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The Role of Speculative Demand in Housing Price Changes in Turkey

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Abstract

Housing accounts for the largest portion of households' total assets in Turkey. It is an economic sector that requires careful analysis, especially considering the government's housing sector support policies and the significant price increases in recent years. This study utilizes the theoretical model developed within the Efficient Markets Hypothesis framework and the SVAR methodology to estimate house price changes. These changes are then decomposed into structural shocks, including supply, residential demand, and speculative demand shocks. The empirical results highlight the significant role of speculative demand in driving house price changes, with house price expectations being the main factor influencing speculative demand shocks. The behavior of the banking sector and interest rates also play a significant role in this process. Consequently, policies to stabilize house prices should consider these factors and not solely focus on credit regulations when consumer expectations are the driving force behind house price changes.

Keywords: House price, Speculative demand, SVAR model

1. Introduction

In the early 2000s, there was growing interest among economists and policymakers regarding the factors that caused fluctuations in housing prices. This was prompted by the realization that fluctuations in US housing prices could have serious repercussions not just within the country, but also on the global economy. Numerous studies have been conducted on this issue. For instance, Krainer-Wei (2004) and Wu-Lux (2018) point out that the low interest rates experienced in the early 2000s were the primary driver behind the housing price hikes in the USA and UK. On the other hand, McCarthy-Peach (2004), Mian-Sufi (2009), Duca et al. (2011), and Cox-Ludvigson (2019) argue that the state of the credit market plays a significant role in explaining changes in house prices. They suggest that house prices tend to increase during periods of credit expansion, and vice versa. In contrast, Case-Shiller (2003),

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Brunnermeier-Julliard (2008), Piazzesi-Schneider (2009), Glindro et al. (2011), Claussen (2013), Kivedal (2013), Sa et al. (2014), and Asal (2019) find that consumers' expectations regarding future housing prices also have an impact on current housing prices. Their research indicates that when consumers anticipate an increase in future housing prices, current house prices tend to rise. Conversely, in cases where consumers expect housing prices to decrease, current house prices tend to decline. These findings demonstrate the relationship between consumers' housing price expectations and the current state of house prices.

In Turkey, housing comprises the largest portion of households' total assets. It is well-known that nearly all of the total non-financial wealth is made up of real estate. According to the Living Standards Statistics published by Turkstat, the homeownership rate among the non-institutional population has averaged around 59% from 2006 to 2022. As shown in Figure 1, although the homeownership rate has decreased in recent years, it has never dropped below 57%. In line with this trend, the tenancy rate for housing, which averaged 24% during the same period, has increased in recent years and reached 27% in 2022. This situation indicates that owning a house in Turkey is becoming increasingly challenging. Undoubtedly, the rising housing prices are one of the main factors contributing to this trend.

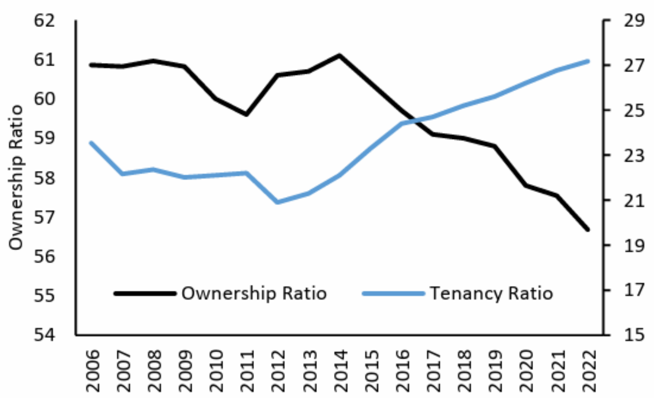

Figure 1. Ownership Status of the Residence (As Percentage of Non-Institutional Population)

Source: *Turkstat*.

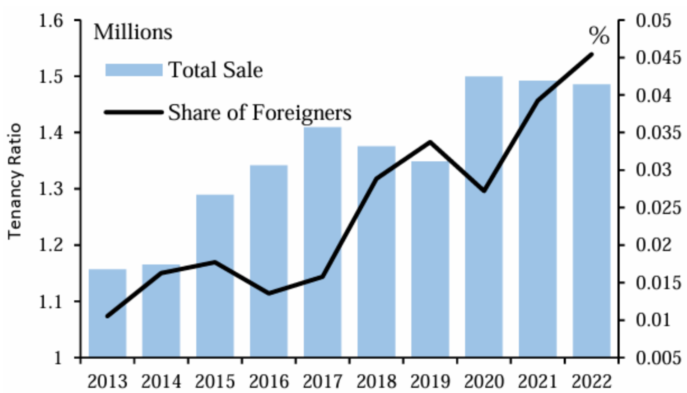

Figure 2. Total Housing Sales and Share of Foreigners

Source: *Turkstat*.

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While the number of houses sold is increasing (see Figure 2), the decreasing homeownership rate indicates a rise in house sales to foreigners in Turkey. According to housing sales statistics compiled by Turkstat, the percentage of housing purchases by foreigners was 1.1% of total sales in 2013, but it had increased to 4.5% by the end of 2022. This situation suggests that house sales are driven not only by residential purposes but also by investment. Therefore, the speculative dimension must be taken into consideration in any analysis carried out. Undoubtedly, this phenomenon is an economic factor that impacts housing prices.

In recent years, housing prices in Turkey have increased rapidly, especially in urban areas. Nominal house prices have risen in line with inflation since 2018, and there has also been an increase in real terms (see Figure 3). These developments have led policymakers, economists, and ordinary citizens to question the factors driving this increase. It is widely accepted that the measures taken by the government to stimulate credit expansion and the decision to cap annual residential rent increases at 25% in 2022 have played a significant role in the emergence and growth of the "housing problem" in Turkey (Suzer-Yamacli, 2023; Holy-Polatoglu, 2023).

There are many studies that aim to investigate the factors behind house price increases specific to Turkey. Most of these studies are regional, aspiring to assess hedonic price components (see, for instance, Calmasur-Aysin, 2019; Guler et al., 2019; Acar, 2020; Igdeli, 2021; Altun, 2022; Guller-Varol, 2022; Gundogmus-Baskaya, 2022; Ozturk, 2023). In the limited number of studies examining changes in house prices on a national basis, the problem is mostly addressed with the ARDL methodology and the causality dimension. These studies proceed to the estimation stage independently of a theoretical model (see, for instance, Alp, 2019; Karadas-Salihoglu, 2020; Yildirim et al., 2021; Cetin, 2021; Sari, 2022; Ozcan, 2023; Sanli-Peker, 2023; Bakirci-Akgemci, 2023). It should be noted that studies investigating the existence of bubbles in the housing market have recently increased (see, for instance, Solak-Kabadayi, 2016; Cagli, 2019; Coskun et al., 2020; Gokce-Guler, 2020; Akkus, 2021; Coskun-Pitros, 2022; Kayacan, 2022; Vergili, 2023; Gunduz et al., 2023).

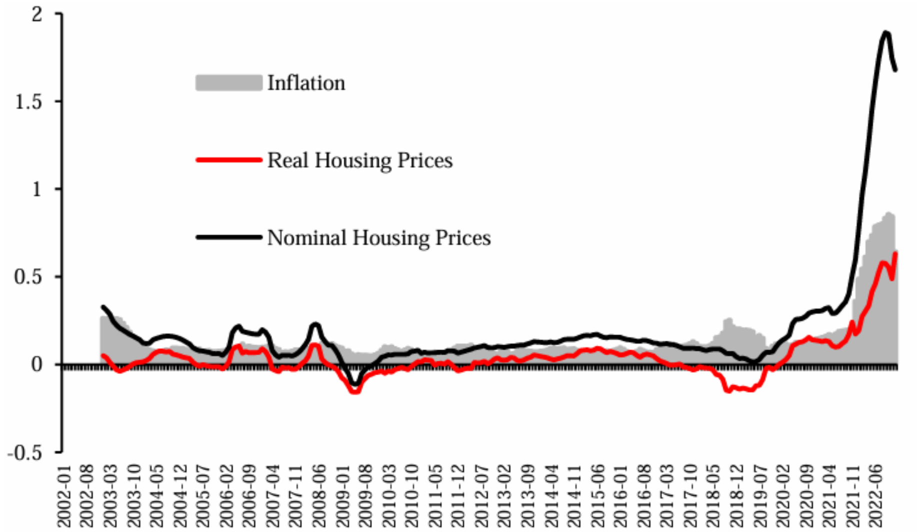


Figure 3. Inflation, Nominal and Real Housing Price Changes in Turkey (Annual %, 2002: January - 2022: December)

The current study differs from previous ones conducted in Turkey in terms of its theoretical background and estimation methodology. In the second part of the study, the theoretical model developed based on the efficient markets hypothesis is discussed. The third part of the study focuses on the general features of the structural vector autoregressive model, which is commonly used to analyze raw material markets with inelastic short-term supply and speculative demand. It also discusses the economic significance of the constraints imposed. The estimation results are presented and discussed in the fourth part. The fifth part of the study examines the factors driving possible speculative demand in the housing market, and the estimation results for this purpose are also discussed. Finally, the sixth part of the study summarizes the analysis results, provides policy recommendations, and concludes the study.

2. Theoretical Model and Implications for the Housing Market

In many previous studies (see, for instance, Renaud et al., 1997; Case-Shiller, 1989; Gallin, 2006 and 2008; Pelizzon-Weber, 2008; Kallberg et al., 2003; Hwang et al., 2006; Hamilton-Schwab, 1985; Phillips, 1988; Capozza-Seguin, 1996; Meese-Wallace, 1994; Baol-Feng, 2018), it has been assumed that asset markets, including the housing market, operate efficiently. Under this assumption, the intrinsic value of a house is calculated as the present value of the rental flows discounted by the effective interest rate (interest rate adjusted for the rental increase rate). Traditionally, this theoretical model has been extended to include rational bubbles.

If we denote the rent increase rate as λ, according to this model, the rent payment at time $t+n$ periods and its present value will be

$$R_t(1+\lambda)^n \tag{1}$$

$$\frac{R_t(1+\lambda)^n}{(1+i)^n} \tag{2}$$

where R and i represent rent payment and interest rate, respectively. The present value of all future rental payments, which is the current price of housing (P_t), is equal to the sum of the following infinite series:

$$P_t = \sum_{n=1}^{\infty} R_t \frac{(1+\lambda)^n}{(1+i)^n} \tag{3}$$

If we define

$$\psi = \frac{(1+\lambda)}{(1+i)}$$

in the above equation, the housing price is expressed as follows:

$$P_t = R\psi(1+\psi+\psi^2+\psi^3+\cdots+\psi^{n-1})$$

As long as $|\psi| < 1$, since the sum of the geometric series in parentheses is $\frac{1}{1-\psi}$, the housing price will be:

$$P_t = \frac{R_t \psi}{1-\psi} \tag{4}$$

By substituting ψ in the above equation, we obtain:

$$P_t = \frac{R_t \frac{(1+\lambda)}{(1+i)}}{1-\frac{(1+\lambda)}{(1+i)}}$$

To simplify, if we multiply the numerator and denominator by $\frac{(1+i)}{(1+i)}$ and rearrange, we get:

$$P_t = \frac{R_t(1+\lambda)}{i-\lambda} = \frac{R_{t+1}}{i-\lambda} \tag{5}$$

If the rental market operates efficiently, rent equals interest income. In this case, the rent at the beginning of the period will be

$$R_t = \frac{R_{t+1}}{i} \tag{6}$$

By substituting this relationship into the house price formula, we obtain

$$P_t = \frac{i}{i-\lambda} R_t \tag{7}$$

If we define the interest rate adjusted for rent increase as the effective interest rate (ζ), we can express the effective interest rate as follows:

$$\zeta \equiv \frac{1+i}{1+\lambda} - 1 = \frac{i-\lambda}{1+\lambda} \approx i - \lambda \tag{8}$$

Substituting this definition into the final equation for the house price, we get

$$P_t = \frac{i}{\zeta} R_t \tag{9}$$

Under the efficient market assumption, the present value of rental flows discounted by the effective interest rate is equal to the sales price of the house. Therefore, we can define the intrinsic value of the house (V_t) as follows:

$$V_t \equiv \frac{R_{t+1}}{\zeta} = \frac{i}{\zeta} R_t \tag{10}$$

Naturally, leaks from the cash flows generated by the house (such as maintenance costs and taxes) will reduce the intrinsic value of the house (Poterba-Sinai, 2008).

Rearranging equation (5) generates

$$i \equiv \frac{R_{t+1}}{P_t} + \lambda \tag{11}$$

The first term on the right-hand side of this equation is the ratio of the housing rental fee to the investment amount and can be considered as the operating rate of return. Since the required rate of return on housing investment (γ) can be evaluated as the sum of the operating rate of return and the capital gain rate, the above equation states that the interest rate should be equal to the required rate of return on housing investment.

Contrary to the results obtained under efficient market assumptions, there may always be a gap between the sale price of a house and its intrinsic value in the market. This gap, known as a bubble (B_t), is defined as

$$P_t = B_t + V_t \tag{12}$$

Based on this definition, bubbles are considered in two different ways from an economic perspective: rational and irrational bubbles. According to the first approach, it is accepted that even if economic units make rational choices and inferences, such as utility maximization or Bayesian conclusions, interaction and herd behavior may disrupt rationality and cause a bubble, as long as certain conditions are met. The second approach is based on the bounded rationality of the masses. Accordingly, a bubble occurs when the price rises above the intrinsic value due to the investor's cognitive decoupling or psychological bias. Since the aim of our study is to see the results that will arise in the presence of a bubble, the empirical analysis to be carried out will not be based on a specific definition of bubbles. Therefore, our study will be based on rational bubble theory without considering theoretical discussions about them.

In the case of the existence of a rational bubble (B_t), it is accepted that it follows the stochastic process described by Blanchard-Watson (1982). The process can be represented as follows:

$$B_{t+1} = \begin{cases} \frac{1+i}{\pi} B_t & \text{with probability } \pi \\ 0 & \text{with probablity (1-}\pi\text{)} \end{cases} \tag{13}$$

Therefore, in the case of a rational bubble, if $B_{t+1}^e \equiv E_t B_{t+1} = (1+i)B_t$ then the expected growth rate of the bubble is equal to the interest rate (i). According to equation (12), changes in house prices may occur for two reasons: changes in the intrinsic value of the house and changes in bubbles. The equation suggests that while a change in the intrinsic value may cause a simultaneous change in the house price, the change in the house price due to the bubble may not have an immediate effect on the intrinsic value of the house. If the housing supply is perfectly inelastic, only changes in intrinsic value (changes in rents, in other words, changes in actual demand cost) and bubbles (changes in speculative demand) will cause changes in house prices. However, since housing supply is not perfectly inelastic in the short term, changes in housing supply may also cause limited changes in housing prices.

In the model discussed above, it is important to emphasize the following four issues when considering the recent developments in the Turkish housing market.

First and foremost, it is important to distinguish between the statement "real estate prices are too high" and the statement "There is a bubble in real estate prices." The increase in housing prices that occurs as a result of the increase in the intrinsic value of real estate is a separate development from a bubble. For instance, the intrinsic value of real estate can rise when interest rates are low, real estate taxes are low, or there is a shortage of rental properties available. These increases and decreases are not linked to fluctuations in real estate prices caused by bubbles. A bubble may be suspected when real estate prices fluctuate significantly beyond what would normally be expected due to low interest rates, taxes, or other factors affecting the intrinsic value of the real estate.

Secondly, the reason why the public expects housing prices to continue increasing may be due to what is known as the "shortage illusion" (Shiller, 1990). When there is a shortage observed in the real estate market, people tend to believe that it is an absolute shortage at all price levels, rather than recognizing that it is actually a supply shortage at a specific price level. This creates the expectation that prices will keep rising in the future (Himmelberg et al., 2005). As a result, in such an environment, demand increases alongside price increases, and simply increasing the supply cannot be the solution. In fact, a higher supply may even lead to further increases in the sales price.

Third, if a rational bubble does not grow after it emerges, housing prices will fall, and the bubble will collapse after a while. As we recall, the required rate of return expected from real estate investment (γ^e) is determined by the ratio of the sum of expected capital gains and rental income to the investment amount:

$$
\begin{aligned}
\gamma^e &= \frac{(P_{t+1}^e - P_t) + R_{t+1}}{P_t} \\
&= \frac{(B_{t+1}^e - B_t) + (V_{t+1} - V_t) + \zeta V_t}{B_t + V_t} \\
&= \frac{(B_{t+1}^e - B_t) + \lambda V_t + (i - \lambda) V_t}{B_t + V_t} \\
&= \frac{(B_{t+1}^e - B_t) + i V_t}{B_t + V_t}
\end{aligned}
$$

If the bubble does not grow, since $B_{t+1}^e = B_t$, the expected return on investment will be lower than the interest rate:

$$\left(\gamma^e = \frac{iV_t}{B + V_t}\right) < i$$

When this situation occurs, economic agents will begin selling assets, which in turn leads to a gradual decline in asset prices. This ultimately results in the deflation of the bubble.

Finally, in a rational bubble, if the expected rate of return on investment (γ^e) is greater than or equal to the interest rate, the bubble will grow at least as much as the interest rate. In order for the bubble to grow, the expected return on investment must be greater than or equal to the interest rate.

$$\left(\gamma^e = \frac{(B_{t+1} - B_t) + iV_t}{B_t + V_t}\right) \geq i$$

Since $B_{t+1} \geq (1+i)B_t$, the lower limit of growth in the bubble is the interest rate.

3. Estimation Methodology and Data

In this study, we will estimate the structural VAR model to assess the impact of structural shocks on the housing market. The general representation of the structural VAR model used can be explained as follows:

$$A_0\omega_t = \alpha + \sum_{j=1}^{p} A_j\omega_{t-j} + \varepsilon_t \tag{14}$$

where A_j refers to the $n \times n$ coefficient matrix, ω_t refers to the $n \times 1$ vector of explanatory variables, and ε_t refers to the $n \times 1$ vector of uncorrelated structural shocks. According to the theoretical model discussed in the previous section, the vector ω_t includes the following variables:

$$\omega_t = [s_t, \Delta v_t, \Delta p_t]'$$

where s_t, Δv_t $\left(= \Delta\left[\frac{i}{\zeta} r_t\right]\right)$, and Δp_t represent the housing supply, the rate of change in the real intrinsic value of the house, and the rate of change in real housing prices, respectively. The unobservable structural relationship in equation (14) can become observable when it is expressed in the following reduced form:

$$\omega_t = \beta + \sum_{j=1}^{p} B_j\omega_{t-j} + \xi_t \tag{15}$$

The data used to represent the variables in the explanatory variables vector is as follows:

The number of building permits issued or the number of houses completed are widely used to represent the housing supply in the housing market. The time-consuming nature of housing construction means that it takes 1 to 3 years for the number of building permits to accurately represent the housing supply. On the other hand, the number of completed houses represents the existing housing supply. However, the announcement of a supply plan can impact current sales prices by signaling that sales prices will change in the future. In markets where supply is inelastic in the short term, such as raw materials or housing, the future supply situation can have a significant impact on the current sales price (Kilian, 2009). Therefore, this study will use the logarithm of the number of building permits to represent the housing supply in estimating the model.

The intrinsic value in the housing market was calculated by adjusting the real rental price index for the effective interest rate, as explained in the theoretical model discussion. To calculate the real rental price index, the nominal index was deflated using the Consumer Price Index (CPI). The effective interest rate was obtained using the 5-year government bond interest rate. The rate of change in this indicator was used in the estimation phase to represent the change in residential demand costs.

The house sales price index is used as the time series to express house prices. To transform the nominal index values into real ones, the Consumer Price Index (CPI) is used. The model includes the percentage change rate of this indicator. It is utilized to represent the fluctuations in speculative demand.

For the variable set described earlier, monthly data from January 2002 to December 2022 was used. All data used, except for the interest rate, have been seasonally adjusted. Price and monetary variables have been deflated using the Consumer Price Index (CPI) to obtain real values. The definition and sources of the data can be found in Appendix 1, located at the end of the study.

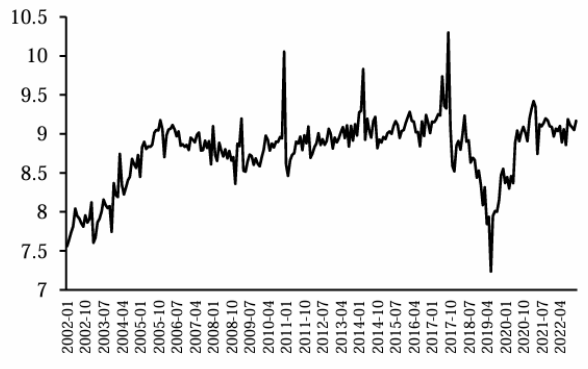
The structural VAR model to be estimated will enable us to examine how changes in housing prices are influenced by supply-side shocks, residential demand shocks, and speculative demand shocks. It will allow us to determine the contribution of each shock to the change in sales prices, as well as evaluate how sales prices respond to each shock.

To estimate the structural form in equation (14) using the reduced relationship in equation (15), we adopted the sequential identification strategy. This strategy is commonly used in raw material markets because it bears resemblance to the housing market. The similarity arises from the fact that both markets have inelastic supply and speculative demand in the short term. The sequential identification constraints accepted in our study are as follows:

$$\xi_t = \begin{pmatrix} \xi_t^{S_t} \\ \xi_t^{\Delta v_t} \\ \xi_t^{\Delta p_t} \end{pmatrix} = A_0^{-1}\varepsilon_t = \begin{bmatrix} \alpha_{11} & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} \end{bmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{pmatrix} \tag{16}$$

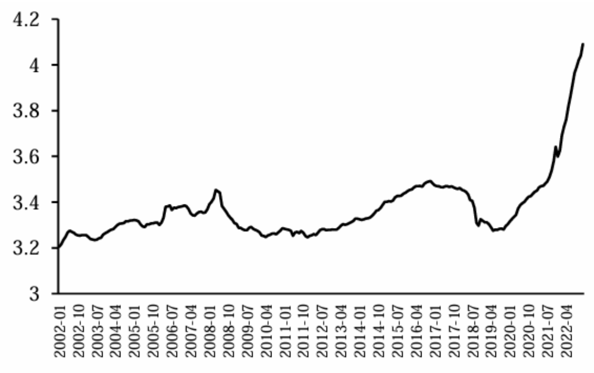
where ε_{1t}, ε_{2t}, and ε_{3t} represent supply shocks, residential demand shocks, and speculative demand shocks in the housing market, respectively. The economic consequences of the sequential identification constraints can be explained as follows: Firstly, the 0 values in the first row of the A_0^{-1} matrix indicate that changes in housing supply (i.e., the number of building permits) are affected by residential demand shocks (ε_{2t}) and speculative demand shocks (ε_{3t}) with a lag of at least one period due to time-consuming and complex administrative procedures. On the other hand, according to the first column of the matrix, it is accepted that supply shocks (ε_{1t}) have a simultaneous effect on both residential and speculative demand. Since the house sales price in the theoretical model is equal to the sum of the intrinsic value and the bubble, the coefficient values in the second and third rows of the A_0^{-1} matrix show that residential demand shocks (ε_{2t}) affect the intrinsic house value simultaneously, but speculative demand shocks (ε_{3t}) affect the intrinsic value of a house with a lag of at least one period.

Figure 4 illustrates the data's course discussed earlier during the sample period. Real house sales prices exhibited a steady increase after the 2001 crisis until 2008 but showed a downward trend after the 2008 global crisis. From 2010 to 2017, real house prices continued to rise, but they have since started to decline and have recently experienced rapid growth due to the low-interest rate policy (refer to Figure 5 below) implemented after 2020. The trend observed in the real intrinsic value of houses, except for the period after 2020, is similar to that of house prices. The intrinsic value generally increased until the 2008 crisis, followed by a decrease until 2010, and then remained stable until 2020. However, due to the low-interest rate policy and accelerating inflation since 2020, there has been a rapid decrease in the real intrinsic value of houses. The housing supply increased until 2006 and has remained stable since then. It is evident that the housing supply, which sharply declined since mid-2017, has now returned to the average levels of the period, experiencing a significant increase since mid-2019.



Housing Supply

Real Intrinsic Value of Houses



Real House Sale Price Index

Figure 4. Data on Theoretical Model Variables (Logarithmic Level)

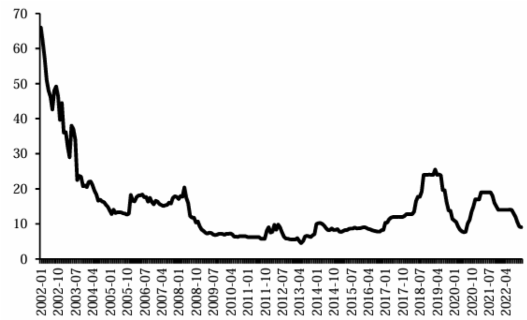


Figure 5. Monetary Policy Interest Rate

Source: The Central Bank of the Republic of Turkey

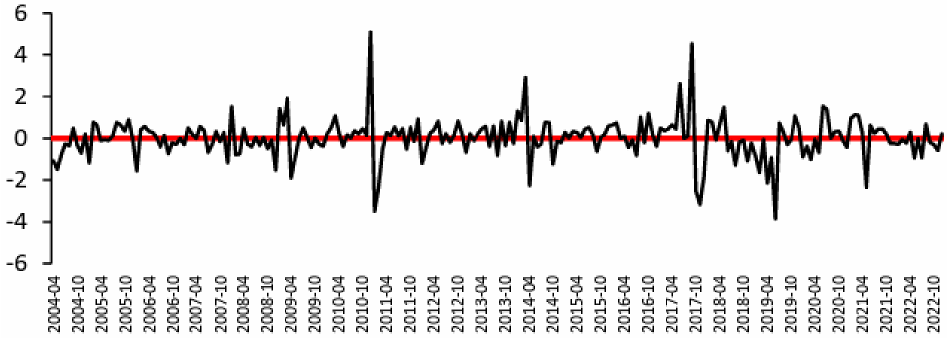
4. SVAR Model Estimation Results

Before estimating with the SVAR method, the data of the model variables must undergo a series of diagnostic tests. The results of the stationarity analysis indicate that the housing supply is stationary at its logarithmic level, and the annual change rates of real principal value and real house prices are stationary at their levels (see Appendix 2). The existence of a cointegration relationship among the variables included in the model is rejected based on the results of the Trace Test and Maximum Eigen Value Test (see Appendix 3). Most of the criteria used to determine the optimum number of lags to be used in the estimation of the model indicate a lag length of 3 months, which was preferred in estimating the unrestricted VAR model (see Appendix 4). According to the results of the diagnostic tests for the unrestricted form (see Appendix 5), the estimated VAR model is stable, and the error terms are independent of autocorrelation and heteroscedasticity problems. Therefore, the outputs obtained by estimating the SVAR model contain statistically consistent and significant results. The estimates obtained for the A matrix coefficients (α_{ij}) in equation (16) through the SVAR method have signs in the expected direction according to economic theory and are statistically significant.

$$A_0^{-1} = \begin{bmatrix} 0.2277\ (5.4711) & 0 & 0 \\ 0.0114\ (3.6341) & 0.38323\ (5.4711) & 0 \\ 0.0011\ (8.6887) & 0.0028\ (2.8872) & 0.0229\ (5.4711) \end{bmatrix}$$

The relevant z statistics are shown in parentheses in the coefficients matrix. Instead of evaluating the obtained coefficient estimates individually, this study will focus on evaluating the obtained impulse-response functions, variance decompositions, and historical decompositions. This approach will allow for an examination of the source of variability in model variables and the dynamic responses of model variables to structural shocks.

Figure 6 illustrates the structural shocks (supply shock, residential demand shock, and speculative demand shock) derived from the SVAR model estimated using the sequential identification constraints specified in Equation (16). These three structural shocks occur at varying rates in each period and impact the sales price. From 2011 to 2017, when Turkey experienced relative price stability (with an average annual inflation of approximately 8%, compared to the sample period average inflation of around 20%), there was a noticeable decrease in the magnitude of demand shocks for residential and speculative purposes. However, in 2018 and onwards, there was an observed increase in the size of both demand shocks, coinciding with an average annual inflation rate of approximately 32% and a deterioration in price stability. Undoubtedly, this situation contributes to the recent surge in housing prices.



Housing Supply Shocks

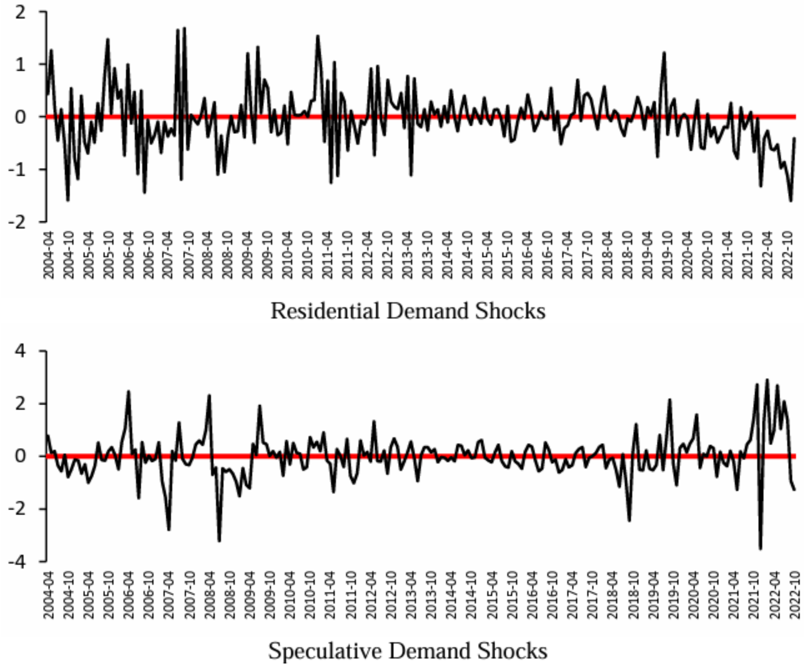


Figure 6. Structural Shock Estimates

Figure 7 below illustrates the responses of housing supply, residential (rental) cost, and housing sales price to the structural shocks mentioned, along with their corresponding 90% - 68% confidence intervals.

Figure 7. Responses of Model Variables to the Structural Shocks

Primarily, a positive supply shock does not have a significant effect on rent and housing prices. While a positive supply shock creates a small adverse effect on residential costs in the very short term (4 months), this effect disappears after the 9th month. However, while the same shock does not have a significant effect on house prices in the first 6 months, it occurs in the opposite direction than expected in the following period. For this reason, it should be noted that housing supply dynamics constitute a separate subject of study. A positive structural shock in residential demand, as expected, positively affects the rental cost and house sales price. In particular, the increase in rents, which starts from the first month, continues to increase for 12 months and decreases from the 12th month onwards, fading out after 24 months. The positive effect of the residential demand shock on housing prices reveals itself starting from the 5th month and creates a permanent price increase until the end of the 24 months. A positive speculative demand shock unquestionably increases both rental costs and housing prices. While the increasing effect of this shock on rental costs weakens after 12 months, its rising effect on housing prices is permanent. However, let us immediately point out that the response of rental costs to a speculative shock loses its statistical significance after the 19th month. This conclusion lends validity to the view that increasing housing prices due to speculative demand also causes the rental cost to increase.

When examining the impact of the shocks on housing prices (graphs in the 3rd column of Figure 6), all three shocks have permanent effects on real housing prices. While the impact of supply shocks in this context is limited, the increasing effect of residential and speculative demand shocks on real housing prices is both high and permanent. This finding strengthens concerns about bubbles in real house prices. However, a separate analysis of the economic effects of price stickiness (wealth and income effects) is required to fully understand this issue. Naturally, this analysis is beyond the scope of the current study.

Another important result obtained from VAR-type estimates is the variance decompositions. Variance decompositions show the percentage share of each structural shock in the variance of forecast errors for variables included in the SVAR model. Figure 8 displays the variance decompositions, with the indicators labeled as shock 1, shock 2, and shock 3 referring to structural shocks in housing supply, residential demand, and speculative demand, respectively. The first notable point in the variance decompositions is that the variance observed in forecast errors largely stems from the relevant variable itself. Specifically, the contribution of speculative demand to housing supply and rental costs increases as the time period lengthens. At the end of 24 months, the contribution of speculative demand to the variability in housing supply rises to approximately 25% and around 35% for rental costs. Although not depicted in the graphs, when the forecast horizon is extended to 60 months, these shares increase to 43% and 48%, respectively (see Appendix 6). Therefore, we can conclude that speculative demand makes a significant contribution to the variability in housing supply and rental costs in the long term. It appears that the most crucial factor in the fluctuation of housing prices is speculative demand. By the end of the forecast period, approximately 85% of the forecast error variance in house prices is attributable to structural shocks in speculative demand, 10% to residential demand, and only 5% to housing supply. Interestingly, this distribution does not significantly change when the forecast horizon is extended to 60 months (see Appendix 6).

Hence, it is possible to conclude that speculative demand plays a very important role in the rising house prices in Turkey.

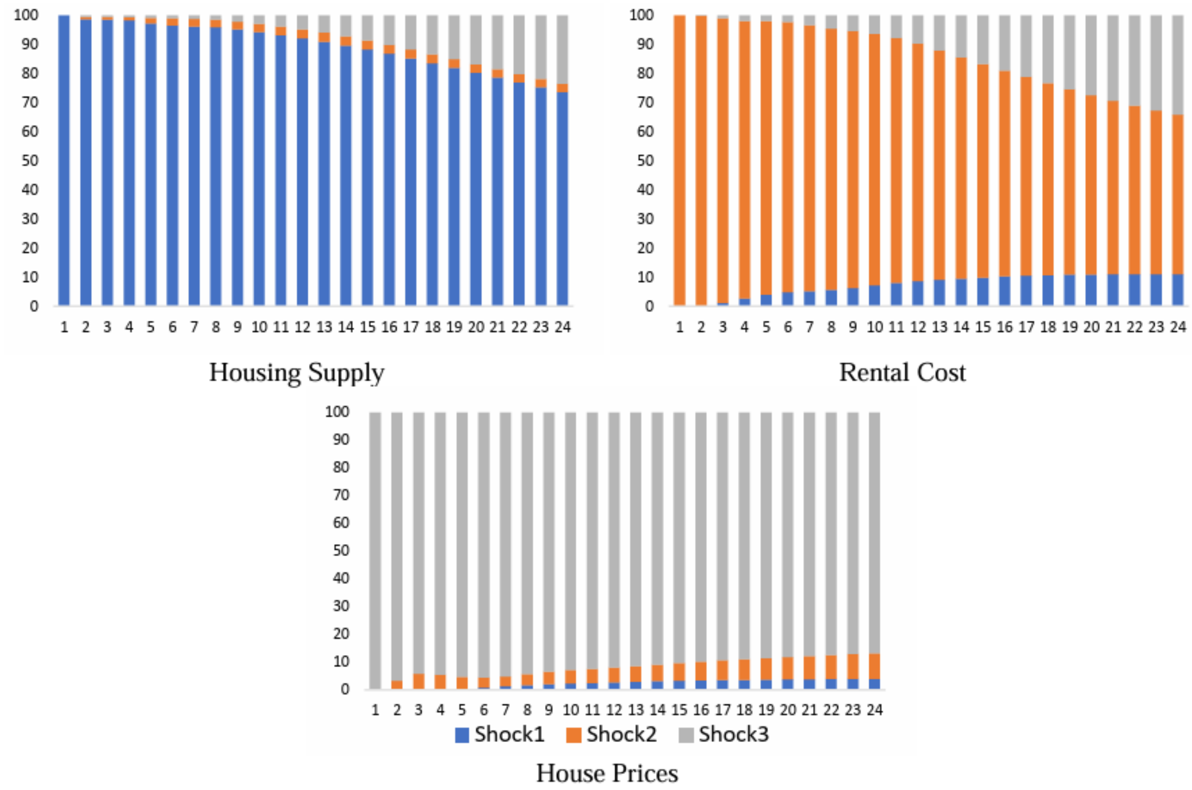


Figure 8. SVAR Model Variance Decompositions

The significant impact of speculative demand, particularly on prices, is evident in both impulse-response functions and variance decomposition values. Therefore, it would be beneficial to analyze the results of another output from VAR-type models: historical decompositions. In this case, we will focus solely on historical decompositions related to housing prices, excluding those of other variables. Through historical decomposition analysis, we can observe how the rate of real house price change would have been affected if only one of the three structural shocks in our model had occurred. For instance, if we consider only the presence of a speculative demand shock $(\widehat{\omega}_{3t})$, its contribution to the change in real house prices can be explained as follows:

$$\widehat{\omega}_{3t} = \theta_0 + \sum_{j=0}^{t-1} \widehat{\Theta}_i \begin{bmatrix} 0 \\ 0 \\ \hat{\varepsilon}_{3t-j} \end{bmatrix} \tag{17}$$

where θ_0 represents the constant term and $\widehat{\Theta}_i$ denotes the 3×3 impulse-response matrix at lag length j. Figure 9 below displays the results of the historical decomposition of changes in real house prices.

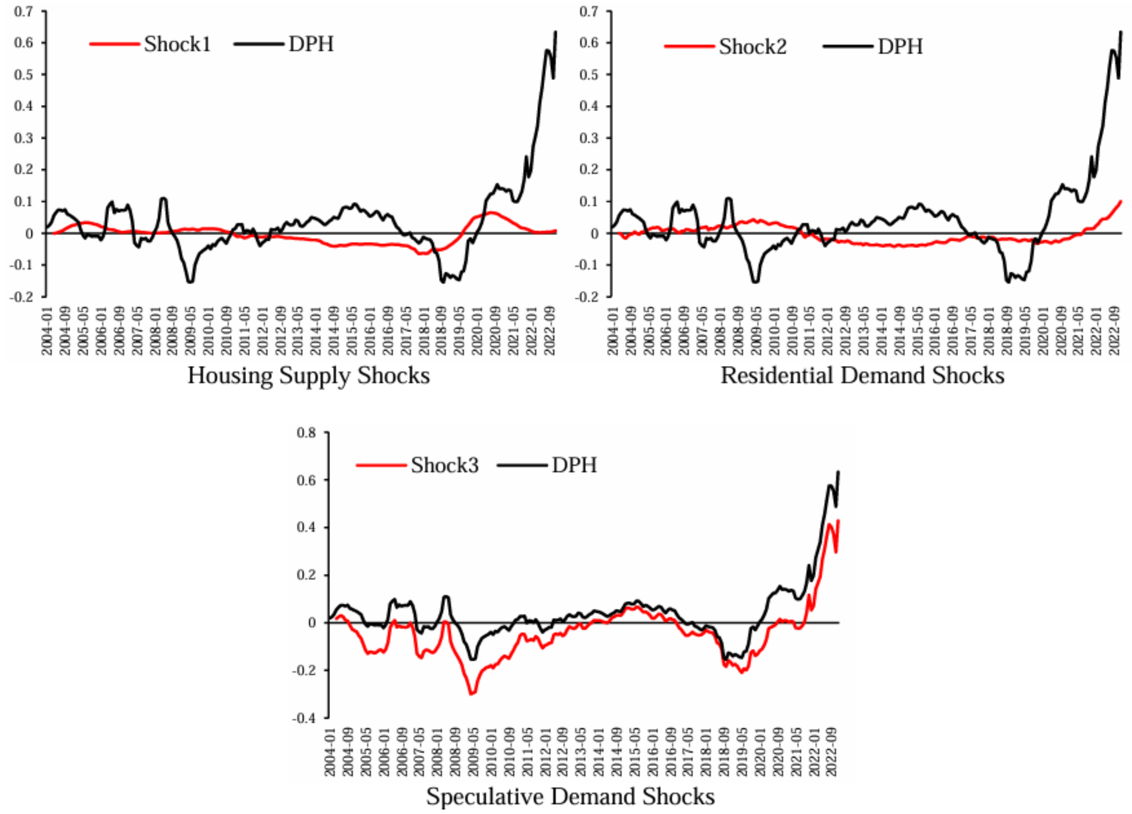


Figure 9. Historical Decompositions of Real House Price Changes

Consistent with the results of the variance decomposition analysis in Figure 8, the real house price change rate mostly aligns with the historical contribution of shocks in speculative demand. The contribution of supply shocks and residential demand to the change in housing prices remains limited. It is worth emphasizing a key point in all three graphs: The contribution of all three shocks to house price changes in the post-2018 period is positive. This situation should be evaluated as a consequence of the irrational interest and exchange rate policies followed during that period.

5. Understanding Speculative Demand Shocks

In this section, we will explore the concept of speculative demand shocks and their implications. By understanding the nature of these shocks, we can gain insights into their impact on house prices. Speculative demand shocks refer to sudden changes in the level of demand caused by shifts in investor sentiment or market expectations. These shocks can either increase or decrease demand for a particular good or service, leading to fluctuations in prices and output. Understanding speculative demand shocks is crucial for policymakers and economists as these shocks can have significant implications for the overall stability and performance of the economy. By anticipating and responding effectively to these shocks, policymakers can minimize the negative effects and promote economic growth and stability.

The results obtained from the SVAR model indicate that speculative demand shocks play a significant role in understanding the housing market in Turkey. It has been found that the variable that most strongly influences changes in real sales prices is speculative demand shocks. Therefore, in this section, we will examine the historical contribution of these shocks ($\widehat{\omega}_{3t}$ in equation 17) and analyze their relationship with various economic variables using regression analysis. This will allow us to gain a better understanding of speculative demand shocks.

The economic variables mentioned were determined as follows: interest rate, stock return rate, industrial production index change rate, banks' housing loan behavior, and consumers' housing price expectations. To assess the impact of interest rates on speculative demand, the interest rate on 5-year government bonds will be used. Similarly, the Borsa Istanbul 100 index return rate will be included in the model to examine the relationship between speculative demand in the housing market and the stock market. Additionally, the industrial production index will be included to analyze the connection between speculative demand and economic fluctuations. To investigate whether loan demand influences speculative demand, the real housing loan change rate, which reflects the loan behavior of banks, will be incorporated into the model. Although the bank loans tendency survey conducted by the Central Bank provides a more accurate proxy variable, it is only available for the period after 2020. Therefore, for the entire period, it is preferable to use the first variable mentioned. Finally, as noted by Kaplan et al. (2020), changes in housing prices are closely associated with expectations regarding future housing prices. Hence, the expected house price index will be utilized to examine the link between consumers' house price expectations and speculative demand. Nevertheless, this data is only available for the period after 2011. The definition and sources of these data are provided in detail in Appendix 1 at the end of the study.

To start, we estimate the relationship between the historical contribution of speculative demand shocks ($\widehat{\omega}_{3t}$) and each of the variables mentioned above separately in the context of the following regression equation:

$$\widehat{\omega}_{3t} = \alpha_0 + \alpha_1 x_{t-1} + \nu_t \tag{18}$$

where x_{t-1} denotes one of the following variables: interest rate (i^b_{t-1}), return rate of stocks (r^s_{t-1}), change rate of industrial production index (Δy_{t-1}), change rate of banks' real housing loans (Δrcr_{t-1}) and change rate of consumers' house price expectation index (Δhp^e_{t-1}). To address the issue of endogeneity, explanatory variables are included in the regression model with a lag of one period. To account for potential heteroscedasticity and correlation in the residual terms, the standard errors recommended by Newey-West (1987) were used as a basis. The results of the univariate regression estimates for equation (18) can be found in the first five lines of Table 1.

Table 1: Factors Explaining the Contribution of Speculative Shocks

i_{t-1}^{b}	r_{t-1}^{s}	Δy_{t-1}	Δrcr_{t-1}	Δhp_{t-1}^{e}	$\bar{R}^2$
-0.0513 (0.0281)**					0.0212
	-0.0019 (0.0018)				-0.0001
		0.0048 (0.0029)***			0.0019
			0.0169 (0.0084)**		0.0323
				0.1796 (0.0645)*	0.1181
-0.0321 (0.0193)***	-0.0009 (0.0067)	0.0013 (0.0074)	0.0238 (0.0111)**	0.2356 (0.0784)*	0.2132

Notes: Values in parentheses represent Newey-West standard errors; *, **, and *** indicate the statistical validity of the coefficient at the 1, 5, and 10% significance levels, respectively. The univariate equation, which includes expected house prices, and the integrated equation, which includes all variables, were estimated with data for the period 2011:01-2022:12.

According to the estimation results of univariate regression equations, all the coefficients (except the return rate of stocks) are statistically significant at traditional levels and have expected signs in line with the theory. The coefficient estimates, excluding expected house prices, are quite small, and the explanatory power of the relevant equations ($\bar{R}^2$) is considerably weak. The results show that the highest determining factor in the contribution of speculative shocks to house price changes ($\widehat{\omega}_{3t}$) is consumers' future house price expectations. They also indicate that the contributions of interest rate and real credit volume change rate cannot be neglected in this process. According to these results, while the increase in interest rates reduces the effect of speculative demand on prices, the increase in real credit volume and economic expansion increases this effect. However, the main contribution to this issue comes from future housing price expectations. Compared to other variables, the increase in expected housing prices increases speculative demand much more.

In the next stage, the same multiple regression model was estimated by including all the variables mentioned earlier in the regression equation.

$$\widehat{\omega}_{3t} = \beta_0 + \beta_1(i_{t-1}^{b}) + \beta_2(r_{t-1}^{s}) + \beta_3(\Delta y_{t-1}) + \beta_4(\Delta rcr_{t-1}) + \beta_5(hp_{t-1}^{e}) + \nu_t \qquad (19)$$

The estimation results can be found in the last row of Table 1. When all five variables are included in the model, three of them show statistical significance at traditional levels: the rate of change in consumers' house price expectations, the interest rate, and the rate of change in real housing loans. It is important to note that this regression equation covers the period from 2011:01 to 2022:12, as we have data available on the housing price expectation index. In this estimation, we observe that the coefficient values for the interest rate and credit volume change rate decrease compared to their values in univariate estimations. However, the coefficient for expected house prices increases. While expected house prices have the highest explanatory power in univariate estimations, including other variables in the regression

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analysis increases the explanatory power of the equation by approximately 10 percentage points. Therefore, we can conclude that the main variables determining the contribution of speculative demand to changes in housing prices in Turkey are expectations regarding housing prices, interest rates, and real credit volume. The fact that speculative demand shocks are closely related to house price expectations suggests that they are linked to the bubble component of house prices. On the other hand, as noted by Capozza-Seguin (1996) and Greenwald-Guren (2021), when consumer expectations drive house price changes, policies aimed at credit regulations are not effective in stabilizing house prices. Therefore, policymakers should consider this result when designing policies to stabilize the housing market.

6. Conclusion

In Turkey, housing holds the greatest value among the assets of households. It is well-known that nearly all of the non-financial wealth is comprised of real estate. The available data suggest that owning a house in Turkey has become more challenging in recent times. The main reason for this trend is undoubtedly the rising housing prices. Current data also reveal that house sales cannot be disregarded solely for residential purposes, as they often serve as investment opportunities. Therefore, the speculative aspect must be taken into account in any analysis conducted. Definitely, this phenomenon is an economic factor that affects housing prices.

In many previous studies, it has been assumed that asset markets, including the housing market, operate efficiently. This assumption suggests that the intrinsic value of a house is determined by the present value of the rental flows, which are discounted by the effective interest rate adjusted for the rental increase rate. Naturally, any leaks from the cash flows generated by the house, such as maintenance costs and taxes, will decrease the intrinsic value of the house. However, contrary to the results obtained under the assumption of an efficient market, there may always exist a gap between the sales price of a house and its intrinsic value in the housing market. This gap, known as a bubble, represents the difference between the intrinsic value and the market price of the house.

To evaluate the effects of structural shocks in the housing market, this study estimated a structural VAR model. This model, based on the developed theoretical model, allows for an examination of changes in housing prices due to supply-side shocks, residential demand shocks, and speculative demand shocks. It also enables an assessment of the contribution of each shock to changes in sales prices and an evaluation of how sales prices respond to each shock. According to the results of the impulse-response analysis, the observed changes in housing prices are primarily influenced by structural shocks in speculative demand and residential demand, with the impact of supply shocks being limited. However, it is important to note that the effects of these three structural shocks on housing prices are permanent. While this raises concerns about housing price bubbles, it also suggests that the economic effects of price stickiness (such as wealth and income effects) should be examined separately. The variance decomposition and historical decomposition analyses reveal that the largest contribution to changes in house prices comes from speculative demand. In the post-2018 period, all three structural shocks have had a positive impact on house price changes. This outcome should be interpreted as a result of the irrational interest and exchange rate policies pursued during this period.

The results obtained from the SVAR model have shown that speculative demand plays a major role in understanding the housing market in Turkey. The variable with the highest impact on explaining changes in sales prices was found to be speculative demand shocks. To understand which economic variables these shocks were associated with, regression analysis was conducted. These economic variables included interest rate, stock return rate, industrial production index change rate, banks' housing loan behavior, and consumers' housing price expectations. While expected house prices had the highest explanatory power in univariate estimations, incorporating other variables in the regression analysis increased the explanatory power of the equation by approximately 10 percentage points. The estimation results reveal that expectations regarding housing prices, interest rate, and real loan volume are the main variables that determine the contribution of speculative demand to the change in housing prices in Turkey.

The close relationship between speculative demand shocks and house price expectations indicates that speculative demand is connected to the bubble component of house prices. In situations where consumer expectations primarily drive changes in house prices, credit regulations alone are ineffective in stabilizing them. Policymakers should take this result into account when formulating housing market stabilization policies.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Macrothink Institute.

The journal’s policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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No additional data are available.

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APPENDICES

Appendix 1: Definitions and Sources of Data

Symbol	Variable	Definition	Source	Transformation
s_t	Housing supply	Number of housing permits	TURKSTAT[3]	Seasonal adjustment[1] - Log level
r_t	Real housing rent index	Housing rent index		Seasonal adjustment - Real transformation[2] - Percentage change rate
p_t	Real housing sale price index	Housing sale price index		Seasonal adjustment - Real transformation - Percentage change rate
CPI	Consumer price index	Consumer price index		-----
y_t	Industrial production index	Industrial production index		Seasonal adjustment - Percentage change rate
hp_t^e	Expected Housing Price Index[4]	Expected Housing Price Index		Seasonal adjustment - Real transformation - Percentage change rate
r_t^s	Common stocks' return rate	BIST100 Index	BIST[5]	Seasonal adjustment - Percentage change rate
i_t^b	Interest rate	Five-year government bond interest rate		-----
rcr_t	Real Housing Credits	Housing credit volume of the banking sector	CBRT[6]	Seasonal adjustment - Real transformation - Percentage change rate

Notes: (1) Seasonal adjustment is carried out through Census-X12 methodology.

(2) Real transformation is carried out through the Consumer Price Index.

(3) Data obtained from the website of the Turkish Statistical Institution: www.tuik.gov.tr

(4) Data is compiled from the beginning of 2011.

(5) Data obtained from the website of the Istanbul Stock Exchange: www.bist.org.tr

(6) Data obtained from the website of the Central Bank of the Republic of Turkey: www.tcmb.gov.tr/evds

Appendix 2: Stationary Test Results

Series	Augmented Dickey-Fuller Test			Phillips-Peron Test			Breakpoint Dickey-Fuller Test			Degree of Integration
	Lag[1]	Test	ρ^2	Band[3]	Test	ρ^2	Lag[1]	Test	ρ^2	
s	1	3.96	0.00	5	4.89	0.00	0	6.52	0.00	I(0)
r	1	5.26	0.00	3	3.17	0.01	1	10.29	0.00	I(0)
p	2	5.43	0.00	7	11.69	0.00	0	11.18	0.00	I(0)
y	1	5.28	0.00	8	8.83	0.00	0	8.07	0.00	I(0)
hp^e	2	3.98	0.00	5	5.50	0.00	0	6.93	0.00	I(0)
r^s	0	3.61	0.01	5	3.85	0.00	0	5.33[4]	0.01	I(0)
i^b	2	6.12	0.00	8	3.55	0.01	0	10.91	0.00	I(0)
rcr	4	3.91[4]	0.01	5	4.01[4]	0.01	4	7.67	0.00	I(0)

Notes: (1) Optimal lag length is determined by using the Schwarz criterion.
(2) Indicates the marginal significance level.
(3) Optimal bandwidth is determined by using Newey-West method.
(4) Includes trend.

Appendix 3: Cointegration Test Results

Number of Cointegrated Equations	Eigen Value	Trace Test		Maximum Eigen Value Test	
		Test Statistic	0.01 Critical Value	Test Statistic	0.01 Critical Value
0	0.0731	41.9105	49.3628	18.1407	30.8340
At most 1	0.0627	23.7698	31.1539	15.4858	23.9753
At most 2	0.0341	8.2841	16.5539	8.2841	16.5539

Notes: Both trace and maximum eigenvalue tests show that there is no cointegration relationship at the 0.01 level.

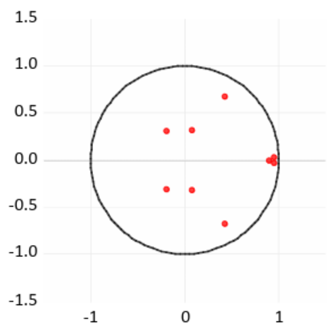
Appendix 4: Lag Length Selection

Lag	Log Likelihood	LR	FPE	AIC	SC	HQ
0	-283.7606	---	0.0025	2.5377	2.5831	2.5560
1	411.3954	1365.71	5.86E-06	-3.5545	-3.3529	-3.4612
2	439.1827	53.8532	4.98 E-06	-3.7007	-3.3829	-3.5725
3	455.5885	31.3599	4.64 E-06*	-3.7673*	-3.3879*	-3.5830*
4	467.1770	21.8439	4.84 E-06	-3.7492	-3.3122	-3.5510
5	476.2413	16.8451	4.80 E-06	-3.7781	-3.1920	-3.4966
6	481.3530	9.3640	4.65 E-06	-3.8019	-3.0633	-3.4072
7	516.0823	62.6971*	3.75 E-06	-3.8362	-2.8926	-3.5799
8	520.5074	7.8711	3.66 E-06	-3.8418	-2.8074	-3.4844

Note: * shows the optimal lag length for the relevant criterion. LR refers to the likelihood ratio, FPE final prediction error, AIC Akaike information, SC Schwarz information, and HQ Hannan-Quinn information criteria.

Appendix 5: Diagnostic Test Results for the Unrestricted VAR Model

Appendix 5.1: Model Stability Test



Appendix 5.2: Residual Autocorrelation Test

Lag	LR Statistics	Degrees of Freedom	Probability	Rao F Statistics	Degrees of Freedom	Probability
1	13.9357	9	0.1057	2.0279	9, 525.8	0.1057
2	10.4552	9	0.3149	1.1655	9, 525.8	0.3149
3	11.2470	9	0.2592	1.2547	9, 525.8	0.2592
4	4.3824	9	0.8845	0.4857	9, 525.8	0.8845

Null Hypothesis: No serial correlation at lag h

Appendix 5.3: Residual Heteroscedasticity Test

Equation for Residuals	R^2	F(18,224)	Probability	χ^2 (18)	Probability
s_t	0.0738	0.9918	0.4701	17.9373	0.4598
Δv_t	0.0623	0.8267	0.6677	15.1379	0.6525
Δp_t	0.0430	0.5585	0.9258	10.4368	0.9167
Joint	---	---	---	20.4643 (108)	0.7122

Note: Numbers in parentheses Show the degrees of freedom for the relevant distribution.

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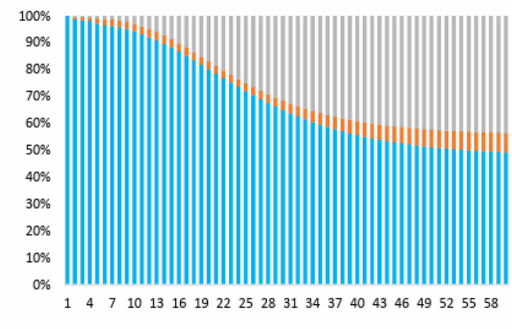
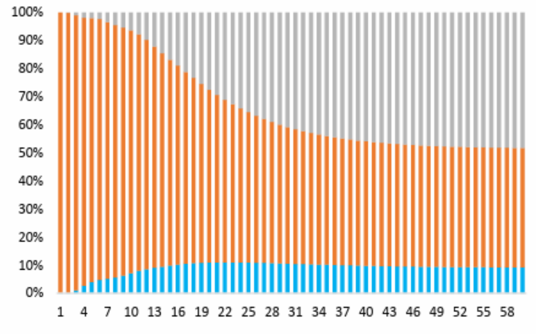
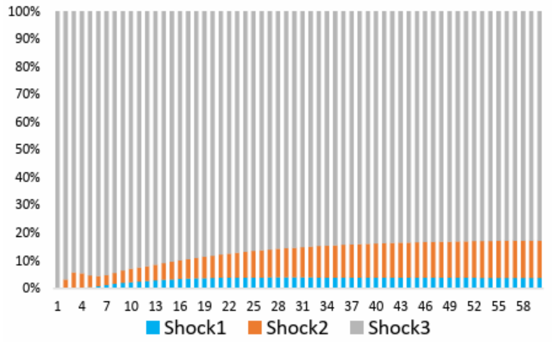
Appendix 6: Variance Decompositions for 60 Months Horizon



Housing Supply



Rental Cost



Housing Price