ANADOLU ÜNİVERSİTESİ
Cilt: 22, Sayı: 4, Yıl: 2022
e-ISSN: 2667-8683
AÜSBD
Anadolu Üniversitesi Sosyal Bilimler Dergisi
Anadolu University Journal of Social Sciences

Examining the Presence of Balloons in Turkey's House Prices [1]

Eda YALÇIN KAYACAN [2]

Submitted by: 09.07.2022 **Accepted by:** 11.12.2022 **Article Type:** Research Article

Abstract

Financial bubbles have a significant effect on economic indicators. Bubbles in the housing market may herald the existence of financial crises, especially those arising from the housing market. In this study, it was aimed to test the existence of bubbles in housing price formations by considering the housing price index of Turkey in general and the housing price index of 26 sub- provinces/regions, including Turkey's three big cities. For this purpose, the existence of bubbles in housing prices were examined using the monthly frequency data of 27 housing price indexes for the 2010M1 – 2022M3 periods, with the methods of the Sup-Augmented Dickey Fuller and Generalized Sup-Augmented Dickey Fuller methods and then the periods of the bubbles determined form each province/region were expressed. In the findings obtained, the presence of undeflated balloons was determined in Turkey in general and in all 26 sub-provinces/regions. Considering the economic risks that balloons indicate, it is clear that necesserity of constantly controlled with regulations both of the housing market and the financial markets associated with the housing market. It is thought that the study will contribute to the literature in terms of handling the period including the COVID-19 pandemic process, using real housing prices, and comprehensively examining the existence of bubbles for both Turkey in general and all sub-regions of Turkey.

Keywords: *Price bubbles, SADF, GSADF, BSADF, House Prices*

Citation: Yalçın Kayacan, E. (2022). Examining the presence of balloons in Turkey's house prices. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 22*(4), 1255-1272.

[1] This study does not require ethics committee permission.

[2] Pamukkale University /Faculty of Science / Department of Statistics, **eyalcin@pau.edu.tr/ edayalcinkayacan@gmail.com,** ORCID: 0000-0002-1616-9121

ANADOLU ÜNİVERSİTESİ
Cilt: 22, Sayı: 4, Yıl: 2022
e-ISSN: 2667-8683
AÜSBD
Anadolu Üniversitesi Sosyal Bilimler Dergisi
Anadolu University Journal of Social Sciences

Türkiye Konut Fiyatlarında Balon Varlığının İncelenmesi

Eda YALÇIN KAYACAN [3]

Başvuru Tarihi: 09.07.2022 **Kabul Tarihi:** 11.12.2022 **Makale Türü:** Araştırma Makalesi

Öz

Finansal balonlar ekonomik göstergeler üzerinde önemli bir etkiye sahiptir. Konut piyasasındaki balonlar, özellikle konut piyasasından kaynaklanan finansal krizlerin varlığını haber verebilmektedir. Çalışmada, Türkiye geneli ve Türkiye geneli dışında üç büyük ili de kapsayan 26 il/bölgeye ait konut fiyat indeksi ele alınarak konut fiyat oluşumlarındaki balonların varlığının sınanması amaçlanmıştır. Bu amaç doğrultusunda 2010M1 – 2022M3 dönemleri için aylık frekanstaki 27 konut fiyat indeksi verisi kullanılarak Sup-Augmented Dickey Fuller ve Generalized Sup-Augmented Dickey Fuller yöntemleriyle konut fiyatlarındaki balonların varlığı incelenmiş ve her bir il/bölge için tespit edilen balonlara ait dönemler ifade edilmiştir. Elde edilen bulgularda, Türkiye geneli ve 26 alt il/ bölgenin tamamında sönmemiş balonların varlığı tespit edilmiştir. Balonların işaret ettiği ekonomik riskler düşünüldüğünde konut piyasasının ve konut piyasasıyla ilişkili yönleriyle finansal piyasaların düzenlemelerle sürekli kontrol edilmesi gerekliliği açıktır. Konut piyasasındaki balonların varlığının sınanmasında, COVID-19 pandemi sürecini içeren periyotun da dikkate alınması, reel konut fiyatlarının kullanılması ve hem Türkiye hem de Türkiye tüm alt bölgelerine ait balonların kapsamlı bir şekilde sınanması hususlarıyla çalışmanın literatüre katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: *Fiyat Balonları, SADF, GSADF, BSADF, Konut Fiyatları*

[3] Pamukkale Üniversitesi Fen-Edebiyat Fakültesi İstatistik Bölümü, **eyalcin@pau.edu.tr/ edayalcinkayacan@gmail.com,** ORCID: 0000-0002-1616-9121

Introduction

While the housing sector meets the basic need of people for shelter, it is also an important indicator of total welfare and has a great importance in the economy. Considering the importance of the housing market, it is clear that it is necessary to reveal whether the increase in housing prices in Turkey especially in recent years indicates the existence of a bubble.

A financial bubble, in the simplest sense, is a situation that occurs when the market value of an asset deviates from its fundamental value and cannot be explained by economic reasons (Hu and Oxley, 2017). The housing bubble, on the other hand, can be defined simply as the deviation of housing prices from their fundamental values. It is also possible to state that housing bubbles are driven by home buyers who expect housing prices to increase unrealistically (Gökçe and Güler, 2020). It is claimed that the majority of financial crises are caused by bubbles in financial assets (Ahamed, 2009). Price bubbles that occur as a result of speculative movements lead market investors to expect more price increases. As a result of these movements, investors behave irrationally and increase both demand and prices. As a result, they cause a possible crisis after the balloon to have more severe consequences (İskenderoğlu and Akdağ, 2019). Considering the relationship between the housing market and many sectors in the economy, it becomes even more important to examine the existence of price bubbles. Housing markets are closely related to macroeconomic and financial stability. The creation of different financial instruments on housing, the presentation of housing as security, the effect of housing prices on savings and consumption through the wealth effect are the main examples of interaction between the housing market and the general economy. In addition, in the presence of housing bubbles, bank balance sheets are generally more affected by housing, and the decline in housing prices also affects other sectors of the economy through the credit channel.

There are many methods that have been studied in detecting price bubbles. In the detection of balloons; interpretation of changes in important ratios such as price-rent ratio and price-income ratio, variance bounds test, unit root and cointegration tests are the main methods used. It is accepted that Sup-Augmented Dickey Fuller (SADF) (Phillips, et al. 2011) and Generalized Sup-Augmented Dickey-Fuller (GSADF) (Phillips et al. 2015) tests, which are recursive test procedures, can yield more successful results. It is especially preferred because the GSADF method provides the detection of multiple price bubbles by analyzing the price bubble periods in detail.

Literature

When the studies using SADF and GSADF methods in the literature on housing bubbles are examined, it is seen that there are studies that are progressing for Turkey in general or by considering some provinces/regions of Turkey. Zeren and Erguzel (2015) tested the existence of balloons for Istanbul, Ankara and Izmir for the dates 2010M1-2014M6 and found that the balloon did not exist. Evrim Mandacı and Çağlı(2018), investigated the existence of housing bubbles for Turkey and many regions for the 2010M1–2017M4 periods and obtained findings regarding the presence of bubbles. Abioğlu (2020), analyzed the monthly housing price indices and housing rent indices for the period 2007-2018 for Turkey and 10 provinces (Adana, Ankara, Antalya, Bursa, Eskişehir, Istanbul, Izmir, Kayseri, Konya and Mersin). In his study, he stated that there were bubble formations in the price-rent ratios of all provinces except Bursa and İzmir. Akdag and Iskenderoglu (2020), examined the bubble formation in house prices between 2010M1 and 2018M12 by using the monthly real hedonic house price index for Turkey and the cities of Ankara, Istanbul and Izmir, and they found that there are bubbles in house prices. Güler and Gökçe (2020a), used seasonally adjusted real house prices in their study aiming to determine whether there was a housing bubble in Turkey, Istanbul and Antalya, and determined the presence of housing bubbles. They also stated that the common point of the balloons obtained is that they

peaked in 2018 and that this coincided with the legal regulations that made it easier for foreigners to acquire housing. Gökçe and Güler (2020b), examined the bubble structure by using the seasonally adjusted real house price index data of Ankara province for the period 2010M1- 2019M8 and found that there was a housing bubble. Akkuş (2021), examined the existence of price bubbles in the housing sector for Turkey and the region of TR22 (Balıkesir-Çanakkale) for the period 2010M1 -2020M6 and obtained findings regarding the existence of price bubbles. Using the obtained bubble dates as the dependent variable, he extended his work by estimating the logit model with the variables of housing real interest rate, inflation and money supply. He stated that the rising real interest rate and inflation increase the probability of a housing price bubble for the region of TR22 (Balıkesir-Çanakkale). Korkmaz et al. (2021), examined the housing price bubbles for the period 2010M1-2021M2 for Turkey and the provinces of Ankara, Izmir, Istanbul and drew attention to the fact that the bubbles that emerged in the post-2019 period have not yet deflated. Tekin (2021) examined the housing bubble formation in Istanbul and its districts for the period of 2010-2019 and identified bubble formations. Using the bubble dates obtained, he examined the factors causing the formation of the housing bubble by using probit and logit models and found that the housing interest was effective in the formation of the housing bubble. Çadırcı and Güner (2022), analyzed the TRA1 region, which includes the provinces of Erzurum, Erzincan and Bayburt, which is expressed as Turkey's Northeast Anatolian Region, using the monthly real house price index for the years 2013-2020, and they found that the bubble that started in the second half of 2019 continued throughout the study period. Kartal (2022), examined the existence of housing bubbles in general Turkey and the region of TR71, where Nigde, Nevsehir, Aksaray, Kırsehir and Kırıkkale are located, for the period 2010M1-2021M7 and determined 3 bubble formation periods.

In this study, the presence of a bubble in the housing market was examined by using the housing price indices of Turkey and 26 sub-provinces/regions, including and the three big cities of Turkey. It is thought that the study will contribute to the literature with the fact that it is in a period that includes the COVID-19 epidemic period, that it takes into account the real housing prices, and that it has examined the existence of balloons in terms of both Turkey in general and Turkey's sub-provinces/regions. After the introductory part, in which the concept of price bubbles and the literature on housing price balloons are examined, the study continues with the methodology in the second part, the findings in the third part, and the conclusion and evaluation in the last part.

Methodology

SADF and GSADF tests are defined as right-tailed unit root tests that detect bubble formations using iterative ADF regressions by developed Phillips et al. (2011) and Phillips et al. (2015). The GSADF test was developed on the SADF test, which was developed to test rational balloon formation, and is used to test the presence of balloon formation, especially in series containing multiple balloons.

In equation (1), k represents the lag length and r_1, r_2 represents the start and end points of the sub-sample used in the regression estimation. However, the ADF test statistic in equation (2) is found by dividing the coefficient of y_{t-1} by its standard error.

$$\Delta y_t = \alpha_{r_1,r_2} + \beta_{r_1,r_2} y_{t-1} + \sum_{i=1}^{k} \psi_{r_1,r_2}^{i} \Delta y_{t-1} + \epsilon_t, \quad (1)$$

$$ADF_{r_1,r_2} = \frac{\beta_{r_1,r_2}}{se(\beta_{r_1,r_2})} \quad (2)$$

While the SADF test is an effective method when there is a bubble, it loses its effectiveness when the periods with more than one bubble are examined. It is possible to state that the GSADF test is more efficient than the SADF test, as iterative flexible estimation windows are used, and it overcomes the problem encountered in SADF when multiple balloons are involved.

The basic hypothesis of the GSADF test is included in equation (3).

$$y_t = dT^{-\eta} + y_{t-1} + \varepsilon_t \qquad \varepsilon_t \sim iid(0, \sigma^2) \tag{3}$$

In equation (3), y_t represents the real house price index, d constant term, T sample size and η the size of the intersection constant. The alternative hypothesis representing the bubble is also expressed in equation (4).

$$y_t = \alpha_{r_1 r_2} + \beta_{r_1 r_2} y_{t-1} + \sum_{j=1}^{J} \varphi_j \Delta y_{t-j} + \varepsilon_t \qquad \varepsilon_t \sim NID(0, \sigma^2) \tag{4}$$

In equation (4), J is the optimal lag length and is determined by Bayesian information criterion. If $\beta_{r_1 r_2} > 1$ the series contains bubbles, whereas if $\beta_{r_1 r_2} = 0$ it does not contain bubbles.

In equation (4), while the regression equation is estimated forward, the entire sample interval is in the range of [0,1]. While the end points (r_2) of the sub-samples go from the minimum sampling window (r_0) to 1, the starting points (r_1) go from 0 to ($r_2 - r_0$). Thus, the GSADF test statistic becomes the largest estimated ADF statistic in the r_1 and r_2 intervals and is expressed as in equation (5).

$$GSADF(r_0) = supADF_{r_1}^{r_2}, r_2 \in [r_0, 1] \text{ ve } r_1 \in [0, r_2 - r_0] \tag{5}$$

After the detection of the balloons during the sampling period, the Backward Sup-Augmented Dickey Fuller (BSADF) test is used to determine the formation dates of the detected balloons. In this method, test statistics are obtained by right-tailed ADF tests applied on samples that expand backwards. While the end point r_2 is fixed, the test statistic obtained as the sup value of the ADF statistics array calculated for the sub-samples whose starting points go from 0 to $r_2 - r_0$ is included in the equation (6) (Phillips et al., 2012).

$$BSADF_{r_2}(r_0) = supADF_{r_1}^{r_2}, r_1 \in [0, r_2 - r_0] \tag{6}$$

It is possible to monitor the process of SADF and GSADF test, which is obtained by right-tailed ADF test, by running different sub-samples forward, as in Figure 1 and Figure 2. In the SADF test, while the starting points of different sub-samples are the same, the ending points are moved forward; in the GSADF test, a dynamic structure is formed by changing both the starting points and the ending points of the samples in each repetition.

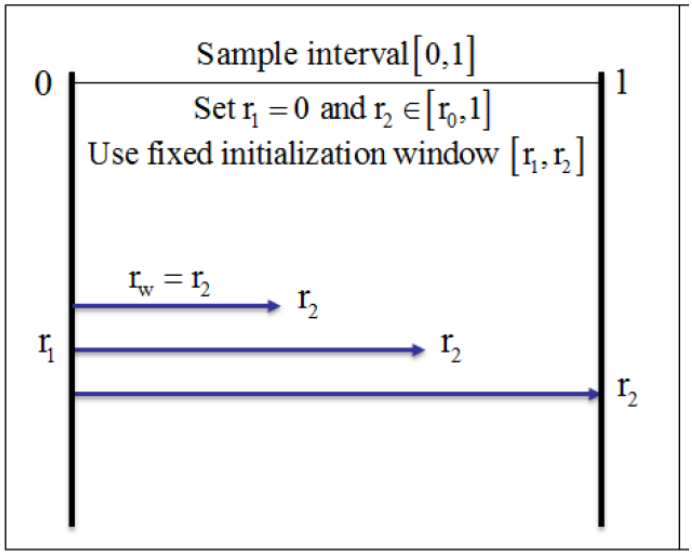


Figure 1. SADF test

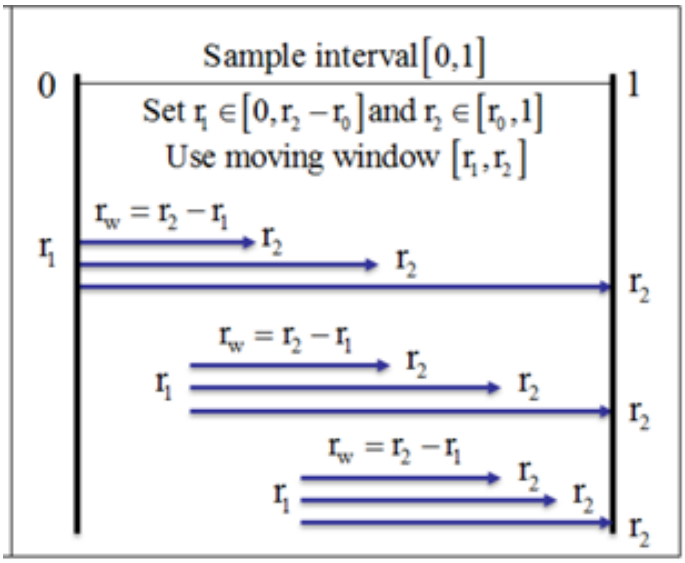


Figure 2. GSADF test

After the balloons were detected in the sampling period, the BSADF test process applied to determine the formation dates of the balloons on the SADF and GSADF tests is given in Figure 3.

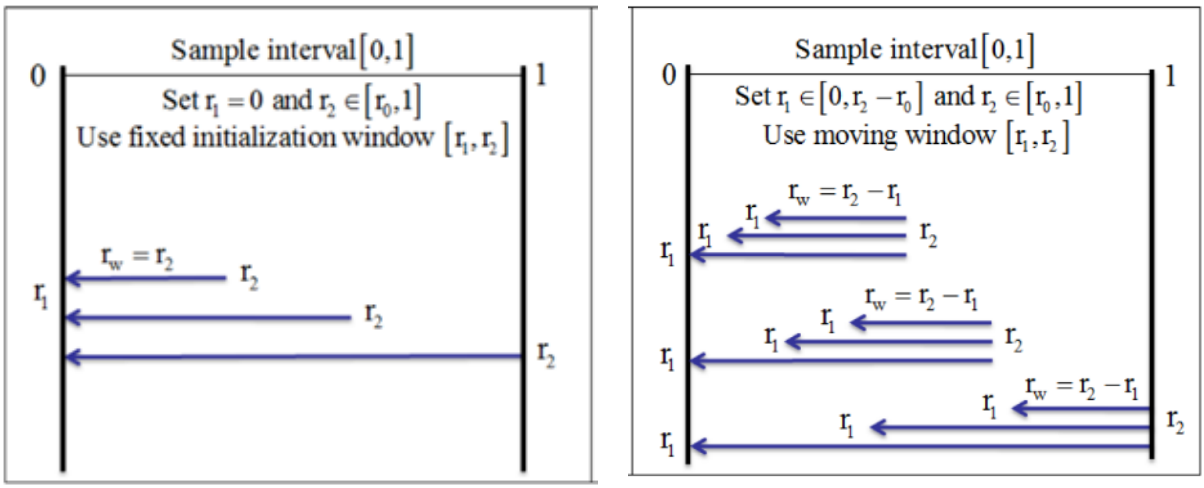


Figure 3. BSADF test (for the tests of SADF & GSADF)

The balloon formations obtained by the BSADF process must be controlled by equation (7) in order to be truly expressed as a balloon.

If bubble formation continues for r_0 consecutive periods, it can be stated that there is a bubble on the relevant dates.

$$r_0 = 0.01 + \frac{1.8}{\sqrt{T}} \qquad (7)$$

Empirical Results

In the study, which aims to express the bubbles detected by testing the existence of housing bubbles in Turkey in general and in Turkey's sub-provinces/regions, 27 house price index data for the 2010M1 – 2022M3 periods were used and the data were obtained from The Central Bank of the Republic of Turkey's electronic data distribution system (TCMB, 2022). Detailed information about the variables is given in Table 1.

Table 1
Variables

TR	Turkey House Price Index
TR 10	İstanbul House Price Index
TR 51	Ankara House Price Index
TR 31	İzmir House Price Index
TR 21	Edirne, Kırklareli, Tekirdağ House Price Index
TR 22	Balıkesir, Çanakkale House Price Index
TR 32	Aydın, Denizli, Muğla House Price Index
TR 33	Afyonkarahisar, Kütahya, Manisa, Uşak House Price Index
TR 41	Bursa, Eskişehir, Bilecik House Price Index
TR 42	Bolu, Kocaeli, Sakarya, Yalova, Düzce House Price Index
TR 52	Konya, Karaman House Price Index
TR 61	Antalya, Burdur, Isparta House Price Index
TR 62	Adana, Mersin House Price Index
TR 63	Hatay, Kahramanmaraş, Osmaniye House Price Index
TR 71	Nevşehir, Niğde, Aksaray, Kırıkkale, Kırşehir House Price Index
TR 72	Kayseri, Sivas, Yozgat House Price Index
TR 81	Zonguldak, Bartın, Karabük House Price Index
TR 82	Çankırı, Kastamonu, Sinop House Price Index
TR 83	Samsun, Çorum, Amasya, Tokat House Price Index
TR 90	Artvin, Giresun, Gümüşhane, Ordu, Rize, Trabzon House Price Index
TR A1	Erzurum, Erzincan, Bayburt House Price Index
TR A2	Ağrı, Ardahan, Kars, Iğdır House Price Index
TR B1	Bingöl, Elazığ, Malatya, Tunceli House Price Index
TR B2	Van, Bitlis, Hakkari, Muş House Price Index
TR C1	Kilis, Adıyaman, Gaziantep House Price Index
TR C2	Diyarbakır, Şanlıurfa House Price Index
TR C3	Batman, Mardin, Siirt, Şırnak House Price Index

The analyzes were first started by calculating the real house price index by using the equation (8). The descriptive statistics for both real and nominal house price indices are given in Table 2.

$$real\ house\ price\ index = \frac{nominal\ house\ price\ index}{1+monthly\ inflation\ rate} \quad (8)$$

Table 2
Descriptive Statistics

	N_Mean	R_Mean	N_Max	R_Max	N_Min	R_Min	N_Std. Dev.	R_Std. Dev.	Variability
TR	96.12	54.90	347.50	198.49	45.40	25.93	51.79	29.58	53.88
TR_10	87.38	49.91	317.90	181.58	36.00	20.56	46.90	26.79	53.67
TR_21	95.21	54.38	329.70	188.32	48.40	27.65	49.38	28.21	51.87
TR_22	100.10	57.18	377.30	215.51	48.40	27.65	60.45	34.53	60.40
TR_31	96.16	54.93	364.00	207.92	42.30	24.16	56.66	32.37	58.92
TR_32	102.83	58.74	463.10	264.52	44.00	25.13	72.32	41.31	70.33
TR_33	98.00	55.98	301.90	172.45	49.80	28.45	45.93	26.23	46.87
TR_41	97.34	55.60	336.30	192.09	49.70	28.39	51.63	29.49	53.04
TR_42	94.06	53.73	309.40	176.73	50.70	28.96	46.08	26.32	48.99
TR_51	97.32	55.59	333.50	190.50	50.70	28.96	46.13	26.35	47.40
TR_52	98.48	56.25	339.60	193.98	47.30	27.02	51.03	29.15	51.82
TR_61	104.57	59.73	476.80	272.35	45.40	25.93	70.26	40.13	67.19
TR_62	93.86	53.61	341.90	195.29	44.10	25.19	49.67	28.37	52.92
TR_63	102.86	58.75	339.90	194.15	57.60	32.90	50.17	28.66	48.77
TR_71	102.50	58.55	317.20	181.18	56.60	32.33	46.05	26.31	44.93
TR_72	100.47	57.39	324.40	185.30	50.10	28.62	49.36	28.19	49.12
TR_81	104.00	59.41	312.20	178.33	56.10	32.04	47.47	27.12	45.65
TR_82	99.36	56.76	304.60	173.99	50.20	28.67	47.73	27.26	48.04
TR_83	102.65	58.64	343.40	196.15	58.20	33.24	51.39	29.36	50.07
TR_90	96.82	55.31	288.00	164.51	56.80	32.44	43.84	25.04	45.28
TR_A1	98.35	56.18	268.40	153.31	50.60	28.90	40.86	23.34	41.55
TR_A2	105.00	59.98	290.00	165.65	60.50	34.56	40.13	22.92	38.22
TR_B1	103.80	59.29	306.30	174.96	55.80	31.87	50.83	29.03	48.97
TR_B2	106.00	60.54	305.70	174.62	59.60	34.04	46.80	26.73	44.16
TR_C1	104.91	59.92	372.30	212.66	43.60	24.90	57.31	32.74	54.63
TR_C2	106.76	60.98	383.20	218.88	55.40	31.64	52.30	29.87	48.99
TR_C3	105.19	60.08	334.10	190.84	56.70	32.39	48.49	27.70	46.10

N: nominal house price index, R: real house price index

When the results in Table 2 are examined, the highest average housing price index in terms of nominal and real prices is in the TRC2 (Diyarbakır, Şanlıurfa) region; it seems that the lowest average is for TR10 (Istanbul). The variability seems to be highest in TR32 (Aydın, Denizli, Muğla) and TRA2 (Ağrı, Ardahan, Kars, Iğdır) regions.

SADF and GSADF tests were conducted to test the existence of bubbles in price formations by using real house price indices for Turkey in general and 26 sub-provinces/regions, and the findings were given in Table 3. When the findings in the table were examined, it has seen that the basic hypothesis was rejected in both SADF and GSADF tests at all significance levels. While the rejection of the basic hypothesis in the SADF test indicated the existence of the balloon effect; the rejection of the main hypothesis in the GSADF test indicates that there was multi-balloons effects. Since the SADF test may give misleading results in the presence of multiple balloons, the results of the GSADF test were taken into account in evaluating the findings.

The fact that the basic hypothesis was rejected for all variables in the GSADF test indicates that there were multiple balloon effects in the 27 real house price indices. After detecting the presence of balloons, the dates of the balloons were obtained with the BSADF method. Although the findings show the existence of previously deflated balloons, it has still showed the presence of undeflated balloons in Turkey and all provincial/regional

indices as of March 2022, when the analyzes were made. For TR (Turkey in general), TR41 (Bursa, Eskişehir, Bilecik), TR42 (Bolu, Kocaeli, Sakarya, Yalova, Düzce) and TR61 (Antalya, Burdur, Isparta) a single balloon that has survived for many years without deflating has been obtained. It has been found that there were many balloons, one of which is still undeflated, in TR71 (Nevşehir, Niğde, Aksaray, Kırıkkale, Kırşehir) and TR72 (Kayseri, Sivas, Yozgat) regions. Since the study includes the period of the covid-19 pandemic, it is thought to be important to detect the presence of balloons that have started to inflate in this period. It seems that the deflated balloons started to inflate again and continue to inflate during the pandemic process in the regions of TR10 (İstanbul), TR51 (Ankara), TR33 (Afyonkarahisar, Kütahya, Manisa, Uşak), TR52 (Konya, Karaman), TR62 (Adana, Mersin), TR63 (Hatay, Kahramanmaraş, Osmaniye),TR71 (Nevşehir, Niğde, Aksaray, Kırıkkale, Kırşehir), TR72 (Kayseri, Sivas, Yozgat), TR81 (Zonguldak, Bartın, Karabük), TR82 (Çankırı, Kastamonu, Sinop), TRA1 (Erzurum, Erzincan, Bayburt), TRA2 (Ağrı, Ardahan, Kars, Iğdır), TRB2 (Van, Bitlis, Hakkari, Muş), TRC1 (Kilis, Adıyaman, Gaziantep), TRC2 (Diyarbakır, Şanlıurfa) ve TRC3 (Batman, Mardin, Siirt, Şırnak).

Table 3
The Results of SADF & GSADF Test

Variable	SADF_test statistic	Balloon Dates	GSADF_test statistic	Balloon Dates
TR	15.20915*	2011.M11-2022.M3	16.49152*	2012.M1-2022.M3
TR 10	14.0678*	2011.M11-2018.M12 2020.M2-2022M3	19.6671*	2012.M1-2018.M7 2020.M2-2022M3
TR 51	14.6016*	2012.M4-2018.M11 2019.M7-2022.M3	15.3872*	2012.M2-2018.M8 2020.M1-2022.M3
TR 31	14.3758*	2011.M11-2022.M3	14.3758*	2012.M1-2012M11 2013.M2-2022.M3
TR 21	13.1013*	2014.M4-2022.M3	13.8379*	2012.M5-2012.M10 2013.M4-2013.M10 2014.M1-2022.M3
TR 22	16.6538*	2012.M5-2012.M9 2013.M4-2013.M11 2014.M4-2022.M3	16.6538*	2012.M4-2012.M9 2013.M6-2013.M10 2014.M5-2022.M3
TR 32	15.8015*	2012.M5-2012.M9 2012.M12-2022.M3	15.8015*	2012.M5-2012.M8 2013.M2-2022M3
TR 33	14.5473*	2011.M11-2022.M3	14.8560*	2012.M1-2013.M11 2014.M1-2018.M10 2019.M7-2022.M3
TR 41	14.5513*	2012.M6-2022.M3	14.5513*	2012.M5-2022.M3
TR 42	14.6712*	2013.M05-2022.M3	16.5275*	2013.M1-2022.M3
TR 52	15.3168*	2012.M2-2022.M3	15.9117*	2012.M2-2018M10 2019.M8-2022M3
TR 61	17.2483*	2011.M11-2022.M3	17.2483*	2012.M1-2022.M3
TR 62	15.9285*	2013.M3-2022.M3	19.4477*	2012.M04-2012.M10 2013.M1-2018.M9 2020.M1-2022.M3
TR 63	17.8500*	2011.M11-2012.M7 2013.M1-2022.M3	17.8500*	2013.M3-2013.M6 2019.M8-2022.M3
TR 71	14.2294*	2013.M5-2013.M10 2014.M3-2015.M4 2015.M6-2016.M1 2016.M3-2018.M11 2019.M1-2022.M3	14.2635*	2012.M5-2013.M2 2013.M5-2013.M10 2014.M2-2015.M1 2015.M8-2015.M10 2016.M4-2016.M7 2017.M2-2017.M7 2017.M10-2018.M8 2019.M7-2022.M3

Critical values: for SADF test *1%: 1.9305, **5%: 1.3560,*** 10%: 1.0383 & for GSADF test *1%: 2.6317, ** 5%: 2.1003, ***10%: 1.8057. Windows size: 23, Lag: 0, Monte Carlo: 1000. Tests have a fixed value but no trend.

Table 3
The Results of SADF & GSADF Test

Variable	SADF_test statistic	Balloon Dates	GSADF_test statistic	Balloon Dates
TR 72	13.7599*	2012.M1-2012.M11 2013.M1-2022.M3	13.7691*	2012.M1-2012.M9 2013.M3-2013.M8 2013.M11-2017.M5 2017.M9-2018.M8 2018.M10-2019.M1 2020.M1-2022.M3
TR 81	12.8561*	2016.M6-2016.M8 2017.M7-2018.M10 2019.M7-2022.M3	13.0165*	2016.M6-2016.M8 2017.M11-2018.M8 2019.M12-2022.M3
TR 82	13.3521*	2012.M3-2012.M6 2012.M8-2013.M7 2014.M12-2015.M3 2015.M12-2016.M6 2016.M9-2018.M9 2019.M3-2022.M3	13.3521*	2017.M1-2018.M7 2020.M1-2022.M3
TR 83	16.2600*	2012.M3-2022.M3	16.2600*	2012.M3-2012.M6 2012.M12-2014.M1 2014.M5-2022.M3
TR 90	13.7351*	2012.M5-2012.M7 2013.M3-2013.M10 2014.M1-2022.M3	13.7351*	2013.M5-2013.M9 2014.M5-2022.M3
TR A1	12.4219*	2011.M10-2012.M1 2012.M6-2013.M5 2017.M3-2018.M8 2019.M2-2022.M3	13.4747*	2012.M6-2012.M10 2017.M3-2017.M7 2018.M5-2018.M7 2019.M12-2022.M3
TR A2	11.5520*	2019.M8-2022.M3	11.8307*	2012.M6-2013.M1 2018.M9-2018.M12 2020.M2-2022.M3
TR B1	13.0874*	2013.M3-2013.M8 2013.M11-2022.M3	13.0874*	2012.M2-2012.M5 2013.M4-2013.M7 2013.M11-2014.M3 2014.M8-2015.M8 2015.M11-2022.M3
TR B2	12.2647*	2015.M5-2015.M12 2017.M10-2018.M7 2018.M9-2022.M3	12.2802*	2015.M5-2015.M10 2019.M10-2022.M3
TR C1	16.5680*	2011.M10-2015.M11 2019.M12-2022.M3	18.6780*	2012.M1-2015.M6 2018.M2-2018.M7 2019.M10-2022.M3
TR C2	19.5821*	2011.M10-2013.M6 2020.M4-2022.M3	21.5841*	2012.M1-2012.M9 2020.M1-2022.M3
TR C3	17.3099*	2011.M12-2012.M2 2014.M7-2015.M7 2016.M1-2016.M3 2020.M1-2022.M3	18.2893*	2015.M2-2015.M5 2020.M2-2022.M3

Critical values: for SADF test *1%: 1.9305, **5%: 1.3560,*** 10%: 1.0383 & for GSADF test *1%: 2.6317, ** 5%: 2.1003, ***10%: 1.8057. Windows size: 23, Lag: 0, Monte Carlo: 1000. Tests have a fixed value but no trend.

The graphical representation of the balloons obtained in the TR, TR10 and TR51 regions were given in Figure 4, Figure 5 and Figure 6, and the graphics of the other regions were presented in the appendices. When the graphs in Figure 4 were examined, it has seen that a single bubble that still continues in 2022M3 from 2012M1 continues to inflate due to the fact that the TR (Turkey in general) housing price index is higher than the critical values of 90% and 95% importance levels.

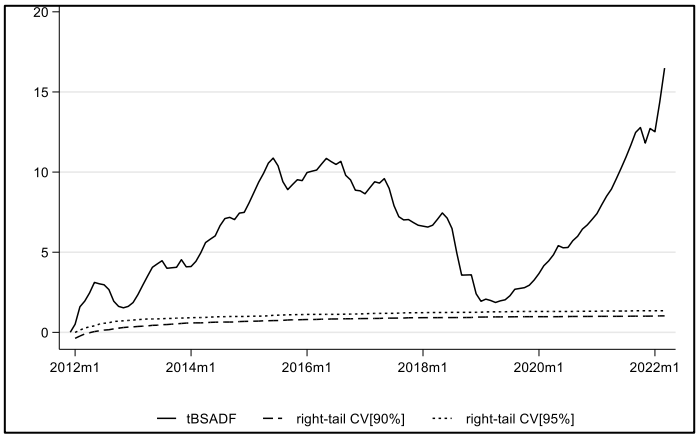


Figure 4. The BSADF graph of TR real house price index

When the graph of the real house price index for TR10 (Istanbul) in Figure 5 was examined, it has seen that the first balloon that started in 2012M2 and deflated in 2018M8 continued for 6 years and 6 months and deflated. The second balloon started to inflate on 2020M2 during the covid-19 pandemic process and still continues to inflate without deflating.

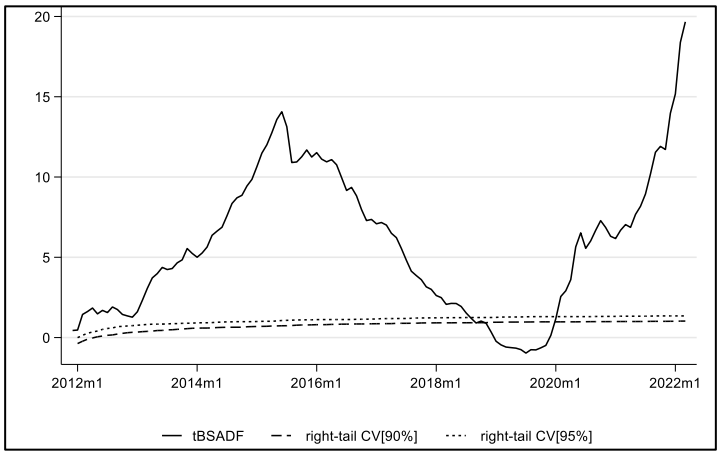


Figure 5. The BSADF graph of TR10 real house price index

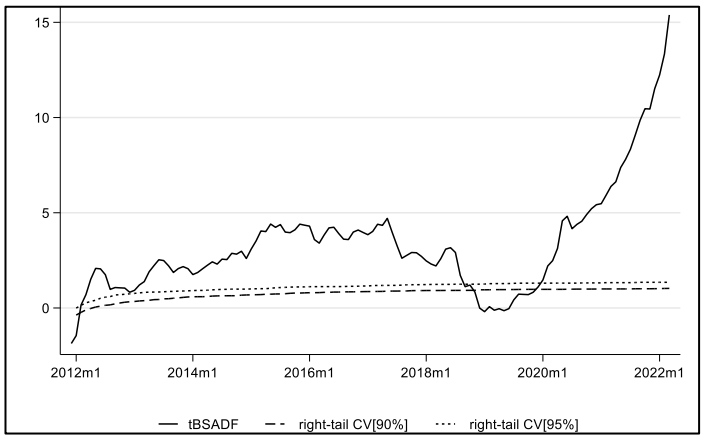


Figure 6. The BSADF graph of TR51 real house price index

Finally, when the graph of the real house price index for TR51 (Ankara) in Figure 6 was examined, it has seen that the first bubble that started in 2012M1 and deflated in 2018M7 continued for 6 years and 6 months and deflated. The second balloon started to inflate from the date of 2020M1, a date in the covid-19 pandemic process, and still continues to inflate without deflating.

Conclusion

In the simplest sense, bubbles, which are expressed as deviations in the real value of an asset as a result of speculative movements, negatively affect the economic system. In addition to the possibility that the existence of bubbles in housing prices may cause a financial crisis, there are many dangerous effects such as deterioration of market efficiency and distorting effect on income distribution. Therefore, it is of great economic importance to detect these bubbles, which play an important role in the emergence of financial crises.

In this study, it was aimed to test the existence of bubbles in housing price formations by considering 27 housing price indexes covering Turkey in general and Turkey's sub-provinces/regions. For this purpose, the existence of bubbles in housing prices was investigated by using Sup-Augmented Dickey Fuller and Generalized Sup-Augmented Dickey Fuller methods using 27 monthly frequency real house price index data for the 2010M1 – 2022M3 periods. Since the SADF test may give misleading results in the presence of multiple bubbles, the results of the GSADF test were interpreted to evaluate the findings and it was concluded that there was also a balloon effect in 27 real house price indexes. Although the findings showed that there were previously deflated balloons, there have been still undeflated balloons in all of Turkey's general and provincial/regional indices in March 2022, when the analyzes were made. In addition, the deflated balloons for the region of TR10, TR51, TR33, TR52, TR62, TR63, TR71, TR72, TR81, TR82, TRA1, TRA2, TRB2, TRC1, TRC2 and TRC3, have started to inflate again since the COVID_19 pandemic process. It is thought to be effective on the this situation that the incentives made on housing loan rates during the pandemic process and their concerns about the increase in housing prices due to the fact that individuals cannot predict how long the epidemic will continue. In addition, it is thought that the situation of individuals working remotely / from home and the increase in the time spent in the house are also effective.

The existence of undeflated bubbles is a destabilizing situation for the macroeconomic. In addition, it causes the deterioration of the balance in the housing market and the emergence of instability in the sectors directly related to the housing market. Therefore, effective fight against bubble formation in the housing market is very important for the health of the Turkish economy. In addition, it is possible that the bubbles in housing prices may cause internal migration movements and an increase in unplanned urbanization.

Considering the existence of undeflated bubbles in Turkey in general and in all 26 sub-provinces/regions of Turkey, effective control of financial instruments for the housing market should be ensured and necessary policies should be implemented. It should not be overlooked that the inflation of the balloons will definitely stop by bursting and the effects of the bursting of so many balloons.

References

Abioğlu, V. (2020). Türkiye konut piyasasinda balon oluşumlari: bölgesel inceleme. *Finansal Araştırmalar ve Çalışmalar Dergisi*, *12*(22), 1–14. doi: 10.14784/marufacd.688444

Akdag, S. and Iskenderoglu, O. (2020). Türkiye de reel konut fiyatlarında balonların varlığı üzerine uygulamalı bir analiz. *Business and Economics Research Journal*, *10*(5), 1085–1093. doi: 10.20409/berj.2019.223

Akkuş, H. T. (2021). Housing price bubbles and factors affecting the formation of bubbles: the turkish case. *Pamukkale University Journal of Social Sciences Institute*, (46), 271-292. doi:10.30794/pausbed.835374

Çadırcı, B. D. and Güner, B. (2022). TRA1 bölgesi konut piyasasinda fiyat oluşumu balon mu? *Elektronik Sosyal Bilimler Dergisi*, *21*(81). doi:10.17755/esosder.931079

Evrim Mandacı, P. and Çağlı, E. Ç. (2018). Türkiye konut piyasasında balon var mı ? istatistiki bölge birimleri üzerine bir analiz. *Finans Politik & Ekonomik Yorumlar*, *646*, 85–113. Retrieved from: http://www.ekonomikyorumlar.com.tr/files/articles/1554382584.pdf

Güler, İ. and Gökçe, A. (2020a). Yabancılara konut satışı ile konut balonu ilişkisinin gsadf sınamaları ile araştırılması:Türkiye geneli ve İstanbul, antalya illeri örneği. *3. Sektör Sosyal Ekonomi Dergisi*, *55*(2), 15659. doi:10.15659/3.sektor-sosyal-ekonomi.20.05.1353

Gökçe, A. and Güler, İ. (2020b). Sağ-yönlü adf sınamaları ile ankara ilinde konut balonu araştırması. *Ankara Hacı Bayram Veli Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, Özel Sayı*, 94–116. Retrieved from: https://dergipark.org.tr/en/download/article-file/1183891

Hu, Y. and Oxley, L. (2017). Exuberance in historical stock prices during the mississippi and south seas bubble episodes. *Working Paper*. Retrieved from: https://researchcommons.waikato.ac.nz/handle/10289/11511

Kartal, G. (2022). Konut piyasasında çoklu balon oluşumu: türkiye geneli ve tr71 bölgesi örneğinden ampirik deliller. *Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *15*(2), 343–360. doi: 10.25287/ohuiibf.1002825

Korkmaz, Ö., Akay Çağlayan, E. and Bülbül, H. (2021). Türkiye'de konut balonları var mı yok mu?, *International Conference on Eurasian Economics,* 279. Retrieved from: https://www.avekon.org/papers/2549.pdf

Phillips, P. C., Wu, Y. and Yu, J. (2011). Explosive behavior in the 1990s Nasdaq: when did exuberance escalate asset values?. *International Economic Review*, *52*(1), 201-226. doi: 10.1111/j.1468-2354.2010.00625.x

Phillips, P. C., Shi, S. and Yu, J. (2012). Testing for multiple bubbles. *Working Paper*. Retrieved from: https://econpapers.repec.org/paper/siuwpaper/09-2011.htm

Phillips, P. C., Shi, S. and Yu, J. (2015). Testing for multiple bubbles: historical episodes of exuberance and collapse in the S&P 500. *International Economic Review*, *56*(4), 1043-1078. doi: 10.1111/iere.12132

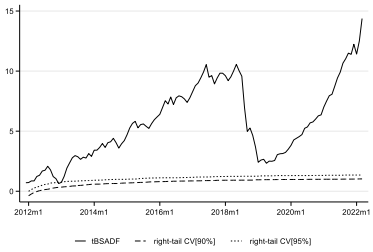
Tekin, S. B. (2021). *Istanbul ve ilçelerinde konut balonu oluşumu ve belirleyicileri*. (Yayınlanmamış doktora tezi), Marmara Üniversitesi, İstanbul.

TCMB. 2021. Elektronik Veri Dağıtım Sistemi, Retrieved from: http://www.tcmb.gov.tr, Retrieved date: 20 April 2022.

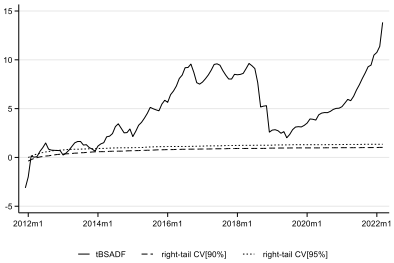
Zeren, F. and Erguzel, O. S. (2015). Testing for bubbles in the housing market: further evidence from Turkey. *Financial Studies*, *19*(1), 40–52. Retrieved from: http://fs.icfm.ro/vol19i1p40-52.pdf

Appendices

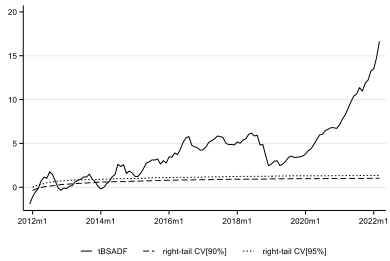
TR31



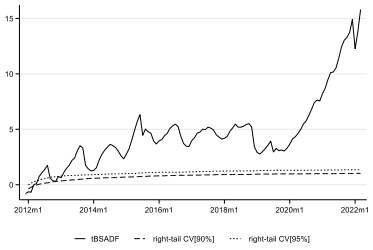
TR21



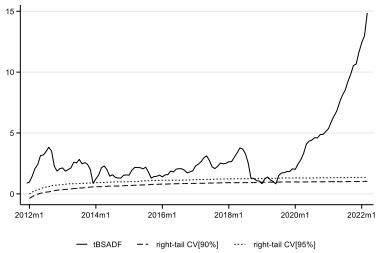
TR22



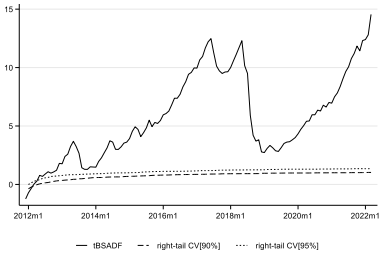
TR32



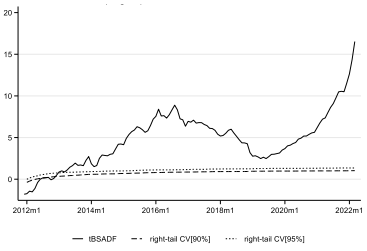
TR33



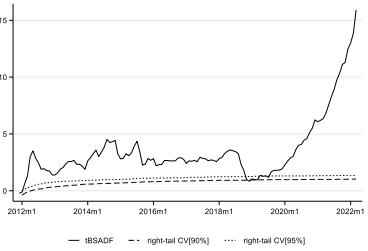
TR41



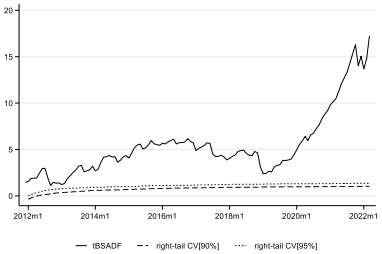
TR42



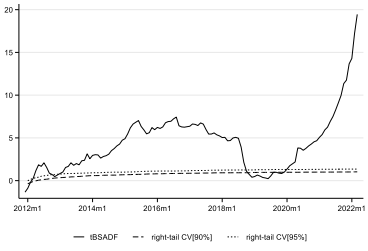
TR52



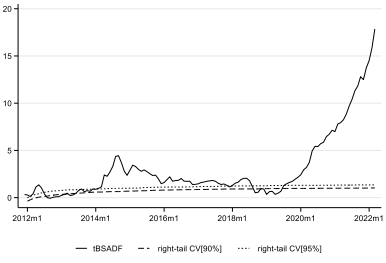
TR61



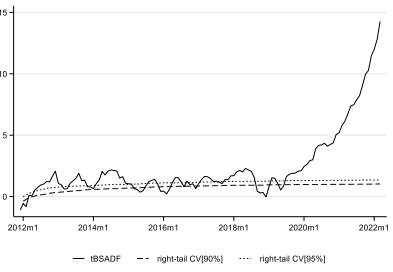
TR62



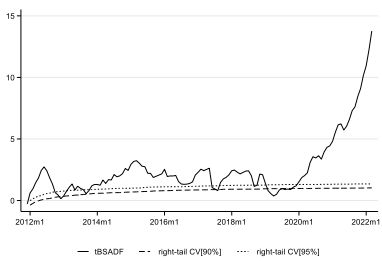
TR63



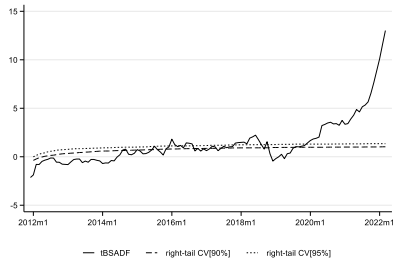
TR71



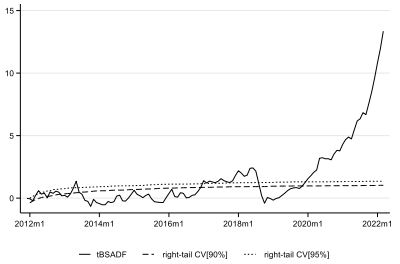
TR72



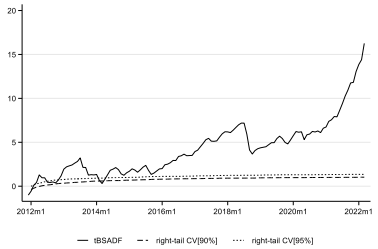
TR81



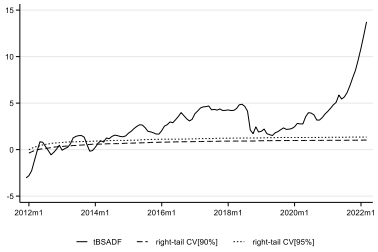
TR82



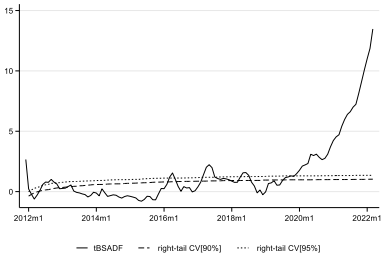
TR83



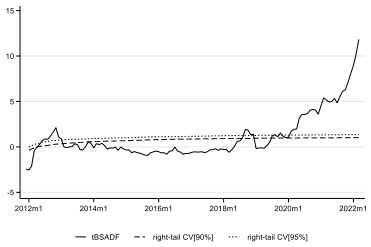
TR90



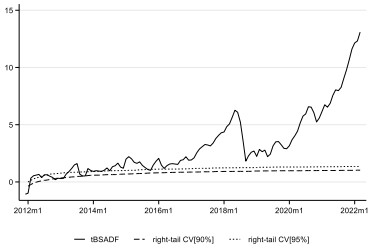
TRA1



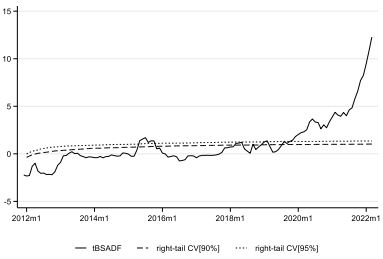
TRA2



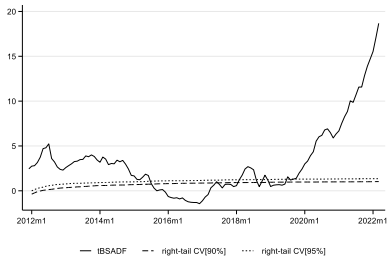
TRB1



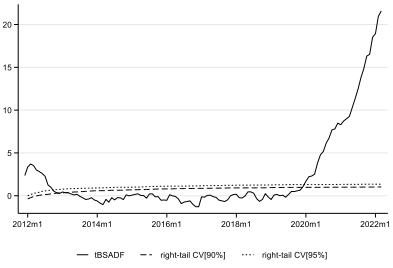
TRB2



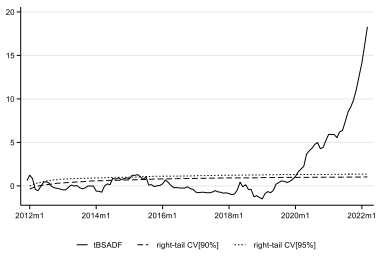
TRC1



TRC2



TRC3



Genişletilmiş Özet

Amaç

Konut piyasasındaki balonlar, konut piyasasından kaynaklanan finansal krizlerin varlığı, piyasa etkinliği ve gelir dağılımın bozulması gibi ciddi makroekonomik riskleri haber verebilmektedir. Özellikle son zamanlarda konut fiyatlarındaki artış dikkate alındığında, bu fiyatların oluşumu üzerinde balon etkisinin olup olmadığının incelenmesi gerekliliği çalışmanın başlangıç noktası olmuştur. Çalışmada, Türkiye geneli ve Türkiye geneli dışında üç büyük ili de kapsayan 26 il/bölgeye ait konut fiyat indeksi ele alınarak konut fiyat oluşumlarındaki balonların varlığının sınanması amaçlanmıştır.

Tasarım ve Yöntem

Türkiye geneli ve üç büyük ilin de içerisinde olduğu 26 alt indeks verisi kullanılarak konut balonlarının varlığının sınanması ve varsa tarihlerininin il/bölge bazında ifade edilmesinin amaçlandığı çalışmada 2010M1 – 2022M3 dönemleri için 27 konut fiyat indeksi verisi kullanılmış ve veriler T.C.M.B Elektronik Veri Dağıtım Sistemi'nden elde edilmiştir. Sup-Augmented Dickey Fuller ve Generalized Sup-Augmented Dickey Fuller yöntemleriyle konut fiyatlarındaki balonların varlığı incelenmiş ve her bir il/bölge için tespit edilen balonlara ait dönemler ifade edilmiştir.

Bulgular

Türkiye geneli ve 26 alt il/bölgeye ait reel konut fiyat indeksleri kullanılarak fiyat oluşumlarındaki balonların varlığının sınanması için SADF ve GSADF testleri yapılmış ve bulgular incelendiğinde tüm önem seviyelerinde hem SADF hem de GSADF testlerinde temel hipotezin reddedildiği görülmüştür. SADF testi, çoklu balonların mevcut olması durumunda yanıltıcı sonuçlar verebileceği için bulguları değerlendirmede GSADF testi sonuçları dikkate alınmıştır.

GSADF testinde temel hipotezin tüm değişkenler için reddedilmiş olması 27 reel konut fiyat indeksinde de balon etkisinin olduğunu ifade etmektedir. Balonların varlığının tespit edilmesinin ardından BSADF yöntemi ile balonların tarihleri elde edilmiştir. Elde edilen bulgular daha önce sönmüş balonların varlığını da göstermekle birlikte analizlerin yapıldığı 2022 Mart tarihinde Türkiye geneli ve tüm il/bölge indekslerinde halen sönmemiş balonların varlığını göstermektedir. TR (Türkiye Geneli), TR41 (Bursa, Eskişehir, Bilecik), TR42 (Bolu, Kocaeli, Sakarya, Yalova, Düzce) ve TR61 (Antalya, Burdur, Isparta) için uzun yıllardır sönmeden varlığını sürdüren tek bir balon elde edilmiştir. TR71 (Nevşehir, Niğde, Aksaray, Kırıkkale, Kırşehir) ve TR72 (Kayseri, Sivas, Yozgat) bölgelerinde biri halen sönmemiş çok sayıda balon olduğu bulgusu elde edilmiştir. TR10 (İstanbul), TR51 (Ankara), TR33 (Afyonkarahisar, Kütahya, Manisa, Uşak), TR52 (Konya, Karaman), TR62 (Adana, Mersin), TR63 (Hatay, Kahramanmaraş, Osmaniye),TR71 (Nevşehir, Niğde, Aksaray, Kırıkkale, Kırşehir), TR72 (Kayseri, Sivas, Yozgat), TR81 (Zonguldak, Bartın, Karabük), TR82 (Çankırı, Kastamonu, Sinop), TRA1 (Erzurum, Erzincan, Bayburt), TRA2 (Ağrı, Ardahan, Kars, Iğdır), TRB2 (Van, Bitlis, Hakkari, Muş), TRC1 (Kilis, Adıyaman, Gaziantep), TRC2 (Diyarbakır, Şanlıurfa) ve TRC3 (Batman, Mardin, Siirt, Şırnak) il ve bölgelerinde sönmüş durumda olan balonların, pandemi sürecinde tekrar şişmeye başladığı ve şişmesine devam ettiği bulgusu elde edilmiştir.

Sınırlılıklar

Türkiye'ye ait il bazında konut fiyat indeksi verilerinin olmaması ve incelenilen periyotun 2010 öncesine ait verilerinin bulunmaması çalışmanın sınırlılıklarını ifade etmektedir.

Öneriler

Sönmeyen balonların varlığı, makroekonomik istikrarı bozucu bir durum olup konut piyasasındaki dengenin bozulmasına ve konut piyasası ile doğrudan ilişkili sektörlerde de istikrarsızlığın ortaya çıkmasına neden olacaktır. Dolayısıyla Türkiye ekonomisinin sağlığı açısından konut piyasasında balon oluşumuyla etkin mücadele oldukça önemlidir.

Türkiye geneli ve Türkiye 26 alt il/bölgenin tamamında sönmemiş balonların varlığı dikkate alınarak konut piyasasına yönelik finansal enstrümanların etkin kontrolü sağlanmalı ve gerekli politikalar uygulanmalıdır. Balonların şişmesinin mutlaka patlayarak duracağı ve bu kadar çok balonun patlamasının yaratacağı etkilerin büyüklüğü göz ardı edilmemelidir.

Özgün Değer

Konut piyasasındaki balonların varlığının sınanmasında, kovid-19 pandemi sürecini içeren periyotun dikkate alınması, reel konut fiyatlarının kullanılması ve hem Türkiye hem de Türkiye tüm alt bölgelerine ait balonların kapsamlı bir şekilde sınanması hususları çalışmanın özgün değerini oluşturmaktadır.

Araştırmacı Katkısı: Eda YALÇIN KAYACAN (%100).