



BULLETIN OF ECONOMIC THEORY AND ANALYSIS

Journal homepage: <https://dergipark.org.tr/tr/pub/beta>

Examining the Effect of Specific Macroeconomic Determinants on Housing Prices Using the ARDL Bound Test Approach: The Case of the TR3 Region

Mert ERSEN  <https://orcid.org/0000-0001-5643-4690>

To cite this article: Ersen, M. (2026). Examining the effect of specific macroeconomic determinants on housing prices using the ARDL bound test approach: the case of the TR3 region. *Bulletin of Economic Theory and Analysis*, 11(1), 625-652.

Received: 07 Sept 2025

Accepted: 01 Feb 2026

Published online: 28 Feb 2026



©All right reserved



This manuscript is licensed under Creative Commons Attribution NonCommercial 4.0 International License ([CC BY NC](https://creativecommons.org/licenses/by-nc/4.0/)).



Bulletin of Economic Theory and Analysis

Volume 11, Issue 1, pp. 625-652, 2026

<https://dergipark.org.tr/pub/beta>

Original Article / Araştırma Makalesi

Received / Alınma: 07.09.2025 Accepted / Kabul: 01.02.2026

Doi: <https://doi.org/10.25229/beta.1779525>

Examining the Effect of Specific Macroeconomic Determinants on Housing Prices Using the ARDL Bound Test Approach: The Case of the TR3 Region

Mert ERSEN^a

^a Ph. D, Independent Scholar, İzmir, TÜRKİYE

<https://orcid.org/0000-0001-5643-4690>

Abstract

The housing price index is one of the key economic indicators reflecting changes in housing prices in a country or region. This index is of critical importance, particularly for investors and financial institutions, in making short- and long-term investment decisions. Various macroeconomic variables affect the housing price index. Therefore, examining the effects of macroeconomic factors on the housing price index is of great importance. In this study, using data from the period 2020:4–2024:12, the effects of macroeconomic variables such as the consumer price index (CPI) and the industrial production index (IPI) on the TR3 region housing price index (HPI3) were analyzed using the ARDL bounds test method. According to the long-term analysis results, the CPI variable has a negative effect on HPI3 at a 10% significance level, and a 1% increase in CPI reduces HPI3 by 0.49%. The IPI was found to have a positive effect on the HPI3 at the 5% significance level, with a 1% increase in the IPI increasing the HPI3 by 7.98%. The error correction coefficient was calculated as -0.17, indicating that short-term imbalances will return to long-term equilibrium within approximately 6 months. In the short-term analysis, the current, one-period, and three-period lagged values of CPI were found to have positive and significant effects on HPI3. These findings reveal that inflation may have a positive effect on housing prices in the short term.

Keywords

Housing Price Index, Industrial Production Index, Consumer Price Index, ARDL Bounds Test

JEL Classification

C32, C82, E31

Contact Mert ERSEN ✉ mert_9034@hotmail.com 📧 Independent Scholar, İzmir, TÜRKİYE.

Citation Ersen, M. (2026). Examining the effect of specific macroeconomic determinants on housing prices using the ARDL bound test approach: the case of the TR3 region. *Bulletin of Economic Theory and Analysis*, 11(1), 625-652.



This manuscript is licensed under Creative Commons Attribution NonCommercial 4.0 International License ([CC BY NC](https://creativecommons.org/licenses/by-nc/4.0/)).

Belirli Makroekonomik Belirleyicilerin Konut Fiyatlarına Etkisinin ARDL Sınır Testi Yaklaşımı ile İncelenmesi: TR3 Bölgesi Örneği

Öz

Konut fiyat endeksi, bir ülke ya da bölgedeki konut fiyatlarındaki değişimleri yansıtan temel ekonomik göstergelerden biridir. Bu endeks, özellikle yatırımcılar ve finans kuruluşları açısından, kısa ve uzun vadeli yatırım kararlarının alınmasında kritik bir öneme sahiptir. Konut fiyat endeksinin etkileyen çeşitli makroekonomik değişkenler bulunmaktadır. Bu nedenle, makroekonomik faktörlerin konut fiyat endeksi üzerindeki etkilerinin incelenmesi büyük önem taşımaktadır. Bu çalışmada, 2020:4–2024:12 dönemine ait veriler kullanılarak tüketici fiyat endeksi (TÜFE) ve sanayi üretim endeksi (SUE) gibi makroekonomik değişkenlerin TR3 bölgesi konut fiyat endeksi (KFE3) üzerindeki etkileri ARDL sınır testi yöntemiyle analiz edilmiştir. Uzun dönem analiz sonuçlarına göre, TÜFE değişkeni %10 anlamlılık düzeyinde KFE3 üzerinde negatif etkili olup, TÜFE’de meydana gelen %1’lik artış KFE3’ü %0.49 oranında azaltmaktadır. SUE ise %5 anlamlılık düzeyinde KFE3 üzerinde pozitif etkili bulunmuş, SUE’deki %1’lik artış KFE3’ü %7.98 oranında artırmıştır. Hata düzeltme katsayısı -0.17 olarak hesaplanmış ve bu değer, kısa dönem dengesizliklerin yaklaşık 6 ay içinde uzun dönem dengeye döneceğini göstermektedir. Kısa dönem analizinde ise TÜFE’nin cari, bir ve üç dönem gecikmeli değerlerinin KFE3 üzerinde pozitif ve anlamlı etkileri tespit edilmiştir. Bu bulgular, kısa vadede enflasyonun konut fiyatlarını artırıcı yönde etkileyebileceğini ortaya koymaktadır.

Anahtar Kelimeler

Konut Fiyat Endeksi, Sanayi Üretim Endeksi, Tüketici Fiyat Endeksi, ARDL Sınır Testi

JEL Kodu

C32, C82, E31

1. Introduction

Housing not only meets people's shelter needs but also stands out as an important savings and investment tool for households and companies. In this regard, the housing market has become an important indicator of individual well-being and economic performance in a country (Bıtrak, 2024). Research on the housing market has shown that it is one of the most effective ways to adapt consumption and production activities in the sector to other sectors of the economy (Alkan, 2022). The housing market is the most critical area of activity for the construction sector and the construction materials industry, which play an important role in the growth of the Turkish economy. The healthy functioning of the construction sector is of great importance in terms of ensuring financial stability. This stability and sense of security lead to an increase in housing investments and a revival in housing demand (KPMG, 2018). However, factors such as population and household growth, demographic developments, urbanization, internal and external migration, and diversification of housing consumption habits are causing both qualitative and quantitative changes in housing needs (Coşkun, 2016). Therefore, the dynamics affecting housing prices stand out as a current research area because they significantly impact a country's overall welfare (Yılmazel et al., 2018; Akyol, 2023).

Housing prices in Türkiye have increased significantly in recent years. According to data from the Central Bank of the Republic of Türkiye (CBRT), the price per square meter of housing across the country was 6,300 TL in 2020, reaching approximately 30,500 TL in 2023, an increase of about 680%. Looking at Türkiye's three leading provinces, prices increased by 583% in Istanbul, 722% in Ankara, and 692% in Izmir (CBRT, 2024; Bıtrak, 2024).

In recent years, significant price changes have occurred in the housing markets in our country. However, it is noteworthy that these price changes exhibit different characteristics depending on the housing price index used, the analysis period, the local market, and price adjustment criteria. This situation highlights the need for a critical reassessment of the perception that housing prices in Türkiye are rising rapidly and that housing is a good investment vehicle. The examination of changes in housing prices is of great importance because housing, which constitutes a significant portion of household assets, is exposed to various risks (Coşkun, 2016).

Housing prices play a significant role in households' decisions to buy or sell homes (Akyol, 2023). However, price fluctuations in the housing market pose certain risks for investors and financial institutions, which can only change the supply quantity to a limited extent in the short term. Price fluctuations can be influenced by various macroeconomic variables, including interest rates, risk premiums (Bıtrak, 2024), money supply, national income, exchange rates and inflation rates, industrial production, construction material prices, consumer prices, and rent levels, in addition to sector-specific dynamics (Badurlar, 2008; Çetin, 2021). Developments in the economy of Türkiye show that major macroeconomic factors such as the value of the local currency against foreign currencies, banks' mortgage policies, and the interest rates applied to these loans affect housing prices (Çetin, 2021).

Theoretical debates and models used in empirical research on the determination of housing prices vary significantly due to the heterogeneous structure of housing markets and seasonal and regional differences. In this context, the factors affecting housing prices in a country or in different regions within the same country may differ from those in other countries or regions (Shinwari and Özdemir, 2022). However, in the international literature, the key economic indicators affecting housing prices include consumer prices, gross domestic product, interest rates, construction costs, and housing loans (Katrakilidis and Trachanas, 2012). Furthermore, while there are numerous studies on the Turkish housing market in the existing literature, it is

evident that analyses focused specifically on the TR3 region are quite limited. However, this region possesses characteristics that distinguish it from other regions of Türkiye in terms of its demographic structure, industrial density, urbanization dynamics, and the diversity of its regional economic activities. Therefore, an empirical examination of how prices are determined in the TR3 region's housing market and the extent to which they are affected by macroeconomic indicators fills an important gap in the literature and offers a unique contribution to the shaping of local housing policies. Analyses focusing on this region reveal points where housing prices may deviate from national trends, enabling policymakers to develop more targeted and effective strategies.

In this regard, this study will analyze the short- and long-term relationships between the TR3 region housing price index with the consumer price index and the industrial production index using the Autoregressive Distributed Lag (ARDL) bounds test.

The results obtained from the research aim to contribute to the formulation and implementation of national and regional policies targeting the housing market, as well as to shed light on future research on this subject. This study consists of five sections. The introduction forms the first section, followed by a literature review in the second section. The econometric method is presented in the third section, followed by the data set and empirical findings in the fourth section, and the conclusions and discussion in the fifth section.

2. Literature Review

The literature on the determinants of housing prices is quite extensive both internationally and nationally, and studies can generally be grouped within the framework of macroeconomic determinants, the effects of credit and monetary policy, dynamic causal relationships, and regional housing market differences. In the international literature, studies such as Lastrapes (2002), Goodhart and Hofmann (2008), Taltavull and White (2012), Katrakilidis and Trachanas (2012), Algieri (2013), Panagiotidis and Printzis (2016), and Kishor and Marfatia (2016) show that housing prices respond strongly to indicators such as money supply, interest rates, industrial production, income, credit volume, and inflation. The common conclusion of these studies is that the housing market has a two-way relationship with both the real economy and financial cycles, and that income and credit channels are among the key determinants of housing prices.

Similarly, in Türkiye, the literature shows that housing prices are sensitive to macroeconomic conditions. Badurlar (2008), Öztürk and Fitöz (2009), Kargı (2013), Çankaya (2013), Lebe and Akbaş (2014), Dilber and Sertkaya (2016), Uysal and Yiğit (2016), Kolcu and Yamak (2018), Akkaya (2019), Alp (2019), Bayır et al. (2019), Kılıcı (2019), Varlık (2020), Eryüzlü and Ekici (2020), Karadaş and Salihoğlu (2020), Tekin (2021), Akkay (2021), Çetin (2021), Yıldırım et al. (2021), Kırca and Canbay (2022) and Shinwari & Özdemir (2022) reveal that interest rates, exchange rates, industrial production, consumer price indices, money supply, and credit conditions significantly affect housing prices in both the short and long term. Most of these studies use ARDL, VECM, and causality tests and show consistency regarding the existence of long-term cointegration relationships.

Another area gaining increasing importance in the literature is regional housing market differences. Regional studies such as Paksoy et al. (2014), Yalçın et al. (2017), and Hatipoğlu (2021) show that the response of housing prices to economic indicators is spatially heterogeneous; for example, while CPI and income effects remain weak in some regions, the decisive role of industrial production comes to the fore in others. The limited number of studies focusing directly on the TR3 region creates a significant gap in the literature. In this context, the TR3 region, with its mixed economic structure shaped by tourism, industry, agriculture, and seasonal population movements, has the potential to produce housing price dynamics that may differ from the findings in the general literature.

Recent studies have made significant contributions to the literature in terms of both current macroeconomic conditions and regional differences in the housing market. Şeyranlıoğlu (2023) examined the causal relationships between housing prices and macroeconomic and financial indicators in Türkiye using the Bootstrap Granger test, revealing that housing prices exhibit bidirectional relationships with certain macro indicators. Soylu and Kaynak (2024) analyzed the determinants and volatility of housing prices in Türkiye using AR-TGARCH models, determining that inflation and economic growth have positive relationships with housing prices, while mortgage interest rates and exchange rates have negative relationships. At the regional level, Kevser et al. (2025) showed that excessive increases in housing prices in different regions are related to common macroeconomic factors and may lead to misinterpretation of bubble-like movements. Furthermore, Bitrak (2024) found that, specifically in Izmir, housing sales to foreigners and the consumer price index increased housing prices, while the mortgage

interest rate decreased them. This general literature framework highlights the need to evaluate both national and regional analyses in the Turkish housing market in conjunction with macroeconomic indicators.

3. Econometric Method

The ARDL (Autoregressive Distributed Lag Bound Test) Bound Test approach is one of the most widely preferred econometric methods, especially in single-country analyses, due to its suitability for working with small sample sizes and its ability to use both stationary (I(0)) and first-differenced (I(1)) variables in the same model. This method consists of two main stages. In the first stage, it is investigated whether there is cointegration (i.e., a long-term relationship) between the variables in the model. This is because cointegration between variables indicates the existence of a long-term relationship. The ARDL bounds test uses the F statistic for this purpose (Pesaran et al., 2001; Shinwari and Özdemir, 2022).

One of the most important advantages of the method is that it eliminates the requirement for all variables in the model to be stationary at the same level. However, certain conditions are required for the method to be validly applied: The dependent variable must be I(1), and none of the variables in the model should be stationary (I(2)) when their second differences are taken (Pesaran et al., 2001; Shinwari and Özdemir, 2022).

If cointegration is detected, the second stage is entered to estimate both short-term and long-term coefficients. In determining the existence of a long-term relationship, the lower and upper critical values presented by Pesaran et al. (2001) are considered. The lower bound is based on the assumption that all variables are I(0), while the upper bound is based on the assumption that all variables are I(1). If the calculated F statistic exceeds the upper bound, the null hypothesis of no cointegration is rejected. If the F statistic falls below the lower bound, the hypothesis of no long-term relationship cannot be rejected. If the F statistic falls between the lower and upper bound values, the test result is considered inconclusive (Shinwari and Özdemir, 2022; Ordu and Songur, 2023).

If a long-term relationship is identified in the first stage, the short- and long-term dynamics of the model are estimated in the second stage. The results obtained in this process will contribute to understanding the short- and long-term relationships between the TR3 region housing price index with the industrial production index and the consumer price index. In the

final stage, various diagnostic tests will be applied to assess the reliability and validity of the estimated model.

First, the Jarque-Bera test (Jarque and Bera, 1980) will be used to examine whether the error terms follow a normal distribution; the Breusch-Godfrey test (Breusch, 1978; Godfrey, 1978) will be used to assess whether there is high-order autocorrelation (serial correlation) among the error terms. Then, the Breusch-Pagan-Godfrey (Breusch and Pagan, 1979; Godfrey, 1978) test will be used to investigate whether there is a problem of varying variance (heteroscedasticity) in the model, and finally, the Ramsey RESET test (Ramsey, 1969) will be used to check whether there is a specification error or deficiency in the model.

In addition, CUSUM and CUSUMQ tests will be used to test whether the coefficients estimated with the ARDL model are stable over time (Durbin and Evans, 1975). The CUSUM test indicates whether the cumulative sum of the error terms remains within the limits at the 5% significance level, while the CUSUMQ test reveals whether the cumulative sum of the squares of the error terms falls within these critical values. If the values in both tests remain within the specified limits, it is concluded that the model coefficients are stable.

The ARDL bounds test approach, also known as the unrestricted error correction model, was first developed by Pesaran et al. (2001). Subsequently, McNown et al. (2018) expanded the model and ensured its integration, naming it the integrated ARDL model. In this study, Equation 1 presents the equation used to examine the long-term relationship between the TR3 region housing price index (HPI3) with the industrial production index (IPI) and the consumer price index (CPI).

$$\Delta \ln HPI3_t = \alpha_1 + \sum_{i=1}^p \beta_1 \Delta \ln HPI3_{t-i} + \sum_{i=0}^q \beta_2 \Delta \ln IPI_{t-i} + \sum_{i=0}^m \beta_3 \Delta \ln CPI_{t-i} + \delta_1 \ln HPI3_{t-1} + \delta_2 \ln IPI_{t-1} + \delta_3 \ln CPI_{t-1} + \varepsilon_t \quad (1)$$

In Equation 1, Δ denotes the difference operator, β_1 , β_2 , and β_3 denote the short-term coefficients, δ_1 , δ_2 , and δ_3 denote the long-term coefficients, and ε_t denotes the error term of the model. In Equation 1, the cointegration relationship between the variables is tested by testing the null hypothesis ($H_0 : \delta_1 = \delta_2 = \delta_3$), which states that there is no long-term relationship.

Similarly, an error correction model (ECM) given in Equation 2 was applied to analyze the short-term dynamics between the house price index (HPI3) and the industrial production index (IPI) and the consumer price index (CPI).

$$\Delta \ln HPI3_t = \alpha_2 + \sum_{i=1}^p \theta_1 \Delta \ln HPI3_{t-i} + \sum_{i=0}^q \theta_2 \Delta \ln IPI_{t-i} + \sum_{i=0}^m \theta_3 \Delta \ln CPI_{t-i} + \omega ECT_{t-1} + \mu_t \quad (2)$$

The ECT term in Equality 2 refers to the one-period lagged form of the error terms obtained from the long-term model and indicates the speed at which the system returns to equilibrium when it deviates from it. This error correction term is expected to be negative and statistically significant; because a negative coefficient indicates that deviations occurring in the short term disappear over time, causing the system to return to equilibrium. While the θ coefficients in the same equation reflect short-term relationships, the ω coefficient indicates the speed at which deviations are corrected via the ECT term. The value of this coefficient is generally between -1 and 0; where 0 represents no correction or return to equilibrium, and -1 represents a complete (perfect) return to equilibrium.

4. Data Set and Empirical Findings

In this study, to examine the short- and long-term relationships and interactions in terms of causality between the TR3 region housing price index (HPI3) with the industrial production index (IPI) and the consumer price index (CPI), the linear model given in Equation 3 was applied based on the model used in the study by Katrakilidis and Trachanas (2012). The TR3 region consists of the provinces of İzmir, Aydın, Denizli, Muğla, Manisa, Afyonkarahisar, Kütahya, and Uşak. The series, which underwent logarithmic transformation, are expressed as $\ln HPI3$, $\ln IPI$, and $\ln CPI$.

$$\ln HPI3_t = f(\ln IPI_t, \ln CPI_t) \quad (3)$$

The monthly data used in this study covers the period 2020:4-2024:12. CPI (2003=100) and IPI (2021=100) data were obtained from the Turkish Statistical Institute, while HPI3 (2023=100) data were obtained from the Central Bank of the Republic of Türkiye database. The data set and abbreviations used in the study are shown in Table 1 (CBRT, 2025; TURKSTAT, 2025a; TURKSTAT, 2025b). All variables used in the analysis were transformed by taking their natural logarithms.

Table 1

Data Description

Variable Name	Definition	Variable Type	Source
HPI3	TR3 Region Housing Price Index	Dependent Variable	CBRT
IPI	Industrial Production Index	Independent Variable	TURKSTAT
CPI	Consumer Price Index	Independent Variable	TURKSTAT

Descriptive statistics for the variables included in the study are presented in Table 2. There are 57 observations for each variable, and values such as the mean, standard deviation, minimum, and maximum of the series can be seen in Table 2. It was observed that the highest mean value of 6.921192 belonged to the InCPI variable. While the InIPI and InCPI variables showed left skewness, the InHPI3 variable showed right skewness. This asymmetry highlights the different trends in the distributions of these variables. On the other hand, when we examine the Jarque-Bera values to test the normal distribution assumption of the variables, we see that the InHPI3 and InCPI variables show a normal distribution, while the InIPI variable does not.

Table 2

Descriptive Statistics of Variables

	InHPI3	InIPI	InCPI
Mean	4.076546	4.612226	6.921192
Median	3.942950	4.647271	6.923284
Maximum	5.229984	4.721174	7.895268
Minimum	2.789248	4.070735	6.119044
Standard Deviation	0.700777	0.108005	0.600574
Skewness	0.169224	-3.124062	0.148234
Kurtosis	1.719615	14.50073	1.612036
Jarque-Bera	4.165590	406.8515	4.784050
Probability	0.124582	0.000000	0.091444

Observations	57	57	57
--------------	----	----	----

The ARDL bounds test approach offers significant advantages, such as its applicability when series are integrated at the I(0) and/or I(1) level, its ability to yield robust results in detecting cointegration relationships even with small sample sizes, its allowance for variables in the model to have different optimal lag lengths, and its reliance on a single reduced-form equation for estimating long-term relationships. It differs from the traditional cointegration tests developed by Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990) (Öztürk and Acaravcı, 2010). However, for the ARDL approach to be validly applied, there must be no second-order integrated [I(2)] variables among the series (De-Vita and Abbott, 2004). Therefore, it is critically important to correctly determine the integration orders of all series included in the model.

Within this framework, the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests were first applied to the series to determine their degrees of stationarity. The results of these tests are presented in Table 3.

When examining the ADF and PP unit root test results in Table 3, it is observed that the lnIPI variable is stationary at the level at the 1% significance level in both methods in the Intercept and Trend & Intercept models. In the lnHPI3 variable, it was found that it is stationary at the first difference at the 1% significance level in both methods in the Intercept and Trend & Intercept models. Finally, it was observed that the lnCPI variable is stationary at the 1% significance level in the Intercept models and at the 5% significance level in the Trend & Intercept models for the first difference in both methods. It was concluded that the three variables used in the study are stationary at the level or in the first difference and meet the I(0) and/or I(1) requirement necessary for the ARDL test.

Table 3

ADF and PP Unit Root Test Results

	PP (Level)			PP (First Difference)		
	lnHPI3	lnIPI	lnCPI	lnHPI3	lnIPI	lnCPI
Intercept	-1.694907 (0.4283)	-9.278607 (0.0000)***	0.715906 (0.9915)	-3.588523 (0.0091)***	-7.185040 (0.0000)***	-3.898482 (0.0038)***

Trend	-0.598497	-10.62278	-2.603754	-4.409382	-7.088368	-3.898481
&Intercept	(0.9752)	(0.0000)***	(0.2804)	(0.0046)***	(0.0000)***	(0.0186)**
	ADF (Level)			ADF (First Difference)		
Intercept	-1.771011	-6.408962	0.152359	-3.580791	-6.859684	-3.821713
	(0.3908)	(0.0000)***	(0.9669)	(0.0093)***	(0.0000)***	(0.0047)***
Trend	-1.044402	-7.617106	-2.879812	-4.304513	-6.899909	-3.806199
&Intercept	(0.9288)	(0.0000)***	(0.1769)	(0.0062)***	(0.0000)***	(0.0236)**

Notes. (*) indicates a 10% significance level, (**) indicates a 5% significance level, (***) indicates a 1% significance level. Levels are based on MacKinnon (1996).

An cointegration analysis will be performed to determine the existence of a long-term relationship between the series. In this context, the preferred method is the ARDL (Autoregressive Distributed Lag) model. For the ARDL boundary test, it is first necessary to determine the appropriate lag length. To select the appropriate model, the variables are tested with different lag combinations, and the model that yields the lowest value according to information criteria is determined (Esen et al., 2012).

For this purpose, before proceeding to cointegration analysis, the lag lengths of the variables included in the model were determined using the VAR (Vector Autoregression) method. Findings regarding the determined optimal lag lengths are presented in Table 4. According to the delay length determination criteria in Table 4, the maximum delay length was determined to be 12, considering the minimum AIC value. Furthermore, it has been observed that this lag length is most appropriate for ensuring the conditions of the diagnostic tests performed to determine the reliability of the ARDL model.

Table 4

Optimal Delay Length Selection Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	25.57310	NA	7.36e-05	-1.003249	-0.882805	-0.958349
1	262.0396	430.8945	3.00e-09	-11.11287	-10.63110*	-10.93327
2	277.3369	25.83545*	2.28e-09*	-11.39275	-10.54964	-11.07845*
3	282.8025	8.501952	2.71e-09	-11.23567	-10.03122	-10.78666
4	290.8541	11.45117	2.91e-09	-11.19351	-9.627740	-10.60981
5	296.1190	6.785918	3.59e-09	-11.02751	-9.100405	-10.30911

6	303.3275	8.329757	4.18e-09	-10.94789	-8.659448	-10.09478
7	319.1635	16.18792	3.43e-09	-11.25171	-8.601938	-10.26390
8	330.0836	9.706810	3.66e-09	-11.33705	-8.325946	-10.21454
9	338.4227	6.300624	4.67e-09	-11.30767	-7.935238	-10.05046
10	353.0833	9.122146	4.91e-09	-11.55926	-7.825488	-10.16735
11	369.0891	7.825055	5.59e-09	-11.87063	-7.775524	-10.34401
12	390.3679	7.565794	6.31e-09	-12.41635*	-7.959916	-10.75504

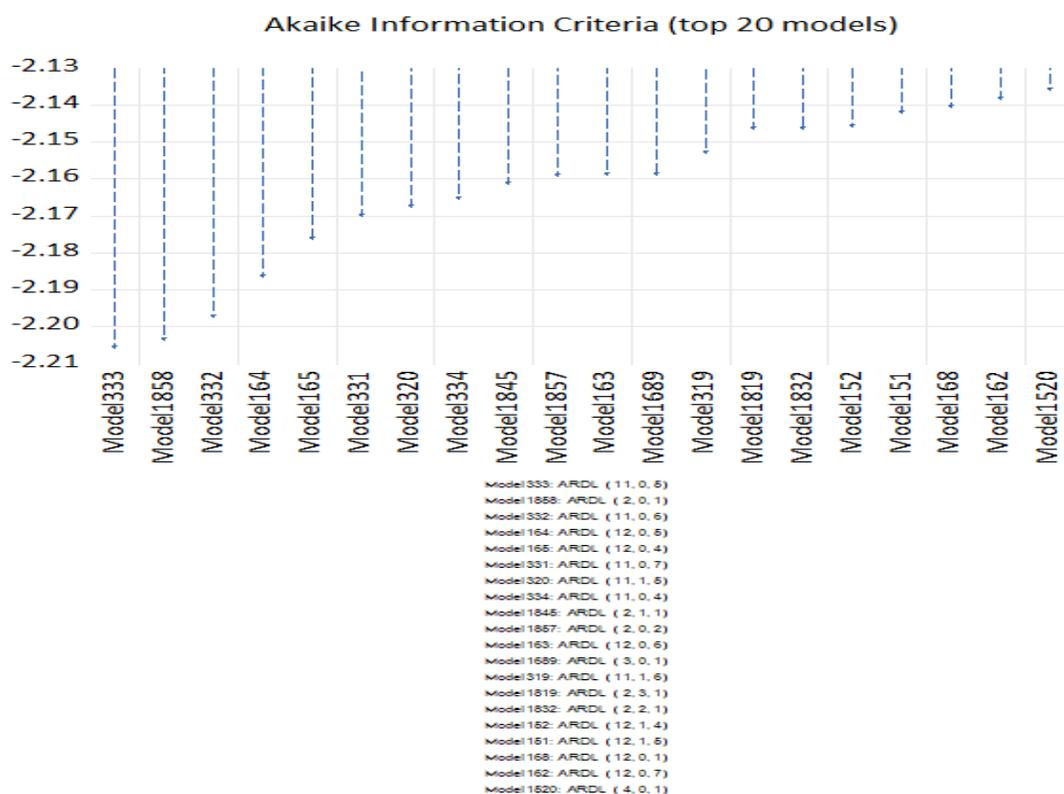


Figure 1. Choosing the Right Model for the Boundary Test

As shown in Figure 1, the ARDL (11, 0, 5) model was selected as the appropriate model according to the Akaike Information Criterion (AIC).

After determining the appropriate lag length as 12, the ARDL model estimation was performed. The estimation results of the ARDL (11, 0, 5) model are presented in Appendix 1. According to the results obtained, both the R^2 and adjusted R^2 values are quite high, indicating

that the model has strong explanatory power. Furthermore, the F-statistic value (210.3857) is statistically significant at the 1% level, indicating that the independent variables have a significant effect on the dependent variables. The Durbin-Watson coefficient (2.056523) being close to 2 indicates that there are no autocorrelation and spurious regression problems in the model. According to the model, the first lag of LNHP13(-1) is significant at the 1% significance level, while the eleventh lag of LNHP13(-11) and the LNCPI and LN1PI variables are significant at the 5% significance level. Furthermore, the constant term in the model is also observed to be significant at the 1% significance level.

To apply the ARDL test, the F statistic value must first be determined. The boundary test results for the specified ARDL (11, 0, 5) model are presented in Table 5. Upon examining Table 5, the F-statistic value obtained exceeds the upper critical value at the 1% level, thus rejecting the null hypothesis (H_0) that there is no cointegration relationship between the variables. Conversely, the alternative hypothesis (H_1), which states that there is a long-term relationship between the variables at the 1% significance level, is accepted.

Table 5

F Statistic Value and Critical Values

k	F stat	I (0)	I (1)	Sign.
2	7.7062622	3.333	4.313	10%
		4.07	5.19	5%
		5.817	7.303	1%

Note. k: Number of explanatory variables.

After determining that cointegration exists among the variables, long-term coefficient estimates and diagnostic tests for the variables are presented in Table 6.

Table 6 shows that when long-term coefficients are examined, the CPI variable negatively affects the HPI3 variable in the long term at a 10% significance level. It is found that a 1% increase in the consumer price index reduces the TR3 region housing price index by 0.49%. The IPI variable positively affects the HPI3 variable in the long term at a 5% significance level. It is determined that a 1% increase in the industrial production index increases the TR3 region

housing price index by 7.98%. Some diagnostic tests were applied to determine the reliability of the ARDL model. First, the Jarque-Bera normality test was performed to determine whether the residuals in the model were normally distributed. The results obtained from the normality test (0.830) indicate that the hypothesis that the residuals in the model are normally distributed is accepted. The probability value (0.29) obtained from the Breusch Pagan-Godfrey heteroscedasticity test supports the null hypothesis that the variance is constant in the model. The results of the Breusch-Godfrey LM autocorrelation test indicate that there is no autocorrelation problem in the model. In other words, based on the probability value obtained from the test (0.42), the null hypothesis that there is no autocorrelation problem in the model was accepted. Finally, the Ramsey-Reset specification test was performed to determine whether there were any variables that should have been included in the model but were not. The probability value obtained from the test (0.09) indicates that the null hypothesis that there is no specification error in the model was accepted.

Table 6

Long-Term Coefficient Forecast Results and Diagnostic Tests

Dependent variable: InHPI3				
Independent Variable	Coefficient	Std.Error	t-Statistics	Probability
InCPI	-0.494448	0.269851	-1.832303	0.0780*
InIPI	7.986686	3.143452	2.540737	0.0171**
$EC=LNHPI3-(-0.4944*LNCPI+7.9867*LN IPI)$				
Diagnostic Tests				
	Coefficients		Probability	
Jarque-Bera	0.370661		0.830829	
Breusch-Pagan-Godfrey (F-stat)	1.240093		0.2993	
Breusch-Godfrey Serial Correlation LM Test (F-stat)	0.892201		0.4224	
Ramsey Reset Test t-stat	1.723196		0.0967	
Ramsey Reset Test F-stat	2.969406		0.0967	

Note. (*) indicates a 10% significance level, (**) indicates a 5% significance level, (***) indicates a 1% significance level.

In addition to the diagnostic tests applied to examine the validity of the ARDL model, CSUM and CSUM-Q tests were performed to measure the stability of the regression coefficients. The graphs of these tests are presented in Figure 2.

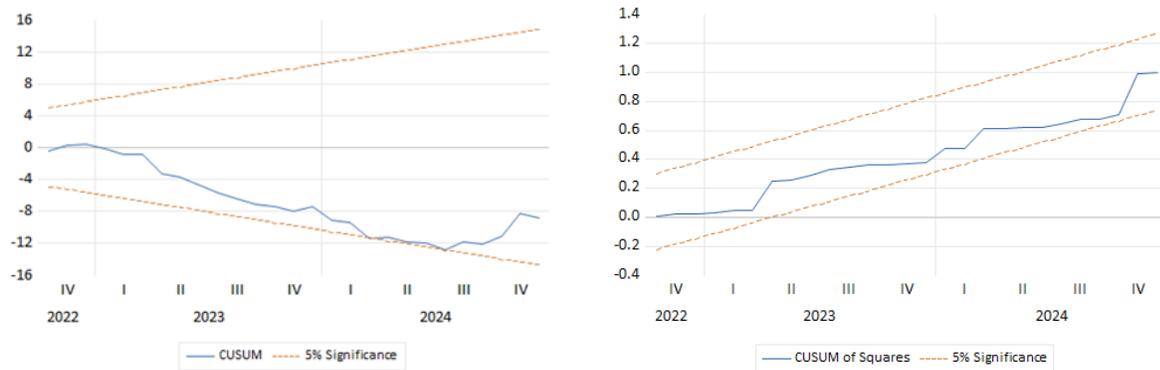


Figure 2. CSUM and CSUM-Q Stability Tests

Figure 2 shows that the graphs in the tests fall within the critical value limits at the 5% significance level, and that the coefficients in the model are stable and do not contain structural breaks.

In the ARDL model, short-term relationships between dependent and independent variables were also examined. Short-term coefficient estimates for variables based on the error correction model are presented in Table 7.

Table 7 shows the cointegration coefficient expressed as “CointEq(-1)”. For the error correction coefficient to be statistically significant, the value found must be between -1 and 0. As seen in the table, the estimated error correction term is statistically significant at the 1% significance level and is negative. The fact that the coefficient is negative and significant supports the cointegration relationship. This indicates that the effect of a shock that may occur in the short term will diminish over time and that the economy will move towards its long-term equilibrium. According to the result obtained, it has been determined that the established model meets the necessary conditions for the ARDL bounds test and that the short-term coefficients are consistent. The value of the error correction coefficient (-0.17) indicates that shocks occurring in the short term will reach the long-term equilibrium level in approximately 6 months ($1/0.17$) in a uniform manner. In other words, it was found that approximately 17% of the shocks occurring in the short term reached the long-term equilibrium level. When the short-term coefficients are examined, the

eight- and ten-period lagged values of the TR3 region housing price index have a positive and significant effect on the TR3 region housing price index at the 5% significance level. It has been observed that the current values of the consumer price index have a positive and significant effect on the TR3 region housing price index at the 1% significance level for one period and at the 5% significance level for three periods.

Table 7

ARDL Error Correction Model Results

Variable	Coefficient	Std.Error	t-Statistics	Probability
C	-5.306658	1.064684	-4.984256	0.0000***
D(LNHPI3(-1))	0.261967	0.159530	1.642122	0.1122
D(LNHPI3(-2))	-0.143295	0.174455	-0.821384	0.4186
D(LNHPI3(-3))	-0.035526	0.169281	-0.209866	0.8353
D(LNHPI3(-4))	-0.170833	0.185328	-0.921786	0.3648
D(LNHPI3(-5))	0.112982	0.184586	0.612080	0.5456
D(LNHPI3(-6))	0.166092	0.191230	0.868542	0.3928
D(LNHPI3(-7))	0.057549	0.179281	0.320997	0.7507
D(LNHPI3(-8))	0.499906	0.186409	2.681767	0.0123**
D(LNHPI3(-9))	0.053181	0.150883	0.352467	0.7272
D(LNHPI3(-10))	0.369286	0.145816	2.532544	0.0174**
D(LNCPI)	1.711910	0.541572	3.160998	0.0039***
D(LNCPI(-1))	1.506367	0.682735	2.206371	0.0360**
D(LNCPI(-2))	0.060253	0.620871	0.097045	0.9234
D(LNCPI(-3))	1.503939	0.648769	2.318142	0.0283**
D(LNCPI(-4))	1.022198	0.621027	1.645980	0.1114
CointEq(-1)*	-0.172746	0.034666	-4.983100	0.0000***

Note. (*) indicates a 10% significance level, (**) indicates a 5% significance level, (***) indicates a 1% significance level.

5. Discussion and Conclusion

The development of technology and the increasing pace of urbanization, along with the continuous rise in population, form the fundamental dynamics of the housing sector. In the housing market, the price of a home is shaped by the balance of supply and demand. Changes in housing prices are closely monitored both globally and in Türkiye, as housing prices are an important indicator of economic success. The most important tool for tracking developments in the housing market over specific time periods is indicators derived from data such as the housing price index. In Türkiye, this index, created to track changes in housing prices, aims to provide accurate information about the market. However, the long-term non-use of the housing price index has limited research on the housing market and led to other macroeconomic variables representing housing prices. This has made it difficult for individuals to access accurate and reliable housing price information. To address this issue, the Central Bank of the Republic of Türkiye began publishing the housing price index in January 2010, thereby seeking to eliminate uncertainties in prices.

The housing price index tracks price changes in the housing sector, providing investors and policymakers with important information about the market. Therefore, examining the factors that influence the housing price index is of great importance. Research shows that macroeconomic factors have a significant impact on the housing price index. In this context, the study examines in detail the relationship between the selected macroeconomic factors and the housing price index.

In this study, based on the model used in the research by Katrakilidis and Trachanas (2012), the dynamic relationship between the TR3 region housing price index with the consumer price index and the industrial production index was analyzed using the ARDL bounds test with monthly data from 2020:4 to 2024:12. The study is expected to contribute to previous studies in terms of the analysis techniques and variables used. For example, the industrial production index used in the study is included in the model as a proxy for gross domestic product, i.e., income, and is expected to have a positive relationship with housing sales. In the literature, the industrial production index is frequently used as an indicator representing gross domestic product, as industrial production constitutes a significant portion of gross domestic product. Therefore, various studies have revealed a strong relationship between industrial production and gross

domestic product (Nilson, 1987; Petit et al., 1996; OECD, 2006). In addition, the industrial sector is a stable and important source of income for workers (Lebe and Akbaş, 2014).

In this study, descriptive statistics were first examined to observe the basic characteristics of the series. Subsequently, the ADF (Augmented Dickey-Fuller) and PP (Philips-Perron) unit root tests were used to test whether the series contained a unit root. Based on the unit root test results obtained, it was concluded that the series other than IPI were not stationary at the level, and therefore, the first differences of these series were taken to make the series stationary. Subsequently, to determine whether there was a long-run cointegration relationship between the variables, the ARDL bounds test approach developed by Peseran et al. (2001) was preferred.

According to the ARDL boundary test results, it was determined that the CPI (Consumer Price Index) variable has a significant negative effect on the HPI3 (TR3 region housing price index) at the 10% significance level in the long term. It is determined that a 1% increase in the consumer price index reduces the housing price index in the TR3 region by 0.49%. This finding raises the question of why increases in inflation negatively affect housing prices and makes it important to discuss the underlying reasons for this relationship.

The rise in inflation weakens consumers' purchasing power and consequently reduces housing demand. This decline in demand may create downward pressure on housing prices. One of the negative effects of inflation on the housing market is manifested through rising interest rates. Rising interest rates in a high inflation environment increase borrowing costs, which makes long-term borrowing, such as mortgages, and access to credit more difficult. This limits households' demand for credit and causes liquidity problems. As a result, credit-based home purchases decline, which can lead to falling prices. Unless there is a significant increase in foreign investor demand, declining domestic demand can pull down the overall level of housing prices.

Similarly, a study by Goodhart and Hofmann (2008) also states that as the consumer price index rises, real gross domestic product falls, nominal interest rates rise, and housing prices decline. These findings are consistent with studies by researchers such as Lastrapes (2002) and Taltavull and White (2012), which show that inflation has a negative effect on housing prices. However, studies such as Kargı (2013), Paksoy et al. (2014), Bitrak (2024) and Soylu and Kaynak (2024) have found a positive relationship between inflation and housing prices, which

differs from the current study in this respect. On the other hand, studies such as Uysal and Yiğit (2016), Bayır et al. (2019), Karadaş and Salihoğlu (2020), Tekin (2021), and Çetin (2021) have revealed the negative effect of inflation on housing prices, and the current findings are consistent with these results. Hatipoğlu (2021), however, argues that inflation does not affect housing prices.

The industrial production index (IPI) variable shows a positive effect on the HPI3 (TR3 region housing price index) in the long term at a 5% significance level. A 1% increase in the industrial production index increases the housing price index in the TR3 region by 7.98%. This result is consistent with studies in the literature such as Kargı (2013), Bayır et al. (2019), Varlık (2020), Karadaş and Salihoğlu (2020), Yıldırım et al. (2021), and Soylu and Kaynak (2024). However, Tekin (2021) and Çetin (2021) found that the industrial production index negatively affected housing prices and reached a different conclusion. Furthermore, Shinwari and Özdemir (2022) stated that increases in the industrial production index negatively affected the hedonic housing price index in Türkiye in the short term.

Furthermore, according to the short-term findings of the study, it was determined that the current value of the consumer price index has a positive and significant effect on the TR3 housing price index at a 1% significance level, while its one- and three-period lagged values have a positive and significant effect at a 5% significance level. This indicates that changes in the consumer price index in the short term may have an upward effect on housing prices in the TR3 region. This result differs from the study by Shinwari and Özdemir (2022), which suggests that inflation reduces housing prices in the short term.

The findings of this study regarding the TR3 region are generally consistent with studies showing that housing prices in Türkiye vary at the regional level in response to macroeconomic variables. Paksoy et al. (2014) and Yalçın et al. (2017) indicate that responses to inflation and income indicators are heterogeneous across regions. The long-term negative impact of CPI in the TR3 region is a result that supports this spatial sensitivity differentiation.

Hatipoğlu (2021), however, did not find any causal relationship between housing prices and inflation in the TR82 region in the short, medium, or long term. Therefore, the fact that inflation has a downward effect on prices in the long term in the TR3 region differs from Hatipoğlu's inflation-neutral finding. This difference may be attributed to the TR3 region having

a market structure that is more sensitive to inflationary conditions due to its tourism activities, seasonal demand fluctuations, and economic interaction with the Istanbul area.

The long-term increase in housing prices in the TR3 region due to industrial production is consistent with the income–demand effect reported in many regions in studies such as Paksoy et al. (2014) and Yalçın et al. (2017).

The findings obtained by Bıtrak (2024) for İzmir, indicating that CPI and foreign demand increase housing prices, contradict the long-term negative effect of CPI in TR3, but appear to be partially consistent with the positive CPI effect observed in the short term. This situation indicates the potential for different price dynamics due to the coastal regions' demand structure being more outward-looking and tourism-oriented compared to TR3.

In general, findings for the TR3 region are both consistent with the literature and show divergent characteristics in certain areas; in particular, a more fragile structure in the face of inflation and a stronger demand-side effect in relation to industrial production stand out.

This study has examined in detail the impact of two important macroeconomic variables, such as the industrial production index and the consumer price index, on the housing market. However, it is also necessary to examine categorical variables reflecting other macroeconomic, demographic, fiscal, or non-monetary policy changes that may affect the housing price index. For example, factors such as urbanization rates, resource adequacy in the construction sector, the demographic structure of the population, or the state of the tourism sector fall within this scope, as they can temporarily or permanently affect both housing supply and demand depending on the unique or changing dynamics of the country's economy. More comprehensive analyses based on non-asymmetric models that include such variables will contribute to the development of healthier policy recommendations for the housing market and more accurate predictions.

Declaration of Research and Publication Ethics

This study which does not require ethics committee approval and/or legal/specific permission complies with the research and publication ethics.

Researcher's Contribution Rate Statement

Since the author is the sole author of the article, his contribution rate is 100%.

Declaration of Researcher's Conflict of Interest

There are no potential conflicts of interest in this study.

References

- Akkay, R. C. (2021). The Macroeconomic Determinants of the Housing Prices in Turkey. *Erciyes University İktisadi ve İdari Bilimler Fakültesi Dergisi*, 58, 241-264.
- Akkaya, M. (2019). Hedonik Konut Fiyat Endeksini Etkileyen Faktörlerin Analizi. *Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 33(2), 435- 454.
- Akyol, Ö. K. (2023). Konut fiyat endeksi belirleyicileri üzerine bir araştırma: Asimetrik eş bütünleşme analizi. *EKEV Akademi Dergisi*, 93, 283-307.
- Algieri, B. (2013). House price determinants: Fundamentals and underlying factors. *Comparative Economic Studies*, 55(2), 315–341.
- Alkan, U. (2022). Main determinants of house prices: Effects of construction cost and house sales to foreigners. *Business & Management Studies: An International Journal*, 10(4), 1512-1528.
- Alp, E. (2019). Türkiye Konut Kira Fiyatlarının Makroekonomik Belirleyicileri. *Bankacılar Dergisi*, 110, 94- 113.
- Badurlar, İ. Ö. (2008). Türkiye’de konut fiyatları ile makro-ekonomik değişkenler arasındaki ilişkinin araştırılması. *Anadolu Üniversitesi Sosyal Bilimler Dergisi*, 8(1), 223-238.
- Bayır, B., Güvenoğlu, H., & Şahin, K.Ş. (2019). Konut Fiyatlarının Belirleyicileri Üzerine Ampirik Bir Analiz. II. International Conference on Empirical Economics and Social Sciences, Bandırma, 760- 774.
- Bıtrak, O. O. (2024). Konut Fiyatlarının Makroekonomik Belirleyicileri ve Yabancıya Konut Satışının Konut Fiyatlarına Etkisinin Değerlendirilmesi: İzmir İli Örneği. *İktisadi İdari ve Siyasal Araştırmalar Dergisi*, 9(24), 354-374.
- Breusch, T. S. (1978). Testing for Autocorrelation in Dynamic Linear Models. *Australian Economic Papers*, 17, 334-355.
- Breusch, T. S., & Pagan, A. R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica*, 47(5), 1287-1294.
- CBRT (2024). Electronic Data Distribution System Residential Unit Prices. URL: <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket> (accessed date: 23.05.2025).
- CBRT (2025). Electronic Data Distribution System Housing Price Index (HPI) (2023=100). URL: <https://evds2.tcmb.gov.tr/index.php?/evds/portlet/KSAktmjeowo%3D/tr> (accessed date: 22.06.2025).
- Coşkun, Y. (2016). Konut Fiyatları ve Yatırımı: Türkiye İçin Bir Analiz. *Niğde Üniversitesi İktisadi Ve İdari Bilimler Fakültesi Dergisi*, 9(2), 201-217.
- Çankaya, S. (2013). Konut Fiyatları ve Makroekonomik Faktörler Arasındaki İlişkiye Global Bakış. *Maliye Finans Yazıları*, 27(100), 143- 154.

- Çetin, A. C. (2021). Türkiye’de Konut Fiyatlarına Etki Eden Faktörlerin Analizi. *Mehmet Akif Ersoy Üniversitesi Uygulamalı Bilimler Dergisi*, 5(1), 1-30.
- De-Vita, G., & Abbott, A. (2004). Real exchange rate volatility and US exports: an ARDL bounds testing approach. *Economic Issues*, 9(1), 69-78.
- Dilber, İ., & Sertkaya, Y. (2016). 2008 Finansal Krizi Sonrası Türkiye’de Konut Fiyatlarının Belirleyicilerine Yönelik Analiz. *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi*, 4(1), 11- 30.
- Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica*, 55, 251-276.
- Eryüzlü, H., & Ekici, S. (2020). Konut Fiyat Endeksi ve Reel Döviz Kuru İlişkisi: Türkiye Örneği. *İktisadi İdari ve Siyasal Araştırmalar Dergisi*, 5(12), 97- 105.
- Esen, E., Yıldırım, S., & Kostakoğlu, S. F. (2012). Feldstein-Horioka hipotezinin Türkiye ekonomisi için sınanması: ARDL modeli uygulaması. *Eskişehir Osmangazi Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 7(1), 251-267.
- Godfrey, L. G. (1978). Testing for Higher Order Serial Correlation in Regression Equations When the Regressors Include Lagged Dependent Variables. *Econometrica*, 46, 1303-1310.
- Goodhart, C., & Hofmann, B. (2008). House prices, money, credit, and the macroeconomy. *Oxford Review of Economic Policy*, 24(1), 180–205.
- Hatipoğlu, M. (2021). Neden Konut Fiyatları ile Enflasyon Arasında Nedensellik İlişkisi Yoktur? *Sakarya İktisat Dergisi*, 10(2), 159-166.
- Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, 6(3), 255-259.
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, 12, 231-254.
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration— with applications to the demand for money. *Oxford Bulletin of Economics and statistics*, 52(2), 169-210.
- Karadaş, H. A., & Salihoğlu, E. (2020). Seçili Makroekonomik Değişkenlerin Konut Fiyatlarına Etkisi: Türkiye Örneği. *Ekonomik ve Sosyal Araştırmalar Dergisi*, 16(1), 63-80.
- Kargı, B. (2013). Konut Piyasası ve Ekonomik Büyüme İlişkisi: Türkiye Üzerine Zaman Serileri Analizi (2000-2012). *International Journal Of Human Sciences*, 10(1), 897- 924.
- Katrakilidis, C., & Trachanas, E. (2012). What drives housing price dynamics in Greece: New evidence from asymmetric ARDL cointegration. *Economic Modelling*, 29(4), 1064–1069.

- Kevser, M., Altaylar, M., Bingöl, U., & Yaşar, Z. R. (2025). Inflation or speculative bubbles? Observing housing prices in Türkiye by using PANICCA and GSADF methods. *Ekonomika*, *104*(3), 44–61.
- Kılıcı, E. (2019). Konut Kredisi Faiz Oranları ile İpotekli Konut Satışları Arasındaki İlişkinin Analizi Türkiye Örneği. *Economics, Finance, Politics*, *14*(1), 95- 107.
- Kırca, M., & Canbay, Ş. (2022). Determinants of housing inflation in Turkey: a conditional frequency domain causality. *International Journal of Housing Markets and Analysis*, *15*(2), 478-499.
- Kishor, N. K., & Marfatia, H. A. (2017). The Dynamic Relationship between Housing Prices and the Macroeconomy: Evidence from OECD Countries. *Journal of Real Estate Finance and Economics*, *54*(2), 237–268.
- Kolcu, F., & Yamak, N. (2018). Gelir ve Faiz Oranlarının Konut Fiyatları Üzerindeki Kısa ve Uzun Dönemdeki İlişkisi. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, Prof. Dr. Harun Terzi Özel Sayısı, 141- 152.
- KPMG. (2018). Sectoral overview 2018 - construction. URL: <https://assets.kpmg/content/dam/kpmg/tr/pdf/2018/01/sektorel-bakis-2018-inaaat.pdf> (accessed date: 22.05.2025)
- Lastrapes, W. D. (2002). The Real Price of Housing and Money Supply Shocks: Time Series Evidence and Theoretical Simulations. *Journal of Housing Economics*, *11*(1), 40-74.
- Lebe, F., & Akbaş Y.E. (2014). Türkiye'nin Konut Talebinin Analizi: 1970-2011. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, *28*(1), 57- 83.
- MacKinnon, J. G. (1996), Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*, *11*, 601–618.
- McNown, R., Sam, C. Y., & Goh, S. K. (2018). Bootstrapping the autoregressive distributed lag test for cointegration. *Applied Economics*, *50*(13), 1509 1521.
- Nilsson, R. (1987), OECD Leading Indicators, *OECD Economic Studies*, No. 9, Paris.
- OECD, (2006). Composite Leading Indicators for Major OECD Non-Member Countries: Brazil, China, India, Indonesia, Russian Federation, South Africa. *Statistics Working Paper*, No. 16 -2006/1.
- Ordu, S., & Songur, M. (2023). Yenilenebilir Enerji ile İstihdam Arasındaki İlişki: Türkiye için ARDL Sınır Testi Yaklaşımı. *Alanya Akademik Bakış*, *7*(2), 741-754.
- Öztürk, I., & Acaravcı, A. (2010). The causal relationship between energy consumption and GDP in Albania, Bulgaria, Hungary and Romania: Evidence from ARDL bound testing approach. *Applied Energy*, *87*(6), 1938-1943.

- Öztürk, N., & Fitöz, E. (2009). Türkiye'de Konut Piyasasının Belirleyicileri Ampirik Bir Uygulama. *Zonguldak Karaelmas Üniversitesi Sosyal Bilimler Dergisi*, 5(10), 21-46.
- Paksoy, S., Yöntem, T., & Büyükçelebi, T. (2014). Konut Fiyat Endeksi ve Enflasyon Arasındaki İlişki (TRC1, TRC2 ve TRC3 Düzey Bölgeleri Üzerine Ampirik Bir Çalışma). *ASSAM Uluslararası Hakemli Dergi*, 2, 54- 69.
- Panagiotidis, T., & Printzis, P. (2016). On the macroeconomic determinants of the housing market in Greece: a VECM approach. *International Economics and Economic Policy*, 13(3), 387–409.
- 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.
- Petit, G., Salou, G., Beziz, P., & Degain, C. (1996). An Update of OECD Leading Indicator. URL: <https://www.oecd.org/sdd/leading-indicators/1909595.pdf> (accessed date: 21.06.2025)
- Ramsey, J. B. (1969). Tests for Specification Errors in Classical Linear Least-Squares Regression Analysis. *Journal of the Royal Statistical Society: Series B (Methodological)*, 31(2), 350–371.
- Shinwari, S., & Özdemir, D. (2022). Türkiye’de Sanayi Üretim ve Tüketici Fiyat Endeksinin Konut Fiyat Endeksi Üzerindeki Etkisi: ARDL Sınır Testi Analizi. *Çukurova Üniversitesi İktisadi Ve İdari Bilimler Fakültesi Dergisi*, 26(1), 61-82.
- Soylu, A. T., & Kaynak, S. (2024). Konut Fiyatları ve Değişkenliğinin Modellenmesi: Türkiye Örneği. *Uluslararası Ekonomi ve Yenilik Dergisi*, 10(2), 195-214.
- Şeyranlıoğlu, O. (2023). Konut fiyatları ve makroekonomik ve finansal göstergeler arasındaki ilişki: Bootstrap nedensellik testi. *Nevşehir Hacı Bektaş Veli Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 13(3), 1713-1732.
- Taltavull, P., & White, M. (2012). Fundamental Drivers of House Price Change: The Role of Money, Mortgages, And Migration in Spain and The United Kingdom. *Journal of Property Research*, 29(4), 341-367.
- Tekin, A. C. (2021). Türkiye’de Konut Fiyatlarına Etki Eden Faktörlerin Analizi. *Mehmet Akif Ersoy Üniversitesi Uygulamalı Bilimler Dergisi*, 5(1), 1-30.
- TURKSTAT (2025a). Statistical Data Portal Industrial Production Index (2021=100). URL: <https://data.tuik.gov.tr/Bulten/Index?p=Sanayi-Uretim-Endeksi-Haziran-2025-57922> (accessed date: 24.06.2025)
- TURKSTAT (2025b). Statistical Data Portal Consumer Price Index (2003=100). URL: <https://data.tuik.gov.tr/Bulten/Index?p=Tuketici-Fiyat-Endeksi-Temmuz-2025-54182> (accessed date: 26.06.2025).

- Uysal, D., & Yiğit, M. (2016). Türkiye’de Konut Talebinin Belirleyicileri (1970-2015): Ampirik Bir Çalışma. *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi*, 19(1), 185-209.
- Varlık, N. (2020). Ekonomik Büyümenin Konut Fiyatları Üzerindeki Asimetrik Etkisi: NARDL uygulaması. *Hitit Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 13(2), 352-367.
- Yalçın, E.C., Tıraşoğlu, M., & Çevik, E. (2017). Bölgesel Bazlı Konut Fiyat Endeksi İle Ekonomik Güven Endeksi Arasındaki İlişkinin Ekonometrik Analizi: Türkiye Örneği. *Girişimcilik ve Kalkınma Dergisi*, 12(1), 123- 137.
- Yıldırım, S., Karakaya, K. B., & Zeren, F. (2021). Türkiye’de Konut Fiyatlarını Belirleyen Makroekonomik Göstergelerin Analizi. *Uluslararası Ekonomi, İşletme ve Politika Dergisi*, 5(1), 1-15.
- Yılmazel, Ö., Afşar, A., & Yılmazel, S. (2018). Konut fiyat tahmininde yapay sinir ağı yönteminin kullanılması. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, 20, 285-300.

Appendix
Appendix 1

Table
ARDL (11, 0, 5) Model Estimation Results

Variable	Coefficient	Std.Error	t-Statistics	Probability
LNHPI3(-1)	1.089221	0.186151	5.851278	0.0000***
LNHPI3(-2)	-0.405262	0.291073	-1.392302	0.1752
LNHPI3(-3)	0.107768	0.301837	0.357042	0.7238
LNHPI3(-4)	-0.135306	0.309606	-0.437028	0.6656
LNHPI3(-5)	0.283814	0.326440	0.869422	0.3923
LNHPI3(-6)	0.053110	0.354347	0.149881	0.8820
LNHPI3(-7)	-0.108543	0.327294	-0.331638	0.7427
LNHPI3(-8)	0.442357	0.324355	1.363807	0.1839
LNHPI3(-9)	-0.446724	0.297908	-1.499536	0.1453
LNHPI3(-10)	0.316105	0.246782	1.280906	0.2111
LNHPI3(-11)	-0.369286	0.157778	-2.340550	0.0269**
LNCPI	1.711910	0.655134	2.613070	0.0145**
LNCPI(-1)	-0.290956	1.151631	-0.252647	0.8025
LNCPI(-2)	-1.446114	1.205041	-1.200054	0.2405
LNCPI(-3)	1.443687	1.208074	1.195031	0.2425
LNCPI(-4)	-0.481742	1.135463	-0.424269	0.6747
LNCPI(-5)	-1.022198	0.701843	-1.456447	0.1568
LNPI	1.379665	0.635375	2.171420	0.0389**
C	-5.306658	2.794429	-1.899013	0.0683*
R-Squared	0.992921	Mean dependent var	4.266027	
Adjusted R-Squared	0.988201	S.D. dependent var	0.638458	

S.E. of regression	0.069351	Akaike info criterion	-2.205996
Sum squared resid	0.129857	Schwarz criterion	-1.450688
Log likelihood	69.73791	Hannan-Quinn criter.	-1.923053
F-statistic	210.3857	Durbin-Watson stat	2.056523
Prob(F-statistic)	0.000000		

(*) indicates a 10% significance level, (**) indicates a 5% significance level, (***) indicates a 1% significance level.