical Office of the Republic of Serbia (SORS)
popgr	Average annual population growth rates in observed cities for a period 2002-2013.	SORS
wage	Total net salary paid per month in observed cities, in millions of EUR	SORS
i	Effective interest rate on housing loans to household and non-financial sectors, for new business	National bank of Serbia
dev	The level of development of observed cities	National Agency for Regional Development, Republic of Serbia
gdp1	Gross domestic product, real growth rate in period 2011-2014. with one period lag	SORS
dist	Distance from Belgrade in km	ViaMichelin Maps&Routes

Source: authors' calculations

We did not consider inflation as an explanatory variable because all the real estate prices in Serbia are in EURO or indexed to this currency.

On the other hand, there are another interesting peculiarities of the Serbian housing market. In particular, most of the housing stock is privately owned, free and clear of any loans, as a result of a massive privatization drive 20 years ago. (Nikolić, I., Kovačević M., 2014; Nikolić, I., 2011). While new housing purchases are typically financed via mortgage loans, trade in the older housing units is often conducted via cash-only transactions. (Šoškić, D., Urošević, B., Živković, B., Božović, M., 2012).

The expected sign of regression coefficients is in square brackets:

- [+] popgr - is demographic variable approximating the number of potential buyers in the market. A larger population is likely to be associated with higher prices. In some way, this variable contains the effect of migration which has also had a big impact on the dwelling market;
- [+] wage - is proxy for real purchasing power ie real demand of the population. Surely it follows that higher income implies a higher price;
- [-] i - is proxy for the opportunity cost of investments in owner-occupied dwelling. Higher opportunity costs are likely to decrease demand for owner-occupied dwelling, and thus dwelling prices;
- [+] gdp1 - is the broadest approximation of economic activity in the country. Should have a positive impact on prices;
- [-] dist - it is expected that demand for new built dwellings falling as we move toward the periphery of the country. It certainly pulls lower prices;
- [+] dev - proxy for the level of development of observed cities. Higher development is therefore likely to be associated with higher dwelling prices.

It should be emphasized that the Law on Regional Development all cities in Serbia i.e. local self-government classified according to the level of development in four groups. The first group consists of 40 units with the level of development above the Republic average, the second group consists of 23 units with the level of development ranging from 80% to 100%, the third group consists of 36 units whose level of development range from 60% to 80% (underdeveloped) and the fourth group consists of 46 LS units with the level of development below 60% of the Republic average (highly underdeveloped LS). Observed cities in this research are classified in the first three groups (NARR, 2015).

Table 3. A panel summary statistics

<i>Variable</i>		<i>Mean</i>	<i>Std.Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Observations</i>
<i>t</i>	overall	2012,5	1,1239	2011	2014	N = 96
	between		0	2012,5	2012,5	n = 24
	within		1,1239	2011	2014	T = 4
<i>price</i>	overall	735,6342	214,2556	484,9652	1795,063	N = 96
	between		209,7276	551,943	1568,871	n = 24
	within		57,52245	639,0363	979,8254	T = 4
<i>dev</i>	overall	1,8333	0,7492	1	3	N = 96
	between		0,7614	1	3	n = 24
	within		0	1,8333	1,8333	T = 4
<i>popgr</i>	overall	-0,4203	0,5930	-1,3039	1,3313	N = 96
	between		0,6026	-1,3039	1,3314	n = 24
	within		0	-0,4204	-0,4204	T = 4
<i>wage</i>	overall	20,4448	52,1667	1,5824	269,2269	N = 96
	between		52,9983	1,6900	263,8711	n = 24
	within		1,1162	12,7063	25,8006	T = 4
<i>gdp1</i>	overall	0,8856	1,3119	-1,0152	2,5717	N = 96
	between		0	0,8856	0,8856	n = 24
	within		1,3119	-1,0153	2,5717	T = 4
<i>i</i>	overall	5,345	0,5213	4,46	5,76	N = 96
	between		0	5,345	5,345	n = 24
	within		0,5213	4,46	5,76	T = 4
<i>dist</i>	overall	148,9625	85,4647	0,1	343	N = 96
	between		86,8469	0,1	343	n = 24
	within		0	148,9625	148,9625	T = 4

Source: authors' calculations

4. Research results

As can be seen in Table 4 the estimation takes the form of a panel model with random effects. Explanatory variables that might be correlated with the unobserved effect are replaced by instrumental variables, which are based on suitable transformations of the model variables. To this end, the means of the city-specific regressors classed as exogenous are used alongside the deviations of the city-specific variables from their mean.

The results based on all four specifications (SP's in Table 4) suggest that the effects of demographic variable such as average annual population growth rates in observed cities and economics variables, such as total net salary paid per month in observed cities and effective interest rate on housing loans to household, on dwelling prices are statistically significant. More specifically, prices tend to increase with gains in households' disposable income (proxied by total net salary in EUR) and, in turn, real dwelling prices. Reductions in real interest rates is found to increase dwelling prices.

Table 4. A random effects models estimates of prices of new construction dwellings in Serbia

Variable	SP 1	SP 2	SP 3	SP 4
<i>popgr</i>	124,27*** (33,17)	114,65** (35,62)	124,13*** (33,14)	124,03*** (33,76)
<i>wage</i>	2,75*** (0,38)	2,71*** (0,38)	2,76*** (0,38)	2,68*** (0,41)
<i>i</i>	-39,95** (12,25)	-39,96** (12,25)	-39,77** (12,33)	-39,96** (12,25)
<i>dev</i>	-	-20,93 (26,37)	-	-
<i>gdp1</i>	-	-	2,2 (4,90)	-
<i>dist</i>	-	-	-	-0,12 (0,22)
<i>_cons</i>	963,1*** (70,4)	998,43*** (83,33)	960,1*** (71,05)	983,1*** (79,31)
N	96	96	96	96
R ² : overall	0,7985	0,8026	0,7987	0,8004
R ² : between	0,8509	0,8553	0,8509	0,8529
R ² : within	0,1242	0,1244	0,1266	0,1245
Wald chi ²	129,59	128,04	129,93	125,79
Prob > chi ²	0,0000	0,0000	0,0000	0,0000
sigma_u	78,8407	79,6901	78,7537	80,4555
sigma_e	62,1802	62,1802	62,6191	62,1802
rho	0,6165	0,6216	0,6127	0,6261

legend: * p<0.05; ** p<0.01; *** p<0.001; std.err. in parenthesis

Source: authors' calculations

The coefficient of determination is rather high in all models (about 80%) and Wald χ^2 statistics is significant at 1%.

However, this is only conditionally since estimations of explanatory variables such as distance from Belgrade and real growth rate of GDP have expected sign but aren't statistically significant. Moreover, variable the level of development of observed cities hasn't expected sign. This paradox can be explained by dwelling price bubble in major and developed serbian cities.

Stata, like most contemporary statistical software produces warnings (for example, usually based on the variance inflation factor- VIFs) if substantial collinearity is found among the independent variables. There was not a problem. Collinearity appeared only in cases if we spread the model by adding new variables, such as unemployment rate or the real effective exchange rate. But this is expected because the collinearity is often found in data sets with few observations, where there is a greater chance of spurious correlation.

To test for the presence of random effects we use the Breusch-Pagan test statistic.

$$\text{price}[\text{id},\text{t}] = X\text{b} + u[\text{id}] + e[\text{id},\text{t}]$$

	Var	sd=sqrt(Var)
price	45905,47	214,2556
e	3866,379	62,18
u	6215,85	78,841

Test

$$\begin{aligned} \text{Var}(u) &= 0 \\ \text{chibar2}(01) &= 48,78 \\ \text{Prob} > \text{chibar2} &= 0,0000 \end{aligned}$$

Source: authors' calculations

Due to the fact that the our χ^2 is large which means zero p-value we reject the null and conclude that random effects is appropriate. This is, evidence of significant differences across observed cities.

5. Conclusions

This paper's analysis and implications are contributes to the academic research of the deterrnants of newly built dwelling prices but departs from the conventional view of perceiving the problem pricing in the property market in Serbia.

In order to estimate the price determinants of newly built dwelling we will apply a panel analysis to see how the data for each of 24 observed cities changed in period 2011-2014. Results suggest that dwelling prices primarily tend to rise with populations growth and real total net wages as a proxy of household incomes, while declines in effective interest rate on housing are associated with higher dwelling prices.

Additional explanatory variables, such as the level of development of observed cities, geographical distance from the capital, or real GDP dynamics in the country, even though the correct sign, didn't have statistically significance influence on the dependant variable.

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