ECONOMIC ANNALS, Volume LXIV, No. 220 / January – March 2019
UDC: 3.33 ISSN: 0013-3264

https://doi.org/10.2298/EKA19200390

*Mustafa Ozan Yıldırım**
*Özge Filiz Yağcıbaşı***

THE DYNAMICS OF HOUSE PRICES AND FISCAL POLICY SHOCKS IN TURKEY

ABSTRACT: *This study examines the interaction between house prices and government spending, mortgage interest rates, and gross domestic product in Turkey. The ARDL bounds test approach is applied to quarterly data covering the 2010:1–2017:4 period. Findings indicate that there is a statistically significant long-run and short-run cointegration between the two house price indexes and government spending, mortgage rates, and GDP. An increase in government spending has a statistically significant positive effect on house prices. The study also indicates that mortgage interest rate and GDP have a statistically significant effect on house prices.*

KEY WORDS: *House Prices, Government Spending, Turkish Economy, Cointegration*

JEL CLASSIFICATION: R31, E44, C32

* Pamukkale University, Department of Economics, Denizli, Turkey. moyildirim@pau.edu.tr
** Izmir Katip Çelebi University, Department of Economics, Izmir, Turkey. ozgefiliz.yagcibasi@ikc.edu.tr

1. INTRODUCTION

After the 2008 global financial crisis, the importance of the housing market in shaping macroeconomics became better understood. The crisis was a turning point for housing market literature and studies on this issue have rapidly increased since the outbreak of the crisis. However, despite significant developments in fiscal policy over the past decade, academics, central banks, and governments have focused more on the relationship between monetary policy and the housing market. As a result, the effects of monetary policy on the housing market have been frequently discussed in the literature[1], but the number of studies discussing the empirical relationship between the housing market and fiscal policy is limited.

It is not surprising that policymakers favour monetary policy over fiscal policy when responding to fluctuations in the financial markets, due to the speed and efficiency of the monetary transmission mechanism. However, once monetary policy has lost its effectiveness, fiscal policy becomes more important. The relatively ineffective monetary policy in advanced economies after the 2008 crisis due to the zero lower bound may be considered a current example of this phenomenon. Many developed countries adopted an expansionary fiscal policy in order to recover (Feldstein 2009; Paula and Pires 2013). On the other hand, in developing countries monetary policy may be ineffective as a counter-cyclical policy measure due to persistently high inflation, defense of the currency against heavy capital inflows, or to guarantee the Central Bank's primary objectives (Buiter 2010). In such cases the effectiveness of fiscal policy becomes even more salient. Since the housing market has a strong effect on macroeconomic stability and financial fragility, the critical role that governments play in this process needs to be carefully assessed. In the light of recent developments in the housing market, understanding the effect of fiscal policy has become essential.

Figure A1 in the Appendix shows the house price index and the ratio of government expenditure to GDP in Turkey in the 2010–2017 period. It shows that In Turkey, real house prices rose by about 40% between 2010 and 2017. However, the share of government expenditure in GDP increased by about 75%, from 8% to 14%. Although government expenditure has followed a fluctuating trend and real house prices have risen relatively steadily, both series show an

[1] For studies investigating the relationship between monetary policy and the housing market, see Iacoviello 2010; Iacoviello 2005; Apergis 2003; Bjørnland and Jacobsen 2010; Elbourne 2008; Yıldırım and İvrendi 2017.

upward growth trend. Figure A1 also reveals that Since 2015 government expenditure in Turkey's economy has increased substantially.

The housing market is a major source of macroeconomic instability in both developed and developing countries and contributes to economic fragility. The impact of fiscal policy shocks on credit conditions, households' disposable income, and overall expectations has significant implications for the housing market. Nevertheless, the evaluation of the transmission mechanism of fiscal policy shocks is inadequate (Ruiz and Vargas-Silva 2016). In recent years studies have shown that fiscal policy shocks may have both incentive and deterrent effects on the housing sector. For example, an increase in government expenditure may lead to an increase in expected future tax rates, triggering negative expectations for future household wealth that will reduce households' current consumption, including housing. On the other hand, financial incentives to stimulate housing demand push house prices upwards (Agnello and Sousa 2013). Fiscal stimulus and government expenditure can push housing demand and prices when the housing supply is inflexible (Afonso and Sousa 2011). Moreover, public expenditure on infrastructure such as roads and bridges makes housing more attractive than other alternatives, thus creating upward pressure on house prices (Khan and Reza 2013).

The main purpose of this study is to examine the short- and long-term relationship between house prices and government expenditure, mortgage interest rates, and gross domestic product. Accordingly, this paper investigates how and to what extent housing prices are affected by short- and long-term fiscal policy shocks. Two different house price indices are used to represent house prices: the house price index and the hedonic house price index. This study contributes to the literature by examining the dynamic relationship between house prices and government expenditure in Turkey.

The findings indicate the existence of a long-term cointegration relationship between house prices and government expenditure. House prices react positively to fiscal shock. In line with the findings of earlier literature (Bjørnland and Jacobsen 2010; Iacoviello 2010; Musso et al. 2011; Wadud et al. 2012; Robstad 2017; Yıldırım and İvrendi 2017), an increase in house prices leads to a statistically significant increase in GDP.

The remainder of this paper is organized as follows. Section 1 presents a brief summary of previous studies on the housing market and government

expenditure. Section 2 discusses the theoretical model and methodology. The data and the results are detailed in Sections 3 and 4, respectively. Finally, Section 5 concludes.

2. LITERATURE REVIEW

In a recent study examining the impact of financial shocks on the housing market, Khan and Reza (2017) show that real house prices increase in response to a positive shock in government expenditure using the Structural VAR (SVAR) method for the US. Ruiz and Vargas-Silva (2016) evaluate the impact of fiscal policy shocks on the US housing market using the VAR method and find that public announcements of shocks do not have a major impact on house prices.

By using the Bayesian Structural VAR method on United States, English, German, and Italian data, Afonso and Sousa (2012) conclude that a shock in government expenditure affects house prices positively and permanently. Afonso and Sousa (2011) examine the impact of fiscal shocks using the Fully Simultaneous System Approach for the same dataset, and find that an increase in government expenditure pushes house prices up. Using the Panel VAR model estimated for 10 developed countries, they show that fiscal shocks, which represent budget deficits, have had a negative impact on credit conditions. Moreover, they find that financial shocks have a negative impact on house prices in economies with a large public sector. Examining the impact of financial shocks on asset prices in South Africa, Aye et al. (2014) reach the conclusion that government expenditure shocks affect stock prices more than housing prices. Gupta et al. (2014), in their study of South Africa using the time-varying parameter VAR (TVP-VAR) for government expenditure and house prices, reveal that unexpected government expenditure shocks have almost no effect on house prices, while expected government expenditure shocks increase housing prices.

The literature on the relationship between fiscal policy and the housing market, which is much thinner than the literature on monetary policy and the housing market, suggests that fiscal shocks may affect house prices both positively and negatively. Another notable finding from the literature is that the response of house prices to fiscal shocks is not as long lasting and permanent as the response to monetary policy shocks.

Apart from an absence – to the best of our knowledge – of studies examining the relationship between fiscal policy shocks and the housing market in Turkey, due to a lack of regular and reliable data there are also few studies on the housing market and house prices. However, as the share of the housing sector in the economy has grown in recent years, the number of studies of the housing sector that use proxies has increased.

The studies that examine the relationship between house prices, GDP, and monetary policy in Turkey show that increases in GDP and expansionary monetary policy have had a meaningful and positive impact on house prices (Badurlar 2008; Ozcelebi 2011; Akseki et al. 2014; Lebe and Aktas 2014; Coşkun 2016; Yıldırım and İvrendi 2017). Studies on the role of mortgage interest rates in determining house prices indicate that there is a statistically significant relationship between house prices and mortgage interest rates (Akkas and Sayılgan 2015; Dilber and Sertkaya 2016; Coskun 2016; Yıldırım and İvrendi 2017). However, in the Turkish literature there are also studies that use variables such as per capita income, money supply, industrialization, unemployment rate, etc. to estimate determinants of housing demand and supply (Halıcıoglu 2005; Sarı et al. 2007; Öztürk and Fitöz 2009; Hepşen and Kalfa 2009; Lebe and Aktaş 2014; Uysal and Yigit 2016; Solak and Kabadayı 2016). These studies show that macroeconomic indicators such as urbanization rate, industrialization, money supply, and per capita income are important determinants of housing demand and supply.

Apart from the studies that investigate housing supply and demand and determinants of house prices, another branch of study examines whether the rapid increase in housing prices has formed a bubble (Coşkun et al. 2017; Coşkun and Jadevicius 2017; Kaya et al. 2012; Erol 2015; Zeren and Ergüzel 2015; Büyükduman 2014). The findings show that house prices are largely explained by macroeconomic factors and the overvaluation of house prices has not led to a bubble in Turkey.

3. DATA AND METHODOLOGY

In this study the short- and long-term relationship between house prices and government expenditure, mortgage rates, and gross domestic product in Turkey is examined using the ARDL bounds test method for the 2010:Q1–2017:Q4 period with quarterly data. The data is from the Central Bank of the Republic of

Turkey (CBRT)[2]. Two different house price indexes are used in the study. The housing price index (HPI) calculates the stratified median home price and represents Turkey in general. The hedonic housing price index (HHPI) monitors house price changes without considering housing quality. The interest rate on residential mortgage loans is calculated on the basis of the weighted average interest rates applied to bank loans at the home loan interest rate (MORT). The interest rate on residential loans, issued in terms of Turkish Lira (TL) in the weighted average of interest rates applied to the loans opened in banks, is used for the home loan interest rate (MORT). The output variable is real gross domestic product (GDP) and the government expenditure variable (GOV)[3] is share of government expenditure in GDP. All series in the analysis are in real terms and natural logarithms have been taken for all variables except mortgage rates. Furthermore, house prices, government expenditure, and gross domestic product series are seasonally adjusted using the Census X-13 technique.

There are many econometric methods in the literature that can be used to study the cointegration relationship between macroeconomic variables. The Engle-Granger (1987) and Johansen (1988, 1991) techniques are the most widely used. This study uses the Autoregressive Distributed Lag (ARDL) bound testing method introduced by Pesaran et al. (2001) because of its advantages over other methods. These advantages are fourfold. First, while other techniques require variables to be stationary in the same order, the ARDL technique allows variables to be stationary at different orders. In other words, variables that are I(0) and I(1) stationary can be used in the same analysis. Second, the ARDL technique has valid t-statistics and long-term unbiased estimation results even if there is an endogeneity problem between model variables, since the construction of the model does not allow residual correlation (Narayan 2005; Odhiambo 2009). Third, the ARDL technique allows working with small samples when compared with the Johansen cointegration technique (Ghatak and Siddiki 2001; Payne 2003). Finally, the ARDL technique provides short and long-run effects of a variable on another variable simultaneously, and separates these effects from each other (Bentzen and Engsted 2001).

The research question is expressed by the following ARDL model:

---

[2] https://evds2.tcmb.gov.tr/

[3] Government expenditure data contains the government's consolidated (general) budget expenditure.

$$\Delta lnHPI_t = \alpha_0 + \sum_{i=0}^{p} \beta_i \Delta lnHPI_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta MORT_{t-i} + \sum_{i=0}^{p} \mu_i \Delta lnGOV_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnGDP_{t-i} + \delta_1 lnHPI_{t-1} + \delta_2 MORT_{t-1} + \delta_3 lnGOV_{t-1} + \delta_4 lnGDP_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta lnHHPI_t = \alpha_0 + \sum_{i=0}^{p} \beta_i \Delta lnHHPI_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta MORT_{t-i} + \sum_{i=0}^{p} \mu_i \Delta lnGOV_{t-i} + \sum_{i=0}^{p} \theta_i \Delta lnGDP_{t-i} + \delta_1 lnHHPI_{t-1} + \delta_2 MORT_{t-1} + \delta_3 lnGOV_{t-1} + \delta_4 lnGDP_{t-1} + \varepsilon_t \quad (2)$$

where Δ is the first difference operator, α_0 is the drift component, εt is the white noise error term, and P is the maximum number of delays. It is possible to implement the ARDL bounds test approach as a two-step process. In the first step, the existence of a long-run relationship between variables is tested by means of the F test, which establishes the joint significance of the lagged level variables in Equation 1 and Equation 2. The null hypothesis ($H0$: $\delta1 = \delta2 = \delta3 = \delta4 = 0$) that rejects a long-run relationship between variables is tested against the alternative hypothesis ($H1$: $\delta1 \neq \delta2 \neq \delta3 \neq \delta4 \neq 0$) that accepts a long-run relationship. Pesaran et al. (2001) provide the upper and lower critical values of this test. If the calculated F-statistic is higher than the upper critical value, the null hypothesis is rejected and the existence of a long-term relationship is accepted. If, on the other hand, the calculated F-statistic is below the lower critical value, the existence of a long-term relationship is rejected. It is not possible to reach a final judgment if the test statistic falls between the lower and upper critical values. Determination of the optimal lag length is also important. The most frequently used criteria for determining the level of the ARDL model are the Schwarz Bayesian Criteria (SBC), the Hannan-Quinn (HQ) criterion, and the Akaike Information Criteria (AIC).

Following the establishment of the long-run relationship, the second step obtains the short-run coefficients. The following error correction models are estimated:

$$\Delta lnHPI_t = \alpha_0 + \sum_{i=0}^{p}\beta_i \Delta lnHPI_{t-i} + \sum_{i=0}^{p}\gamma_i \Delta MORT_{t-i} + \sum_{i=0}^{p}\mu_i \Delta lnGOV_{t-i} + \sum_{i=0}^{p}\theta_i \Delta lnGDP_{t-i} + \pi ECM_{t-1} + \varepsilon_t \quad (3)$$

$$\Delta lnHHPI_t = \alpha_0 + \sum_{i=0}^{p}\beta_i \Delta lnHHPI_{t-i} + \sum_{i=0}^{p}\gamma_i \Delta MORT_{t-i} + \sum_{i=0}^{p}\mu_i \Delta lnGOV_{t-i} + \sum_{i=0}^{p}\theta_i \Delta lnGDP_{t-i} + \pi ECM_{t-1} + \varepsilon_t \quad (4)$$

The error correction model results indicate the speed of convergence to the long-term equilibrium in response to a short-term shock. Here, the coefficient (π) of the lagged error correction term (ECM_{t-1}) governs the long-term convergence dynamics. If this coefficient is statistically significant and lies between 0 and –1 it is an important indicator of the model's tendency to reach long-run equilibrium.

4. SUMMARY STATISTICS AND UNIT ROOT TESTS

Table 1 presents the descriptive statistics of the data used in the study. It can be observed from Table 1 that the averages of the two house prices indices used in the study are close to each other. This indicates that the variables are consistent. Moreover, the standard deviations of all variables except mortgage rate are low; that is, they have relatively low volatility.

Table 1: Descriptive Statistics of Variables

Variable	Obs.	Mean	Median	Minimum	Maximum	Std. Dev.
HPI	32	2.93	2.94	2.32	3.43	0.29
HHPI	32	2.84	2.87	2.33	3.30	0.25
MORT	32	3.41	3.37	0.03	7.13	1.68
GOV	32	–2.21	–2.26	–2.51	–1.91	0.16
GDP	32	19.65	19.67	19.37	19.88	0.14

Prior to ARDL cointegration analysis, it is necessary to perform unit root tests for the variables, presented in Table 2. The ARDL approach requires that variables in the analysis be I (1) or I (0) and it is not appropriate to use variables with a higher degree of integration. For this reason, ADF and PP tests were carried out to make sure that the variables are suitable for ARDL analysis and to determine the stationarity of the corresponding variables in the model.

Table 2: Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) Unit Roots Tests

Variable	ADF		PP		
	Level	1.dif	Level	1.dif	Decision
HPI	–2.63 (0.26)	–5.69 (0.00)**	–2.53 (0.31)	–6.25 (0.00)**	I(1)
HHPI	–2.68 (0.24)	–5.72 (0.00)**	–2.45 (0.34)	–6.35 (0.00)**	I(1)
MORT	–2.08 (0.53)	–5.33 (0.00)**	–2.28 (0.43)	–5.39 (0.00)**	I(1)
GOV	–3.60 (0.04)**	-------	–3.53 (0.05)	–12.99 (0.00)**	I(0)
GDP	–3.30 (0.08)	–7.80 (0.00)**	–3.25 (0.09)	–7.93 (0.00)**	I(1)

Note: Test results are reported for model with constant and trend. (**) indicates significance at the level of 5%. The critical value of ADF and PP is –3.56 for 5%.

Both ADF and PP unit root tests find that the two house price indexes, mortgage rates, and GDP are integrated of order (1). However, the ADF test shows government expenditure to be stationary in level while the PP test suggests that it becomes stationary after first differencing. As the unit root test results indicate that none of the variables is I(2), we can proceed to the bounds testing procedure.

5. EMPIRICAL RESULTS

The stationarity levels of all variables in the model allow ARDL modelling, so the next step is to apply the bounds test for the two different models developed in the study. Table 3 shows the results of the ARDL boundary test. The F-values calculated for both models (6.22 and 8.89) are higher than the upper limit value obtained at three significance levels (10%, 5%, and 1%). There is strong evidence of long-run cointegration between the house price and macroeconomic variables. In other words, house prices and government expenditure, mortgage rates, and GDP move together in the long run.

Table 3: Bound Test for Cointegration

Model 1 – Dependent Variable: House Price Index (HPI)		
F-stat k=3	6.22 Critical Value	
Significance	I(0) Lower Bound	I(1) Upper Bound
10%	2.72	3.77
5%	3.23	4.35
1%	4.29	5.61
Model 2 – Dependent Variable: Hedonic House Price Index (HHPI)		
F-stat k=3	8.89 Critical Value	
Significance	I(0) Lower Bound	I(1) Upper Bound
10%	2.72	3.77
5%	3.23	4.35
1%	4.29	5.61

Note: F-statistic values are calculated by the bound testing approach described by Pesaran et al. (2001)

The estimation output of the two ARDL models with house price index and hedonic house price index as dependent variables can be found in the Appendix (Table A1 and Table A2, respectively). Both models passed standard diagnostic tests, including heteroscedasticity, normality, functional form, and autocorrelation[4]. The stability of the model parameters was examined with CUSUM and CUSUMSQ tests. The corresponding results can be found in Figure A in the Appendix. The findings indicate that the model residuals are within acceptable limits; hence it can be inferred that the model parameters are stable and there is no structural change.

5.1. Long-Run Estimation Results

The optimal lag length for the estimation of the long-run cointegration relationship between house prices, mortgage rates, GDP, and government expenditure is determined using Hannan-Quinn (HQ) criteria. The optimal lag lengths are found to be ARDL (3,3,2,2) for the model with house price index as

[4] The diagnostic tests for the ARDL models are reported in Appendix Table 1A. The results of the diagnostic tests suggest the absence of any autocorrelation among the residuals and of heteroscedasticity. The Ramsey RESET test suggests that the estimated model is stable.

the dependent variable (Model 1), and ARDL (3,2,1,0) for the model with hedonic house price index as the dependent variable (Model 2). Model estimation results are presented in Table 4.

Table 4: ARDL Long-Run Results

Model 1 – ARDL (3,3,2,2) – Dependent Variable: House Price Index (HPI)			
Variable	Coefficient	Standard Error	t-stat
MORT	0.063	0.021	2.980*
GDP	0.963	0.455	2.115*
GOV	0.640	0.347	1.843*
C (constant)	–4.807	9.709	–1.525

Model 2 – ARDL (3,2,1,0) – Dependent Variable: Hedonic House Price Index (HHPI)			
Variable	Coefficient	Standard Error	t-stat
MORT	0.055	0.015	3.570*
GDP	0.690	0.402	1.713
GOV	0.524	0.297	1.763*
C (constant)	–9.753	8.546	–1.141

*indicates 10% significance level.

Table 4 indicates the long run coefficients for ARDL (3,3,2,2) and ARDL (3,2,0,1) model estimations. The findings demonstrate the existence of a statistically significant and positive relationship between government expenditure and house prices in the long run[5]. In Model 1, where the house price index is the dependent variable, an increase of 1% in government expenditure pushes house prices by 0.64% in the long run. A similar interpretation is valid for Model 2, where the hedonic house price index is the dependent variable. Accordingly, it can be inferred that the upward effect of an increase in government expenditure is higher on the house price index than on the hedonic house price index. These findings are in line with the existing literature (Afonso and Sousa 2012; Gupta et al. 2014).

[5] In the present paper we also tried to investigate the impact of current and capital government expenditure on house prices in Turkey. Even though the results show significant long-run cointegration, we could not interpret their coefficients, which are economically nonsense, since as time series they have high seasonality patterns.

On the other hand, although a 1% increase in gross domestic product creates a positive (0.96) and statistically significant effect on the house price index in Model 1, the positive impact on the hedonic house price index (0.69) in Model 2 is statistically insignificant at the 10% level. The finding that government expenditure has a positive impact on house prices is consistent with other studies in literature on the housing market (Oikarinen 2009; Yıldırım and İvrendi 2017). Tsatsaronis and Zhu (2004), Iacoviello and Neri (2008), Goodhart and Hoffman (2008), and Adams and Füss (2010) also indicate a strong positive relationship between GDP and house prices. Finally, a 1-unit increase in mortgage rates raises both house price indicators by about 0.05 and 0.06, respectively. These results are in line with previous studies on house prices in the Turkish economy (Yıldırım and İvrendi 2017). Since a mortgage rate increase is a major cost element in housing construction, a rise in interest rates increases house prices in the long run even if it is small.

5.2. Short-Run Estimation Results

The short-run relationship between the variables is investigated with the error correction model based on the ARDL approach. The error correction term (ECT) variable in the model indicates how much of the imbalance caused by a shock in the short run will be tolerated in the long run. For the error correction model to be valid and acceptable, this variable has to be statistically significant and lie between 0 and –1.

The error correction model coefficients obtained from Model 1 and Model 2 are shown in Table 5. The majority of the findings are statistically significant. Table 5 shows that the sign of error correction (ΔECT_{t-1}) is negative and statistically significant, as expected. This value indicates that if there are any deviations from the long-run equilibrium in future periods, this deviation can be corrected. The error correction coefficients of the two models are –0.79 and –0.78, respectively, which indicates that in response to a shock, 78%–79% of the deviation from the long-run equilibrium will die out and convergence to the long-run equilibrium will be rapid.

Table 5: ARDL Short-Run Results

Model 1 – Dependent Variable: House Price Index (HPI)				
Variable	Coefficient	Standard Error	t-stat	Prob
ΔHPI_{t-1}	0.7454	0.1711	4.3556	0.0006*
ΔHPI_{t-2}	0.2993	0.2191	1.3662	0.1920
$\Delta MORT$	0.0940	0.0151	6.1924	0.0000*
$\Delta MORT_{t-1}$	–0.0715	0.0418	–1.7100	0.1079
$\Delta MORT_{t-2}$	0.0010	0.0303	0.0339	0.9734
ΔGOV	0.3904	0.2696	1.4478	0.1682
ΔGOV_{t-1}	–0.3385	0.2652	–1.2760	0.2213
ΔGDP	0.0083	1.2873	0.0064	0.9949
ΔGDP_{t-1}	–0.0309	1.2575	–0.0246	0.9807
ΔECT_{t-1}	–0.7918	0.1858	–4.2602	0.0007*

Model 2 – Dependent Variable: Hedonic House Price Index (HHPI)				
Variable	Coefficient	Standard Error	t-stat	Prob
$\Delta HHPI_{t-1}$	0.6994	0.1432	4.8836	0.0001*
$\Delta HHPI_{t-2}$	0.3678	0.1118	3.2879	0.0039*
$\Delta MORT$	0.0891	0.0131	6.7568	0.0000*
$\Delta MORT_{t-1}$	–0.0650	0.0183	–3.5421	0.0022*
ΔGOV	0.5236	0.2228	2.3493	0.0298*
ΔGDP	0.5421	0.3725	1.4554	0.1619
ΔECT_{t-1}	–0.7856	0.1491	–5.2672	0.0000*

Note: * represents 10% significance level.

Model 2 shows, in the short run, a statistically significant and positive relationship between mortgage rates and house prices for both current and lagged variables. While the direction of the relationship is positive for the first period, it becomes negative after one period. Since all interest rates in the market tend to move in the same direction, a rise in mortgage rates will increase commercial interest rates, leading to an increase in the cost of housing production and putting upward pressure on house prices. On the other hand, an increase in mortgage rates will also reduce house prices by lowering household demand. Moreover, it can be observed that government expenditure has a statistically significant and positive impact on house prices in the current

period. On the other hand, the coefficient that measures the short-term effect of gross domestic product on house prices is found to be not statistically significant.

6. CONCLUSION

This study examines the short-run and long-run relationship between house prices, government expenditure, mortgage rates, and gross domestic product in Turkey. In this study the ARDL bounds test method is used to analyse cointegration for the 2010:1–2017:4 period. The analysis results indicate the existence of a long-term cointegration relationship between house prices and government expenditure, mortgage interest rates, and GDP. According to this result, both government expenditure and increases in GDP affect house prices positively in the short and long term. In addition, an increase in mortgage interest rates appears to raise house prices. According to this finding, which appears theoretically consistent, since housing loans are the main cost element of housing demand, a rise in the mortgage interest rate increases house prices. On the other hand, an alternative demand-side theory suggests that an increase in mortgage interest rates will reduce household demand by lowering household debt and house prices. Another important finding is that the response of house prices to fiscal policy shocks is not as persistent as the response to monetary policy shocks.

The relationship between house prices and government expenditure has some important policy implications. It is clear that government expenditure has a significant impact on house prices in both the long and the short term, and economic policymakers must take fiscal policy into account. Another policy implication is that the risk of creating a significant and sustained increase in house prices may be somewhat suppressed by limiting government expenditure.

REFERENCES

Adams Z & Füss R. (2010). Macroeconomic determinants of international housing markets. *Journal of Housing Economics*, 19(1): 38–50.

Afonso, A. & Sousa, R. M. (2011). What are the effects of fiscal policy on asset markets? *Economic Modelling*, 28(4), 1871–1890.

Afonso, A. & Sousa, R. M. (2012). The macroeconomic effects of fiscal policy. *Applied Economics*, 44(34), 4439–4454.

Agnello, L. & Sousa, R. M. (2013). Fiscal policy and asset prices. *Bulletin of Economic Research*, 65(2), 154–177.

Akkaş, M.E. & Sayilgan, G. (2015). Housing Prices and Mortgage Interest Rate: Toda-Yamamoto Causality Test. *Journal of Economics, Finance and Accounting*, 2, 572–583.

Akseki, U., Çatık, A.N. & Gök. B. (2014). A Regime-dependent Investigation of the Impact of Macroeconomic Variables on the Housing Market Activity in Turkey. *Economics Bulletin*, 34, 1081–1090

Apergis, N. (2003). Housing Prices and the Macroeconomic Factors: Prospects within the European Monetary Union. *International Real Estate Review*, 6, 63–74.

Aye, G. C., Balcilar, M., Gupta, R., Jooste, C., Miller, S. M. & Ozdemir, Z. A. (2014). Fiscal policy shocks and the dynamics of asset prices: the South African experience. *Public Finance Review*, 42(4), 511–531.

Badurlar, İ. Ö. (2008). Investigation of Relationship Between House Prices and Macroeconomic Variables in Turkey. *Anadolu University Journal of Social Science*, 8, 223–238.

Bentzen, J. & Engsted, T. (2001). A revival of the autoregressive distributed lag model in estimating energy demand relationships. *Energy*, 26(1), 45–55.

Bjørnland, C.H. &Jacobsen, D.H. (2010). The Role of House Prices in the Monetary Policy Transmission Mechanism in Small Open Economies. *Journal of Financial Stability*, 6, 218–229.

Buiter, W. H. (2010). The limits to fiscal stimulus. *Oxford Review of Economic Policy*, 26(1), 48–70.

Büyükduman, A. (2014). *Bir Kent Efsanesi: Konut Balonu*. Scala Yayıncılık, İstanbul.

Coşkun, Y. (2016). Property Prices and Investment: An Analysis for Turkey. *Journal of the Faculty of Economics and Administrative Science*, Niğde University, 9, 201–217.

Coskun, Y., Seven, U., Ertugrul, H. M. & Alp, A. (2017). Housing price dynamics and bubble risk: the case of Turkey. *Housing Studies*, 1–37.

Coskun, Y. & Jadevicius, A. (2017). Is there a Housing Bubble in Turkey? *Real Estate Management and Valuation*, 25, 48–73.

Dilber, İ. & Sertkaya, Y. (2016). 2008 Finansal Krizi Sonrası Türkiye'de Konut Fiyatlarının Belirleyicilerine Yönelik Analiz. *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi*, 4, 11–29.

Elbourne, A. (2008). The UK Housing Market and the Monetary Policy Transmission Mechanism: A SVAR approach. *Journal of Housing Economics*, 17, 65–87.

Engle, R. F. & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 251–276.

Erol, I. (2015). Türkiye'de Konut Balonu Var mı? Konut Sektörü Kapitalizasyon Oranları Analizi. İmge Kitabevi Yayınları, İstanbul.

Feldstein M. (2009). Rethinking the Role of Fiscal Policy. In *AEA Meetings* 2009.

Ghatak, S. & Siddiki, J. U. (2001). The use of the ARDL approach in estimating virtual exchange rates in India. *Journal of Applied Statistics*, 28(5), 573–583.

Goodhart C. & Hofmann B. (2008). House prices, money, credit, and the macroeconomy. *Oxford Review of Economic Policy* 24(1),180–205.

Gupta, R., Jooste, C. & Matlou, K. (2014). A time-varying approach to analyzing fiscal policy and asset prices in South Africa. *Journal of Financial Economic Policy*, 6(1), 46–63.

Halıcıoğlu, F. (2005). The Demand for New Housing in Turkey: An Application of ARDL Model. *Global Business and Economics Review*, 9, 16–29.

Hepşen, A. & Kalfa, N. (2009). Housing Market Activity and Macroeconomic Variables: An Analysis of Turkish Dwelling Market Under New Mortgage System. İstanbul University Journal of the School of Business Administration, 38, 38–46.

Iacoviello, M. (2005). House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle. *American Economic Review*, 95, 739–764.

Iacoviello M. & Neri S. (2008). Housing market spillovers: Evidence from an estimated DSGE model. *Economic Working Papers* 659, Bank of Italy, Economic Research and International Relations Area.

Iacoviello, M. & Neri S. (2010). Housing Market Spillovers: Evidence from an Estimated DSGE Model. *American Economic Journal: Macroeconomics,* 2, 125–64.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2–3), 231–254.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, 1551–1580.

Kaya, A., Bozkurt, A. T., Baştan, E. M. & Ayanoğlu, Ö. A. (2012). Constructing a house price index for Turkey. *IFC Bulletin*, 36, 153–171.

Khan, H. & Reza, A. (2013). House prices, consumption, and government spending shocks. Carleton University, Department of Economics.

Khan, H. & Reza, A. (2017). House prices and government spending shocks. *Journal of Money, Credit and Banking*, 49(6), 1247–1271.

Lebe, F. & Akbaş, Y.E., (2014). Türkiye'nin Konut Talebinin Analizi: 1970–2011. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 28, 57–83.

Musso, A., Neri, S. & Stracca L. (2011). Housing, Consumption and Monetary Policy: How different are the US and the Euro Area? *Journal of Banking and Finance*, 35 (11), 3019–3041.

Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied Economics*, 37(17), 1979–1990.

Odhiambo, N. M. (2009). Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. *Energy Policy*, 37(2), 617–622.

Özcelebi, O. (2011). Determinants of construction sector activity in Turkey: A vector autoregression approach. *International Journal of Economics and Finance*, 3, 130–139.

Öztürk, N. & Fitöz, E. (2009). The Determinants of the Housing Sector in Turkey: An Empirical Analysis. *ZKU Journal of Social Sciences*, 5, 21–46.

Paula, L. F. D. & Pires, M. C. D. C. (2013). The effects of fiscal policy after the global recession: assessing the evidence. *Revista de Economia Política*, 33(2), 315–321.

Payne, J. E. (2003). Post-stabilization estimates of money demand in Croatia: error correction model using the bounds testing approach. *Applied Economics*, 35(16), 1723–1727.

Pesaran, M. H., Shin, Y. & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326.

Ruiz, I. & Vargas-Silva, C. (2016). The impacts of fiscal policy shocks on the US housing market. *Empirical Economics*, 50(3), 777–800.

Sarı, R., Ewing, T.B. & Aydın, B. (2007). Macroeconomic Variables and the Housing Market in Turkey. *Emerging Markets Finance and Trade*, 43, 5–19.

Robstad, O. (2017). House Prices, Credit, and the Effect of Monetary Policy in Norway: Evidence from Structural VAR Models. *Empirical Economics*, January, 1–23.

Solak, A. O. & Kabadayi, B. (2016). An Econometric Analysis of Housing Demand in Turkey. *Advances in Management and Applied Economics*, 6, 47.

Tsatsaronis K. & Zhu H. (2004). What drives housing price dynamics: cross-country evidence. *BIS Quarterly Review*, March 2004.

Uysal, D. & Yiğit, M. (2016). Determinants of Housing Demand in Turkey (1970–2015): An Empirical Study. *Sosyal Bilimler Meslek Yüksekokulu Dergisi*, 19, 186–209.

Yıldırım, M. O. & İvrendi, M. (2017). House Prices and the Macroeconomic Environment in Turkey: The Examination of a Dynamic Relationship. *Economic Annals*, Volume 62, No. 215.

Zeren, F. & Ergüzel, O. Ş. (2015). Testing for Bubbles in the Housing Market: Further Evidence from Turkey. *Financial Studies*, 19, 40–52.

Wadud, M., Bashar, O. & Ahmet, H.J.A. (2012). Monetary Policy and the Housing Market in Australia. *Journal of Policy Modeling*, 34, 849–863.

Received: August 3, 2018
Accepted: November 17, 2018

APPENDIX

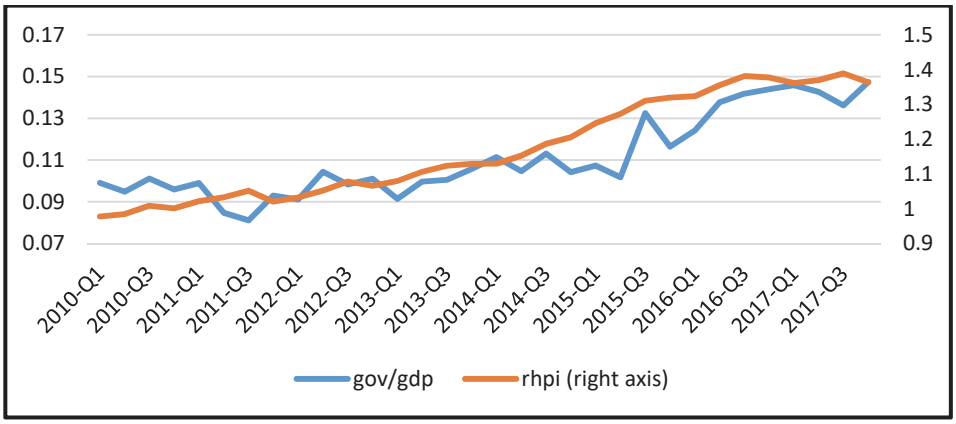
Table A1: Model 1 ARDL (3,3,2,2) Estimation Output

Model 1 – Dependent Variable: House Price Index (HPI)				
Variable	Coefficient	Standard Error	t-stat	Prob
LRHPI2(–1)	0.9535	0.2187	4.3602	0.0006
LRHPI2(–2)	–0.4460	0.3029	–1.4725	0.1615
LRHPI2(–3)	–0.2993	0.2191	–1.3662	0.1920
RMORT	0.0940	0.0151	6.1924	0.0000
RMORT(–1)	–0.1145	0.0325	–3.5161	0.0031
RMORT(–2)	0.0715	0.0418	1.7100	0.1079
RMORT(–3)	–0.0010	0.0303	–0.0339	0.9734
LGOVGDP	0.3904	0.2696	1.4478	0.1682
LGOVGDP(–1)	–0.2213	0.2456	–0.9011	0.3818
LGOVGDP(–2)	0.3385	0.2652	1.2760	0.2213
LGDP	0.0083	1.2873	0.0064	0.9949
LGDP(–1)	0.7240	1.2491	0.5796	0.5708
LGDP(–2)	0.0309	1.2575	0.0246	0.9807
C	–11.7253	9.4143	–1.2454	0.2321
Diagnostic Tests				
$R^2 = 0.94$				
$\overline{R}^2 = 0.89$				
Breusch-Godfrey LM Test= 0.84 (0.14)				
Breusch-Pagan-Godfrey = 1.69 (0.79)				
Jarque-Bera Normality Test= 1.58 (0.45)				
Ramsey Reset Test = 0.54 (0.47)				

Table A2: Model 2 ARDL (3,2,1,0) Estimation Output

Model 2 – Dependent Variable: Hedonic House Price Index (HHPI)				
Variable	Coefficient	Standard Error	t-stat	Prob
LHEDO2(–1)	0.9138	0.1532	5.9644	0.0000
LHEDO2(–2)	–0.3316	0.1642	–2.0193	0.0578
LHEDO2(–3)	–0.3678	0.1118	–3.2879	0.0039
RMORT	0.0891	0.0131	6.7568	0.0000
RMORT(–1)	–0.1109	0.0219	–5.0486	0.0001
RMORT(–2)	0.0650	0.0183	3.5421	0.0022
LGOVGDP	0.5236	0.2228	2.3493	0.0298
LGOVGDP(–1)	–0.1115	0.2105	–0.5299	0.6023
LGDP	0.5421	0.3725	1.4554	0.1619
C	–7.6621	7.4549	–1.0277	0.3170
Diagnostic Tests				
$R^2 = 0.91$				
$\bar{R}^2 = 0.87$				
Breusch-Godfrey LM Test= 0.85 (0.24)				
Breusch-Pagan-Godfrey = 1.53 (0.62)				
Jarque-Bera Normality Test= 1.56 (0.45)				
Ramsey Reset Test = 1.39 (0.18)				

Figure A1: Real House Prices and Government Expenditure to GDP (2010–2017)



Source: Authors' compilation from CBRT data.

Figure A2: CUSUM VE CUSUMQ Test Results