THE DYNAMIC RELATIONSHIP BETWEEN THE RESIDENTIAL REAL ESTATE MARKETS, MACRO – ECONOMY AND INSTITUTIONAL DEVELOPMENT: EVIDENCE FROM EU COUNTRIES

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Abstract

The peculiar characteristics of the real estate properties and their production process determine the multi dimension research perspectives. This research investigates the dynamic relationships between the residential construction output, construction market, housing market, urbanization and institutional development across European Union (EU) countries. Using a VECM approach, the long-run and short-run patterns of the residential construction activities are analysed. The estimated results suggest that the residential construction output is mostly elastic to the conditions of the construction industry and housing market. The positive effect of the institutional development on construction activity appears to be significant only in some of the EU countries.

Keywords: residential construction, housing market, institutions, equilibrium

Introduction

Housing is a complex system that relies on the interactions of suppliers and consumers of housing (demand) and the economic policies of the government in order to allow the market outcomes (Rhodes, 2012). The intrinsic characteristics of housing (immobility, indivisibility, heterogeneity, complexity etc.) make it significantly different from other goods and determine the function mode of the real estate markets (Arnott, 1987, p. 959).

Within the neoclassical theory, the real estate market is defined by the convergence of supply and demand to the equilibrium state, but from an institutional perspective, it embraces all the institutional arrangements, through which real estate is developed, traded and used by a wide range of actors involved in these processes (Keogh and D'Arcy, 1999). In this context, the real estate is itself an institution, whose purpose and structure reflect the dominant interests of the society (Keogh and D'Arcy, 1999, p. 2408). On the one hand, the real estate market interacts with the political, social, economic and legal environment, and on the other hand, intersects the interests of market participants.

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The institution structures contribute to the reducing information asymmetry, transaction costs and the real estate market uncertainties (D'Arcy and Keogh, 1999). The efficiency of the functioning of real estate markets is determined by the functioning of the market and non-market mechanisms through which the real estate sector operates (Keogh and D'Arcy, 1999). Hence, the real estate markets operate in correlation with multiple equilibriums related to each interfered structure, and not just on a single equilibrium to ensure the economic condition of neoclassical theory (Mooya, 2016).

This paper aims to investigate the dynamic relationships between the housing markets, macro – economy and institutional development across EU countries, over the period of 1995 – 2018. Little research has provided an insight into the trend of the real estate construction output from a cross-disciplinary perspective for European countries. The close linkages between the construction industry, the economy and the social well-being highlight the importance of a deeper assessment of the real estate market equilibrium for the households, practitioners and policymakers.

With reference to the broader economic impact, the research proposes a multi-dimensional equilibrium of the construction and real estate activities in relation to the residential construction output, construction market, housing market, urbanization and institutional development across EU countries. A vector error correction model (VECM) is applied for each country analysed. The results suggest that the residential construction output is mostly elastic to the conditions of the construction industry and housing market.

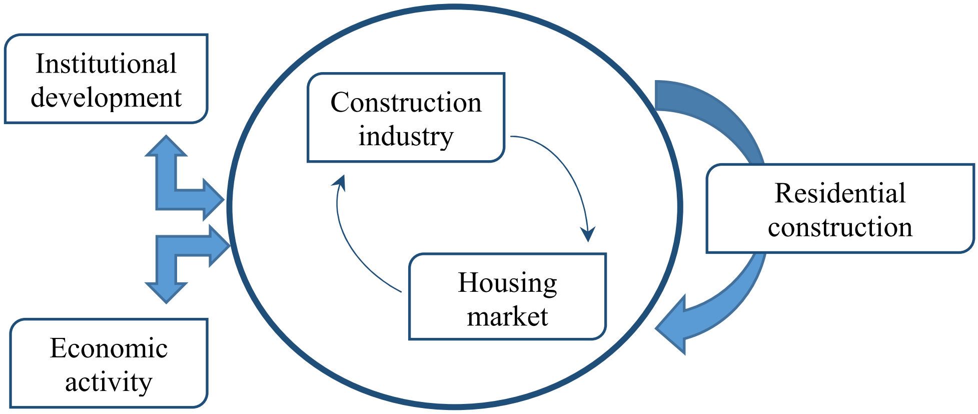
This paper is structured as follows: section 1 introduces an overall framework of the residential real estate system; section 2 outlines the main features of the empirical strategy and data; section 3 reports the main results, and in the conclusion section, the most important contribution of this paper are summarized.

1. Conceptual framework of the residential construction dimensions equilibrium

Referring to the major real estate market structures, housing markets can be illustrated by an interconnection system between the construction industry and real estate markets, on the one hand, and economic and institutional development, on the other (Figure 1). The applicability of the system theory to the residential real estate domain interferes with ample model that prescribe the multitude of links between economic, social, cultural, political variable etc. (Rhodes, 2012). The economy of a country is represented by a macro system that interconnects all economic activities, and the direction and magnitude of links between them indicate the potential of a sectoral capacity to stimulate or to induce activities in other sectors (Cai and Leung, 2004). The literature documents two types of economic links in relation to the direction of interdependencies: an upstream link that reflects the input resources and a downstream link identifying how the sector distributes output to the economy (Cai and Leung, 2004, p. 65).

In the residential real estate system, the construction output assures the direct link between the construction industry and the real estate market, providing the necessary supply on the market to meet housing demand and ensuring the spread of the effects in the economy through the three major channels – investment, banking and consumption (Muellbauer, 2012).

Figure 1. The residential real estate system



Source: own representation

Through all these channels, real estate price fluctuations tend to amplify the economic cycle. In relation to the residential construction output, previous studies identify the following types of equilibrium: the external equilibrium, which adjusts the construction output according to the economic conditions; the individual equilibrium, determined either by the level of the construction costs and the land availability or by the housing prices; the dual market equilibrium, through which the residential construction output is influenced by both the construction industry's inputs and the housing market prices (Ma *et al.*, 2018, p. 23). According to these theoretical considerations and taking into account the institutional implications in the real estate field, the research aims to analyse the multiple dimensions of the residential real estate equilibrium in relation to the construction output.

External equilibrium determined by the institutional development and macro – economic activities

The relevance of the construction industry for economic growth is widely documented in the literature (Hillebrandt, 2000; Ho, 2016; Hung *et al.*, 2019), being demonstrated the positive and significant relationship between construction output and macroeconomic conditions (Bon, 1992; Chiang *et al.*, 2015; Hosein and Lewis, 2005). Most studies validate Bon's (Bon, 1992) theory, according to which construction activity follows the direction of an inverted U curve in relation to the different stages of economic development; as the economy of a country is more mature, the contribution of the construction industry will be lower (Bon and Pietroforte, 1990; Ilhan and Yaman, 2011; Pietroforte and Gregori, 2003). The housing theory considers that the residential construction function is local (DiPasquale, 1999; Glaeser *et al.*, 2006; Taltavull and Gabrielli, 2015) and strongly depends on the external factors specific to different regions such as economic, political, social, cultural etc. (Adams and Füss, 2010; Hutchison and Disberry, 2015; Muellbauer and Murphy, 2008; Oxley and Haffner, 2010).

The residential real estate markets are strongly influenced by social and economic policies and are among the most regulated sectors[1]. The state intervenes with different policies to reduce the risks associated with the real estate market: macroeconomic policies (monetary and fiscal policies), prudential policies (supervisory and regulatory policies), and structural policies (Hilbers *et al.*, 2008). The efficiency of the institutional framework, such as land availability, administrative procedures, zoning regulations, housing policies, influences the speed of propagation of macroeconomic shocks in the real estate domain (Adams and Füss, 2010, p. 39).

Construction industry equilibrium

The supply of new housing comes from the construction sector and "depends on the price of those assets relative to the cost of replacing or constructing them" (DiPasquale and Wheaton, 1992, p. 186). Higher costs of construction, including construction material and labour costs, increase the financing costs of construction, that lead to a decrease in construction, and thus to a lower level of housing stock (Adams and Füss, 2010, p. 41). Also, a crucial factor in the construction industry is the land availability for new residential constructions. Based on the urban spatial theory, "land prices depend on the stock of housing, not the flow or level of building activity" (DiPasquale, 1999, p. 14). The model of DiPasquale and Wheaton (1994) implies that "housing price levels generate new construction only if those prices dictate a level of the stock that is higher than the current level" (DiPasquale, 1999, p. 14). The construction studies suggest that the relating trend of the residential construction output should be determined by the equilibrium of the construction market (Ma *et al.*, 2018, p. 22).

Housing market equilibrium

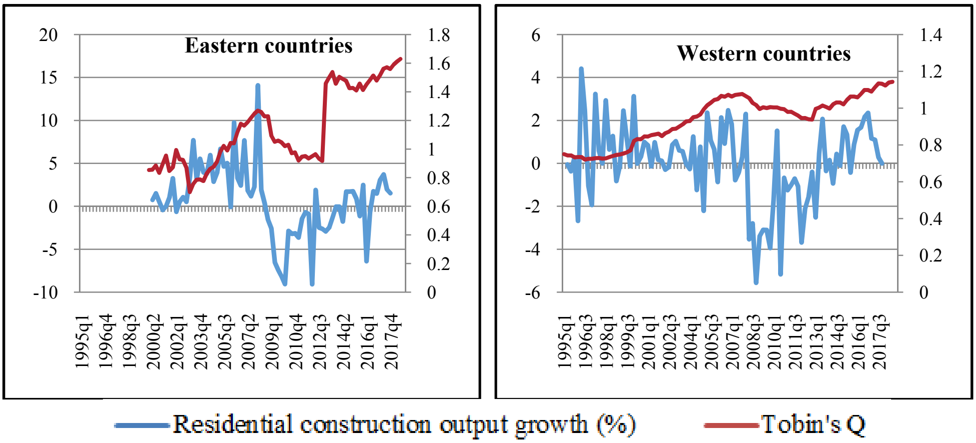
The housing theory highlights that the house prices are very sensitive to the demand shock, which must equal its supply. An increase in the demand to own real estate assets will raise prices, while a greater supply of space will depress prices (DiPasquale and Wheaton, 1992, p. 186). For example, the growth of urban population pushes the housing demand, which is accommodated by an expansion of the urban area (Mayer and Somerville, 2000). The empirical studies underline

[1] see ESRB (2016), Vulnerabilities in the EU Residential Real Estate Sector, Frankfurt am Main , p.12 (retrieved from https://doi.org/10.2849/733467).

the deep connection and strong correlation between urban population change and housing stock (Glaeser *et al.*, 2006).

According to the economic theory, higher construction costs could reduce the volume of residential construction work. The effects of the construction costs on the new residential construction can be estimated by the Tobin's Q indicator for residential investment, calculated as a ratio between the nominal prices of the houses and the costs of new residential constructions. The nominal values are used to capture the current information of the housing market. Figure 2 shows the variation of the residential constructions and the profitability of the constructions, quantified by Tobin's Q. Rising housing prices increase the property's market value relative to construction costs, contributing to the increase of Q values and thus the profitability of residential property investments (Asal, 2018). However, the effects of the variables may vary from country to country.

Figure 2. The profitability of the residential construction investment



Notes: The residential construction output growth is calculated using the volume index buildings production (left axis); the Tobin's Q is the ratio between the nominal housing prices and residential construction costs (right axis).
Source: own estimation and representation based on Eurostat database

Based on these arguments, the new housing supply reactions are important for understanding house price movements and market equilibrium (Barker, 2003; DiPasquale, 1999). There is a widespread agreement among researchers about the general price elasticity features of housing stock, sustaining that housing supply is relatively price inelastic in the short-run and more elastic in the long-run (Mayer and Somerville, 2000; Pozdena, 1988; Rosenthal, 1999). The partial response of the housing supply to cyclical movements in demand is due to lags in construction, relatively small effect of annual construction on the total housing stock, information asymmetries and financial requirements of the project (Arnott, 1987; Taltavull and Gabrielli, 2015).

2. Research methodology

The equilibrium relationships between residential construction output, construction industry, housing market and economic and institutional development are estimated using a vector error correction model (VECM).

2.1. Data sources and description

For the empirical investigation, quarterly time series data are collected over the period 1995Q1 to 2018Q4 for all 28 EU countries ($N = 28$). Due to missing data in some countries, an unbalanced panel dataset is built. To ensure consistency in comparison across countries, Eurostat and World Bank databases are used.

In the empirical analysis, the volume index of buildings production is used as a proxy for the residential construction output ($RCCO$). The $RCCO$ missing data in Italy, Luxembourg, Malta and Netherlands are replaced with the volume index of construction production, which captures the residential construction and the civil engineering works. The indicators of the construction industry are residential construction costs and land availability, frequently used in the literature as proxy for housing supply. The residential construction cost index ($RCCI$), deflated by the consumer price index (CPI), is applied to capture the labour and material costs of construction residential buildings. The land supply for new residential construction is reflected by the index of residential building permits (RBP), expressed in square meters of useful floor area. The building permits are estimated based on useful floor area, and not on the number of permits, as the land price depends on the stock of existing housing, and not on the flow or level of building activity (DiPasquale and Wheaton, 1994). The housing prices (HPI) dataset includes the prices of the heterogeneous houses (i.e., existing and new houses) based on the data availability. The missing house price data from Eurostat was completed with data of databases, constructed by Mack *et al.* (2011) and Cesa-Bianchi *et al.* (2015). The nominal values of HPI are transformed in real values, using the CPI series. For capturing the influence of the development, depth, efficiency and flexibility of the institutions, a proxy measure of institutional development (IDS) is constructed, based on the first principal component extracted from indices of business freedom, investment freedom, financial freedom, government integrity and property rights, calculated by Heritage Foundation. Because of difficulty to quantify the effect of institutional development, a similar approach is used also by Ciarlone (2015) to investigate the characteristics of house price dynamics in emerging economies. The urbanization phenomenon is measured by the urban population growth (URP), estimated by the World Bank staff.

Figure 3. Dynamics of the real housing prices and real residential construction costs in EU countries

Source: own representation based on Eurostat database

All series expressed as index have the reference base in the 2015 year. Also, in order to assume a normal distribution, all the series data are winsorized and logged, with the exception of the institutional development and urban population growth, which have registered negative values. The descriptive statistics of variables for each analysed country are reported in Appendix A. Further, Figure 2 plots the time series pattern of real house price growth and real construction cost growth, which underlines the heterogeneous dynamics of the housing market and construction industry across EU countries.

In the majority of the countries, HPI and $RCCI$ are highly correlated, as a result of variables convergence in the same directions. Both the descriptive statistics presented in Appendix A and Figure 2 indicate that the housing markets in the Baltic States have registered the highest average price changes and volatility among EU countries. In rest, the most housing markets of EU witness a combination of lower average prices changes and higher volatility. Greece, Ireland, Portugal and Spain, the most affected EU countries by the financial crises from 2007 – 2009, have experienced a very big drop in the construction industry in the analysed period.

This country group is characterized by the lowest average construction volume changes and the highest volatility in the sector. In contrast, the Baltic States, Bulgaria, Malta, Finland, Romania have experienced a boom in the construction industry, registering a combination of higher average volume of residential construction output and lower volatility. This evidence is supported also by the higher volatility of the residential building permits in these countries. The highest quarterly growth averages of the institutional development score and with lower volatility were registered for Portugal, Spain, Cyprus, Estonia, Slovenia, Malta, Lithuania, although, the values are negative because of some negative correlations between the components of the score.

According to the statistics of urbanization rates (URP), the Eastern countries have registered negative values that indicate the population decline determined by the massive migrations and negative natural growth, in contrast with the Western countries, where the dynamics of the urban population is increasing. Overall, these initial statistics highlight the need to explore the heterogeneous behaviour of the construction industry, housing market, institutional development and urban phenomenon for each EU countries.

2.2. Estimation method

The VECM method is commonly used to empirically analyse the dynamic behaviour of macroeconomic variables (Price, 1998), because of its dynamic nature and sensitivity to a variety of factors affecting the measured variables (Wong and Ng, 2010). This method captures the cointegration restrictions in a vector autoregressive model, incorporating the long-run equilibrium relationships among variables in the system (Lütkepohl, 2006) and allowing to eliminate the short-run forecast errors (Allen and Morzuch, 2006). The VECM approach has been widely used to assess the interconnections between housing market, construction sector and their fundamentals (Ma and Liu, 2014; Ma *et al.*, 2018; Malpezzi, 1999; Panagiotidis and Printzis, 2016; Wong and Ng, 2010).

The VECM procedure, developed by Johansen (1988, 1995), includes the cointegration test and the model estimation. This paper adopts the methodological approach, developed by Ma *et al.* (2018), who identify the long-run equilibrium types of residential construction output in the eight Australian states and territories.

Cointegration test for identification the long-run equilibrium

The cointegration test implies the identification of the long-run relations among a group of variables, where each has a unit root (Rao, 1994). The main condition of cointegration is that all time series of interest must be integrated in the same order (Andrei and Bourbonnais, 2017). If two sets of variables are integrated of order one and the linear combination of variables is stationary then the time series of the observed variables are said to be cointegrated at the first order (Rao, 1994). The cointegrated variables will revert to the equilibrium state otherwise economic forces will operate to restore the equilibrium.

The generalised vector autoregression (VAR) based on Johansen procedure can be written as follows:

$$X_t = c + \sum_{i=1}^{n} A_i X_{t-i} + \varepsilon_t \tag{1}$$

where X_t represents the n-dimension vector of the interest variables and X_{t-1} is the vector of the i lagged; c indicates the constant that captures the exogenous effects; A is the estimated coefficients of the matrix $n\ x\ n$; and ε_t reflects the n-dimension vector of the error term. The null hypothesis of the Johansen trace statistics is that $rank(\Pi) = r_0$ and the alternative hypothesis is that $r_0 < rank(\Pi) \leq n$, where n indicates the maximum number of possible cointegrating vectors (Dwyer, 2015).

The existence of equilibriums between residential construction output ($RCCO$), residential construction costs ($RCCI$), building permits (RBP), housing prices (HPI), institutional development (IDS) and urbanization (URP) is investigated based on the co-integration relationship, expressed as follows:

$$CointEq(X_t) = A\ x\ (RCCO, RCCI, RBP, HPI, IDS, URP) \tag{2}$$

where A reflects the estimated equilibrium coefficients of the residential construction output that takes values from $1\ to\ \alpha_5$. The existence of an equilibrium is confirmed by the rejection of the null hypothesis.

The VECM estimation for identification the type of long-run equilibriums

The VECM model captures the long-run equilibrium and the short-run dynamic patterns of residential construction output, and can be represented as follows:

$$\Delta X_t = C + \Pi CointEq(X_{t-1}) + \sum_{i=1}^{\tau} \Gamma_i \Delta X_{t-i} + \varepsilon_t \tag{3}$$

where ΔX_t and ΔX_{t-i} represents the vectors that indicate the changes of the variables at time periods t and $t-i$; C is the intercept indicating the average change of the variables; the matrix Π captures the long-run information and the matrix Γ reflects the short-run patterns of the relationship among the elements; $i = 1,2,\dots,\tau$ represents the number of lags used for estimation; ε_t is the error term. The long-run equilibrium is specified by $\Pi CointEq(X_{t-1})$ that is equal with AX_{t-1}, where $A = (1, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5)$ and the parameter Π indicates the speed of convergence towards the equilibrium trajectory.

An important step in defining the VECM model is that of identifying the number of lags that are taken into account in assessing the present value of each variable (Andrei and Bourbonnais, 2017). The optimal lag (i) is selected by the VAR approach, including all variables, from a possible larger number of lag length. The literature recommends Akaike (AIC) and Schwarz (SC) information criteria to assess the optimal lag (Andrei and Bourbonnais, 2017). From the values indicated by these two criteria, the lowest value is chosen.

Based on the VECM results, the types of equilibrium relating to residential construction output are identified using *t*-statistic of the estimated matrix *A* coefficients from the Equation 3. The estimated parameters can be interpreted as follows:

(1) if all $\alpha_1 \dots \alpha_5$ coefficients are insignificant, then the residential buildings equilibrium is dominated by the external factors of economic, political, social etc.;
(2) if α_1 and/or α_2 parameters are significant, the equilibrium of construction output is determined by the construction market;
(3) if α_3 coefficient is significant, then residential construction is correlated with the housing market;
(4) if α_4 estimated parameter is significant, the equilibrium of the residential construction output is supported by the institutional development;
(5) if α_5 coefficient is significant, then the residential constructions converge in the equilibrium relation with the urbanization phenomenon;
(6) if all $\alpha_1 \dots \alpha_5$ coefficients are significant, then the equilibrium of the residential construction output is influenced by the conditions of the construction market, housing market, institutional development and urbanization.

2.3. Pre-test and post-test treatments

The augmented Dickey-Fuller (ADF) unit tests conducted country-by-country prior to the estimation suggest that all variables are stationary in first differences, i.e., integrated of order 1 (see Appendix B). The cointegration analysis between the variables was also performed on country-specific time series based on the Johansen procedure as presented in Equation 1 (Appendix C). Due to the lower number of observations for some countries, the cointegration results at the country level should be viewed with caution (Philiponnet and Turrini, 2017, p. 18). The *p*-value of trace statistics indicates between 4 and 6 cointegrating equations at the 0.05 level, reflecting the existence of the strong long-run relationships between variables across EU countries.

In order to check the specifications of the model, tests for autocorrelation (Portmanteau and Lagrange Multipliers (LM)), normality test (Jarque-Bera), and test for heteroscedasticity in errors (White) were applied to the recommendation of Johansen (2009). The results of tests are plotted in Appendix D, which indicate the achievement of non-autocorrelation and homoscedasticity conditions for residuals, but non-fulfilment of multivariate normality condition at the 5% significance level. However, the literature demonstrates the robustness of the Johansen procedure in the presence of non-normal residuals and recommends following the outcomes of the trace test as this test is more robust to non-normality (Cheung and Lai, 1993; Gonzalo, 1994; Silvapulle and Podivinsky, 2000). Also, the Jarque-Bera test is more adequate for large panels than for short time-series (n<92) that will discard the normality test because of the central limit theorem (Jarque and Bera, 1987). Taking into account that in our models the residuals are non-autocorrelated and homoscedastic, we consider the estimated coefficients efficient. To improve the distribution, we winsorized all variables and logged the positive ones. Also, to select the number of cointegrating equations, we used the trace statistic.

3. Discussion of results

The long-run equilibrium and short-run dynamic patterns between the residential construction output and the indicators of the construction industry, housing market, institutional development and urbanization are expressed as follows:

$$\Delta RCCO_t = C + \Pi(RCCO_{t-1} + \alpha_1 RCCI_{t-1} + \alpha_2 RBP_{t-1} + \alpha_3 HPI_{t-1} + \alpha_4 IDS_{t-1} + \alpha_5 URP_{t-1} + C_0) + \sum_{i=1}^{\tau} \beta_{1i}\Delta RCCO_{t-i} + \sum_{i=1}^{\tau} \beta_{2i}\Delta RCI_{t-i} + \sum_{i=1}^{\tau} \beta_{3i}\Delta RBP_{t-i} + \sum_{i=1}^{\tau} \beta_{4i}\Delta HPI_{t-i} + \sum_{i=1}^{\tau} \beta_{5i}\Delta IDS_{t-i} + \sum_{i=1}^{\tau} \beta_{6i}\Delta URP_{t-i} + \varepsilon_t \quad (4)$$

The item $RCO_{t-1} + \alpha_1 RCCI_{t-1} + \alpha_2 RBP_{t-1} + \alpha_3 HPI_{t-1} + \alpha_4 IDS_{t-1} + {}+\alpha_5 URP_{t-1} + C_0$ indicates the long-run construction output equilibrium, based on the estimated α_n coefficients. The average change of the construction output is captured by the C parameter and the cointegration term by the Π coefficients. The short-run patterns are reflected by the estimated $\beta_{1i} \ldots . \beta_{6i}$ coefficients, where i indicates the optimum lag included in VECM. According to the AIC and SC information criteria, the lowest value for each country is 1, which is adopted as the optimal lag for the VECM estimation.

Table 1 reports the estimated long-run relationships between analysed variables for each EU country. The EU panel is traditionally divided into Western countries and Eastern countries. The results confirm that the equilibrium of the residential construction output is most determined by the dual construction – housing market and urbanization, which validates the urban theory. The institutional development controls the residential constructions only in 10 out of 17 Western EU countries and in 2 out of 11 Eastern EU countries.

All long-run coefficients, based on the optimal lag, appear to be statistically significant for Belgium and Spain, which suggests that the equilibriums of the residential construction output are determined by the construction market, housing market, institutional development and urbanization. Also, the equilibrium of construction output is controlled by all variables, except construction costs, in Cyprus and, building permits, in Greece and Poland. The residential construction output converges with the construction industry, housing market and urbanization in Sweden, Croatia, Hungary, Lithuania and Slovakia. A significant influence exerts the dual construction – housing markets and institutional development on the construction output of Malta, Portugal and the United Kingdom. The construction equilibrium is determined by a single dimension in the Netherlands, Slovenia (construction market) and in Romania by the housing market. The conditions of the dual construction – housing markets are significant for the determination of the residential construction volume in Denmark, Italy, Luxembourg, Bulgaria and Latvia. The construction equilibrium of Austria, Finland, Germany and Estonia is controlled by the construction market and institutions, while in Ireland by the construction market and urbanization, and in the Czechia by housing market and urbanization. Also, the construction industry, institutional development and urbanization are important for the construction equilibrium of France.

Table 1. EU countries equilibriums between residential construction ($RCCO$) and independent variables

	$RCCI$		RBP		HPI		IDS		URP		C_0
	α_1	*t*-stat.	α_2	*t*-stat.	α_3	*t*-stat.	α_4	*t*-stat.	α_5	*t*-stat.	
Western EU countries											
Austria	**-1.312**	**[-6.72]**	**0.199**	**[2.53]**	0.147	[1.39]	**-0.317**	**[-4.24]**	0.031	[1.46]	-0.039
Belgium	**-1.697**	**[-4.11]**	**-0.891**	**[-7.54]**	**0.576**	**[2.39]**	**0.409**	**[2.94]**	**-0.209**	**[-3.51]**	4.440
Cyprus	50.186	[1.11]	**-15.433**	**[-2.04]**	**-39.168**	**[-2.77]**	**-52.094**	**[-3.63]**	**45.663**	**[3.39]**	-33.747
Denmark	-0.040	[-0.26]	**-0.138**	**[-3.87]**	**-0.540**	**[-4.35]**	0.178	[1.24]	**0.453**	**[3.28]**	-1.977
Finland	**-5.723**	**[-6.44]**	**-1.262**	**[-6.80]**	**2.684**	**[4.00]**	0.157	[1.53]	0.001	[0.02]	14.053
France	0.329	[1.57]	**-0.381**	**[-7.13]**	-0.024	[-0.22]	**-0.244**	**[-3.01]**	**-0.639**	**[-7.50]**	-3.579
Germany	0.030	[0.26]	**-0.312**	**[-6.50]**	-0.254	[-1.36]	**-0.545**	**[-6.60]**	0.024	[1.51]	-1.614
Greece	**22.715**	**[4.56]**	0.286	[0.82]	**-5.840**	**[-3.90]**	**-1.474**	**[-2.49]**	**1.915**	**[2.15]**	-88.013
Ireland	**1.139**	**[8.97]**	**-0.091**	**[-2.15]**	-0.073	[-0.78]	-0.100	[-0.73]	**-0.699**	**[-13.23]**	-8.219

	$RCCI$		RBP		HPI		IDS		URP		C_0
	α_1	*t*-stat.	α_2	*t*-stat.	α_3	*t*-stat.	α_4	*t*-stat.	α_5	*t*-stat.	
Western EU countries											
Italy	**6.103**	**[4.72]**	0.215	[1.70]	**-3.236**	**[-4.69]**	0.110	[0.44]	**0.557**	**[3.96]**	-18.725
Luxembourg	0.452	[1.72]	**0.223**	**[6.17]**	**-0.398**	**[-3.79]**	0.111	[1.39]	0.016	[0.58]	-5.945
Malta	**-2.543**	**[-3.49]**	**0.310**	**[4.16]**	**-1.826**	**[-4.99]**	**0.550**	**[4.64]**	-0.005	[-0.09]	14.903
Netherlands	**-0.618**	**[-2.46]**	**-0.207**	**[-7.74]**	-0.168	[-1.20]	0.144	[1.28]	-0.048	[-1.05]	-0.209
Portugal	**2.354**	**[6.36]**	**-0.397**	**[-11.51]**	**0.987**	**[3.01]**	**-1.521**	**[-6.53]**	0.163	[1.64]	-18.677
Spain	**2.635**	**[5.24]**	**-0.336**	**[-4.84]**	**-1.554**	**[-7.88]**	**-1.821**	**[-4.80]**	**0.494**	**[5.31]**	-8.513
Sweden	**0.339**	**[2.03]**	**-0.173**	**[-5.67]**	**-0.273**	**[-3.75]**	-0.095	[-1.46]	**-0.182**	**[-3.90]**	-2.961
United Kingdom	**1.097**	**[5.59]**	-0.034	[-0.90]	**-1.169**	**[-7.28]**	**0.440**	**[5.84]**	0.063	[0.80]	-4.714
Eastern EU countries											
Bulgaria	**-33.793**	**[-6.74]**	**-1.824**	**[-5.65]**	**3.492**	**[5.24]**	-0.297	[-0.39]	-2.244	[-0.71]	145.618
Croatia	**-4.552**	**[-5.55]**	-0.281	[-1.42]	**2.671**	**[3.87]**	-0.749	[-1.82]	**-0.505**	**[-4.66]**	-3.156
Czechia	-0.634	[-1.60]	-0.175	[-1.58]	**0.558**	**[3.77]**	-0.047	[-0.44]	**-0.557**	**[-4.39]**	-5.145
Estonia	**-2.593**	[-3.85]	**-0.254**	**[-3.26]**	0.107	[1.04]	**0.510**	**[2.14]**	**-0.492**	**[-4.35]**	8.524
Hungary	0.492	[0.30]	**0.647**	**[2.97]**	**-5.544**	**[-5.01]**	-1.698	[-1.78]	**2.074**	**[5.68]**	17.258
Latvia	**18.703**	**[4.57]**	**1.335**	**[2.88]**	**-5.955**	**[-4.49]**	-1.014	[-0.94]	1.406	[1.78]	-75.536
Lithuania	**-6.858**	**[-2.39]**	**-2.099**	**[-5.56]**	**2.739**	**[4.96]**	-0.124	[-0.33]	**-0.584**	**[-3.25]**	26.473
Poland	**-4.808**	**[-7.25]**	0.070	[0.55]	**-0.281**	**[-2.36]**	**-0.153**	**[-2.53]**	**-0.711**	**[-4.11]**	13.879
Romania	1.463	[0.78]	0.598	[0.54]	**4.049**	**[7.47]**	-0.227	[-0.50]	0.053	[0.05]	-31.324
Slovakia	**-3.626**	**[-3.69]**	**-1.151**	**[-5.25]**	**1.142**	**[2.56]**	-0.277	[-0.84]	**1.163**	**[3.24]**	13.586
Slovenia	**1.703**	**[2.95]**	**-1.183**	**[-11.38]**	**-0.340**	**[-1.04]**	-0.328	[-1.86]	-0.086	[-0.63]	-5.576

Notes: The table shows the effects of residential construction costs ($RCCI$), building permits (RBP), real housing prices (HPI), institutional development (IDS) and urban population (URP) on the residential construction output ($RCCO$). All variables are logged with the exception of institutional development (IDS) and urban growth (URP). The estimated coefficient is significant if the absolute value of the corresponding *t*-statistic is greater than 2.00.

The negative sign of the $RCCI$ coefficient indicate that higher construction costs reduce the volume of the residential construction in Austria, Belgium, Finland, Malta, Netherlands, Malta, Bulgaria, Croatia, Estonia, Lithuania, Poland and Slovakia, while in other countries, like Greece, Ireland, Italy, Portugal, Spain, Sweden, United Kingdom, Latvia and Slovenia, the higher costs generate more construction output. The coefficient of the land supply index (RBP) (i.e. building permits) is positive in Austria, Luxembourg, Malta, Hungary and Latvia, apparently indicating that a larger availability of land is incorporated by developers in expectations of the booming housing market. However, in most of the EU countries the higher availability land conducts to a lower construction production, which can be explained by the reduced land availability and the existence of structural constraints, such as building and zoning regulations, construction delayed, etc. (Ciarlone, 2015; Hilbers *et al.*, 2008). The increased housing prices contribute more positively to the long-term construction equilibrium, which means that construction output growth depends on the housing market conditions. This situation is specific for Finland, Portugal, Bulgaria, Croatia, Czech Republic, Lithuania, Romania and Slovakia. In the rest of the countries, where the α_3 coefficient is significant, higher housing prices diminish in the long term the level of construction. The improvement of the overall business and institutional environment would tend to reduce in the majority of countries the construction output, while in other would enhance the construction industry. The effect of the urbanization on the residential construction equilibrium is also heterogeneous among EU countries. While in some countries, the urban population growth enhances the housing construction (Cyprus, Denmark, Greece, Italy, Spain, Hungary and Slovakia), in other the effect is reverse (Belgium, France, Ireland, Sweden, Croatia, Czechia, Estonia, Lithuania and Poland).

Table 2 presents the dynamic patterns among EU countries. The values of the C coefficient indicate the changes in the dynamics of the variables. The cointegration coefficients are captured by the Π parameter, whose negative and significant values indicate the rate of adjustment to long-run equilibrium, while positive values suggest that the dynamics move away from the equilibrium *(Ma et al.*, 2018). The negative values of the C parameter for construction output denote that the residential construction activity will slow down on the long-term in 9 Western countries and 5 Eastern countries, while in countries for which have registered positive results the construction industry will grow. In most EU countries, the positive estimates of $\Delta RCCI$ and ΔHPI reflect the possible increase in construction costs and housing prices in the long term. Interesting is that for all Eastern countries, except Hungary, the positive signs of the ΔIDS suggest institutional development improvements on the long run, however, the rate is low and mostly insignificant. The estimates of the urbanization indicator highlight the dynamic patterns of the urban population across EU countries, where the urbanization phenomena are heterogeneous and relative stable on the long-run.

Table 2. Long-run dynamic patterns

Western EU countries

The changes in the dynamics of the variables (C)

Countries	ΔRCO		$\Delta RCCI$		ΔRBP		ΔHPI		ΔIDS		ΔURP	
	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.
Austria	0.003	[0.73]	**0.004**	**[2.41]**	0.026	[1.57]	0.002	[0.29]	-0.008	[-1.19]	0.021	[0.92]
Belgium	-0.002	[-0.71]	0.002	[1.42]	-0.005	[-0.33]	**0.004**	**[2.47]**	0.005	[0.70]	-0.013	[-0.85]
Cyprus	-0.008	[-0.90]	0.004	[1.83]	-0.016	[-0.97]	0.014	[1.37]	**-0.022**	**[-2.40]**	**-0.017**	**[-2.14]**
Denmark	0.001	[0.43]	**0.005**	**[3.92]**	0.002	[0.07]	0.004	[1.00]	-0.004	[-0.71]	0.010	[1.54]
Finland	**0.007**	**[2.25]**	0.001	[1.08]	-0.006	[-0.64]	**0.003**	**[2.26]**	0.021	[1.58]	-0.007	[-0.90]
France	-0.002	[-1.17]	**0.005**	**[3.41]**	0.000	[-0.01]	**0.009**	**[4.29]**	-0.008	[-0.90]	0.002	[0.32]
Germany	-0.002	[-0.56]	**0.004**	**[2.88]**	0.017	[1.26]	-0.002	[-0.70]	0.000	[-0.04]	0.006	[0.14]
Greece	**-0.034**	**[-2.82]**	0.003	[1.44]	**-0.045**	**[-2.02]**	-0.001	[-0.25]	-0.017	[-1.35]	-0.009	[-0.84]

The changes in the dynamics of the variables (C)

Countries	ΔRCO		$\Delta RCCI$		ΔRBP		ΔHPI		ΔIDS		ΔURP	
	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.
Ireland	-0.006	[-1.18]	0.001	[0.44]	-0.021	[-1.12]	0.010	[1.56]	-0.004	[-0.58]	-0.001	[-0.05]
Italy	**-0.007**	**[-2.11]**	**0.004**	**[3.19]**	**-0.022**	**[-2.23]**	0.008	[1.50]	0.002	[0.15]	0.004	[0.15]
Luxembourg	0.002	[0.33]	0.003	[1.61]	0.046	[1.31]	**0.008**	**[3.28]**	-0.009	[-1.35]	0.011	[0.73]
Malta	**0.022**	**[3.04]**	0.003	[1.20]	0.001	[0.04]	**0.009**	**[2.03]**	0.009	[0.70]	0.020	[1.10]
Netherlands	0.000	[-0.16]	**0.003**	**[2.23]**	-0.014	[-0.65]	0.005	[1.25]	-0.001	[-0.17]	-0.014	[-1.40]
Portugal	**-0.011**	**[-3.39]**	0.003	[1.01]	-0.011	[-1.35]	0.000	[0.24]	0.003	[0.52]	-0.021	[-1.93]
Spain	-0.004	[-0.66]	**0.005**	**[2.65]**	-0.002	[-0.10]	0.011	[1.77]	-0.003	[-0.65]	-0.003	[-0.14]
Sweden	**0.011**	**[2.46]**	0.003	[1.65]	0.012	[0.55]	0.007	[1.27]	0.001	[0.12]	**0.025**	**[2.94]**
United Kingdom	-0.002	[-0.71]	0.004	[1.96]	-0.001	[-0.04]	0.003	[1.67]	-0.002	[-0.37]	0.008	[1.39]

The coefficient equilibrium (Π)

	ΔRCO		$\Delta RCCI$		ΔRBP		ΔHPI		ΔIDS		ΔURP	
	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.
Austria	-0.116	[-0.91]	**0.136**	**[2.70]**	-0.445	[-0.91]	-0.155	[-0.75]	**0.636**	**[3.34]**	0.264	[0.39]
Belgium	0.037	[0.98]	0.011	[0.55]	**0.788**	**[4.40]**	-0.019	[-0.81]	-0.042	[-0.45]	**0.595**	**[2.88]**
Cyprus	0.001	[0.81]	0.000	[-0.93]	**0.009**	**[3.78]**	-0.001	[-0.56]	**0.004**	**[3.13]**	0.001	[0.47]
Denmark	**-0.214**	**[-4.68]**	**-0.047**	**[-2.32]**	0.152	[0.42]	-0.015	[-0.25]	-0.101	[-1.10]	**-0.199**	**[-2.08]**
Finland	-0.026	[-0.93]	0.006	[0.56]	**0.464**	**[5.52]**	0.011	[0.93]	-0.127	[-1.02]	**-0.168**	**[-2.29]**
France	-0.052	[-1.90]	-0.038	[-1.97]	**0.441**	**[2.53]**	**-0.134**	**[-5.05]**	0.109	[0.90]	-0.051	[-0.74]
Germany	**-0.378**	**[-4.98]**	0.006	[0.23]	**0.646**	**[2.50]**	0.035	[0.63]	0.013	[0.10]	0.219	[0.26]
Greece	**0.070**	**[2.78]**	**-0.012**	**[-2.96]**	0.062	[1.31]	0.006	[0.74]	**0.082**	**[3.08]**	**0.062**	**[2.60]**
Ireland	-0.051	[-0.67]	-0.022	[-0.63]	0.066	[0.24]	-0.144	[-1.48]	-0.051	[-0.48]	**1.355**	**[5.80]**
Italy	**-0.072**	**[-5.64]**	0.000	[-0.05]	**-0.166**	**[-4.19]**	0.015	[0.66]	-0.029	[-0.49]	0.181	[1.64]
Luxembourg	**-0.442**	**[-4.34]**	0.030	[0.86]	**-3.050**	**[-4.13]**	-0.095	[-1.83]	-0.064	[-0.45]	-0.190	[-0.58]
Malta	-0.075	[-1.22]	0.009	[0.47]	**-0.765**	**[-2.88]**	-0.030	[-0.75]	**-0.346**	**[-3.18]**	-0.175	[-1.10]
Netherlands	**-0.210**	**[-3.00]**	-0.045	[-1.25]	0.341	[0.62]	-0.055	[-0.51]	-0.064	[-0.67]	**0.927**	**[3.56]**
Portugal	-0.072	[-1.69]	-0.053	[-1.56]	**-0.289**	**[-2.55]**	**-0.084**	**[-4.15]**	0.050	[0.74]	-0.023	[-0.16]
Spain	**-0.113**	**[-2.13]**	**-0.044**	**[-2.92]**	**-0.292**	**[-2.01]**	0.076	[1.52]	0.045	[1.22]	-0.340	[-1.85]
Sweden	**-0.488**	**[-5.69]**	**-0.079**	**[-2.06]**	-0.420	[-1.04]	**-0.245**	**[-2.38]**	0.105	[0.60]	0.010	[0.06]
United Kingdom	**-0.225**	**[-3.65]**	-0.018	[-0.33]	0.128	[0.35]	**0.133**	**[2.70]**	-0.036	[-0.24]	**0.355**	**[2.43]**

Eastern EU countries

The changes in the dynamics of the variables (C)

Countries	ΔRCO		$\Delta RCCI$		ΔRBP		ΔHPI		ΔIDS		ΔURP	
	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.	C	*t*-stat.
Bulgaria	0.003	[0.46]	0.004	[1.27]	0.010	[0.65]	0.015	[1.25]	0.006	[0.36]	0.000	[0.08]
Croatia	0.000	[-0.01]	0.003	[0.48]	0.004	[0.28]	0.008	[1.17]	0.009	[0.71]	0.017	[0.29]
Czech Rep.	0.002	[0.35]	**0.003**	**[2.96]**	0.006	[0.52]	0.006	[1.82]	0.000	[0.01]	0.006	[0.59]
Estonia	0.002	[0.77]	0.000	[0.14]	-0.010	[-0.24]	0.003	[0.17]	0.002	[0.20]	**0.018**	**[2.14]**
Hungary	0.005	[0.74]	**0.006**	**[2.41]**	0.003	[0.18]	0.003	[0.56]	-0.005	[-0.95]	0.010	[0.84]
Latvia	0.000	[-0.02]	0.006	[1.43]	0.016	[0.47]	0.014	[1.30]	0.023	[1.60]	-0.001	[-0.09]
Lithuania	-0.008	[-0.64]	0.003	[1.00]	0.014	[0.65]	0.019	[1.70]	**0.023**	**[2.60]**	-0.018	[-0.76]
Poland	-0.006	[-0.64]	0.000	[0.27]	0.008	[0.38]	0.010	[1.27]	0.003	[0.24]	-0.002	[-0.23]
Romania	-0.006	[-0.36]	0.004	[0.86]	0.012	[0.81]	-0.027	[-1.37]	0.020	[0.85]	0.004	[0.39]
Slovakia	-0.013	[-1.37]	**0.005**	**[3.58]**	0.004	[0.16]	**0.015**	**[2.08]**	0.007	[0.77]	0.005	[0.45]
Slovenia	-0.003	[-0.30]	**0.008**	**[2.14]**	-0.004	[-0.22]	0.005	[0.84]	0.006	[0.44]	0.000	[-0.03]

The coefficient equilibrium (Π)

	ΔRCO		$\Delta RCCI$		ΔRBP		ΔHPI		ΔIDS		ΔURP	
	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.	Π	*t*-stat.
Bulgaria	0.007	[0.65]	**0.019**	**[3.98]**	**0.089**	**[3.59]**	0.003	[0.14]	-0.021	[-0.85]	0.001	[0.17]
Croatia	-0.014	[-1.01]	0.037	[1.77]	0.065	[1.36]	-0.032	[-1.43]	-0.062	[-1.57]	**0.570**	**[3.20]**
Czechia	-0.159	[-1.11]	0.021	[0.80]	**0.385**	**[2.14]**	0.025	[0.52]	**-0.230**	**[-2.39]**	**0.516**	**[3.37]**
Estonia	**-0.105**	**[-5.08]**	0.021	[1.35]	0.116	[0.38]	-0.164	[-1.32]	0.032	[0.42]	0.083	[1.33]
Hungary	**-0.069**	**[-4.11]**	0.009	[1.40]	**-0.160**	**[-4.23]**	-0.016	[-1.30]	0.010	[0.75]	**-0.064**	**[-2.36]**
Latvia	-0.009	[-1.00]	**-0.010**	**[-2.20]**	-0.052	[-1.38]	0.019	[1.59]	0.009	[0.56]	-0.021	[-1.17]
Lithuania	-0.013	[-0.36]	0.004	[0.59]	**0.140**	**[2.45]**	**-0.115**	**[-3.90]**	0.002	[0.09]	-0.041	[-0.63]
Poland	**-0.310**	**[-3.24]**	**0.034**	**[2.08]**	0.076	[0.36]	0.125	[1.54]	-0.128	[-1.13]	0.061	[0.61]
Romania	**-0.124**	**[-3.79]**	0.005	[0.56]	-0.028	[-0.93]	-0.056	[-1.40]	0.007	[0.15]	**0.056**	**[2.85]**
Slovakia	-0.052	[-1.21]	**0.021**	**[3.17]**	**0.248**	**[2.32]**	**0.075**	**[2.21]**	0.005	[0.11]	-0.041	[-0.87]
Slovenia	**-0.300**	**[-4.05]**	-0.039	[-1.58]	**0.346**	**[2.97]**	-0.079	[-1.88]	-0.076	[-0.93]	0.097	[0.99]

Notes: The table shows the average changes in the dynamics of the variables (C) and coefficient equilibrium (Π) for residential construction output ($RCCO$), residential construction costs ($RCCI$), building permits (RBP), real housing prices (HPI), institutional development (IDS) and urban population (URP) on the. All variables are logged with the exception of institutional development (IDS) and urban growth (URP). The estimated coefficient is significant if the absolute value of the corresponding *t*-statistic is greater than 2.00.

The negative results of the error correction term (Π) for the construction output show the long-run trends of construction activities towards the equilibrium state in all EU countries, except Belgium, Bulgaria and Cyprus. The construction costs and housing prices equilibriums adjustments are visible only in Denmark, Greece, Spain, Sweden, France, Portugal and Latvia.

The positive and significant signs of the Π parameter, observable for the construction and housing prices in Austria, Bulgaria, Poland, Slovakia and the United Kingdom, denote the prices of construction and housing will be unable to achieve the equilibrium level. If the changes of the building permits dynamics are mostly insignificant, the coefficients equilibrium of the ΔRBP are significant and negative in Italy, Luxembourg, Malta, Portugal, Spain and Hungary, denoting the equilibrium adjustment of the land availability, and significant and positive in Belgium, Cyprus, Finland, France, Germany, Bulgaria, Czech Republic, Lithuania, Slovakia and Slovenia, suggesting the inability of the land supply to achieve an equilibrium level. The tendency of the institutional development in the context of the construction environment towards the equilibrium level is observed only in Malta and the Czechia, while the urban population is able to adjust the construction equilibrium only in Denmark, Finland and Hungary.

Also, the short-run coefficients (β_{ni}) estimated by the VECM are reported in the Appendix E. Most coefficients of the variables are insignificant, indicating that the residential construction dynamics was not determined by the contemporary changes of the construction industry, housing market, institutional development and urbanization. However, there are some direct causalities on short-term between housing prices changes in countries where after the financial crisis from 2008, residential markets have quickly rebounded and house prices have continued rising. This means that the lag prices increase the current dynamics of prices with 0.33% in Belgium, 0.50% in Denmark, 0.65% in Finland, 0.62% in Great Britain, 0.60% in Czechia and 0.33% in Latvia. Also, in some of the EU countries, the previous residential construction changes influence negatively the current housing supply of Belgium (-0.41%), Denmark (-0.25%), Luxembourg (-0.28%), Malta (-0.41%), Hungary (-0.29%) and Romania (-0.59%). These evidences are sustained also by the significant and negative short-run coefficients of the residential building permits, which indicate the current decreasing of the residential construction activities under the influence of the previous dynamics of building permits in Austria (-0.49%), Cyprus (-0.39%), France (-0.31%), Italy (-0.41%), Malta (-0.31%), Sweden (-0.41%), Czechia (-0.28%), Estonia (-0.30%), Poland (-0.42%), Romania (-0.40%). These facts explain the current situation of the most EU countries, especially Western, which are facing with a large-scale structural housing shortage in urban areas associated to the growing urban population, reinforced by recent waves of migration. In other EU countries, like Ireland, Bulgaria, Estonia and Latvia, the lag of construction output changes determine the increasing current level of the residential construction with 0.31-0.84%, while in Belgium and Portugal, the short-run dynamics of residential building permits stimulate with about 0.30% the current authorization of residential constructions.

The estimated coefficients highlight the heterogeneity of the construction industry and residential markets in EU countries. However, the results show some differences between Eastern and Western countries that are mostly determined by the regional socio-economic conditions.

According to Eurostat data compared to Western markets, the housing markets from Eastern countries are more active, where after the crisis has passed, the construction industry has started to grow by 14-30%. In most of the Eastern countries, the estimated results validate the housing supply theory (DiPasquale and Wheaton, 1992), according to which the growth of residential construction costs affects the output of construction industry, while the increasing of built area reduces the land availability that on long term contributes to the decreasing of construction volume. Unlike the Eastern countries, on the Western markets, the reduced availability of land for new constructions, particularly in the big cities, together with the growing urban population has generated in the last years an acute crisis of the affordable housing for the population with low and medium incomes[2]. Between the two groups of states, the biggest differences exist in explaining the new housing supply depending on the institutional development. In the Western markets, the supply reacts to the efficiency of the institutional changes, unlike the ones from the East, where the effect is largely insignificant. This fact is due to the maturity and high transparency of the real estate domain in the Western countries,

[2] See Housing Inequality in Europe. Tackling Inequalities in Europe: The Role of Social Investment, Paris (retrieved from https://coebank.org/media/documents/Part_3-Inequality-Housing.pdf).

where the regulation (land regulation, administrative rules, housing policy measures) are more robust[3].

Conclusions

This research investigates the equilibrium types related to the construction environment and institutional development across EU countries, using a VECM approach during the period 1995 - 2018. The research proposed an innovative way to identify the long-term equilibrium of the new housing supply, quantified through residential construction output, in relation to construction costs, building permits, housing prices, institutional development and urban population growth. All these dimensions represent the system of residential real estate.

The estimated results are very heterogeneous among EU regions, suggesting the local nature of the housing construction activity that reflects the socio-economic factors of each country. The estimations confirm that the equilibrium of residential construction is largely determined by the construction markets, housing markets, institutional efficiency and urbanization, validating the presumptions of urban theory. However, only in Belgium and Spain, the output of the residential construction industry is determined by all dimensions of the residential real estate system. In most Eastern countries, rising construction costs lead to a decrease in the volume of residential construction, unlike to Western countries where the effect is often opposite, which can be explained by the high demand for housing compared to the existing supply of living spaces. Also, in Western countries, housing construction is very sensitive to the reduced availability of land for construction. These empirical facts underline the housing shortage prevalent in the major European cities under the influence of urban population growth.

The effect of institutional development on the residential construction output is quite heterogeneous, because while in most Western countries (Austria, Cyprus, France, Germany, Greece, Portugal and Spain), the improvement of the institutional factor is reflected in the diminution of the new housing supply, meaning, in fact, the efficiency of the residential construction works, from the Eastern countries, the significant negative influence is visible only in Poland. These pieces of evidence are also validated by the significant influence of rising house prices, which in long-term reduce the construction of new homes in most Western countries, and in Eastern ones, on the contrary they boost the activity of real estate developers. Following the financial crisis of 2007 - 2008, the EU increased the protection measures against the risks of the real estate markets, demanding more transparency and efficiency from the tangential real estate institutions. The effect of EU regulations is more visible in the countries with mature and transparent real estate markets like Western. Thus, the improvement of

[3] See *Global Real Transparency Index 2018. Transparency: Data, Disclosure and Disruption* (retrieved from http://www.jll.com/greti/Documents/greti-revamp/JLL Transparency Report 2018 FINAL.pdf)

the institutional structures reduces the information asymmetry, transaction and search costs on the housing market, and accelerate the efficiency of the construction activity.

Housing is a key sector in the real economy and represents a major part of household wealth, which is why policymakers and supervisors should pay close attention to its evolution. Also, the reaction of the residential construction output is important to understand the housing price movements and market equilibrium in order to assure financial stability. The crucial need for affordable housing in many European states in a period of increased demand requires urgent action from the authorities that should reconsider the land-use zones that allow the building of new homes. For this reason, the approach used in this study could be applied in the analysis of long-term equilibrium relationships in European cities, in order to highlight the vulnerabilities of local markets in relation to national need.

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Appendix A. Descriptive statistics

EU countries	Residential construction output ($RCCO$)			Residential construction costs ($RCCI$)			Residential building permits (RBP)			Real housing prices (HPI)			Institutional development (IDS)			Urban population growth (annual %) (URP)		
	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD
Austria	88	92.32	14.08	96	83.51	14.57	55	108.05	19.36	95	96.69	6.69	96	0.78	0.15	92	0.18	0.59
Belgium	72	102.18	3.18	75	91.90	7.44	95	96.25	15.54	95	82.05	18.24	96	0.51	0.22	92	0.57	0.28
Bulgaria	72	90.84	35.38	64	108.96	4.77	76	173.13	125.21	95	106.39	39.70	96	-1.35	0.20	92	-0.33	0.41
Croatia	72	83.75	20.58	75	19.29	2.28	76	105.10	41.57	95	100.96	16.85	96	-1.31	0.38	92	-0.04	1.02
Cyprus	71	93.24	28.17	84	98.08	13.94	76	75.70	37.28	67	89.09	20.30	96	0.06	0.39	92	1.42	0.59
Czechia	72	97.68	11.30	76	5.46	0.52	76	107.26	23.63	79	90.40	23.59	96	-0.38	0.18	92	0.04	0.33
Denmark	72	109.08	7.68	96	9.23	1.67	84	120.25	42.43	95	95.47	22.05	96	1.25	0.28	92	0.59	0.16
Estonia	68	139.69	38.94	83	147.34	12.37	84	168.08	114.51	87	134.42	58.84	96	0.19	0.29	92	-0.57	0.61
Finland	91	83.87	22.30	96	78.12	9.90	95	88.48	17.82	95	84.50	14.40	96	1.19	0.28	92	0.59	0.21
France	92	95.92	7.14	95	82.88	11.26	96	95.73	18.43	95	85.02	23.04	96	0.34	0.20	92	0.84	0.17
Germany	92	111.22	15.66	76	93.66	10.18	96	153.90	42.39	95	108.82	10.85	96	0.86	0.14	92	0.27	0.46
Greece	71	166.64	112.80	76	107.52	5.92	71	132.74	110.44	95	87.24	17.22	96	-0.79	0.32	92	0.49	0.37
Hungary	72	110.74	20.54	75	0.59	0.06	84	177.80	81.84	83	111.06	21.82	96	-0.43	0.19	92	0.12	0.38
Ireland	71	219.77	111.24	75	86.46	10.88	76	234.47	159.65	95	107.55	33.80	96	0.78	0.21	92	1.61	0.63
Italy	92	89.79	16.10	96	92.42	12.48	74	123.98	65.62	95	93.58	15.82	96	-0.55	0.38	92	0.48	0.39
Latvia	72	173.71	55.37	76	150.76	22.45	76	180.50	135.49	75	143.47	61.51	96	-0.84	0.37	92	-1.19	0.32
Lithuania	80	157.53	56.02	84	172.26	19.34	80	110.99	51.13	80	119.86	58.60	96	-0.69	0.41	92	-1.09	0.38
Luxembourg	72	97.69	3.64	74	83.87	7.33	75	108.14	28.14	95	88.69	23.55	96	0.92	0.25	92	2.11	0.45
Malta	72	92.40	25.47	75	132.52	7.08	75	143.23	59.42	95	96.30	18.38	96	-0.30	0.53	92	1.11	0.58
etherlands	72	103.51	8.02	76	90.02	7.43	96	113.84	33.32	95	93.97	19.38	96	0.99	0.22	92	1.49	0.36
Poland	72	104.80	19.78	75	40.46	1.66	76	92.03	26.09	72	95.18	27.97	96	-0.60	0.39	92	-0.16	0.24
Portugal	72	117.25	48.78	76	120.98	10.85	76	169.04	124.64	95	99.28	6.48	96	0.03	0.08	92	1.21	0.50
Romania	72	102.01	28.76	75	45.54	7.69	76	106.13	40.72	39	83.87	15.47	96	-1.49	0.33	92	-0.65	0.45
Slovakia	72	85.75	16.39	95	130.62	24.65	64	107.31	26.84	64	103.90	23.79	96	-0.87	0.20	92	-0.15	0.16
Slovenia	72	82.03	34.82	84	115.29	13.28	84	94.10	35.82	94	97.33	17.21	96	-0.33	0.34	92	0.47	0.34
Spain	72	125.49	34.64	96	96.86	15.00	95	277.07	175.65	95	91.56	25.91	96	-0.05	0.21	92	0.95	0.73
Sweden	92	86.99	17.56	96	7.71	1.41	76	108.16	39.64	95	75.94	20.81	96	1.06	0.26	92	0.77	0.50
UK	88	99.26	10.77	94	95.22	20.93	83	161.52	40.65	95	87.03	25.20	96	1.01	0.12	92	0.83	0.31

Notes: The database is constructed using quarterly time series over the period 1995-2018. The variables $RCCO, RCCI, RBP$ and HPI are expressed as index with the reference base in the 2015 year. The variable of institutions (IDS) represents the first principal component extracted from indices of business freedom, investment freedom, financial freedom, government integrity and property rights. The criterion Bénzécri was applied to determine the number of principal components. The IDS variable is uniformly explained by the input variables in a positive direction, about 40-50% of the variation of each variable.
Source: own representation based on Eurostat, World Bank and Heritage Foundation databases

Appendix B. Country-level unit root tests (augmented Dickey-Fuller tests)

	$RCCO$		$RCCI$		RBP		HPI		IDS		URP	
	levels	1st diff.	levels	1st diff.	levels	1st diff.	levels	1st diff.	levels	1st diff.	levels	1st diff.
Austria	0.18	0.00	0.83	0.00	0.05	0.00	0.06	0.00	0.30	0.00	0.44	0.02
Belgium	0.30	0.00	0.87	0.00	0.00	0.00	0.47	0.09	0.01	0.01	0.33	0.00
Bulgaria	0.13	0.05	0.17	0.01	0.07	0.02	0.87	0.00	0.66	0.00	0.11	0.00
Croatia	0.55	0.00	0.22	0.00	0.61	0.00	0.70	0.00	0.01	0.00	0.07	0.00
Cyprus	0.88	0.00	0.39	0.00	0.72	0.00	0.25	0.00	0.66	0.00	0.57	0.06
Czechia	0.22	0.00	0.82	0.00	0.29	0.00	0.78	0.00	0.25	0.05	0.75	0.00
Denmark	0.33	0.01	0.86	0.00	0.27	0.00	0.68	0.00	0.00	0.00	0.85	0.00
Estonia	0.05	0.01	0.21	0.10	0.10	0.00	0.40	0.00	0.47	0.00	0.20	0.00
Finland	0.83	0.00	0.73	0.00	0.10	0.00	0.12	0.00	0.00	0.00	0.51	0.00
France	0.75	0.00	0.62	0.00	0.23	0.00	0.72	0.00	0.18	0.00	0.13	0.02
Germany	0.07	0.00	0.90	0.00	0.27	0.00	0.19	0.00	0.26	0.00	0.04	0.00
Greece	0.86	0.00	0.46	0.03	0.73	0.00	0.61	0.00	0.44	0.00	0.28	0.03
Hungary	0.46	0.00	0.98	0.02	0.57	0.00	0.21	0.00	0.97	0.00	0.59	0.00
Ireland	0.66	0.01	0.15	0.00	0.73	0.00	0.85	0.00	0.02	0.00	0.17	0.03
Italy	0.89	0.00	0.92	0.00	0.84	0.04	0.69	0.00	0.05	0.00	0.40	0.00
Latvia	0.07	0.00	0.86	0.02	0.46	0.00	0.41	0.00	0.90	0.00	0.35	0.00
Lithuania	0.17	0.00	0.36	0.00	0.22	0.00	0.88	0.00	0.27	0.00	0.31	0.00
Luxembourg	0.00	0.00	0.65	0.00	0.00	0.00	0.97	0.00	0.00	0.00	0.72	0.00
Malta	0.97	0.00	0.12	0.00	0.05	0.00	0.78	0.01	0.34	0.00	0.49	0.01
Netherlands	0.12	0.02	0.87	0.00	0.15	0.00	0.61	0.00	0.00	0.00	0.47	0.01
Poland	0.56	0.00	0.25	0.00	0.73	0.01	0.67	0.00	0.49	0.00	0.03	0.00
Portugal	0.93	0.00	0.88	0.00	0.26	0.03	0.67	0.03	0.02	0.00	0.93	0.01
Romania	0.39	0.00	0.72	0.09	0.40	0.00	0.79	0.00	0.73	0.00	0.08	0.00
Slovakia	0.45	0.00	0.01	0.00	0.02	0.00	0.65	0.00	0.01	0.00	0.29	0.00
Slovenia	0.70	0.00	0.62	0.00	0.66	0.00	0.82	0.00	0.02	0.00	0.35	0.00
Spain	0.78	0.00	0.81	0.00	0.72	0.00	0.88	0.00	0.58	0.00	0.28	0.02
Sweden	0.93	0.00	0.68	0.00	0.68	0.00	0.69	0.00	0.50	0.00	0.97	0.00
United Kingdom	0.60	0.00	0.25	0.00	0.46	0.00	0.64	0.00	0.13	0.00	0.48	0.04

Notes: Lag length selection based on SIC criteria. The probability reported is the one associated with the null hypothesis that the time series has a unit root.

Appendix C. Results of the country-specific tests for cointegration based on Johansen procedure

Number of cointegration eqn(s)	None	One	Two	Three	Number of cointegrating eqn(s) (n) at the 0.05 level
Austria					
Trace statistic	246.748	156.460	86.749	49.801	4
p-value	0.000	0.000	0.000	0.000	
Belgium					
Trace statistic	273.997	164.435	108.230	63.329	6
p-value	0.000	0.000	0.000	0.000	
Cyprus					
Trace statistic	858.658	385.816	195.378	89.572	6
p-value	0.000	0.000	0.000	0.000	
Denmark					
Trace statistic	335.941	217.874	135.520	74.399	5
p-value	0.000	0.000	0.000	0.000	
Finland					
Trace statistic	248.279	148.711	72.504	39.517	4
p-value	0.000	0.000	0.000	0.003	
France					
Trace statistic	357.304	171.237	113.186	65.388	6
p-value	0.000	0.000	0.000	0.000	
Germany					
Trace statistic	420.480	248.086	109.423	61.815	5
p-value	0.000	0.000	0.000	0.000	
Greece					
Trace statistic	420.888	245.760	124.403	67.119	6
p-value	0.000	0.000	0.000	0.000	
Ireland					
Trace statistic	400.635	228.598	140.077	78.817	6
p-value	0.000	0.000	0.000	0.000	
Italy					
Trace statistic	397.504	232.199	106.198	61.861	5
p-value	0.000	0.000	0.000	0.000	
Luxembourg					
Trace statistic	270.924	160.826	66.003	34.029	4
p-value	0.000	0.000	0.000	0.015	
Malta					
Trace statistic	360.046	167.302	102.894	50.745	5
p-value	0.000	0.000	0.000	0.000	
Netherlands					
Trace statistic	359.268	187.412	102.050	34.343	4
p-value	0.000	0.000	0.000	0.014	
Portugal					
Trace statistic	364.268	228.022	129.560	71.018	6
p-value	0.000	0.000	0.000	0.000	
Spain					
Trace statistic	417.134	206.480	114.652	62.685	6
p-value	0.000	0.000	0.000	0.000	

Number of cointegration eqn(s)	None	One	Two	Three	Number of cointegrating eqn(s) (n) at the 0.05 level
Sweden					
Trace statistic	306.394	184.315	117.207	58.293	5
p-value	0.000	0.000	0.000	0.000	
United Kingdom					
Trace statistic	221.565	146.393	79.337	41.651	5
p-value	0.000	0.000	0.000	0.001	
Bulgaria					
Trace statistic	255.736	170.859	98.090	52.348	5
p-value	0.000	0.000	0.000	0.000	
Croatia					
Trace statistic	311.598	189.494	113.111	48.420	4
p-value	0.000	0.000	0.000	0.000	
Czechia					
Trace statistic	323.347	174.049	82.830	42.590	5
p-value	0.000	0.000	0.000	0.001	
Estonia					
Trace statistic	397.068	238.038	136.114	63.351	6
p-value	0.000	0.000	0.000	0.000	
Hungary					
Trace statistic	182.511	106.669	68.481	35.568	4
p-value	0.000	0.000	0.000	0.010	
Latvia					
Trace statistic	0.000	0.000	0.000	0.000	5
p-value	408.886	240.351	150.311	77.664	
Lithuania					
Trace statistic	369.904	157.606	93.778	45.568	6
p-value	0.000	0.000	0.000	0.000	
Poland					
Trace statistic	374.368	209.758	102.698	37.425	4
p-value	0.000	0.000	0.000	0.006	
Romania					
Trace statistic	385.860	242.117	122.494	54.145	6
p-value	0.000	0.000	0.000	0.000	
Slovakia					
Trace statistic	190.370	133.519	93.325	54.738	5
p-value	0.000	0.000	0.000	0.000	
Slovenia					
Trace statistic	295.833	176.526	99.114	55.268	5
p-value	0.000	0.000	0.000	0.000	

Notes: The null hypothesis of the Johansen trace statistics is that $rank(\Pi) = r_0$ and the alternative hypothesis is that $r_0 < rank(\Pi) \leq n$, where n indicates the maximum number of possible cointegrating vectors (see Equation 1).

Appendix D. VECM robustness tests

Models for countries	Autocorrelation tests		Normality test	Heteroskedasticity test
	Portmanteau Tests[a]	LM Tests[b]	Jarque-Bera[c]	White test[d]
	Q-stat.	LM-stat.	Chi-sq.	Chi-sq.
Austria	19.760	14.307	885.844*	686.388
Belgium	21.691	19.650	710.112*	651.454
Bulgaria	15.553	17.732	5358.893*	711.676
Croatia	20.739	18.740	1307.884*	780.515
Cyprus	36.140	35.595	2164.148*	644.998
Czechia	40.624	42.022	154.886*	672.320
Denmark	19.182	17.691	4637.956*	680.369
Estonia	31.387	23.422	3025.660*	675.713
Finland	49.759	49.412	948.129*	677.248
France	54.989	41.621	3030.505*	696.979
Germany	33.451	24.644	4582.126*	736.379
Greece	49.230	47.874	368.234*	730.075
Hungary	28.886	19.213	952.749*	680.267
Ireland	34.049	26.238	2153.410*	654.283
Italy	20.688	18.745	6010.943*	684.155
Latvia	30.340	25.713	4050.373*	699.316
Lithuania	26.510	16.527	2811.499*	697.023
Luxembourg	46.099	38.431	703.644*	592.150
Malta	28.651	31.151	381.660*	638.114
Netherlands	29.174	23.233	5219.986*	655.461
Poland	21.478	21.470	2953.336*	766.560
Portugal	36.585	30.593	125.948*	711.322
Romania	40.498	23.741	144.922*	613.520
Slovakia	24.450	26.365	1234.285*	700.079
Slovenia	37.801	41.932	2476.534*	632.419
Spain	40.816	37.642	4657.530*	800.424
Sweden	23.069	18.847	7364.251*	668.816
UK	43.512	33.3694	909.309*	667.770

Notes: [a] Null hypothesis: *No residual autocorrelations up to lag h.* The test is valid only for lags larger than 1, specified by the VAR estimation. Given the large volume of data, the table shows only the Q-statistic for the 2 lags, but note that for most of the countries, the test indicates the lack of autocorrelation for more than 2 lags.

[b] Null hypothesis: *No serial correlation for 1 lag.*

[c] Null hypothesis: *Residuals are multivariate normal.* Orthogonalization method – Cholesky method (Lutkenpohl). * indicates the p-value < 0.05.

[d] Null hypothesis: *No heteroskedasticity.* The test includes cross terms.

The test statistics do not reject the null hypothesis for autocorrelation and heteroskedasticity tests, but reject the null of normality test.

Appendix E. Short-run coefficients

Western EU countries

Short-run coefficient, optimal lag = 1

Dependent variables	Austria						Belgium					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	-0.142	-0.029	-0.245	0.286	0.000	-0.497	**-0.406**	0.047	-0.406	**0.167**	-0.140	-1.070
	[-0.7254]	[-0.37298]	[-0.32518]	[0.89477]	[0.00026]	[-0.47685]	**[-3.12325]**	[0.68009]	[-0.65376]	**[2.07465]**	[-0.42649]	[-1.49547]
$\Delta RCCI_{(-1)}$	-0.069	0.308	-1.392	0.057	**1.257**	-0.798	0.047	-0.035	1.114	0.003	-0.625	0.819
	[-0.1708]	[1.89915]	[-0.88788]	[0.08602]	**[2.05292]**	[-0.36785]	[0.19234]	[-0.27376]	[0.95855]	[0.01708]	[-1.01894]	[0.61102]
$\Delta RBP_{(-1)}$	-0.009	-0.011	**-0.493**	-0.067	-0.061	0.158	0.040	0.004	**0.285**	-0.004	0.017	0.187
	[-0.2466]	[-0.70989]	**[-3.41281]**	[-1.08777]	[-1.07773]	[0.79038]	[1.37000]	[0.27163]	**[2.02125]**	[-0.22327]	[0.22695]	[1.15144]
$\Delta HPI_{(-1)}$	-0.031	-0.033	0.396	0.003	-0.067	-0.058	0.267	0.180	0.351	**0.326**	0.356	1.927
	[-0.30997]	[-0.81105]	[1.01952]	[0.01724]	[-0.44462]	[-0.10849]	[1.39168]	[1.77347]	[0.38300]	**[2.74541]**	[0.73700]	[1.82293]
$\Delta IDS_{(-1)}$	0.077	0.024	0.161	-0.019	-0.013	-0.011	0.013	0.015	0.034	0.045	-0.008	-0.200
	[0.80121]	[0.61681]	[0.43110]	[-0.12033]	[-0.09046]	[-0.02081]	[0.25031]	[0.55092]	[0.14077]	[1.41277]	[-0.06346]	[-0.71155]
$\Delta URP_{(-1)}$	0.014	-0.013	-0.128	0.017	-0.026	0.038	-0.006	-0.002	0.111	0.000	0.025	-0.010
	[0.35310]	[-0.87433]	[-0.85844]	[0.27542]	[-0.44627]	[0.18368]	[-0.23784]	[-0.14605]	[0.98120]	[-0.01927]	[0.41861]	[-0.07711]

Dependent variables	Cyprus						Denmark					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	0.127	0.044	0.480	0.237	-0.246	0.103	**-0.251**	-0.002	-0.130	0.015	-0.207	0.199
	[0.96451]	[1.36154]	[1.94627]	[1.57186]	[-1.87314]	[0.86920]	**[-2.33761]**	[-0.04012]	[-0.15227]	[0.10993]	[-0.95121]	[0.88393]
$\Delta RCCI_{(-1)}$	0.422	0.139	1.414	0.074	0.676	0.079	0.329	0.006	-1.422	-0.176	-0.056	-0.340
	[0.68517]	[0.91627]	[1.22039]	[0.10446]	[1.09319]	[0.14209]	[1.09587]	[0.04381]	[-0.59407]	[-0.44851]	[-0.09245]	[-0.54034]
$\Delta RBP_{(-1)}$	0.076	0.021	**-0.389**	0.021	-0.047	0.056	-0.011	-0.011	-0.077	0.008	**-0.071**	-0.042
	[1.17551]	[1.31538]	**[-3.18196]**	[0.28745]	[-0.72444]	[0.96368]	[-0.64134]	[-1.44943]	[-0.58716]	[0.39441]	**[-2.11905]**	[-1.21313]
$\Delta HPI_{(-1)}$	0.119	-0.013	0.402	-0.033	0.139	0.127	-0.094	0.046	**1.894**	**0.501**	0.027	-0.105
	[0.82074]	[-0.37724]	[1.47674]	[-0.19913]	[0.95708]	[0.97583]	[-0.97125]	[1.09456]	**[2.46616]**	**[3.96999]**	[0.13937]	[-0.52049]
$\Delta IDS_{(-1)}$	0.098	-0.004	0.320	-0.006	0.090	-0.007	-0.061	0.019	0.314	-0.048	-0.015	0.042
	[0.70847]	[-0.10949]	[1.23104]	[-0.04036]	[0.65168]	[-0.05749]	[-0.92504]	[0.66765]	[0.59810]	[-0.55336]	[-0.11583]	[0.30229]
$\Delta URP_{(-1)}$	0.072	-0.026	-0.295	0.138	-0.240	-0.147	**0.141**	0.035	0.095	0.019	0.117	-0.008
	[0.43564]	[-0.62694]	[-0.95064]	[0.72553]	[-1.45005]	[-0.98414]	**[2.13076]**	[1.18667]	[0.17912]	[0.21812]	[0.86963]	[-0.05923]

Dependent variables	Finland						France					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	0.063	0.054	0.093	-0.023	-0.018	0.118	-0.102	0.059	0.793	0.119	0.402	0.131
	[0.61366]	[1.35952]	[0.30616]	[-0.54019]	[-0.03950]	[0.44435]	[-1.02141]	[0.79723]	[1.16961]	[1.19905]	[0.89258]	[0.53208]
$\Delta RCCI_{(-1)}$	0.254	0.167	-1.001	-0.193	-1.541	-0.882	0.256	0.068	0.941	0.030	0.110	-0.134
	[0.79056]	[1.33448]	[-1.04911]	[-1.42060]	[-1.08705]	[-1.06000]	[1.58669]	[0.57061]	[0.86033]	[0.18576]	[0.15158]	[-0.33682]
$\Delta RBP_{(-1)}$	0.058	-0.007	0.161	**0.031**	-0.014	-0.022	-0.020	0.016	**-0.305**	-0.002	-0.040	**0.099**
	[1.75955]	[-0.52971]	[1.63556]	**[2.22962]**	[-0.09569]	[-0.25940]	[-1.16701]	[1.23190]	**[-2.61466]**	[-0.12157]	[-0.52149]	**[2.34210]**
$\Delta HPI_{(-1)}$	**0.508**	**0.211**	**2.102**	**0.652**	-0.202	0.729	0.128	0.033	-0.124	-0.057	-0.069	-0.244

	[2.40340]	**[2.56037]**	**[3.34543]**	**[7.28299]**	[-0.21648]	[1.33053]	[0.95443]	[0.33791]	[-0.13687]	[-0.42834]	[-0.11357]	[-0.73909]
$\Delta IDS_{(-1)}$	-0.005	0.002	0.144	0.018	-0.017	0.009	-0.008	-0.009	-0.025	-0.016	-0.030	0.002
	[-0.1933]	[0.20853]	[1.84740]	[1.61820]	[-0.14604]	[0.13897]	[-0.28201]	[-0.45791]	[-0.13343]	[-0.58647]	[-0.24121]	[0.02532]
$\Delta URP_{(-1)}$	0.062	0.004	**0.263**	0.010	0.003	-0.067	-0.003	-0.015	-0.293	-0.051	-0.127	0.061
	[1.40996]	[0.22454]	**[2.02904]**	[0.52407]	[0.01406]	[-0.59296]	[-0.06177]	[-0.37443]	[-0.81077]	[-0.96966]	[-0.52733]	[0.46699]

Dependent variables	Germany						Greece					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	-0.190	0.027	0.015	0.138	0.098	1.748	-0.235	0.031	-0.162	0.028	**-0.308**	-0.158
	[-1.5879]	[0.63659]	[0.03759]	[1.56157]	[0.48448]	[1.33106]	[-1.65066]	[1.35950]	[-0.60515]	[0.61940]	**[-2.05054]**	[-1.18160]
$\Delta RCCI_{(-1)}$	-0.064	0.173	-3.779	0.188	-0.067	0.009	-1.423	0.084	-0.838	-0.002	-1.365	-1.155
	[-0.1709]	[1.30081]	[-2.96850]	[0.68391]	[-0.10625]	[0.00212]	[-1.58147]	[0.58271]	[-0.49515]	[-0.00816]	[-1.43789]	[-1.36559]
$\Delta RBP_{(-1)}$	-0.059	0.017	0.061	0.030	0.050	0.213	0.053	0.003	-0.206	0.036	-0.025	0.039
	[-1.6822]	[1.34036]	[0.51324]	[1.17433]	[0.84125]	[0.55385]	[0.75253]	[0.28347]	[-1.54944]	[1.60856]	[-0.33269]	[0.58469]
$\Delta HPI_{(-1)}$	-0.054	-0.003	-0.032	-0.059	-0.117	0.255	0.860	-0.066	0.874	-0.085	0.266	0.528
	[-0.3114]	[-0.04925]	[-0.05343]	[-0.46035]	[-0.39504]	[0.13322]	[1.86414]	[-0.89061]	[1.00742]	[-0.58476]	[0.54598]	[1.21625]
$\Delta IDS_{(-1)}$	-0.113	-0.023	0.156	0.023	0.016	0.579	0.053	-0.007	-0.391	-0.067	0.008	0.023
	[-1.0342]	[-0.58679]	[0.41946]	[0.28283]	[0.08819]	[0.48321]	[0.38853]	[-0.29692]	[-1.51980]	[-1.54393]	[0.05663]	[0.17944]
$\Delta URP_{(-1)}$	-0.002	-0.001	0.043	0.006	0.006	0.055	-0.097	0.022	0.353	0.057	-0.202	-0.202
	[-0.1662]	[-0.20893]	[1.03782]	[0.65973]	[0.28159]	[0.41698]	[-0.60008]	[0.85284]	[1.15886]	[1.11929]	[-1.18111]	[-1.32906]

Dependent variables	Ireland						Italy					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	**0.614**	-0.033	0.381	**0.314**	-0.036	0.161	-0.130	**0.126**	0.417	-0.016	-0.171	1.152
	[5.11531]	[-0.59598]	[0.86364]	**[2.01663]**	[-0.20880]	[0.43232]	[-1.09604]	**[2.70587]**	[1.14346]	[-0.07660]	[-0.30983]	[1.13790]
$\Delta RCCI_{(-1)}$	0.371	0.540	0.493	0.238	0.043	-0.154	0.272	0.151	0.165	-0.342	0.057	0.582
	[1.75751]	[5.50801]	[0.63425]	[0.86956]	[0.14274]	[-0.23567]	[0.84271]	[1.18897]	[0.16556]	[-0.61310]	[0.03778]	[0.21058]
$\Delta RBP_{(-1)}$	0.027	**-0.037**	-0.006	0.051	-0.018	0.037	-0.069	-0.013	-0.405	0.094	0.039	0.325
	[0.72212]	**[-2.13305]**	[-0.04005]	[1.04845]	[-0.32919]	[0.31598]	[-1.77500]	[-0.87711]	[-3.39315]	[1.40972]	[0.21275]	[0.98111]
$\Delta HPI_{(-1)}$	0.207	0.083	0.496	0.083	-0.026	0.356	-0.023	-0.019	-0.437	-0.012	-0.305	1.140
	[1.84737]	[1.58386]	[1.20254]	[0.56828]	[-0.16250]	[1.02327]	[-0.22170]	[-0.46539]	[-1.37258]	[-0.06937]	[-0.63153]	[1.29007]
$\Delta IDS_{(-1)}$	0.129	0.053	0.562	0.081	-0.028	0.232	0.009	-0.008	0.077	-0.029	-0.004	-0.026
	[1.26154]	[1.12645]	[1.49704]	[0.61538]	[-0.19017]	[0.73141]	[0.30154]	[-0.74802]	[0.86518]	[-0.57809]	[-0.03209]	[-0.10661]
$\Delta URP_{(-1)}$	0.045	**0.050**	0.111	-0.017	-0.006	**0.273**	0.012	0.008	0.021	0.008	0.042	-0.113
	[1.09943]	**[2.64696]**	[0.73760]	[-0.31179]	[-0.09910]	**[2.14780]**	[0.59496]	[1.03046]	[0.34310]	[0.22183]	[0.45935]	[-0.67201]

Dependent variables	Luxembourg						Malta					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	**-0.280**	0.012	1.421	0.008	-0.014	-0.183	**-0.411**	-0.002	1.136	0.001	0.233	0.123
	[-2.6985]	[0.33519]	[1.88847]	[0.15167]	[-0.0999]	[-0.5435]	**[-3.4724]**	[-0.0558]	[2.21157]	[0.01346]	[1.11125]	[0.40214]
$\Delta RCCI_{(-1)}$	-0.224	-0.017	1.099	0.069	-0.037	0.532	-0.090	-0.075	-1.095	-0.239	-0.551	0.092
	[-0.6015]	[-0.1330]	[0.40643]	[0.36149]	[-0.0711]	[0.44041]	[-0.2068]	[-0.5654]	[-0.5808]	[-0.8515]	[-0.7146]	[0.08187]
$\Delta RBP_{(-1)}$	**0.050**	-0.003	-0.243	**0.023**	0.012	0.025	-0.013	-0.010	**-0.303**	0.028	-0.047	0.016
	[2.95207]	[-0.4614]	[-1.9699]	**[2.64014]**	[0.52710]	[0.46375]	[-0.4947]	[-1.1677]	**[-2.5940]**	[1.62487]	[-0.9820]	[0.22938]
$\Delta HPI_{(-1)}$	0.030	0.124	-4.374	0.194	0.227	-0.669	-0.184	0.066	-0.316	-0.130	-0.355	-0.467

	[0.10987]	[1.34346]	[-2.2419]	[1.41802]	[0.61013]	[-0.7686]	[-0.8543]	[0.99018]	[-0.3380]	[-0.9308]	[-0.9265]	[-0.8350]
$\Delta IDS_{(-1)}$	-0.037	-0.012	0.118	-0.001	0.015	0.059	0.000	0.000	-0.072	0.065	0.060	-0.005
	[-0.3812]	[-0.3517]	[0.16531]	[-0.0179]	[0.11259]	[0.18576]	[0.00498]	[-0.0222]	[-0.2447]	[1.47386]	[0.49922]	[-0.0290]
$\Delta URP_{(-1)}$	0.035	0.009	-0.139	0.005	0.020	-0.011	-0.040	-0.002	-0.005	-0.033	-0.107	-0.042
	[0.84976]	[0.60067]	[-0.4615]	[0.24654]	[0.35591]	[-0.0840]	[-0.7793]	[-0.1557]	[-0.0208]	[-0.9960]	[-1.1727]	[-0.3166]

Dependent variables	Netherlands						Portugal					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	0.192	0.063	0.623	0.064	-0.215	**1.004**	0.169	-0.035	0.186	-0.018	0.061	0.022
	[1.58345]	[1.01335]	[0.65737]	[0.33867]	[-1.2977]	**[2.22484]**	[1.36464]	[-0.3526]	[0.56022]	[-0.3061]	[0.31162]	[0.05347]
$\Delta RCCI_{(-1)}$	0.206	0.174	0.752	0.055	-0.067	0.244	-0.190	0.039	-0.474	0.144	-0.042	0.322
	[0.79504]	[1.30950]	[0.37133]	[0.13819]	[-0.1882]	[0.25307]	[-1.1186]	[0.2875]	[-1.0439]	[1.76558]	[-0.1565]	[0.55874]
$\Delta RBP_{(-1)}$	-0.028	-0.009	-0.209	-0.048	0.004	-0.052	0.096	0.010	**0.307**	-0.029	0.022	0.175
	[-1.4459]	[-0.9373]	[-1.3719]	[-1.5978]	[0.15305]	[-0.7198]	[1.85307]	[0.2515]	**[2.22311]**	[-1.1592]	[0.27026]	[0.99771]
$\Delta HPI_{(-1)}$	**0.166**	0.009	0.706	-0.013	0.008	0.155	0.028	**-0.401**	-0.017	0.178	0.096	1.321
	[2.01793]	[0.20699]	[1.09376]	[-0.1050]	[0.07487]	[0.50335]	[0.11358]	**[-2.0674]**	[-0.0267]	[1.53017]	[0.24847]	[1.60677]
$\Delta IDS_{(-1)}$	-0.116	0.026	-0.470	0.003	0.040	-0.520	-0.084	0.010	-0.590	-0.050	0.036	0.024
	[-1.1557]	[0.50765]	[-0.6009]	[0.01971]	[0.29307]	[-1.3971]	[-0.9221]	[0.1405]	[-2.4241]	[-1.1514]	[0.24543]	[0.07737]
$\Delta URP_{(-1)}$	0.054	0.023	-0.028	0.039	0.012	-0.182	-0.002	-0.044	0.097	0.038	0.003	-0.210
	[1.51887]	[1.26719]	[-0.1013]	[0.70490]	[0.25437]	[-1.3658]	[-0.0462]	[-1.4885]	[0.98589]	[2.13950]	[0.04556]	[-1.6771]

Dependent variables	Spain						Sweden					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	0.063	0.011	0.435	**0.265**	0.090	0.674	-0.143	-0.012	-0.125	-0.103	0.065	0.273
	[0.51007]	[0.32207]	[1.28362]	**[2.26508]**	[1.04953]	[1.56743]	[-1.3248]	[-0.2419]	[-0.2476]	[-0.7970]	[0.29609]	[1.37709]
$\Delta RCCI_{(-1)}$	-0.246	0.030	-1.242	-0.202	0.057	0.574	0.328	0.234	0.161	0.425	0.121	-0.372
	[-0.5766]	[0.2508]	[-1.0682]	[-0.5039]	[0.19477]	[0.38961]	[1.14595]	[1.8193]	[0.11990]	[1.23816]	[0.20598]	[-0.7072]
$\Delta RBP_{(-1)}$	-0.015	-0.001	-0.041	-0.021	-0.025	0.028	-0.052	-0.005	**-0.410**	-0.016	0.088	0.062
	[-0.2942]	[-0.0919]	[-0.3018]	[-0.4458]	[-0.7194]	[0.16157]	[-1.6729]	[-0.3696]	**[-2.8348]**	[-0.4430]	[1.39355]	[1.09537]
$\Delta HPI_{(-1)}$	0.019	-0.051	-0.698	0.158	0.110	0.238	-0.087	-0.035	0.518	-0.027	0.113	0.079
	[0.13588]	[-1.2620]	[-1.7850]	[1.16908]	[1.11298]	[0.48088]	[-0.7801]	[-0.6878]	[0.98546]	[-0.2015]	[0.49216]	[0.38501]
$\Delta IDS_{(-1)}$	-0.134	-0.031	-0.292	-0.065	-0.026	-0.486	-0.016	0.014	-0.358	-0.033	-0.034	-0.044
	[-0.67329]	[-0.5443]	[-0.5389]	[-0.3455]	[-0.1926]	[-0.7075]	[-0.2470]	[0.4664]	[-1.1703]	[-0.4198]	[-0.2567]	[-0.3699]
$\Delta URP_{(-1)}$	0.042	0.002	0.193	0.044	-0.001	0.072	-0.093	0.045	0.223	0.035	0.034	-0.172
	[1.04417]	[0.17504]	[1.77451]	[1.18079]	[-0.0193]	[0.52508]	[-1.1825]	[1.2889]	[0.60605]	[0.36776]	[0.21209]	[-1.1893]

Dependent variables	United Kingdom					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	0.021	-0.085	-0.838	0.103	0.332	0.452
	[0.20465]	[-0.9612]	[-1.3943]	[1.27862]	[1.35501]	[1.89290]
$\Delta RCCI_{(-1)}$	0.165	0.089	-1.626	-0.007	0.230	-0.433
	[1.10015]	[0.67728]	[-1.8178]	[-0.0560]	[0.62967]	[-1.2175]
$\Delta RBP_{(-1)}$	0.023	**-0.036**	-0.148	0.023	0.061	-0.017
	[1.16920]	**[-2.1060]**	[-1.2762]	[1.51688]	[1.28840]	[-0.3649]
$\Delta HPI_{(-1)}$	**0.407**	**0.259**	**1.719**	**0.623**	-0.286	0.136
	[3.81198]	**[2.76628]**	**[2.69668]**	**[7.30818]**	[-1.1007]	[0.53782]

$\Delta IDS_{(-1)}$	-0.065	-0.036	-0.466	-0.019	0.019	-0.188
	[-1.15335]	[-0.7396]	[-1.3917]	[-0.4219]	[0.13895]	[-1.4084]
$\Delta URP_{(-1)}$	-0.022	0.015	-0.233	0.017	-0.014	-0.165
	[-0.42050]	[0.31986]	[-0.7367]	[0.39197]	[-0.1079]	[-1.3130]

Note: t-statistics in [ ]. The estimated coefficient is significant if the absolute value of the corresponding t-statistic is greater than 2.00.

Eastern EU countries

Short-run coefficient, optimal lag = 1

Dependent variables	Bulgaria						Croatia					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	**0.308**	0.013	0.378	0.131	0.022	-0.009	**0.392**	0.334	0.479	0.219	-0.017	0.024
	[2.41259]	[0.22568]	[1.21976]	[0.56896]	[0.07314]	[-0.17550]	**[3.38156]**	[1.90468]	[1.19581]	[1.18826]	[-0.05145]	[0.01585]
$\Delta RCCI_{(-1)}$	-0.503	0.041	1.249	0.205	0.135	0.028	0.108	-0.013	0.470	-0.098	-0.258	1.827
	[-1.51658]	[0.27035]	[1.54815]	[0.34222]	[0.16860]	[0.19912]	[1.23812]	[-0.09873]	[1.55552]	[-0.70344]	[-1.04148]	[1.62910]
$\Delta RBP_{(-1)}$	**0.170**	-0.026	-0.017	0.159	0.045	-0.002	**0.080**	-0.046	-0.195	-0.117	0.050	-0.294
	[3.21084]	[-1.08099]	[-0.13464]	[1.66723]	[0.35622]	[-0.10501]	**[2.16286]**	[-0.82745]	[-1.52537]	[-1.99299]	[0.47417]	[-0.62006]
$\Delta HPI_{(-1)}$	0.042	-0.066	0.107	0.055	0.009	0.002	-0.017	-0.179	-0.380	-0.153	0.134	-1.135
	[0.48584]	[-1.68640]	[0.51507]	[0.35563]	[0.04371]	[0.04216]	[-0.21932]	[-1.50275]	[-1.39046]	[-1.22040]	[0.59957]	[-1.12001]
$\Delta IDS_{(-1)}$	0.028	0.000	-0.166	-0.076	0.001	0.001	0.034	0.008	-0.092	-0.097	-0.040	0.227
	[0.43203]	[-0.01607]	[-1.03903]	[-0.64351]	[0.00633]	[0.04985]	[0.64284]	[0.10069]	[-0.50503]	[-1.16213]	[-0.26525]	[0.33651]
$\Delta URP_{(-1)}$	-0.067	-0.021	**-2.264**	-0.329	0.071	0.005	0.008	0.010	0.035	-0.009	-0.018	0.134
	[-0.17587]	[-0.12178]	**[-2.44655]**	[-0.47992]	[0.07763]	[0.02844]	[0.70171]	[0.59641]	[0.88634]	[-0.49665]	[-0.56341]	[0.92512]

Dependent variables	Czechia						Estonia					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	-0.159	0.021	-0.169	0.051	0.225	-0.082	**0.835**	**0.100**	1.597	0.331	0.089	-0.164
	[-1.11176]	[0.79509]	[-0.60201]	[0.67776]	[1.50830]	[-0.34620]	**[15.1578]**	**[2.47270]**	[1.96990]	[1.00067]	[0.43838]	[-0.99370]
$\Delta RCCI_{(-1)}$	-0.107	**0.233**	-0.881	-0.269	0.274	-0.756	0.132	0.038	-1.881	0.716	**1.474**	0.699
	[-0.17511]	**[2.06268]**	[-0.73764]	[-0.83878]	[0.42969]	[-0.74469]	[0.78664]	[0.30970]	[-0.76227]	[0.71072]	**[2.37601]**	[1.38792]
$\Delta RBP_{(-1)}$	**0.133**	0.010	**-0.276**	0.016	0.037	0.202	**-0.027**	0.009	**-0.298**	0.032	-0.027	-0.009
	[2.09915]	[0.88480]	**[-2.23007]**	[0.46830]	[0.55944]	[1.92515]	**[-3.02892]**	[1.37028]	**[-2.28782]**	[0.60542]	[-0.82346]	[-0.33646]
$\Delta HPI_{(-1)}$	0.241	-0.052	0.355	**0.603**	-0.090	**0.714**	0.029	0.021	0.440	0.065	0.004	0.016
	[1.17890]	[-1.36895]	[0.88856]	**[5.62554]**	[-0.42092]	**[2.10137]**	[1.28937]	[1.29278]	[1.34870]	[0.48449]	[0.04576]	[0.24372]
$\Delta IDS_{(-1)}$	-0.105	0.008	0.188	-0.014	-0.071	0.273	0.005	0.016	-0.512	0.076	0.009	0.006
	[-0.82241]	[0.34865]	[0.75063]	[-0.21550]	[-0.53320]	[1.27897]	[0.13178]	[0.53578]	[-0.83912]	[0.30667]	[0.05948]	[0.04475]
$\Delta URP_{(-1)}$	-0.090	**0.035**	-0.030	0.026	-0.035	-0.121	-0.041	-0.006	0.932	-0.019	0.018	-0.110
	[-1.22176]	**[2.55491]**	[-0.20803]	[0.66056]	[-0.46029]	[-0.98747]	[-0.77452]	[-0.15420]	[1.20673]	[-0.06169]	[0.09200]	[-0.69498]

Dependent variables	Hungary						Latvia					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	**-0.287**	-0.008	-0.192	0.006	-0.094	-0.014	**0.350**	0.011	0.428	0.264	0.147	0.257
	[-2.40001]	[-0.17604]	[-0.71053]	[0.06265]	[-1.01795]	[-0.07261]	**[3.35989]**	[0.20528]	[1.00465]	[1.97078]	[0.83795]	[1.28444]
$\Delta RCCI_{(-1)}$	0.129	**-0.588**	-0.476	0.229	-0.347	-0.218	0.370	-0.166	0.818	0.122	0.291	0.631
	[0.39394]	**[-4.87565]**	[-0.64292]	[0.92294]	[-1.37981]	[-0.41166]	[1.46940]	[-1.30506]	[0.79550]	[0.37710]	[0.68623]	[1.30637]
$\Delta RBP_{(-1)}$	-0.030	-0.001	-0.090	0.044	-0.003	0.005	0.048	0.003	-0.182	0.009	0.005	-0.085
	[-0.59026]	[-0.05528]	[-0.76986]	[1.13277]	[-0.07469]	[0.05627]	[1.55920]	[0.22456]	[-1.44720]	[0.23450]	[0.09992]	[-1.43876]
$\Delta HPI_{(-1)}$	-0.283	0.089	**-1.045**	-0.135	0.149	-0.110	0.107	-0.003	-0.203	**0.334**	-0.151	0.108
	[-1.35671]	[1.15592]	**[-2.21530]**	[-0.85720]	[0.92652]	[-0.32566]	[1.05979]	[-0.05516]	[-0.49072]	**[2.56757]**	[-0.88426]	[0.55740]
$\Delta IDS_{(-1)}$	-0.208	0.138	-0.833	-0.083	0.120	0.141	-0.082	0.016	-0.331	-0.043	-0.035	-0.014
	[-1.05230]	[1.89501]	[-1.86353]	[-0.55337]	[0.78721]	[0.44085]	[-1.05819]	[0.40986]	[-1.03848]	[-0.43171]	[-0.26352]	[-0.09197]
$\Delta URP_{(-1)}$	0.089	-0.014	0.065	0.095	0.014	-0.002	**0.182**	0.002	0.260	0.084	0.051	-0.043
	[1.11967]	[-0.48605]	[0.35850]	[1.57933]	[0.23071]	[-0.01845]	**[2.62045]**	[0.06311]	[0.91441]	[0.94198]	[0.43463]	[-0.32212]

Dependent variables	Lithuania						Poland					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	-0.006	**0.069**	0.007	**0.297**	0.101	-0.196	-0.093	0.033	-0.155	0.046	0.165	-0.070
	[-0.04129]	**[2.36818]**	[0.02937]	**[2.39990]**	[0.99393]	[-0.72816]	[-0.77892]	[1.61766]	[-0.57837]	[0.45069]	[1.15665]	[-0.55097]
$\Delta RCCI_{(-1)}$	1.016	-0.026	1.347	0.070	-0.416	1.005	**1.706**	0.194	-0.324	0.015	-0.284	0.267
	[1.63972]	[-0.21075]	[1.31680]	[0.13091]	[-0.95853]	[0.87105]	**[2.47910]**	[1.64886]	[-0.21143]	[0.02579]	[-0.34633]	[0.36796]
$\Delta RBP_{(-1)}$	0.069	0.027	-0.119	-0.020	0.045	0.053	0.097	0.005	**-0.423**	0.012	-0.061	-0.003
	[0.90762]	[1.79301]	[-0.94798]	[-0.31373]	[0.85709]	[0.37697]	[1.80623]	[0.50449]	**[-3.54759]**	[0.26135]	[-0.95827]	[-0.05121]
$\Delta HPI_{(-1)}$	0.214	0.001	0.263	0.034	-0.027	0.254	**0.410**	0.007	0.442	0.220	-0.081	-0.003
	[1.57074]	[0.02036]	[1.16818]	[0.28732]	[-0.28174]	[1.00234]	**[2.78346]**	[0.28663]	[1.34677]	[1.76614]	[-0.46385]	[-0.02041]
$\Delta IDS_{(-1)}$	0.194	0.037	-0.369	-0.024	-0.116	0.160	**-0.288**	-0.001	0.017	-0.027	-0.046	0.019
	[1.07728]	[1.01565]	[-1.24127]	[-0.15412]	[-0.91660]	[0.47827]	**[-2.55631]**	[-0.07711]	[0.06761]	[-0.28664]	[-0.34244]	[0.15833]
$\Delta URP_{(-1)}$	-0.064	0.004	-0.048	-0.121	-0.026	0.004	0.029	-0.001	-0.133	-0.040	0.004	-0.002
	[-0.83563]	[0.25305]	[-0.37910]	[-1.83624]	[-0.48574]	[0.02540]	[0.44135]	[-0.10890]	[-0.91558]	[-0.73150]	[0.04802]	[-0.02366]

Dependent variables	Romania						Slovakia					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	**-0.590**	-0.073	0.142	0.057	0.092	0.134	-0.015	0.007	-0.250	0.021	0.005	0.240
	[-3.17579]	[-1.52462]	[0.83533]	[0.25360]	[0.34641]	[1.20344]	[-0.10657]	[0.32642]	[-0.73684]	[0.19752]	[0.03332]	[1.59325]
$\Delta RCCI_{(-1)}$	1.451	0.273	0.121	-0.811	0.133	-0.880	2.236	0.002	-1.627	-0.956	-0.133	0.252
	[1.69140]	[1.23270]	[0.15401]	[-0.77932]	[0.10845]	[-1.71420]	-0.97072	-0.15026	-2.39034	-0.76013	-0.97232	-1.06083
$\Delta RBP_{(-1)}$	-0.122	-0.019	**-0.399**	-0.157	0.246	0.100	0.020	0.012	-0.065	0.026	0.043	-0.059
	[-0.70525]	[-0.43017]	**[-2.51971]**	[-0.74678]	[0.99092]	[0.96391]	[0.46278]	[1.81268]	[-0.60009]	[0.74263]	[0.96456]	[-1.21713]

$\Delta HPI_{(-1)}$	**0.298**	**0.092**	0.180	**-0.793**	-0.187	**-0.174**	0.243	-0.029	**1.320**	0.145	0.017	0.117
	[2.10451]	**[2.52431]**	[1.38697]	**[-4.60906]**	[-0.92146]	**[-2.04983]**	[1.20412]	[-0.93246]	**[2.65896]**	[0.91918]	[0.08318]	[0.53145]
$\Delta IDS_{(-1)}$	-0.054	-0.016	-0.107	0.245	0.047	-0.003	-0.164	0.026	-0.417	0.202	-0.029	-0.106
	[-0.36562]	[-0.43167]	[-0.79508]	[1.37526]	[0.22409]	[-0.03183]	[-1.04193]	[1.08406]	[-1.07497]	[1.63274]	[-0.18580]	[-0.61807]
$\Delta URP_{(-1)}$	0.370	-0.012	-0.015	-0.079	0.000	-0.114	0.126	-0.003	-0.150	-0.067	-0.038	0.063
	[1.17865]	[-0.14291]	[-0.05243]	[-0.20657]	[0.00050]	[-0.60929]	[0.79777]	[-0.13938]	[-0.38724]	[-0.54579]	[-0.24278]	[0.36692]

Dependent variables	Slovenia					
	ΔRCO	$\Delta RCCI$	ΔRBP	ΔHPI	ΔIDS	ΔURP
$\Delta RCO_{(-1)}$	0.074	0.038	0.036	-0.052	0.160	-0.220
	[0.62798]	[0.98513]	[0.19707]	[-0.77994]	[1.23758]	[-1.40219]
$\Delta RCCI_{(-1)}$	0.005	**-0.439**	-0.939	0.237	0.103	0.155
	[0.01277]	**[-3.46087]**	[-1.56318]	[1.09558]	[0.24562]	[0.30385]
$\Delta RBP_{(-1)}$	**-0.273**	-0.042	-0.138	0.003	-0.003	**0.369**
	[-3.05508]	[-1.42742]	[-0.98124]	[0.05203]	[-0.03292]	**[3.09855]**
$\Delta HPI_{(-1)}$	-0.088	-0.096	**0.799**	-0.120	-0.170	0.176
	[-0.37693]	[-1.24052]	**[2.18123]**	[-0.91230]	[-0.66410]	[0.56540]
$\Delta IDS_{(-1)}$	**-0.307**	-0.046	0.061	-0.018	-0.041	0.143
	[-2.55038]	[-1.14191]	[0.32088]	[-0.26846]	[-0.30553]	[0.89074]
$\Delta URP_{(-1)}$	0.076	-0.062	0.227	0.022	0.017	0.142
	[0.72859]	[-1.78204]	[1.39184]	[0.37898]	[0.14579]	[1.02235]

Note: t-statistics in [ ]. The estimated coefficient is significant if the absolute value of the corresponding t-statistic is greater than 2.00.