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Araştırma Makalesi

DO HOUSE PRICES IN TURKEY FOLLOW EURO AREA TRENDS?: REGIME SWITCHING APPROACH*

TÜRKİYE'DE KONUT FİYATLARI EURO ALANI TRENDLERİNİ İZLİYOR MU?: REJİM DEĞİŞİM YAKLAŞIMI

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Abstract

The purpose of this study is to make a comparative analysis on the house price trends of Turkey and Euro Area over the 2003-2016 period. Since the economic interactions between these regions have a substantial volume, any shocks or booms in a region might affect the other one. Within this scope, the study attempts to investigate the house price trends in these economies by applying separated Regime Switching Models. The findings firstly show that the low regime in Turkey corresponds to the 2008-2012 period while in the Euro Area it corresponds to the 2006-2013 period. Secondly, the impacts of the potential factors vary across regions. For Turkey, the interest rate has a negative significant impact on house prices during both regimes, while unemployment rate has a negative significant impact only in the high regime. For the Euro Area, both interest rate and unemployment rate have a statistically significant, negative impact on house prices. As for income level, it is observed that for both regimes in Turkey and the Euro Area, income level has a positive impact on house prices. The breakpoints suggest that the prior impacts of the global recession around 2008 firstly appear in Euro Area but firstly ends in Turkey.

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JEL Codes: H30, C34, O52

Öz

Bu çalışmanın amacı, 2003-2016 dönemi için Türkiye ve Euro Alanı'nın konut fiyat trendleri üzerine karşılaştırmalı bir analiz yapmaktır. Bu bölgeler arasındaki ekonomik etkileşimler kayda değer bir hacme sahip olduğu için bir bölgede meydana gelen herhangi bir şok veya canlanma diğerini de etkileyebilmektedir. Bu çerçevede, çalışma, bu ekonomilerdeki konut fiyat trendlerini ayrışık rejim değişim modelleri uygulayarak araştırmaya çalışmaktadır. Bulgular öncelikle, Euro Alanı'nda düşük rejim 2006-2013 dönemine denk düşerken Türkiye'de 2008-2012 dönemine denk düştüğünü göstermektedir. İkinci olarak, potansiyel faktörlerin etkileri bölgeden bölgeye farklılık göstermektedir. Türkiye için, faiz oranı her iki rejimde de negatif anlamlı bir etkiye sahipken işsizlik oranı sadece yüksek rejimde negatif anlamlı bir etkiye sahiptir. Euro Bölgesi için ise hem faiz hem de işsizlik oranı konut fiyatları üzerinde istatistiki olarak anlamlı, negatif bir etkiye sahiptir. Gelir düzeyi açısından ise, Türkiye ve Euro Alanı'nda her iki rejimde de gelir düzeyinin konut fiyatları üzerinde pozitif bir etkisi olduğu gözlenmektedir. Rejimlerin kırılma noktaları 2008 yılında meydana gelen küresel durgunluğun öncül etkilerinin ilk olarak Euro Alanı'nda ortaya çıktığını ancak ilk olarak Türkiye'de sona erdiğini ortaya koymaktadır.

Anahtar Kelimeler: Konut piyasası, Rejim Değişim Modeli, Türkiye, Euro Alanı

JEL Kodları: H30, C34, O52

1.INTRODUCTION

Since the last few decades, large cyclical fluctuation of house prices has become important in many industrialized countries across the world. The property of housing market cycles is that house prices usually rise rapidly, and then suddenly fall. It was a typical example of what many countries, especially the US, experienced during the recent global financial crisis. In the US, house prices increased by nearly 60% between 2000-2005 period; and sharply decreased by 40% over the next four years. The European countries, particularly Spain, Italy, Greece, Ireland, and Portugal, experienced a similar process of house prices.

House price cycles are crucially important to understand the state of the many countries 'business cycles as housing represent the most important asset for households in developed countries. Moreover, policymakers struggle to achieve some information contained in housing market dynamics to forecast the future path of the economy (Dufrénot & Malik, 2012). It plays a key role to understand the cause of fluctuations in house prices in terms of pursuing both macroeconomic and financial stability in an economy. This is important because house prices, which affect credit markets, are linked to business and financial cycles since the house prices are used to borrow from banks thanks to collateral of the value of their homes.

(Iacoviello, 2005). The banking sector problems that arose in some Euro-zone countries after the financial crisis can be shown as an example.

Following the US, other countries also found themselves in a situation of housing market crash. The large fluctuations in house prices in the Euro Area and Turkey before and after in the recent financial crisis have raised concerns among policymakers and academicians. House prices in the Euro Area steadily increased from early 2005 until mid-2008. House prices in the Euro Area started again in mid-2013 and reached a peak at the beginning of 2016. REIDIN House Price Index reveals that house prices in Turkey went up by 160 % from 2009 to 2016, in addition to over 230% from 2003 to 2006. Except for the decreasing 2008-2009 period due to the global financial crisis, the growth trend of house prices has been experienced an unprecedented success.

The sharp increase in house prices both in the Euro Area and Turkey has been substantially related to housing market fundamentals that consist of housing demand and supply. The increase in income and the improvement in employment conditions, together with the reduction in the mortgage rates are closely associated with house price movements. After some rise and fall during the long-term period of recovery, the house prices in the Eurozone are finally on the rise again in recent months. In a similar manner, house prices in Turkey has increased due to the following reasons: decreasing mortgage rates, increases in housing transactions made by economic agents for financial investment purposes on housing, improving the assets demand as the increase of per capita income, etc.

Most of previous studies related to house markets do not consider the significant structural changes that are caused by the rapid rise and fall in house prices. Instead, it is assumed that there is a stable and constant relationship between house prices and some macroeconomic variables (Nneji, Brooks & Ward, 2013). However, depending on the regime in which the housing cycles are located, the sensitivity of house prices to the variables in the so-called variables may change. For this reason, this paper employs an econometric model designed to evaluate both the Euro Area and Turkey housing market cycles separating the high and low house price regimes. The objective is to determine whether house prices follow similar trends in Turkey and the Eurozone, whether they are affected by fundamental economic variables, and whether the relationship between house prices and macroeconomic variables vary depending on the regime.

One of the main goals of this paper is to measure quantitatively how the fundamental determinants of house prices such as income, interest rates, and employment have played a role in the observed house price dynamics. In addition to this, this paper tries to find out a few policy-relevant questions in this research. First of them, is the house prices in both the Euro Area and Turkey more sensitive to macroeconomic shocks in boom or bust periods? Secondly, what are the macroeconomic variables that have an important effect on house

prices in each regime? In order to answer these questions, the Markov-Switching approach is used to examine a shift in the house prices and to observe the nonlinear characteristics of the housing market and its determinants for both different areas. To our knowledge, this is the first study that employs a Markov switching model in the context of the relationship between the house prices and the macroeconomic variables by taking into account the Eurozone and Turkey.

This paper shows that the nonlinear behavior of house prices of Turkey and the Euro Area has displayed switching properties throughout the last decade, uncovering the existence of low and high house prices regimes. The results obtained from the three models firstly suggest that income level, mortgage interest rate, and unemployment rate have a statistically significant impact on house prices in both Turkey and the Euro Area. So, this also reveals that fluctuations of house prices in both areas are related to economic fundamentals play a major role in explaining house price behavior. Within this framework, the study will employ three Regime Switching Models after presenting a brief literature review, explaining the data and the methodology.

2.LITERATURE REVIEW

In recent years, although many studies have been conducted to model the determinants and drivers of house prices, most of them use linear models to research the relationship between macroeconomic variables and the dynamics of house prices. The literature of existing linear models that employed different econometric methods investigate the effect of variables including income, interest rates, inflation, employment in evaluating how the house prices react to the macroeconomic factors (Englund & Ioannides, 1997; Capozza, Hendershott, Mack & Mayer, 2002; Tsatsaronis & Zhu, 2004**;** Bjørnland & Jacobsen, 2010). Besides, there are also some studies that analyze the relationship between monetary policy and housing market in industrialized countries (Jarocinski & Smets, 2008; Bjørnland & Jacobsen, 2010; Robstad, 2018; Kishor & Marfatia, 2017). On the other hand, some studies reveal that monetary policy shocks in many European countries play an important role on house price in the long run. On the contrary, Vargas-Silva (2008) shows that house prices in the US are negatively related by contractionary monetary policy shock.

Considering the consequence of housing market for macroeconomy in many developed countries, there are some papers that investigate cross-border house prices movements (Hiebert & Roma, 2010; Merikas, Merika, Laopodis & Triantafyllou, 2012; Yunus, 2015). If there is a convergence and co-movement between house prices in different countries and house prices are highly correlated across borders, this would make a common monetary policy feasible. Beltratti and Morana (2010) examine that the house price movements across G-7 countries and find that global shocks account for much of the fluctuations in national house

prices. Demir and Yıldırım (2017) examine whether there is a convergence process of house prices between OECD countries. Their findings suggest that house prices are converging within twenty OECD countries. Vansteenkiste and Hiebert (2011) examine the expectation for house price spillovers in the Eurozone and their results suggest that spillovers result from country-specific house prices shocks in the Euro Area, but they are of a relatively low magnitude. Gupta, Andre and Gil-Alana (2015) investigate house price co-movement for the eight euro area countries. The authors find that co-movement in house prices are stronger within the Eurozone than at the OECD as member states share a common monetary policy that affects income developments and mortgage rates.

The number of studies on the housing market in Turkey is notably growing. Since there is a lack of historical data on house market in Turkey, some of these studies have used variables related to the housing market instead of house prices. Yildirim and Ivrendi (2017) study the relationship between house prices and the rest of selected macroeconomic variables using SVAR models. Their findings point out that house prices and house permits are very sensitive to monetary policy, mortgage rates, and income shocks. They also underline that house market variables have highly crucial function in determining the real sector variables for Turkey through monetary policy transmission mechanism. Coskun, Seven, Ertugrul and Alp (2017) analyze the house prices dynamics using several methods and find that there is a long-term cointegration among house prices and some macroeconomic variables such as housing rent, construction cost, and real mortgage rates. The authors show that house prices have experienced some period of overvaluation, but this is not a bubble. Karakoyun and Yildirim (2017) also indicate that house price increases have not any bubble characteristic in Turkey and real interest rates and other variables affect the house prices in the long run, but this effect does not work in the short term.

Coskun (2016) does a case study analysis and shows the effect of house price variations by considering micro and macro levels. According to his results, housing offers Turkish households an ideal profitable investment opportunity. He also indicates that real earnings of housing might change according to the local market level, due to the increase in the valuation of houses in various duration. Akkas and Sayilgan (2015) examine the causality relation between house prices and mortgage rates for the 2010-2015 period. Their results point the existence of causality which shows the direction from mortgage rates to house prices. They also find a significantly negative impact of mortgage rate shocks on house prices. Akseki, Catik and Gok (2014) consider the effect of macroeconomic variables on housing market activity in Turkey between 1992 and 2012. They operate a two-regime MS-VAR model and reveal that monetary variables such as M1 and interbank rate play an important role in the fluctuation of housing permits. There are also a few studies that point out a substantial link between housing market variables and mortgage rates (Badurlar, 2008; Kargi, 2013; Sari, Ewing & Aydin 2007). In addition to these studies,

Halicioglu (2007), Oztürk and Fitoz (2009),vand Hepsen and Kalfa (2009) show the relationship between housing demand-housing supply and different variables which are related to economic activity.

Recently, especially after the global financial crisis, the empirical literature that considers asymmetric effects have investigated the importance of cyclical patterns in house prices in some countries. These papers aim to take into account house prices that experienced different cycle in a different state as called boom and bust (Muellbauer & Murphy, 1997; Ceron & Suarez, 2006; Agnello & Schuknecht, 2011). Ceron and Suarez (2006) study the experience of 14 developed countries to investigate the changes in the volatility of real house price increase. Their findings show that a cyclical component postulated as a two-regime Markov switching process, which featured high and low volatility phases with parameters common to all the countries. Corradin and Fontana (2013) investigate the house price dynamics for 13 European countries via the Markov-switching model by considering the deviation between house prices and fundamentals emerged the short-run dynamics. They find that the cycles of house prices in Europe are generally existed by three (high, medium, and low) states and growth rates within regimes differ mostly across countries.

3.METHODOLOGY AND DATA

The literature investigates the house prices mostly include studies using linear models. However, as data containing volatilities and breaks, the house price index requires an estimator that considers nonlinearities. Nonlinear dynamics in house prices are first discussed by Genesove and Mayer (2001), Engelhardt (2001) and Seslen (2004). Therefore, in this study, nonlinear models are preferred when the effects of the key economic variables on house prices are examined following Kim and Bhattacharya (2009), Posedel and Vizek (2010). In this study, Markov Regime Switching Model is used as a nonlinear model. Besides, as stated in Fratzscher (2003) and Alvarez-Plata and Schrooten (2006), the use of linear models neglects the fact that shifts in expectations and private sector beliefs may cause movements of the dependent variable. Hence, using the Markov model allows us to include these factors which cannot be observed but influence the house prices. The Markov Regime Switching Model can be written as follows:

$$y_t = \alpha_{S_t} + x_t'\beta_{S_t} + \varepsilon_t \qquad t = 1,....,T \tag{1}$$

$$\varepsilon_t \sim i.i.d.(0,\sigma_{S_t}^2) \qquad \alpha_{S_t} = \alpha_0(1-S_t) + \alpha_1 S_t \tag{2}$$

$$\beta_{S_t} = \beta(1-S_t) + \beta_1 S_t \qquad \sigma_{S_t}^2 = \sigma_0^2(1-S_t) + \sigma_1^2 S_t \tag{3}$$

where y_t denotes dependent variable and x_t represents the matrix of explanatory variables. It is assumed that α, β and σ depend on the unobservable state variable. The Markov models written for the purpose of the study are in the following forms;

$$HPI_t = \alpha_0(S_t^H) + \beta_1(S_t^H)HPI_{t-1} + \beta_2(S_t^H)\,\mathrm{INC}_t + \sigma_1(S_t^H)\varepsilon_t \quad (4)$$

$$HPI_t = \alpha_1(S_t^H) + \beta_3(S_t^H)HPI_{t-1} + \beta_4(S_t^H)\,\mathrm{MOR}_t + \sigma_2(S_t^H)\varepsilon_t \quad (5)$$

$$HPI_t = \alpha_2(S_t^H) + \beta_5(S_t^H)HPI_{t-1} + \beta_6(S_t^H)\,\mathrm{UN}_t + \sigma_3(S_t^H)\varepsilon_t \quad (6)$$

where *HPI* is House Price Index, *INC* is Income, *MOR* is Mortgage Interest Rate, *UN* is Unemployment rate and ε_t is a normal mean zero-constant variance error term that is state dependent variable. These models allow the smoothed adjustment of House Price by including the AR (1) term following Markov Regime Switching Model of Ricci-Risquete (2016). Lagged House Price Index is added into models to avoid both economic and econometric problems. Otherwise, endogeneity problems may be encountered in Markov estimates (Thams, 2007). The long-run coefficients of INC, MOR and UN are calculated as $\beta_2(S_t^H)/[1-\beta_1(S_t^H)]$, $\beta_4(S_t^H)/[1-\beta_3(S_t^H)]$ and $\beta_6(S_t^H)/[1-\beta_5(S_t^H)]$ respectively like in Ricci-Risquete (2016). In this paper, $S_t^H \in \{1,...,\mathrm{N}\}$ indicator denotes House Price Index at time *t*. s_t is a random variable that can only take integer values between $\{1,2,...,N\}$. It is assumed that the probability that s_t is equal to some particular value j depends on the past only through the most recent value s_{t-1}.

$$p_{ij} = P\{s_t = j \mid s_{t-1} = i\} \quad (7)$$

$$P\{s_t = j \mid s_{t-1} = i, s_{t-2} = k, ...\} = P\{s_t = j \mid s_{t-1} = i\} = p_{ij} \quad (8)$$

Such a process $\{p_{ij}\}_{i,j=1,2,...,N}$ represents a Markov chain of N-states. The transition probability p_{ij} represents the likelihood of occurrence of state j after state i. Note that:

$$p_{i1} + p_{i2} + ... + p_{iN} = 1 \quad (9)$$

It is often convenient to show transition probabilities in the $(N \times \mathrm{N})$ matrix P:

$$P = \begin{bmatrix} p_{11} & p_{21} & \cdots & p_{N1} \\ p_{12} & p_{22} & \cdots & p_{N2} \\ \vdots & \vdots & \cdots & \vdots \\ p_{1N} & p_{2N} & \cdots & p_{NN} \end{bmatrix} \quad (10)$$

The row j, column i element of P is the transition probability p_{ij}. Autoregressive processes, in which the autoregressive parameters are variable, are considered as a consequence of a regime shift variable. Here, the regime itself is defined as the end of a Markov chain that cannot be observed (Hamilton, 1994).

As in Abiad (1999), Alvarez-Plata and Schrooten (2006), Lopes and Nunes (2012) and Ricci-Risquete (2016) which use the Markov regime change model in the literature, this study also assumes two different regime periods. The high regime is the regime in which the average and volatility are high, and the house price index is high, while the other regime is the regime in which the house prices index is low. According to this study, Regime 1 shows the low house price period and Regime 2 shows the high house price period.

This paper employs quarterly data covering 2003:1 to 2016:3 sample period. Table 1 shows the descriptive statistics for the following four main variables that are used in this paper: The House Prices Index (HPI), Gross Domestic Product (INC), Mortgage Interest Rates (MOR), and the Unemployment Rate (UN). The last four column report the mean, minimum, maximum and standard deviation for each variable. HPI for Turkey is from REIDIN Real Estate Company, which is the only longest house prices data that can be accessed. HPI for Euro Area, MOR and UN are taken from OECD Economic Database. Both INC data is from Penn World Tables 9.0.

Table 1: Descriptive statistics

Variable	Notation	Source	Mean	Min.	Max.	St. Dev.
Turkey						
House Price Index	HPI	REIDIN	122.579	98.670	157.315	16.082
Gross Domestic Product	INC	Penn World Tables 9.0	1327711	877005.8	1831378	279327.9
Mortgage Interest Rate	MOR	OECD	17.007	8.300	48.990	8.297
Unemployment Rate	UN	OECD	10.007	7.700	14.533	1.412
Euro Area						
House Price Index	HPI	OECD	97.298	87.885	105.218	4.731
Gross Domestic Product	INC	Penn World Tables 9.0	12026937	11092654	12725570	418747.4
Mortgage Interest Rate	MOR	OECD	3.674	1.890	5.460	0.889
Unemployment Rate	UN	OECD	3.018	2.609	4.156	0.377

Note: The descriptive statistics are calculated using the raw data. Min., Max. and St. Dev. denote minimum, maximum and standard deviation, respectively.

4.EMPIRICAL ANALYSIS

The empirical analysis consists of the estimation results of the equation (4), (5) and (6). Even though using additional explanatory variables is not a necessary condition for the Markov Regime Switching Model, we employ three different variables that reflect the conditions of the demand side. To avoid the collinearity issue, for each explanatory variable, separated models are estimated.

The results in Table 2 indicate findings obtained from the Markov Regime Switching Model of the "income" model. There are a number of empirical studies that investigate the relationship

between the housing market and macroeconomic variables such as income, inflation, and population, etc. (Adams & Füss, 2010; Hofmann, 2004; Tsatsaronis & Zhu, 2004; Ciarlone, 2015; Algieri, 2013). As we expect that higher income tends to encourage greater demand for new housing, we include the income in the model when analyzing the house prices.

As it has been stated in the previous section, for all the estimated models in this study, it is assumed that there are only two different regimes; the high (regime 1) and the low (regime 2). Table 2 presents the results in a comparative framework. The findings on Turkey suggest that for both regimes, increases in income level raise house prices in Turkey as expected. The probability that regime 1 is followed by regime 1 is 0.96 and the probability that regime 2 is followed by regime 2 is 0.84. However, the probability that regime 1 is followed by regime 2 is 0.03 and the probability that regime 2 is followed by regime 1 is 0.15. Thus, it is possible to suggest that both regimes in Turkey are persistent but the persistence of the regime 1 is higher than the regime 2. Using these probabilities, the expected duration of the regimes is calculated. According to these calculations, in Turkey, regime 1 approximately goes ahead for 27.2 quarters while regime 2 approximately goes ahead for 6.6 quarters. Similar to Turkey, there is a statistically significant and positive relationship between income level and house prices for both regimes in the Euro Area. The regimes in the Euro Area are also persistent. The probability that regime 1 is followed by regime 1 is 0.95 and the probability that regime 2 is followed by regime 2 is 0.96. Despite the probabilities are quite close, the expected duration of the regimes differ from each other. The findings suggest that in the Euro Area, regime 1 approximately goes ahead 21.7 quarters while regime 2 approximately goes ahead 31.2 quarters and clearly imply that the persistence of the low regime in the Euro Area is stronger than the low regime of Turkey and the high regime of the Euro Area.

Table 2: Markov Regime switching estimation results for Turkey and the Euro Area (Model 1)

Dependent variable: HPI	Turkey		Euro Area	
	R. 1	R. 2	R. 1	R. 2
Cons.	0.0674 *** (0.0208)	-0.2382 ***(0.0526)	0.1810 *** (0.0141)	-0.0957 *** (0.0251)
Lagged HPI	0.9843 *** (0.0252)	0.6094 *** (0.1144)	0.9950 *** (0.0150)	0.9676 *** (0.0233)
INC	0.0815 *** (0.0216)	0.6482 *** (0.1460)	0.0298 ** (0.0123)	0.0655 *** (0.0137)
Log (sigma)	-2.1169 *** (0.1251)	-2.0515 *** (0.3038)	-2.9576 *** (0.1767)	-2.3092 *** (0.1473)
Transition Prob.	P(1 | 1) = 0.9632 P(2 | 1) = 0.1511	P(1 | 2) = 0.0368 P(2 | 2) = 0.8489	P(1 | 1) = 0.9540 P(2 | 1) = 0.0320	P(1 | 2) = 0.0460 P(2 | 2) = 0.9680
Exp. Duration (Q)	27.1935	6.6197	21.7347	31.2191
Log-Likelihood	30.7439		53.3245	
AIC	-0.7683		-1.6760	

SIC	-0.4000	-1.3076
HQC	-0.6262	-1.5339
Linearity Test χ^2	31.20 [0.00]	54.51 [0.00]
Davies p-value	[0.00]	[0.00]
Serial correlation χ^2	10.43 [0.58]	11.09 [0.35]
Normality χ^2	0.30 [0.86]	2.69 [0.26]

Note: The values in parentheses and brackets are standard errors and p-value respectively. ***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively. Q – Quarters.

The linearity test results in Table 2 reject the null hypothesis and confirms the validity of the nonlinear model estimation. Also, the Davies (1987) LR test which estimates the upper bounds probabilities suggests that the regime switching approach is suitable for the models. The serial correlation and normality test results imply that there are neither autocorrelation nor normality problem for any of the models. These diagnostic test results do not differ for any of the three models.

The long-run coefficients calculated from the short-run coefficients of the Markov Regime Switching Model in Table 2 are presented in Table 3. The results imply that for both regimes, income has a positive impact on house prices also in the long-run. For both countries, the magnitude of this impact in regime 1 is bigger than regime 2. This result holds also in the short-run.

Table 3: Decomposing the short – and long-run effects (Model 1)

Dependent variable: HPI	Turkey		Euro area	
	R. 1	R. 2	R. 1	R. 2
Short-run				
L.HPI	0.9843	0.6094	0.9950	0.9676
INC	0.0815	0.6482	0.0298	0.0655
Long-run				
INC	5.1911	1.6595	5.9600	2.0216

The filtered regime probabilities obtained from Model 1 are shown in Figure 1. The graphs show both high and low regimes in Turkey and Euro Area and imply that the high regimes go on except the global recession started around 2008. According to the probabilities, the low regime holds between 2008 and 2010 in Turkey while it starts in 2007 and expands until 2015 in the Euro Area. The findings reveal that the impact of the 2008 global recession on house prices is more explicit in the Euro Area than in Turkey. Moreover, considering the volume of the commercial and financial interactions between these two regions, there might be a spillover mechanism from the Euro Area to Turkey. Also, the residual, actual and fitted values of house prices for these regions are presented in Figure 2.

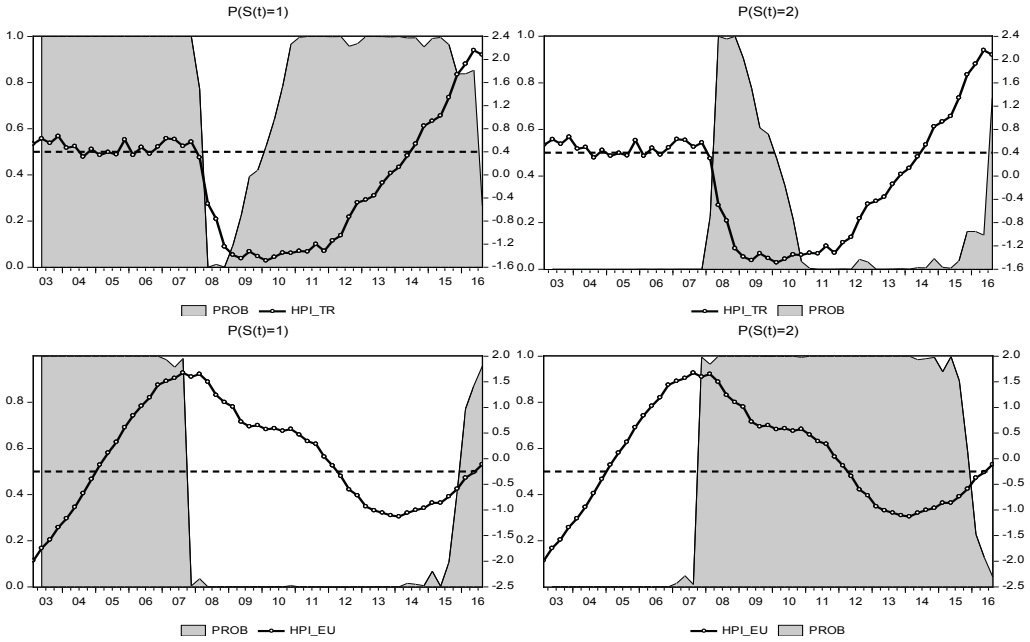

Figure 1: Filtered regime probabilities for Turkey and the Euro Area (Model 1)

Note: TR: Turkey and EU: Euro Area.

The results in Table 4 indicate findings obtained from the Markov Regime Switching Model of the "mortgage interest rate" model (the Model 2). Because the mortgage interest rate plays a key role in the decision of purchasing a house, we included this variable in the model as a determinant of house prices. However, an increase in the mortgage interest rate lowers house prices because it raises the cost of buying a house, reducing demand and, finally, house prices. For instance, Tsatsaronis and Zhu (2004) and Apergis (2003) point out the strong and negative relationship between mortgage interest rate and house price movements.

The findings on Turkey suggest that for both regimes, increases in mortgage interest rate reduce house prices in Turkey as expected and the coefficients are statistically significant. The probability that regime 1 is followed by regime 1 is 0.97 and the probability that regime 2 is followed by regime 2 is 0.91. However, the probability that regime 1 is followed by regime 2 is 0.02 and the probability that regime 2 is followed by regime 1 is 0.08. According to the probability values, it is possible to suggest that both regimes in Turkey are persistent but the persistence of the regime 1 is higher than the regime 2 and when the high regime (regime 1) starts, it approximately goes ahead for 47.2 quarters in Turkey while the low regime (regime 2) approximately goes ahead for 11.3 quarters. Similar to Turkey, there is also a statistically significant and negative relationship between mortgage interest rate and house prices for both regimes in

the Euro Area. The regimes in the Euro Area are also persistent. The probability that regime 1 is followed by regime 2 is 0.97 and the probability that regime 2 is followed by regime 1 is 0.95 and suggest that in the Euro Area when the high regime (regime 1) starts, it approximately goes ahead 12 quarters while the low regime (regime 2) approximately goes ahead 29 quarters. The findings reveal that the low regime in the Euro Area takes much more time.

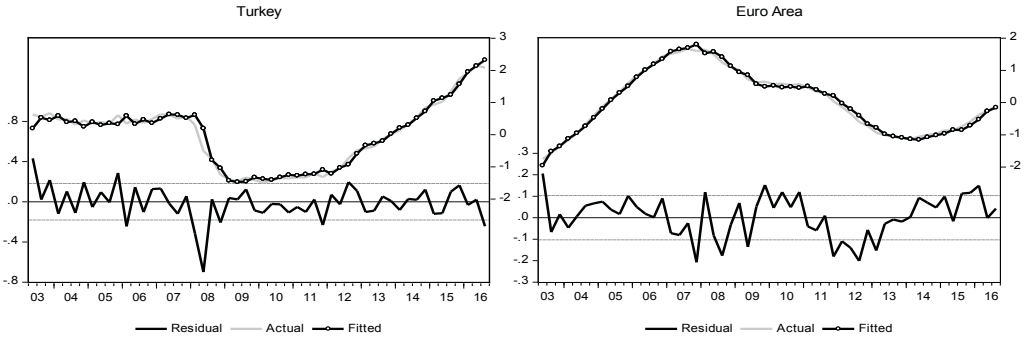

Figure 2: Residual, actual and fitted house price index (Model 1)

Table 4: Markov Regime Switching estimation results for Turkey and the Euro Area (Model 2)

Dependent variable: HPI	Turkey		Euro Area	
	R. 1	R. 2	R. 1	R. 2
Cons.	0.0820 *** (0.0307)	-0.6150 *** (0.0618)	0.2038 *** (0.0151)	-0.0989 *** (0.0269)
Lagged HPI	0.9941 *** (0.0379)	0.6047 *** (0.0619)	0.9142 *** (0.0166)	0.9428 *** (0.0501)
MOR	-0.0593 ** (0.0293)	-0.1292 * (0.0671)	-0.6825 *** (0.1305)	-0.0262 *** (0.0463)
Log (sigma)	-1.8862 *** (0.1235)	-2.5737 *** (0.2216)	0.2284 *** (0.0364)	0.1049 *** (0.0144)
Transition Prob.	P(1 | 1) = 0.9788	P(1 | 2) = 0.0212	P(1 | 1) = 0.9716	P(1 | 2) = 0.0284
	P(2 | 1) = 0.0878	P(2 | 2) = 0.9122	P(2 | 1) = 0.0465	P(2 | 2) = 0.9535
Exp. Duration (Q)	47.2416	11.3954	12.0000	29.0000
Log-Likelihood	23.7215		49.6411	
AIC	-0.6556		-0.9833	
SC	-0.2873		-0.6150	
HQC	-0.5135		-0.8412	
Linearity Test χ^2	22.52 [0.00]		51.78 [0.00]	
Davies p-value	[0.00]		[0.00]	
Serial correlation χ^2	16.73 [0.16]		11.78 [0.46]	
Normality χ^2	1.06 [0.59]		2.05 [0.36]	

Note: The values in parentheses and brackets are standard errors and p-value respectively. ***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively. Q – Quarters.

The long-run coefficients calculated from the short-run coefficients of the Model 2 are presented in Table 5 The results imply that for both regimes, the mortgage interest rate has a negative impact on house prices in the long-run. Similar to the first model, the magnitude of this impact in high regime is bigger than in low regime. However, in the short run, the impact of the mortgage interest rate in the low regime is bigger than the high regime as against to its long-run impact.

Table 5: Decomposing the short – and long-run effects (Model 2)

Dependent variable: HPI	Turkey		Euro area	
	R. 1	R. 2	R. 1	R. 2
Short-run				
L.HPI	0.9941	0.6047	0.9142	0.9428
MOR	-0.0593	-0.1292	-0.6825	-0.0262
Long-run				
MOR	-10.0508	-0.3268	-7.9545	-0.4580

The filtered regime probabilities obtained from Model 2 are shown in Figure 3. Despite minor differences, the patterns of the graphs show similarities with Figure 1. According to the probabilities, the low regime holds between 2008 and 2012 in Turkey while it starts in 2007 and expands until 2014 in the Euro Area. Almost all the findings of the Model 2 confirm the findings obtained from Model 1. Therefore, the interpretations of Figure 1 might be made also for this model. The residual, actual and fitted values of house prices for these regions are presented in Figure 2.

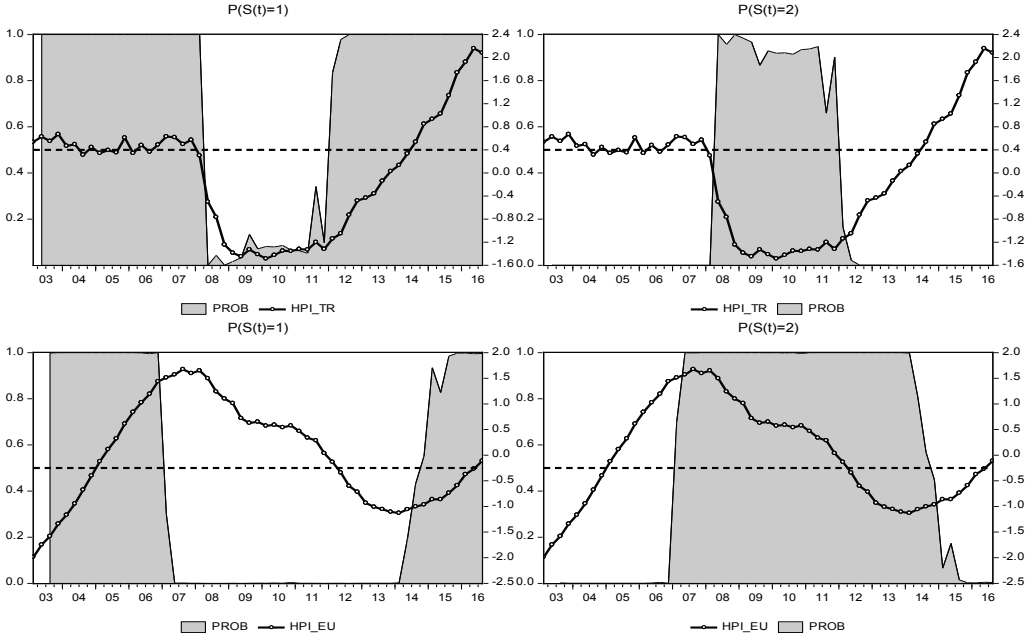

Figure 3: Filtered regime probabilities for Turkey and the Euro Area (Model 2)

Note: TR: Turkey and EU: Euro Area.

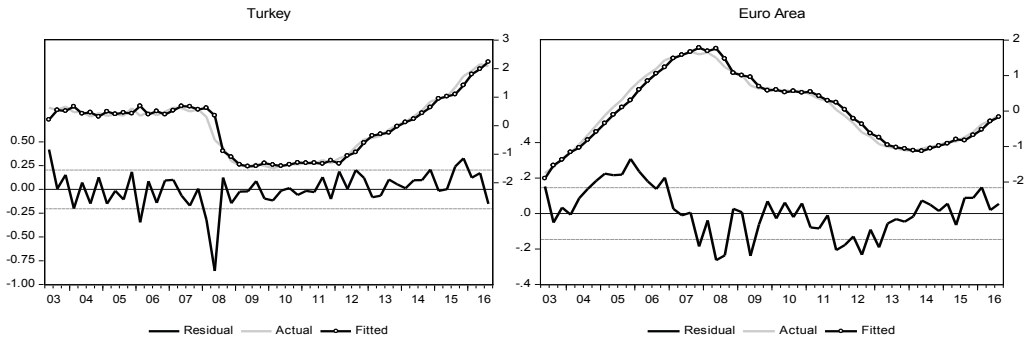

Figure 4: Residual, actual and fitted house price index (Model 2)

Lastly, the Regime Switching Model on house prices is estimated by controlling the unemployment rate which is an important proxy reflecting the behavior of market demand. The conditions in labor markets might have some impact on the housing market. Lower levels of unemployment may raise the housing demand and house prices. Abelson, Joyeux, Milunovich and Chung (2005), Apergis (2003), Barot and Yang (2002) show that unemployment determines house prices.

Expectedly, increases in the unemployment rate negatively affect house prices for both Turkey and the Eurozone and for both regimes. The expected duration of the high regime in Turkey lasts in about 48 quarters while the low regime lasts for about 4.1 quarters. In the Euro Area, when the high regime starts, it goes on about 25.5 quarters and the low regime lasts for about 23.8 quarters. Even though in the Euro Area the diminishing time of the high regime is longer than the low regime, the difference is very little. However, similar to the previous two models, the duration of the low regime is much longer in the Euro Area than in Turkey.

The long-run coefficients calculated from the short-run results of the Model 3 are presented in Table 7. The long-run coefficients imply that the negative impact of the unemployment rate in Turkey is stronger in the low-regime (regime 2) while in the Euro Area the stronger impact is shown in the high-regime (regime 1). These findings suggest that when house prices are low, the magnitude of the negative impact of unemployment is much bigger in Turkey and vice-versa for the Euro Area.

Table 6: Markov Regime Switching estimation results for Turkey and the Euro Area (Model 3)

Dependent variable: HPI	Turkey		Euro Area	
	R. 1	R. 2	R. 1	R. 2
Cons.	0.0667 *** (0.0207)	-0.4546 ***(0.0118)	0.0917 ** (0.0399)	0.0388 * (0.0231)
Lagged HPI	0.8360 *** (0.0243)	0.9744 *** (0.2443)	0.9308 *** (0.0182)	0.6662 *** (0.0368)
UN	-0.6458 *** (0.0758)	-0.4036 ***(0.0707)	-0.1186 ** (0.0473)	-0.2604 *** (0.0359)
Log (sigma)	-1.9498 *** (0.1035)	-1.6432 *** (0.3505)	-2.5386 *** (0.1258)	-2.7025 *** (0.1664)
Transition Prob.	P(1 | 1) = 0.9792 P(2 | 1) = 0.2431	P(1 | 2) = 0.0208 P(2 | 1) = 0.7569	P(1 | 1) = 0.9609 P(2 | 1) = 0.0419	P(1 | 2) = 0.0391 P(2 | 2) = 0.9581
Exp. Duration (Q)	48.0820	4.1139	25.5548	23.8762
Log-Likelihood	22.0490		60.5154	
AIC	-0.4266		-1.8469	
SIC	-0.0583		-1.4786	
HQC	-0.2846		-1.7049	
Linearity Test χ^2	25.75 [0.00]		40.92 [0.00]	
Davies p-value	[0.00]		[0.00]	
Serial correlation χ^2	9.01 [0.70]		7.77 [0.80]	
Normality χ^2	1.62 [0.42]		0.39 [0.82]	

Note: The values in parentheses and brackets are standard errors and p-value respectively. ***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively. Q – Quarters.

Table 7: Decomposing the short – and long-run effects (Model 3)

Dependent variable: HPI	Turkey		Euro area	
	R. 1	R. 2	R. 1	R. 2
Short-run				
L.HPI	0.8360	0.9744	0.9308	0.6662
UN	-0.6458	-0.4036	-0.1186	-0.2604
Long-run				
UN	-3.9378	-15.7656	-1.7139	-0.7801

The filtered regime probabilities obtained from Model 3 are depicted in Figure 5. The regime intervals imply that the low regime (regime 2) occurs only in 2008 for Turkey while it starts in 2007 and goes on until 2014 for the Euro Area. Also, these regime intervals are quite similar to the findings of the Model 1 and Model 2 and confirm the previous inferences. The impact of the recession around 2008 spread over a longer period in the Euro Area. The residual, actual and fitted values obtained from the Model 3 are presented in Figure 6.

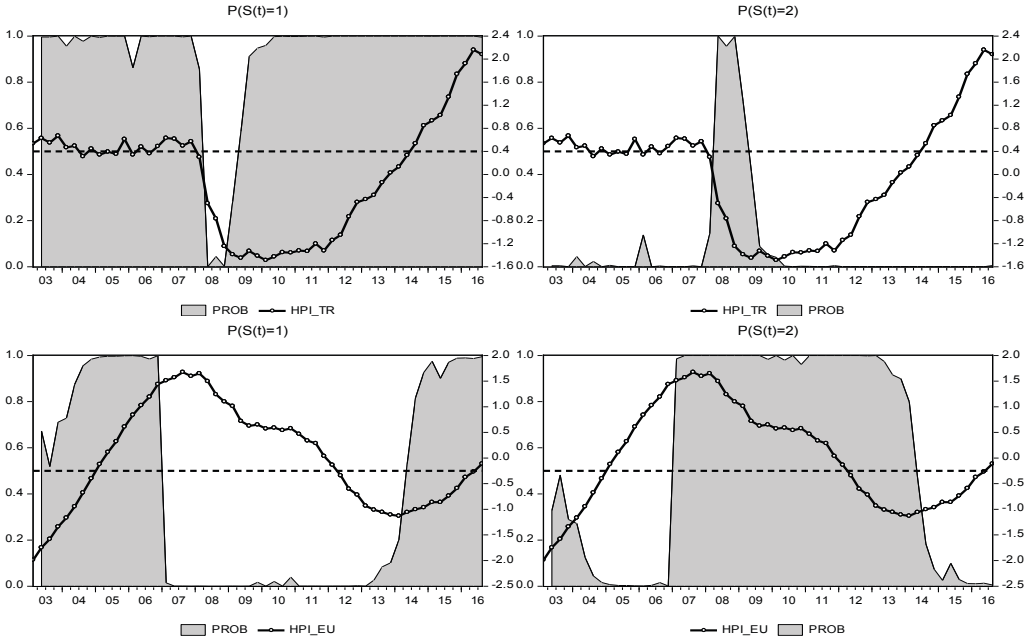

Figure 5: Filtered regime probabilities for Turkey and the Euro Area (Model 3)

Note: TR: Turkey and EU: Euro Area.

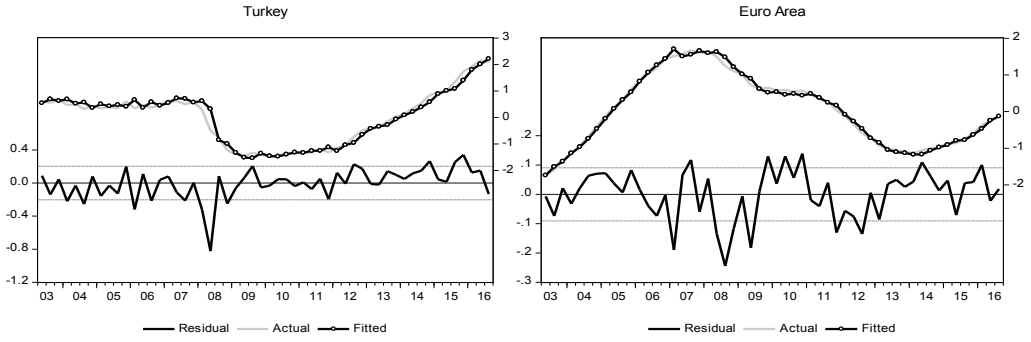

Figure 6: Residual, actual and fitted house price index (Model 3)

5.CONCLUSION

In this paper, we focused the possible similarities of the house price trends between Turkey and the Euro Area; and investigated the regime shifts of the house prices for the Turkish economy and the Euro Area over the 2003-2016 period. Since housing markets

and assets gain their importance around the world, examining the volatilities and regime shifts in house prices can provide important information to researchers and policymakers. The study suggests that due to the substantially large volume of the commercial and financial interactions between two regions, the trends of house prices might show similarities.

We applied regime switching models to allow possible shifts in the house prices and account the nonlinearities of the housing market. For this purpose, three different Markov Regime Switching Models are employed in the study; in which income level, mortgage interest rate, and unemployment rate are controlled, respectively.

Our results reveal that the nonlinear behavior of house prices of Turkey and the Euro Area has displayed switching paths over the period of the analysis. The findings obtained from the three models firstly suggest that income level, mortgage interest rate, and unemployment rate have a statistically significant impact on house prices both in Turkey and the Euro Area. So, this result reveals that the fluctuation of house prices in both areas is explained by its determinants, which implies that economic fundamentals play a major role in explaining house price behavior. Expectedly, house prices increase as income level rises, and decreases as mortgage interest rate and unemployment rate increase. However, the magnitude of the impacts of these control variables varies across different regimes. For instance, both in Turkey and in the Euro Area, the impact of income level is relatively stronger in the high regime, which implies that when house prices are relatively high, the house price is more sensitive to income level. The relatively stronger sensitivity during the high regime is valid also for the impacts caused by the mortgage rate. The findings of the last model, which is estimated by controlling unemployment rate, show that the magnitude of the negative impact caused by the rising unemployment rate is relatively stronger during the low regime.

All the models employed reveal that during the 2003-2016 period, the duration of the low regime in Turkey is quite shorter than the low regime in the Euro Area. For both regions, the low regime starts around the 2008 global crisis but ends at different times. According to the results, when the low house price regime in Turkey starts, it goes on about 4-11 quarters while a low regime in the Euro Area goes on about 23-31 quarters. The figures depicted by using the filtered regime probabilities allow for a clearer outlook of the regime shifts. These figures reveal that the low house price regime in Turkey corresponds only a temporary period while it takes in the Euro Area about 6-8 years. The finding can be interpreted as the viability and resistivity of the Turkish housing market. On the other side, we have still very little knowledge about the future of the housing market in Turkey. Further technical researches will enlighten the shaded areas in this subject as the market activities go on and the related data is being accumulated.

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