

# The Macroeconomic Effects of Housing Price Shocks in Türkiye: A Structural VAR Approach

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Received: April 24, 2026    Accepted: June 16, 2026    Published: July 1, 2026

doi:10.5296/ber.v16i3.23720    URL: <https://doi.org/10.5296/ber.v16i3.23720>

## Abstract

This study empirically examines the dynamic relationships between housing prices and key macroeconomic variables in Türkiye from January 2003 to December 2025, using a six-variable structural vector autoregressive model. The model includes the policy interest rate, M1 money supply, industrial production index, consumer price index, consumption expenditures, and housing price index. The empirical findings reveal three main results. First, the interest rate channel is operative: a monetary policy tightening shock has a statistically significant, cumulative negative effect on housing prices, with no evidence of a price puzzle. Second, a positive housing price shock significantly and permanently raises both consumption expenditures -supporting the wealth effect channel- and consumer price inflation. Third, counterfactual simulations show that the housing price channel amplifies the impact of monetary policy shocks on consumption and inflation. The Central Bank of the Republic of Türkiye does not respond systematically to housing price developments in its monetary policy decisions. These findings underscore the need for macroprudential tools to complement monetary policy in addressing housing market imbalances.

**Keywords:** Housing prices, Monetary policy transmission, SVAR, Wealth effect, Türkiye

**JEL Classification:** E52, R31, C32, E31

## 1. Introduction

A growing body of evidence from global economies demonstrates that housing prices are closely linked with macroeconomic dynamics. Changes in housing prices directly impact consumption, the largest component of national income, through the *wealth* effect. Furthermore, investment expenditures, which are crucial for economic growth, are also directly influenced by fluctuations in the housing market. Observed changes in key

macroeconomic variables affect housing prices, particularly through the established relationship between interest rates and housing prices (Mishkin, 2007). In this context, the present study aims to examine the dynamics between housing prices and macroeconomic variables, focusing on three distinct areas: the relationship between interest rate changes and housing prices; the interaction between changes in housing prices and key macroeconomic variables such as consumption, income, and inflation; and the connection between housing prices and the transmission of monetary policy. This study will analyze these focal points in Türkiye from 2003 to 2025 using a Structural Vector Autoregressive (SVAR) model based on variables such as housing prices, production, consumption, inflation, interest rates, and money supply. The study period encompasses a significant span characterized by intense fluctuations in both the global and Turkish economies. In Türkiye, the housing sector not only fulfills the need for shelter but also represents the largest component of household wealth, serving as collateral for the financial system and acting as a dynamic channel through which monetary policy decisions affect the real economy (Coskun et al., 2020). This period coincides with a time of profound evolution in the Turkish housing market, reflecting the structural transformation of the Turkish economy, the impact of global financial crises, changes in monetary policy regimes, and the high inflation environment experienced in recent years. Therefore, it is essential to examine developments in the macroeconomy and the housing sector in Türkiye during this period in detail.

The study is structured as follows: The second section reviews existing research on the relationship between housing and macroeconomics in both international and national contexts. This review emphasizes three key areas: the relationship between interest rates and housing prices, the connection between housing prices and consumption, and the impact of monetary policy transmission on housing prices. The third section evaluates developments in the Turkish economy through key macroeconomic indicators and examines trends in the housing sector. Section four describes the model employed in this study and provides a comprehensive overview of the methodology used to identify the SVAR model. Section five presents the dataset used for estimation and includes the results, along with an analysis of impulse response functions and variance decompositions. This section also incorporates a simulation analysis of the role of housing prices in monetary policy transmission. Finally, section six concludes with a summary of the study's findings and offers policy recommendations.

## **2. Literature Review**

This section systematically evaluates both international and national literature regarding the relationship between housing prices and macroeconomic variables. The literature review is organized around three primary research axes: (i) the impact of interest rate changes on housing prices, (ii) the interaction between housing prices and consumption, income, and overall price level, and (iii) the connection between housing prices and the monetary policy transmission mechanism. Within this framework, a dedicated subsection examines empirical studies specific to Türkiye.

### *2.1 The Relationship Between Interest Rates and Housing Prices*

The theoretical framework explaining the relationship between housing prices and interest rates is grounded in the user cost approach. This model posits that housing demand arises when rental income and expected capital gains are weighed against interest costs and depreciation. A decline in interest rates lowers borrowing costs, thereby stimulating housing and investment demand, which in turn drives equilibrium housing prices upward (Mishkin, 2007). This mechanism was originally formulated by Poterba (1984), and subsequent empirical studies have examined its validity across various countries.

Dokko et al. (2011) analyzed 14 OECD countries and argued that monetary policy had a limited influence on housing bubbles during the 2000s. Similarly, Luciani (2015) employed U.S. data in a structural dynamic factor model and found that the Federal Reserve's expansionary policy from 2002 to 2004 had a minimal impact on the housing market. In contrast, Bernanke (2010) asserted that elevated housing prices were primarily driven by foreign capital inflows and inadequate financial regulation, rather than interest rate policy. Collectively, these studies reflect the prevailing skepticism of that early period.

In a comprehensive review of the relationship between interest rates and housing prices, Kuttner (2013) systematically examined empirical evidence and concluded that the impact of interest rate shocks on housing prices is significantly smaller than predicted by standard user cost theory. This finding emphasizes that the relationship cannot be attributed solely to the interest rate mechanism; additional factors such as market expectations, credit constraints, and structural characteristics must also be incorporated into the model.

Del Negro & Otrok (2007) conducted a VAR study on the U.S. housing market, revealing that monetary policy shocks significantly influenced housing price movements. Similarly, Jarocinski & Smets (2008) demonstrated the effects of monetary policy on housing investment and prices using a VAR model specifically designed for the U.S. McDonald & Stokes (2013), utilizing the Case–Shiller index, indicated that the Federal Reserve's interest rate cuts from 2001 to 2004 contributed to the housing price bubble. Furthermore, Jorda et al. (2015) conducted a comprehensive empirical study spanning 17 developed countries and 140 years of data, demonstrating that prolonged accommodative monetary policy fosters conditions conducive to housing price bubbles and financial vulnerabilities.

Beraja et al. (2017) confirmed that monetary policy significantly affects housing prices using regional data from various U.S. states. Similarly, Fehrle (2019) used the DSGE model by integrating credit conditions and market expectations. His findings indicated that the influence of monetary policy on housing market cycles remained robust and statistically significant, even when controlling for interest rate shocks. Furthermore, this study revealed a notable asymmetry: the stimulative effect of interest rate reductions on the market was considerably stronger than the dampening effect of interest rate increases.

Institutional differences among countries significantly affect the relationship between interest rates and housing prices. Sa et al. (2014), employing the panel VAR method, found that housing markets in countries with well-developed mortgage systems are more responsive to

interest rate shocks. Similarly, Calza et al. (2013), in their analysis utilizing OECD data, found that the transmission mechanism varies in countries with high fixed-rate mortgage rates, resulting in a slower impact of monetary policy on the housing market. Additionally, Bjørnland & Jacobsen (2010), in their SVAR study of small open economies, including Norway, Sweden, and the United Kingdom, identified that housing prices are critical in the transmission of monetary policy. Their findings underscore that the effectiveness of this transmission is influenced by mortgage structure and the level of financial development.

## *2.2 Housing Prices, Consumption, and Income: The Wealth Effect*

The impact of housing prices on consumption is examined through the lens of the *life-cycle income* hypothesis. This theory posits that households tend to increase their consumption expenditures when their wealth consistently rises. Given that housing assets constitute a significant portion of household balance sheets, increasing housing prices are expected to directly enhance consumption. This relationship is likely to play a crucial role in influencing aggregate demand and, ultimately, economic growth. Mishkin (2007) described this process as the interest rates–housing wealth–consumption–aggregate demand chain, emphasizing it as a key channel in the transmission mechanisms of monetary policy.

In a study by Case et al. (2005) using U.S. state-level panel data, the elasticity of consumption with respect to housing wealth ranged from 5 to 9 percent. In contrast, the effect of stock wealth on consumption was not statistically significant. This finding clearly highlights the asymmetrical impact of housing versus financial wealth on consumption and has significantly influenced the literature. Similarly, Carroll et al. (2011), using U.S. time series data, estimated that a one-dollar increase in residential wealth boosts consumption by approximately 9 cents in the long run. In contrast, a comparable increase in non-residential wealth contributes only 4 cents to consumption. Additionally, Iacoviello & Neri (2010) explored this relationship within a structural equilibrium model where consumption and housing wealth are determined endogenously. They found that while the positive correlation between the two largely arises from common factors, a real wealth effect remains evident.

Conversely, studies with controversial findings contribute significantly to the existing literature. Attanasio et al. (2009) found that, in the United Kingdom, both homeowners and tenants displayed similar consumption responses to fluctuations in housing prices. This indicates that the relationship between housing and consumption may not stem from a direct wealth effect, but rather from a common factor influencing both variables, such as anticipated income growth. In a study of OECD countries, Girouard & Blöndal (2001) observed notable variations in results across different nations; in some economies, equity wealth had a more significant impact on consumption, while in others, housing wealth was predominant.

The second channel that enhances the wealth effect is the collateral mechanism. Iacoviello (2005) demonstrated that in a Dynamic Stochastic General Equilibrium (DSGE) model incorporating borrowing constraints, rising housing prices increase credit utilization and consumption by enhancing collateral value. Aoki et al. (2004) found that collateral value significantly influences both housing investments and consumption, and that this interaction, coupled with credit constraints, amplifies sensitivity to monetary policy. In this context,

rising housing prices not only promote independent consumption growth but also further stimulate consumption through the credit channel, highlighting the critical role of the housing market in macroeconomic expansion.

Beltratti & Morana (2010) conducted a comprehensive study utilizing Factor-Augmented VAR, revealing that housing price shocks exert a significantly greater influence on consumption, investment, and output than stock price shocks. Likewise, Claessens et al. (2012), in an extensive analysis encompassing 44 countries, determined that housing market downturns are closely linked to economic contractions in terms of both duration and severity. In contrast, periods of economic expansion do not exhibit this degree of correlation. This asymmetry implies that the adverse effects of housing shocks on the real economy are particularly profound and long-lasting.

The topic of bidirectional causality is also prominent in the literature. In their panel cointegration analysis of 15 countries over a span of 30 years, Adams & Füss (2010) found that, in the long run, economic growth and construction costs positively affect housing prices. Conversely, long-term interest rates exert a negative influence, with an annual adjustment rate of approximately 16 percent. This finding underscores that housing prices align with macroeconomic variables within a long-term equilibrium relationship, although the return to this equilibrium occurs gradually.

### *2.3 Housing Market and Monetary Policy Transmission*

Mishkin (2007) identified five key channels through which monetary policy influences the housing sector: the user cost channel, the expectations channel, the housing supply channel, the wealth effect, and the collateral-balance-sheet channel. This framework underscores the importance of housing as a vital intermediary in the transmission of monetary policy to the real economy. Goodhart & Hofmann (2008), through their panel VAR analysis of the U.S., Eurozone, Japan, and the U.K., established a strong bidirectional causal relationship between housing prices, credit growth, and monetary policy. Their study further demonstrated that the inclusion of housing market variables in the financial conditions index significantly enhances its predictive power regarding economic activity.

The SVAR method has become the preferred approach in international literature for modeling the relationship between the housing market and monetary policy. Musso et al. (2011) undertook a comprehensive analysis of the housing market's role in macroeconomic fluctuations through their SVAR studies, comparing the U.S. and Eurozone. Bjørnland & Jacobsen (2010) evidenced that in SVAR models employing the Kolesnik identification technique, shocks to short-term interest rates exert statistically significant impacts on housing prices and private consumption. Additionally, Jarociński & Smets (2008) identified in their SVAR analysis of U.S. data that monetary policy shocks have a substantial influence on both housing investment and prices.

Recent studies are enhancing the SVAR model by integrating credit conditions, expectation variables, and measures of uncertainty. Leamer (2007) found that monetary policy accounts for approximately 30 percent of long-term housing market cycles, with effects exhibiting

significant asymmetry. A similar conclusion is also obtained by Chen et al. (2024) using SVAR and time-varying VAR methods for the U.S. Furthermore, Kiyotaki & Moore (1997) demonstrated how the interaction between asset prices and credit constraints can initiate financial accelerator mechanisms, a model that continues to provide valuable theoretical insights for contemporary SVAR definitions.

The price puzzle problem, which refers to the unexpected rise in inflation following a contractionary monetary policy shock, remains a significant topic of discussion within the monetary policy literature. This phenomenon has also been observed in studies regarding housing prices. Castro & Sousa (2012) analyzed asset markets and the responsiveness of monetary policy in the Eurozone, the U.S., and the United Kingdom, finding that central banks respond asymmetrically to fluctuations in housing prices. Their research offers substantial evidence that not only does monetary policy affect housing prices, but housing prices can also influence policy decisions.

#### *2.4 Literature on Developing Economies*

Most international research examining the relationship between housing and the macroeconomy has predominantly focused on developed OECD countries. While studies about developing economies have been relatively limited, their number has been growing rapidly. These studies suggest that the structural differences inherent to developing economies can significantly alter the transmission mechanisms involved.

Égert & Mihaljek (2007) demonstrated that in Central and Eastern European countries, the effects of income, credit expansion, and financial deepening on housing prices were markedly greater than the OECD average. Cerutti et al. (2017) conducted a comprehensive study involving 61 countries and found significant variations in both the frequency and magnitude of housing bubbles across nations. They identified the institutional framework, access to finance, and macroprudential policy tools as key factors influencing these differences. Additionally, Tsatsaronis & Zhu (2004), in their analysis for the Bank for International Settlements (BIS), compared the housing markets of 17 countries and revealed that the structure of interest rates (fixed or variable), credit standards, and tax policies had a substantial impact on housing price dynamics.

Panagiotidis & Printzis (2016) identified a long-term equilibrium relationship among housing prices, the retail sector, and mortgage loans in Greece using the Vector Error Correction Model (VECM) methodology. This study is particularly relevant for comparison with the Turkish economy, which shares structural similarities, including limited mortgage penetration.

#### *2.5 Empirical Studies Specific to Türkiye*

Lebe & Akbas (2014) analyzed the Turkish housing market from the demand perspective using the VECM method, identifying income, industrialization, and employment variables as the primary determinants in the long run. In a subsequent study covering the period from 2000 to 2008, Ozturk & Fitoz (2009) identified key macroeconomic factors influencing the housing market, concluding that GDP, interest rates, and credit volume significantly impact

price dynamics.

Sari et al. (2007) conducted a long-term analysis of Türkiye from 1961 to 2000, employing variance decomposition and historical decomposition methods within the VAR framework. This pioneering study explores the interaction between housing expenditure shocks and key macroeconomic variables, including money supply, interest rates, and output. Notably, it covers an extended period and adopts a multivariate approach, contributing significantly to the Turkish literature. The findings reveal that even during this period, when the mortgage financing system lacked an established institutional framework, macroeconomic variables exerted substantial effects on the housing market.

Erdem et al. (2013) examined the Turkish housing market from October 2007 to December 2011 using the VECM method. Their study demonstrated that interest rates, GDP, and housing prices are cointegrated, indicating that the housing market is responsive to shocks in both demand and supply.

Yildirim & Ivrendi (2017) conducted a comprehensive national study of the Turkish housing market utilizing SVAR methodology, covering the period from 2003 to 2016. Their findings indicated that while monetary policy shocks had a significant short-term impact on housing prices, long-term price determination was predominantly driven by market dynamics. Furthermore, the study identified the credit-to-value ratio as a crucial threshold variable affecting the relationship between housing shocks and the real economy.

Coskun et al. (2020) analyzed the alignment of Turkish housing prices with long-term macroeconomic fundamentals through a combination of VECM and bubble analysis methods. Their research identified a regional risk of housing bubbles, particularly in Istanbul, and highlighted significant differences in housing price dynamics across various cities. This finding underscores the necessity of considering regional heterogeneity in studies of the Turkish housing market, which may be overlooked in analyses conducted at the national level.

In her VAR study spanning from 2011 to 2019, Kutlu (2021) found that expansionary monetary policy resulted in a decrease in housing prices, suggesting that the price puzzle also influences the housing market. This implies that the demand channel of monetary policy is not functioning effectively in Türkiye.

Bayir (2020) identified housing prices as a critical mediating variable in the monetary transmission mechanism within the SVAR model for the period from 2010 to 2019. The findings confirm that housing prices significantly mediate the impact of monetary shocks on consumption and output.

Dilber & Sertkaya (2016), in their VAR analysis covering the years 2008 to 2014, revealed a notable transformation in housing price dynamics in Türkiye following the 2008 global financial crisis. They identified interest rates and credit variables as key determinants of this transformation. This finding emphasizes the necessity of accounting for structural breaks and regime shifts when developing empirical models for Türkiye.

Eryuzlu & Ekici (2020) investigated the relationship between the real exchange rate and the housing price index using causality tests. Their analysis revealed a significant positive correlation between the two variables, suggesting that increases in the exchange rate lead to higher housing prices through cost and inflation hedging mechanisms.

Tanrivermis et al. (2022) conducted long-term VECM and Granger causality studies from 1971 to 2019, revealing that gold prices, inflation rates, and credit volume positively influence housing prices over the long term. Additionally, they identified that inflation hedging and store-of-value motives specific to Türkiye significantly impact housing demand.

Paksoy et al. (2014) examined the relationship between the housing price index and inflation at the regional level through a panel data analysis of Türkiye's different regions. Their findings indicated that the strength of the housing-inflation relationship varied by region, although a positive correlation was observed across all areas.

In a separate study focused on Istanbul, Tuncsiper & Akgunduz (2022) employed the hedonic pricing method to analyze the determinants of housing prices, emphasizing the significance of location, accessibility, and physical characteristics in price formation. Similarly, Ucdogruk (2001) utilized the hedonic approach in İzmir to systematically clarify intra-city price variations. These studies highlight the necessity of considering urban dynamics alongside macroeconomic relationships at the national level.

A comprehensive evaluation of international literature indicates findings that are often similar yet occasionally contradictory. Generally, a negative relationship exists between interest rates and housing prices; however, the strength of this relationship is significantly influenced by the institutional framework, particularly the depth of the mortgage market and the distribution of fixed versus variable interest rates. While the wealth effect channel is empirically supported, it exhibits considerable variation across different countries. Housing prices have consistently been identified as both a responsive element and a reinforcing factor in the transmission of monetary policy. In developing economies, these relationships tend to diverge due to greater volatility and less robust institutional infrastructure.

A review of the literature on Türkiye highlights significant contributions but also reveals two notable gaps. First, there are few studies that specifically employ the SVAR model for Türkiye, with most existing research focusing on relatively short timeframes, primarily covering the years after 2010. Second, there is a lack of comparative studies that analyze the relationship between monetary policy transmission and the housing market in Türkiye over an extended period, encompassing both crisis and normalization phases.

### **3. Macroeconomic Dynamics of the Turkish Economy and Housing Market (2003-2025)**

From 2003 to 2025, the Turkish economy experienced significant changes characterized by structural reforms, periods of high growth, and macroeconomic volatility. Throughout this period, the housing market evolved from merely satisfying basic housing needs to becoming a crucial component of inflation hedging, the wealth effect, and the transmission mechanisms of monetary policy.

### *3.1 Macroeconomic Background: Growth, Inflation, and Monetary Policy*

Following the stabilization program implemented after the 2001 crisis, the Turkish economy demonstrated strong growth, averaging 7% annually between 2003 and 2007. Key features of this period included a reduction of inflation to single-digit levels and the establishment of a market-oriented institutional infrastructure, highlighted by the enactment of the Housing Finance Law in 2007. Although the economy contracted by 4.9% due to the 2008 global financial crisis, a rapid recovery ensued, driven by the opportunities provided by a resilient banking sector, which enabled double-digit growth rates in 2010 and 2011.

The tightening of external financing conditions following the *taper tantrum* of 2013 led to a prolonged depreciation of the Turkish lira. This situation was further exacerbated by the 2018 currency crisis, which caused inflation to rise to 25%. Concurrently, the implementation of tighter monetary policy increased housing loan costs, resulting in a cyclical slowdown in the market (Siklar & Akca, 2020). Between 2020 and 2022, expansionary credit policies and negative real interest rates, introduced to mitigate the effects of the pandemic, resulted in an unprecedented surge in housing demand. By the end of 2022, the inflation rate reached 84.4%, positioning housing as a primary investment instrument and a store of value for households. In 2023, a policy shift raised the policy interest rate from 8.5% to 50%, initiating a disinflation process and stabilizing the housing market, where credit-driven sales were significantly reduced.

### *3.2 Structural Transformation and Periodic Analysis of the Housing Market*

The evolution of the Turkish housing market from 2003 to 2025 can be analyzed in five primary phases, reflecting its responsiveness to macroeconomic shocks:

*Institutionalization and Expansion (2003-2007):* Economic stabilization and the housing finance law facilitated access to finance, channeling pent-up demand into the market.

*Crisis and Liquidity-Focused Recovery (2008-2013):* The decline in real prices attributed to the global crisis led to a rapid recovery thanks to the central bank's interest rate reduction cycle and increased capital inflows.

*Exchange Rate Pressure and Stagnation (2014-2018):* Heightened geopolitical risks and the depreciation of the Turkish lira suppressed real returns, despite nominal price increases. Urban transformation projects emerged as the primary supply-side determinant during this period.

*Speculative Demand and Price Volatility (2019-2022):* The effects of negative real interest rates and cost-driven shocks resulted in housing prices increasing nominally by over 100%. During this period, housing was viewed more as a financial asset than as a means of shelter.

*Return to Rational Policies and Rebalancing (2023-2025):* Tight monetary policy and rising interest rates reduced the share of mortgage sales to the 13-15% range. The expectation that the nominal price increase rate will remain below inflation by 2025 indicates a correction process in the real value of housing.

From 2003 to 2025, the Turkish housing market exhibited a structure characterized by considerable nominal volatility, sensitivity to exchange rates, and a strong responsiveness to interest rates. The primary factor constraining supply was the exchange rate pass-through in construction costs. Meanwhile, demographic dynamics, urbanization, and investment appetite during periods of negative real interest rates sustained demand. These structural characteristics highlight the housing market's essential role as a channel for the transmission of macroeconomic shocks.

#### 4. Model

This study seeks to analyze the relationships between housing prices and the macroeconomy in Türkiye through the application of an SVAR model. The SVAR model is particularly well-suited for addressing three critical questions: How do interest rates influence housing prices? What effects do fluctuations in housing prices have on key macroeconomic variables? And what role do housing prices play in the transmission of monetary policy?

SVAR models typically cannot be estimated directly. Consequently, when conducting empirical analysis using an SVAR model, it is essential first to estimate the reduced-form VAR model, followed by the identification of the SVAR model based on the obtained results. This identification process involves establishing a contemporaneous relationship between the residuals of the reduced-form VAR model and the shock terms of the SVAR model. There are three commonly employed methods for identifying the SVAR model. The first method is the Cholesky decomposition, which transforms a simultaneous system of equations involving shocks and residuals into a series of equations. However, a limitation of this method is that the identification results can vary depending on the order of the variables. Notable studies exploring the relationship between housing prices and macroeconomic variables include Aoki et al. (2004), Lastrapes (2002), and Giuliadori (2005). The second method is the long-term constraint approach, known as the Blanchard-Quah decomposition, which emphasizes the long-term characteristics of shocks. Research examining the impact of this method on housing prices includes contributions by Iacoviello (2005) and Iacoviello & Minetti (2008). The third method is the contemporaneous constraint approach, which establishes a direct relationship between shock terms and residuals based on conclusions drawn from economic theory and assumptions regarding policymakers' behavior. Studies by Chirinko et al. (2008) and Elbourne (2008) utilize this method to analyze the connection between housing prices and the macroeconomy. Given our initial objectives, employing the contemporaneous constraint approach to identify the SVAR model in this study is deemed appropriate.

In our case, the reduced-form VAR and SVAR models will be constructed using six equations and six variables. These equations include the monetary policy reaction function, the money demand function, the production function, the general price level function, the consumption function, and the housing price function. The endogenous variables incorporated in these functions include the policy interest rate ( $i$ ), money supply ( $M1$ ), production volume ( $ip_i$ ), general price level ( $cpi$ ), consumer spending ( $cns$ ), and housing prices ( $hpi$ ).

In the SVAR approach, we can express the following equation, where  $X_t$  denotes the vector of endogenous variables,  $A_i$  represents the matrix of coefficients,  $p$  indicates the number of

optimal lags, and  $\varepsilon_t$  signifies the vector of structural shocks:

$$A_0 X_t = A_1 X_{t-1} + \dots + A_p X_{t-p} + \varepsilon_t \quad (1)$$

In this model, the diagonal of the  $A_0$  matrix is set to 1. We assume that the structural shock vector has a mean of 0 and a covariance matrix  $\Sigma$ , and that it is independent of any serial correlation issues. Consequently, the off-diagonal elements of the covariance matrix  $\Sigma$  are 0. Since Equation (1) cannot be estimated directly, we transform it into a reduced-form VAR model, resulting in the following equation:

$$X_t = B_1 X_{t-1} + \dots + B_k X_{t-k} + v_t \quad (2)$$

where  $B_i = A_0^{-1} A_i$ . In the equation,  $v_t$  represents the estimation error of the reduced-form VAR model, which has a mean value of 0 and a covariance matrix of  $\Omega$ . The relationships between  $v_t$  and  $\varepsilon_t$ , as well as between  $\Omega$  and  $\Sigma$ , are defined as follows:

$$\varepsilon_t = A_0 v_t \quad (3)$$

$$\Sigma = A_0 \Omega A_0' \quad (4)$$

To obtain the SVAR model in equation (1) from the estimation results of the reduced VAR model in equation (2), it is necessary to compute  $A_0$  and  $\Sigma$  using equation (4). This computation requires additional constraints beyond the estimation of the covariance matrix of the error terms ( $v_t$ ) in the reduced form VAR model. Both matrices  $A_0$  and  $\Sigma$  contain  $n^2$  elements, but only  $n(n+1)/2$  pieces of information are available to estimate  $\Omega$ , which is symmetric. Consequently, at least  $n(n-1)/2$  additional constraints are needed. As previously mentioned, this study employs the contemporaneous constraint method proposed by Sims (1986), Bernanke (1986), and Blanchard & Watson (1986). This method involves constraining certain elements of the  $A_0$  matrix in equation (3) to 0 based on insights from economic theory and assumptions about decision-makers' behavior. In this study, the following additional constraints were imposed:

$$\begin{bmatrix} \varepsilon_i \\ \varepsilon_m \\ \varepsilon_{ipi} \\ \varepsilon_{cpi} \\ \varepsilon_{cns} \\ \varepsilon_{hpi} \end{bmatrix} = \begin{bmatrix} 1 & \alpha_{12} & 0 & 0 & 0 & 0 \\ \alpha_{21} & 1 & \alpha_{23} & \alpha_{24} & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & \alpha_{43} & 1 & 0 & 0 \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & 0 & 1 & \alpha_{56} \\ \alpha_{61} & \alpha_{62} & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_i \\ v_m \\ v_{ipi} \\ v_{cpi} \\ v_{cns} \\ v_{hpi} \end{bmatrix} \quad (5)$$

The equation above consists of several rows, each representing different economic functions. The first row describes the monetary policy reaction function. The monetary authority assesses the economic situation using various data to adjust interest rates; however, they lack information on production, prices, consumption, and housing prices at the time of decision-making. Consequently, it is assumed that the only data available to the monetary authority is the money supply, thus assuming  $\alpha_{13} = \alpha_{14} = \alpha_{15} = \alpha_{16} = 0$ . The second row represents the money demand function, which follows the traditional view that money demand decreases with rising interest rates and increases with higher income and prices. Therefore, it is assumed that consumer spending and housing prices do not contemporaneously affect money demand, resulting in  $\alpha_{25} = \alpha_{26} = 0$ . The third row reflects

the production function, where it is assumed that only supply shocks have a simultaneous effect on production. Hence,  $\alpha_{31} = \alpha_{32} = \alpha_{34} = \alpha_{35} = \alpha_{36} = 0$ . In the fourth row, which represents the general price level function, it is assumed that prices react to demand changes with a lag, while supply shocks impact prices contemporaneously. Thus,  $\alpha_{41} = \alpha_{42} = \alpha_{45} = \alpha_{46} = 0$ . The fifth row illustrates the consumption function, where it is assumed that consumption expenditures respond simultaneously to all endogenous variables except for the general price level. To investigate whether the housing price channel, as noted by Mishkin (2007), operates in Türkiye, this variable is incorporated into the consumption function, leading to the assumption that  $\alpha_{54} = 0$ . The last row denotes the housing price function. Following Elbourne (2008), it is assumed that housing prices are only affected contemporaneously by monetary variables, as data on production, prices, and consumption are released with a lag and thus cannot simultaneously influence housing prices ( $\alpha_{63} = \alpha_{64} = \alpha_{65} = 0$ ). The expected signs of the coefficients to be estimated in the  $A_0$  matrix are summarized in Table 1 below.

Table 1. Expected Signs of Contemporaneous Coefficients

Function	Coefficient	Expected Sign	Function	Coefficient	Expected Sign
$v_i$	$\alpha_{12}$	+	$v_{cns}$	$\alpha_{52}$	+
$v_m$	$\alpha_{21}$	-		$\alpha_{53}$	+
	$\alpha_{23}$	+		$\alpha_{56}$	+
	$\alpha_{24}$	+	$v_{hpi}$	$\alpha_{61}$	-
$v_{cpi}$	$\alpha_{43}$	+		$\alpha_{62}$	+
$v_{cns}$	$\alpha_{51}$	-			

## 5. Estimation Results

### 5.1 Estimation Period and Data

In a developing economy like Türkiye, where housing functions as a shelter, an investment, and a hedge against inflation, analyzing long-term dynamics is essential for understanding the influence of housing prices. Accordingly, the estimation period is defined from 2003 to 2025, constrained by data availability. Monthly data have been selected to provide a comprehensive assessment of short-term dynamics. The estimation period comprises 276 observations, encompassing data for each variable from January 2003 to December 2025. This study employs the Central Bank of the Republic of Türkiye (CBRT) policy interest rate to represent interest rates, the M1 money stock for money supply, the industrial production index (2005=100) for output, the consumer price index (2003=100) for the general price level, the household consumption expenditure index (2005=100) for consumption expenditures, and the housing price index (2010=100) for housing prices. Data for the policy interest rate, M1 money supply, and housing price index were sourced from the CBRT, while data for the industrial production index, consumer price index, and household consumption expenditure index were obtained from the Turkish Statistical Institute (TurkStat) databases. All variables, except for the interest rate, were seasonally adjusted using the Tramo-Seats method, and all variables, except for the interest rate, were logarithmically transformed for analysis.

Before estimating the reduced-form VAR model, it is imperative to conduct preliminary tests on the variables and their long-term relationships. Initially, unit root tests were performed on each time series to determine the level of integration. The results from the augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and breakpoint Dickey-Fuller (Breakpoint DF) tests indicate that all time series are stationary in their first differences and exhibit the  $I(1)$  property (see Appendix 1). Subsequently, a cointegration test was conducted to assess the existence of long-term relationships among the time series that are non-stationary at their levels. The results demonstrated no evidence of a cointegrating vector (see Appendix 2). Consequently, it was concluded that a VAR model could be estimated using the logarithmic levels of the time series. The optimal lag length for the reduced VAR model was determined to be 5 months based on various criteria (see Appendix 3). To estimate the SVAR model, the results of the VAR model with a 5-month lag underwent a series of diagnostic tests. According to these tests (see Appendix 4), the VAR model is overall stable (as indicated by the AR Roots Test), the error terms follow a normal distribution (Jarque-Bera Test), and there are no issues with autocorrelation or heteroskedasticity (Breusch-Godfrey and White Tests, respectively). Based on these findings, equation (5) was estimated while imposing the necessary constraints, resulting in the following coefficient matrix. In this matrix, the values in parentheses represent the z-statistics for the respective coefficients, and \*, \*\*, and \*\*\* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\begin{bmatrix} \varepsilon_i \\ \varepsilon_m \\ \varepsilon_{ipi} \\ \varepsilon_{cpi} \\ \varepsilon_{cns} \\ \varepsilon_{hpi} \end{bmatrix} = \begin{bmatrix} 1 & -3.77 (2.09^{**}) & 0 & 0 & 0 & 0 \\ 0.05 (2.54^*) & 1 & 0.04 (0.37) & -2.21 (3.14^*) & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0.09 (1.68^{***}) & 1 & 0 & 0 \\ -0.01 (1.69^{***}) & 0.01 (1.06) & 0.07 (7.35^*) & 0 & 1 & 0.06 (3.83^*) \\ -0.04 (3.07^*) & 0.03 (1.77^{***}) & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_i \\ v_m \\ v_{ipi} \\ v_{cpi} \\ v_{cns} \\ v_{hpi} \end{bmatrix} \quad (6)$$

All estimated coefficients are consistent with theoretical expectations, and all coefficients, except for the income elasticity of money demand and the money supply elasticity of consumption, are statistically significant at conventional levels. The model is overidentified, imposing 19 constraints based on theoretical expectations, which exceeds the 15 constraints required for exact identification. Consequently, a likelihood ratio test was conducted to evaluate the significance of the imposed restrictions. The resulting value of  $\chi^2 = 2.47$  ( $p = 0.65$ ) supports the statistical validity of these constraints.

### 5.2 Impulse Response Functions and Variance Decompositions

The primary advantage of VAR-type analyses lies in their capacity to clarify the dynamic effects of an unexpected shock to one endogenous variable on other endogenous variables over time, as illustrated by impulse response functions. Figure 1 depicts the responses of the model variables over the subsequent 12 months to a one-standard-deviation positive shock in the interest rate. All model variables exhibit a downward response, consistent with theoretical expectations. The self-response to the interest rate shock is statistically significant from 1 to 5 months. The sustained positive response to the shock over the 12-month period suggests a high level of persistence in monetary policy.

The monetary policy shock induces a simultaneous and enduring decline in money demand,

with the observed response being statistically significant. This interest rate shock leads to a permanent reduction in M1 demand by increasing the opportunity cost of holding money. Moreover, it is evident that the structural constraints identified in the money demand function are substantial.

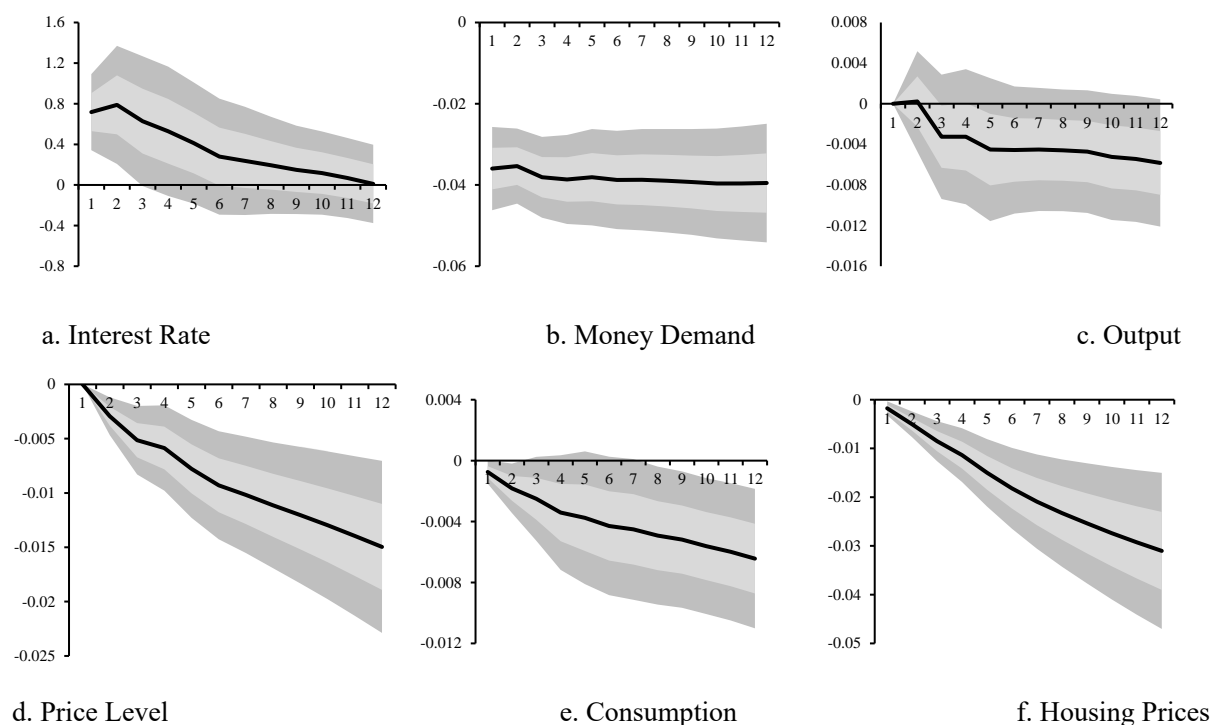


Figure 1. Model Variables' Responses to Interest Rate Shock

Note: The light and dark shaded areas indicate the 95% and 69% confidence intervals, respectively.

While the response of industrial production to the monetary policy shock is negative, its statistical significance is limited by wide confidence intervals. The sustained negative response over 12 months is consistent with the standard monetary policy transmission mechanism, in which increases in interest rates inhibit industrial production by raising investment costs and reducing aggregate demand. Nevertheless, the weak statistical significance suggests that this channel may be functioning with either diminished strength or a lag. Overall, these findings indicate that both structural characteristics and cyclical dynamics shape the real sector's sensitivity to monetary policy.

Conversely, the consumer price index exhibited a sustained and statistically significant decline following the monetary policy shock. This persistent downward trend in inflation indicates that the tightening of monetary policy has effectively and durably influenced price stability. Crucially, these results suggest that the price puzzle, frequently cited in the literature, is absent in the Turkish context. This outcome stands in contrast to studies such as Kutlu (2021) in the Turkish VAR literature, underscoring the different structural dynamics that may stem from variations in the sample period.

A positive interest rate shock has a significant negative impact on consumer spending, which

aligns with the theoretical expectation that increased borrowing costs will constrain household expenditure. However, the actual effect is relatively modest. Following a cumulative increase of approximately 100 basis points in interest rates, consumer spending declines by about 1.25 basis points by the end of the observation period. This finding empirically indicates that the credit channel is not functioning effectively in Türkiye.

Housing prices exhibit a significant negative response to interest rate shocks throughout the simulation period, with this adverse effect intensifying over time. This suggests that the impact of interest rates on housing prices accumulates rather than occurs instantaneously. Nevertheless, the overall magnitude of this effect remains modest during the simulation, reflecting a cumulative decrease in housing prices of approximately 22 basis points against a cumulative interest rate increase of 400 basis points. This limited response may be attributed to Türkiye’s low mortgage penetration rate. Furthermore, it underscores that confidence and expectation channels, which influence housing demand beyond borrowing costs, are also integrated into the transmission mechanisms captured by the model.

Figure 2 illustrates the response of the macroeconomic variables in the model to a one-standard-deviation positive shock in housing prices. Initially, the policy interest rate exhibits a negative response to the housing price shock; however, it becomes positive starting from the seventh month. It is important to note that this change in the interest rate is not statistically significant. This suggests that the CBRT has not established a clear mechanism for its monetary policy response to fluctuations in housing prices. In essence, the CBRT monitors and reacts to increases in housing prices not as a direct policy target but rather indirectly through their effects on inflation and output.

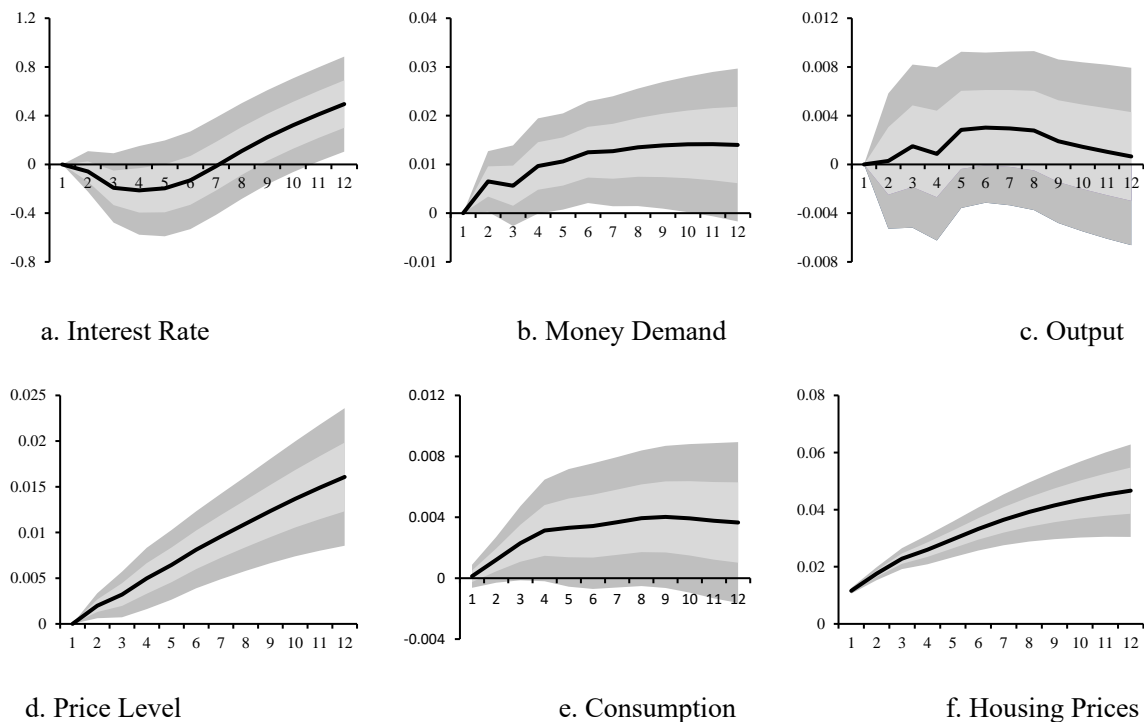


Figure 2. Model Variables' Responses to Housing Price Shock

Note: The light and dark shaded areas indicate the 95% and 69% confidence intervals, respectively.

Housing price shocks consistently and significantly increase the demand for M1. This observation is economically sound and underscores the interplay of several factors. The wealth effect generated by rising housing prices enhances transaction demand for money. Furthermore, heightened construction activity and housing purchases elevate payment needs, further driving up M1 demand. This indicates a structural and enduring relationship between the housing market and monetary aggregates.

In contrast, the response of industrial production to housing price shocks is positive but not statistically significant. The positive point estimates suggest that increased demand from the housing and construction sectors has had a limited impact on industrial production. This indicates that the influence of housing prices on the real sector is indirect and unstable, rendering the transmission of housing market developments to industrial production uncertain.

A positive shock in housing prices has a significant impact on the consumer price index throughout the simulation period, marking one of the study's most important findings. Several channels contribute to the influence of rising housing prices on overall prices. The first and most direct channel is the rent component; increases in housing prices affect the rental market, and stemming from the substantial weight of housing expenses in the Turkish consumer price basket, this results in a permanent increase in the general price level. The second channel involves demand pressure stemming from the wealth effect. As housing values rise, improved household balance sheets enhance overall consumer demand, leading to increased inflationary pressure. The third channel operates through expectations; rising housing prices cultivate inflationary expectations, which subsequently influence wage and price adjustment behaviors. These findings provide empirical support for the notion that the housing market plays a crucial role in shaping inflation dynamics in Türkiye.

The housing price shock results in a statistically significant increase in consumption expenditures throughout the simulation period. This response intensifies during the first eight months, after which it stabilizes. This observation provides empirical evidence that the wealth effect channel operates effectively in Türkiye. The relationship between housing wealth and consumption, as established in international studies such as those by Case et al. (2005) and Carroll et al. (2011), is also validated in Türkiye. Households perceive the increase in their housing asset values as a permanent rise in wealth, prompting them to elevate their consumption expenditures accordingly. In contrast to the limited impact of monetary policy shocks on consumption, a housing price shock has a stronger and more enduring effect; for instance, a cumulative 100 basis point increase in housing prices results in approximately an 11 basis point increase in consumption by the end of the period. This finding underscores that, in Türkiye, the influence of the interest rate channel on consumption lags significantly behind that of the housing wealth channel. Essentially, consumption expenditures are more responsive to changes in asset values on the household balance sheet than to variations in borrowing costs.

The response of housing prices to their own shocks produces notable results. First, the self-response of housing prices to these shocks is consistently positive and significant

throughout the 12-month simulation period. The point estimate indicates a steady upward trend, suggesting that the response intensifies rather than diminishes. This observation points to a strong persistence and rigidity within the Turkish housing market. Several structural dynamics contribute to this high level of persistence. On the supply side, new housing production is highly sensitive to construction costs and land constraints in urban areas, resulting in a sluggish response to price increases. On the demand side, the concurrent presence of genuine user demand and investment demand creates a structural barrier that hinders short-term price stabilization. Additionally, the self-reinforcing nature of price increases, driven by adaptive expectations, plays a crucial role in delaying the damping process. These findings correspond with the regional bubble risk identified for Türkiye by Coskun et al. (2020), Yildirim et al. (2021), and Sahin (2025). Therefore, the self-reinforcing dynamics of housing price shocks lead to a divergence of prices from long-term macroeconomic fundamentals, thereby heightening the risk of speculative pricing.

A significant output of VAR-type models is variance decomposition, which identifies the shocks contributing to the variance in the prediction errors of the model variables over time. While impulse response functions illustrate the dynamic effects of these shocks, the complementary variance decomposition underscores their relative importance. Figure 3 presents the variance decompositions for the model variables derived from the SVAR model over a 12-month simulation period.

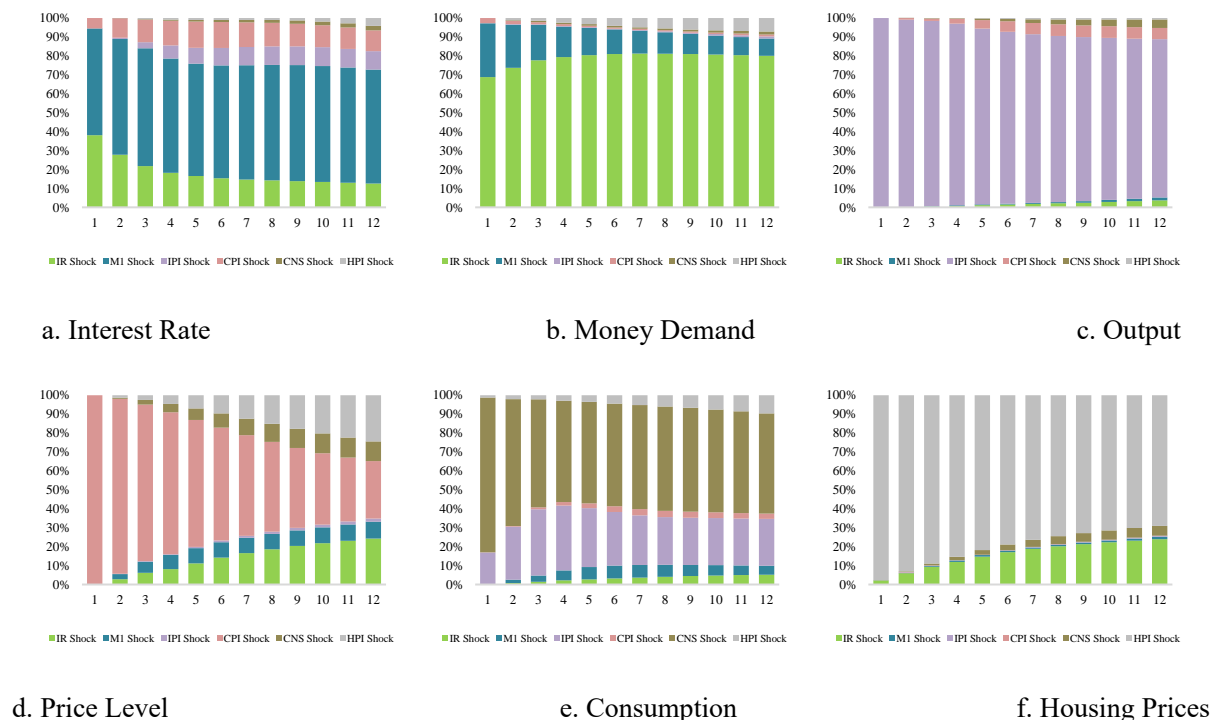


Figure 3. SVAR Model Variance Decomposition

Upon analyzing the sources of forecast error in the policy interest rate, it becomes clear that the M1 money supply shock consistently exhibits the greatest explanatory power throughout

the simulation period. This indicates that fluctuations in money demand conditions significantly influence monetary policy decisions in Türkiye. Essentially, the CBRT's adjustments to the policy interest rate are primarily responsive to changes in money demand. Initially, the interest rate is elevated at the outset of the shock simulation period due to its lagged values, but it gradually decreases over time. This trend suggests that while monetary policy exerts a strong influence in the short term, this self-determination diminishes progressively, with external factors -particularly money demand conditions- gaining greater importance in the long term. The impact of the price index shock begins low, peaks between months four and seven, and subsequently declines in the following months, clearly illustrating the effect of inflation developments on monetary policy decisions. In contrast, the contribution of the housing price shock remains relatively limited throughout the simulation period. This finding is consistent with the impulse response functions, which indicate that the CBRT demonstrates limited and indirect sensitivity to housing market developments in its monetary policy response.

The significant impact of policy interest rate shocks on fluctuations in money demand is noteworthy. This finding indicates that the relationship between money demand and monetary policy in Türkiye is both strong and unidirectional. Changes in interest rates consistently influence M1 demand, while fluctuations in M1 are expected to reduce the unexplained portion of money demand. However, the impact of M1 shocks on its own variance diminishes over time, suggesting that the independent dynamics of money demand are increasingly influenced by monetary policy. Although the effect of housing price shocks on M1 demand remains limited, it shows a rising trend. This observation aligns with the significant positive effects seen in impulse response functions and confirms that the expansion of the housing market serves as a long-term support channel for money demand. The transaction demand generated by construction activities and housing purchases is the primary driver of this channel.

According to the production function defined in this study, supply shocks -specifically those arising from their lagged values- play a crucial role in explaining forecasting errors in industrial production. Notably, the influence of price index shocks on production has increased over time, suggesting that inflationary pressures constrain production capacity through the real cost channel. In contrast, the effects of policy interest rate shocks and housing price shocks are relatively minor. This finding, which aligns with the weak responses observed in the impulse response functions, indicates that the impacts of monetary policy and the housing market on industrial production are indirect and secondary.

The variance decomposition of the price index presents significant insights for this study. Initially, the own shock of the price index accounts for nearly all price dynamics; however, this proportion declines rapidly and consistently over the simulation period. This decrease indicates that an increasing share of the unexplained component of inflation is being attributed to other structural shocks within the model. In the long term, rising housing prices contribute substantially to inflation through the rent channel, demand pressure stemming from the wealth effect, and expectation dynamics. The considerable impact of this relationship, as evidenced by the variance decomposition and supported by impulse response

functions, underscores that the housing market is a critical factor influencing inflation dynamics in Türkiye. Furthermore, the similar impact of monetary policy interest rate shocks on housing prices highlights the essential role of monetary policy in maintaining price stability.

The variance decomposition of consumption expenditures reveals that a variety of shocks influences consumption dynamics. In the short term, consumption expenditures are primarily driven by their own shocks; however, in the medium and long term, they become more susceptible to external shocks. Notably, the effect of industrial production shocks is particularly pronounced, increasing rapidly in the short term before declining and stabilizing. The pronounced short-term impact of supply changes on consumption highlights the persistent relevance of the income-consumption nexus in Türkiye, reinforcing the notion that production-driven income growth is a critical determinant of consumption volumes. Furthermore, the influence of housing price shocks on consumption expenditures progressively increases throughout the simulation period. This finding aligns with the positive and significant responses identified in impulse response functions, confirming that the wealth effect channel operates effectively in Türkiye. Rising housing prices strengthen household balance sheets and bolster consumption spending, indicating that the wealth effect serves as both a short-term and a structural long-term dynamic. In contrast, the contribution of the M1 money supply shock illustrates that liquidity conditions significantly impact consumption in the medium term. Conversely, the effect of the interest rate shock remains limited, supporting the conclusion that the direct influence of borrowing costs on consumption in Türkiye is constrained.

The variance decomposition of housing prices provides critical insights that directly address the primary research questions of this study. Fluctuations in housing prices are primarily influenced by their own lagged shocks throughout the simulation period. Although the impact of these shocks diminishes over time, it remains significant by the end of the period. This suggests that external factors -such as market inertia, speculative demand dynamics, and supply constraints- play a crucial role in shaping housing prices in the long term. Furthermore, the influence of policy interest rate shocks on housing prices demonstrates a consistent and rapid increase throughout the simulation. This finding highlights that monetary policy affects housing prices through a cumulative transmission mechanism rather than an immediate one. In essence, the constraining effect of monetary policy on housing prices intensifies over time, ultimately becoming a critical factor in the long run. The pronounced negative response observed in the impulse response functions further supports this conclusion. In contrast, the contribution of other shocks to the variance in housing prices remains minimal.

### *5.3 Counterfactual Simulation: Effects of Changes in Monetary Policy*

Asset prices and housing prices introduce an additional interaction mechanism in the monetary policy transmission process, particularly concerning credit channels. In addition to the direct changes in consumption driven by adjustments in policy interest rates, these changes also affect housing prices, which subsequently influence consumption expenditures, thereby creating another link in the chain. To assess the magnitude of the effect arising from

housing prices, we will employ the counterfactual simulation method proposed by Bernanke et al. (1999), which has also been utilized in studies such as Giuliadori (2005) and Elbourne (2008). We will evaluate the outcomes of the transmission channel where housing prices impact consumption by comparing them to the results of a model that restricts this channel. Specifically, we will re-estimate the model by setting the parameter  $\alpha_{56}$  in equation (5) to zero and then compare these results to our previous findings.

Figure 4 presents two response functions that differ from the previously obtained impulse-response functions in response to a positive monetary policy shock. The black lines represent the earlier response functions, while the dashed lines depict the counterfactual simulation results. The figure illustrates that when the direct impact of monetary policy is constrained, the effect of the shock on consumption and prices significantly diminishes. Consequently, approximately 30 percent of the reduction in consumption resulting from interest rate changes -considering cumulative responses- can be attributed to the housing price channel. Regarding the overall price level, the decline in prices following the interest rate shock is less pronounced when the direct effect is restricted, indicating a roughly 10 percent reduction in effectiveness when cumulative responses are taken into account. In the counterfactual model, the impact of a positive interest rate shock on other model variables is minimal.

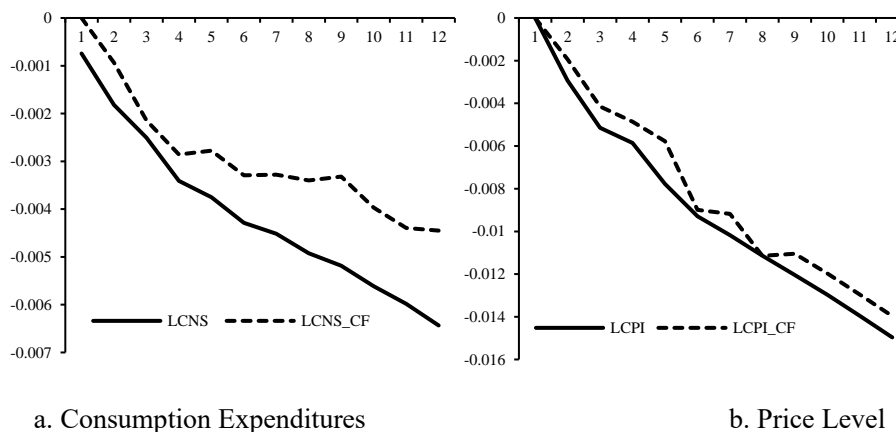


Figure 4. Impulse Response Functions Comparing Counterfactual Simulations

## 6. Conclusion and Policy Recommendations

This study empirically investigates the dynamic relationships between housing prices and key macroeconomic variables in the Turkish economy, employing an SVAR model. The analysis utilizes monthly data from January 2003 to December 2025 and focuses on three main areas: the impact of interest rate changes on housing prices, the interaction between housing prices and consumption, income, and inflation, and the role of housing prices in the monetary policy transmission mechanism. The six-variable SVAR model incorporates the policy interest rate, M1 money supply, industrial production index, consumer price index, consumption expenditures, and housing price index, and was estimated under structural constraints to

ensure theoretical consistency. Overall, the findings from impulse response functions, variance decomposition, and counterfactual simulations reveal that the Turkish housing market exhibits unique dynamics that significantly differ from standard macroeconomic models.

Housing prices respond negatively, cumulatively, and significantly to monetary policy shocks. The interest rate channel influences the housing market through a cumulative mechanism rather than an instantaneous one. Although the numerical impact of this effect is relatively limited, its statistical significance suggests that the transmission channel is operational but has yet to reach its full potential in Türkiye, where mortgage penetration remains relatively low. This interpretation is further supported by variance decomposition findings. Thus, while monetary policy acts as an effective tool for regulating the housing market, it is not the primary driver of housing price fluctuations; rather, the internal dynamics of the market -such as supply constraints, speculative expectations, and urban land limitations- predominantly shape price formation.

The housing price shock leads to a significant, positive, and sustainable increase in both consumption expenditures and the consumer price index throughout the simulation period. Specifically, a cumulative increase of 100 basis points in housing prices results in approximately an 11 basis points increase in consumption by the end of the period, demonstrating the effectiveness of the wealth effect channel in Türkiye. This effect is stronger and more persistent than that resulting from monetary policy shocks, indicating that consumption expenditures are more responsive to changes in household balance sheet asset values than to borrowing costs. This finding empirically supports the established housing wealth-consumption relationship in the literature for Türkiye, a developing economy. Furthermore, the impact of the housing price shock on the consumer price index is one of the study's most notable findings. When analyzed through variance decomposition, this effect accounts for approximately 24-25% at the end of the period, which is comparable to the magnitude of the monetary policy shock. This strong connection reflects a complex transmission mechanism that operates through the rent channel, demand pressure, and inflation expectations.

Counterfactual simulation analysis demonstrates that housing prices serve as a significant and measurable amplifier in the monetary policy transmission mechanism. When the housing price channel is obstructed, the effect of a monetary policy shock on consumption declines by approximately 30 percent, while its effect on prices decreases by about 10 percent. These findings empirically confirm that the housing market is not merely a passive variable influenced by monetary policy decisions; instead, it acts as a structural transmission link that affects both consumption and inflation through the interest rate channel. Conversely, the results also indicate that the CBRT does not exhibit statistically significant sensitivity to fluctuations in housing prices in its monetary policy response. This suggests that the CBRT monitors the housing market indirectly, rather than treating it as a direct policy target, focusing instead on its influence on inflation and overall output.

Finally, the sustained and significant increase in housing prices following their own shock

over the 12-month simulation period underscores the structural price persistence and rigidity in the Turkish housing market. This self-reinforcing market structure results from a combination of supply constraints, speculative demand, and adaptive expectation mechanisms.

The empirical findings of this study have important implications for four key policy areas.

The findings confirm that monetary policy has a significant and cumulative disciplinary effect on housing prices. This suggests that the monetary policy implemented by the CBRT, under the inflation targeting framework, indirectly influences the housing market. However, the relatively limited quantitative impact of this effect, along with the observation that most fluctuations in housing prices arise from internal dynamics, indicates that monetary policy alone is insufficient to ensure housing price stability. Therefore, the CBRT should enhance its monetary policy aimed at price stability by incorporating macroprudential tools specifically designed for the housing market. Potential policy measures include loan-to-value (LTV) limits on housing loans, thresholds for debt-to-income ratios, and restrictions on sectoral credit growth during periods of heightened interest rate sensitivity.

The long-term impact of housing price shocks on inflation—reaching approximately 25 percent by the end of the variance decomposition period—approaches a magnitude comparable to that of monetary policy shocks. This suggests that a price stability strategy relying solely on interest rate tools may be insufficient. Therefore, it is crucial for the countercyclical capital buffer requirements and LTV restrictions established by the Banking Regulation and Supervision Agency (BDDK) to be developed in coordination with monetary policy. Tightening credit restrictions during periods of housing market expansion can serve as an effective complementary measure to prevent the formation of price bubbles. Moreover, Türkiye's low mortgage penetration rate, which significantly limits the effectiveness of the interest rate-housing price channel, necessitates careful policy design aimed at enhancing housing finance. Expanding accessible long-term housing loan opportunities, along with implementing robust standards for long-term mortgages and assessing debt repayment capacity, should be viewed as complementary objectives rather than conflicting ones.

The persistent nature of housing prices and the slow response of supply to price increases highlight the critical need for supply-side policies. Many factors influencing housing prices fall outside the established model, indicating that demand management tools alone will have limited effectiveness. Therefore, policymakers should prioritize three key areas: first, expanding the supply of land in urban areas, particularly in high-demand regions such as Istanbul, Ankara, and Izmir, through updated zoning regulations; second, streamlining construction processes by removing regulatory barriers to accelerate the time required for new housing projects to reach the market; and third, implementing earthquake-resistant urban transformation programs in a coordinated and market-friendly manner to enhance the construction capacity of the private sector. These measures will help make housing supply more responsive to increases in demand, stabilize prices, and improve the effectiveness of monetary policy and macroprudential tools.

Türkiye's macroeconomic journey from 2003 to 2025 -a period characterized by multiple

crises, significant policy shifts, and notable fluctuations in the housing market- provides valuable insights for housing market researchers in emerging economies. This study enhances the empirical evidence available to national policymakers and other emerging economies facing similar macroeconomic challenges while also making a distinctive contribution to the existing literature.

**Author contributions**

Not applicable.

**Funding**

Not applicable.

**Competing interests**

Not applicable.

**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).

**Provenance and peer review**

Not commissioned; externally double-blind peer reviewed.

**Data availability statement**

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.

**Data sharing statement**

No additional data are available.

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## References

- Adams, Z., & Füss, R. (2010). Macroeconomic determinants of international housing markets. *Journal of Housing Economics*, 19(1), 38-50. <https://doi.org/10.1016/j.jhe.2009.10.005>
- Aoki, K., Proudman, J., & Vlieghe, G. (2004). House prices, consumption, and monetary policy: A financial accelerator approach. *Journal of Financial Intermediation*, 13(4), 414-435. <https://doi.org/10.1016/j.jfi.2004.06.003>
- Attanasio, O., Blow, L., Hamilton, R., & Leicester, A. (2009). Booms and busts: Consumption, house prices and expectations. *Economica*, 76(301), 20-50. <https://doi.org/10.1111/j.1468-0335.2008.00708.x>
- Bayir, M. (2020). Konut fiyatlarının parasal aktarım mekanizmasındaki rolü: Türkiye örneği. *Sosyoekonomi*, 28(45), 63-86. <https://doi.org/10.17233/sosyoekonomi.2020.03.05>
- Beltratti, A., & Morana, C. (2010). International house prices and macroeconomic fluctuations. *Journal of Banking & Finance*, 34(3), 533-545. <https://doi.org/10.1016/j.jbankfin.2009.08.020>
- Beraja, M, Fuster, A., Hurst, E., & Vavra, J. (2017). *Regional heterogeneity and monetary policy*. NBER Working Paper 23270. <https://doi.org/10.3386/w23270>
- Bernanke, B. (1986). Alternative explanation of the money-income correlation. *Carnegie-Rochester Conference Series on Public Policy*, 25, 49-99. [https://doi.org/10.1016/0167-2231\(86\)90037-0](https://doi.org/10.1016/0167-2231(86)90037-0)
- Bernanke, B. (2010). *Monetary policy and the housing bubble* [Speech]. Annual Meeting of the American Economic Association on January 3, Atlanta, GA, United States. [Online] Available: <https://www.federalreserve.gov/newsevents/speech/bernanke20100103a.htm>
- Bernanke, B., Gertler, M., & Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. In J. Taylor & M. Woodford (Eds.), *Handbook of macroeconomics*. North-Holland. <https://doi.org/10.1016/s1574-0048>
- Blanchard, O., & Watson, M. (1986). Are business cycles all alike? In R. Gordon (Ed.), *The American business cycle: Continuity and change*. University of Chicago Press. [Online] Available: <https://www.nber.org/books-and-chapters/american-business-cycle-continuity-and-change/are-business-cycles-all-alike>
- Bjørnland, H., & Jacobsen, D. (2010). The role of house prices in the monetary policy transmission mechanism in small open economies. *Journal of Financial Stability*, 6(4), 218-229. <https://doi.org/10.1016/j.jfs.2010.02.001>
- Calza, A., Monacelli, T., & Stracca, L. (2013). Housing finance and monetary policy. *Journal of the European Economic Association*, 11(S1), 101-122. <https://doi.org/10.1111/j.1542-4774.2012.01095.x>
- Carroll, C., Otsuka, M., & Slacalek, J. (2011). How large are housing and financial wealth

- effects? A new approach. *Journal of Money, Credit and Banking*, 43(1), 55-79.  
<https://doi.org/10.1111/j.1538-4616.2010.00365.x>
- Case, K., Quigley, J., & Shiller, R. (2005). Comparing wealth effects: The stock market versus the housing market. *Advances in Macroeconomics*, 5(1), Article 1.  
<https://doi.org/10.2202/1534-6013.1235>
- Castro, V., & Sousa, R. (2012). How do central banks react to wealth composition and asset prices? *Economic Modelling*, 29(3), 641-653. <https://doi.org/10.1016/j.econmod.2012.01.006>
- Cerutti, E., Claessens, S., & Laeven, L. (2017). The use and effectiveness of macroprudential policies: New evidence. *Journal of Financial Stability*, 28(1), 203-224.  
<https://doi.org/10.1016/j.jfs.2015.10.004>
- Chen, S., Lin, T., & Wang, J. (2024). Monetary policy and housing market cycles. *Macroeconomic Dynamics*, 28(8), 1682-1714. <https://doi.org/10.1017/S1365100523000615>
- Chirinko, R., de Haan, L., & Sterken, L. (2008). *Asset price shocks, real expenditures, and financial structure: A multi-country analysis*. CESifo Working Paper No.2342.  
<https://doi.org/10.2139/ssrn.1156753>
- Claessens, S., Kose, M., & Terrones, M. (2012). How do business and financial cycles interact? *Journal of International Economics*, 87(1), 178-190.  
<https://doi.org/10.1016/j.jinteco.2011.11.008>
- Coskun, Y., Seven, U., Ertugrul, H., & Alp, A. (2020). Housing price dynamics and bubble risk: The case of Turkey. *Housing Studies*, 35(1), 50-86.  
<https://doi.org/10.1080/02673037.2017.1363378>
- Del Negro, M., & Otrok, C. (2007). 99 Luftballons: Monetary policy and the house price boom across U.S. states. *Journal of Monetary Economics*, 54(7), 1962-1985.  
<https://doi.org/10.1016/j.jmoneco.2006.11.003>
- Dilber, I., & Sertkaya, Y. (2016). 2008 finansal krizi sonrası Türkiye'de konut fiyatlarının belirleyicilerine yönelik analiz. *Mus Alparslan Üniversitesi Sosyal Bilimler Dergisi*, 4(1), 11-30. <https://doi.org/10.18506/anemon.95997>
- Dokko, J., Doyle, B., Kiley, M., Kim, J., Sherlund, S., Sim, J., & Van den Heuvel, S. (2011). Monetary policy and the global housing bubble. *Economic Policy*, 26(66), 237-287.  
<https://doi.org/10.1111/j.1468-0327.2011.00262.x>
- Égert, B., & Mihaljek, D. (2007). Determinants of house prices in central and eastern Europe. *Comparative Economic Studies*, 49(3), 367-388.  
<https://doi.org/10.1057/palgrave.ces.8100221>
- Elbourne, A. (2008). The UK housing market and monetary policy transmission mechanism: an SVAR approach. *Journal of Housing Economics*, 17(1), 65-87.  
<https://doi.org/10.1016/j.jhe.2007.09.002>
- Erdem, O., Oruc, H., & Varli, Y. (2013). Housing market and macroeconomic fundamentals.

*Istanbul Stock Exchange Review*, 13(51), 58-81.

<https://ideas.repec.org/a/bor/iserev/v13y2013i51p58-81.html>

Eryuzlu, H., & Ekici, S. (2020). Konut fiyat endeksi ve reel doviz kuru ilişkisi: Türkiye örneği. *Iktisadi İdari ve Siyasal Araştırmalar Dergisi*, 5(12), 97-105.

<https://doi.org/10.25204/iktisad.650420>

Fehrle, D. (2019). Housing and the business cycle revisited. *Journal of Economic Dynamics and Control*, 99(1), 103-115. <https://doi.org/10.1016/j.jedc.2018.12.004>

Girouard, N., & Blöndal, S. (2001). *House prices and economic activity*. OECD Economics Department Working Papers No. 279. <https://doi.org/10.1787/061034430132>

Giuliodori, M. (2005). The role of house prices in the monetary transmission mechanism across European countries. *Scottish Journal of Political Economy*, 52(4), 519-543.

<https://doi.org/10.1111/j.1467-9485.2005.00354.x>

Goodhart, C., & Hofmann, B. (2008). House prices, money, credit, and the macroeconomy. *Oxford Review of Economic Policy*, 24(1), 180-205. <https://doi.org/10.1093/oxrep/grn009>

Iacoviello, M. (2005). House prices, borrowing constraints, and monetary policy in the business cycle. *American Economic Review*, 95(3), 739-764.

<https://doi.org/10.1257/0002828054201477>

Iacoviello, M., & Neri, S. (2010). Housing market spillovers: Evidence from an estimated DSGE model. *American Economic Journal: Macroeconomics*, 2(2), 125-164.

<https://doi.org/10.1257/mac.2.2.125>

Iacoviello, M., & Minetti, R. (2008). The credit channel of monetary policy: Evidence from the housing market. *Journal of Macroeconomics*, 30(1), 69-96.

<https://doi.org/10.1016/j.jmacro.2006.12.001>

Jarociński, M., & Smets, F. (2008). House prices and the stance of monetary policy. *Federal Reserve Bank of St. Louis Review*, 90(4), 339-365. <https://doi.org/10.20955/r.90.339-366>

Jordà, Ò., Schularick, M., & Taylor, A. M. (2015). Leveraged bubbles. *Journal of Monetary Economics*, 76(S), S1-S20. <https://doi.org/10.1016/j.jmoneco.2015.08.005>

Kiyotaki, N., & Moore, J. (1997). Credit cycles. *Journal of Political Economy*, 105(2), 211-248. <https://doi.org/10.1086/262072>

Kutlu, S. (2021). The role of house prices in monetary transmission mechanism: Evidence from Turkish economy. *Yonetim ve Ekonomi*, 28(3), 581-594.

<https://doi.org/10.18657/yonveek.878337>

Kuttner, K. (2013). Low interest rates and housing bubbles: Still no smoking gun. In D. Evanoff, C. Holthausense, G. Kaufman, & M. Kremer (Eds.), *The role of central banks in financial stability: How has it changed?* (pp. 159-185). World Scientific.

[https://doi.org/10.1142/9789814449922\\_0008](https://doi.org/10.1142/9789814449922_0008)

- Lastrapes, W. (2002). The real price of housing and money supply shocks: Time series evidence and theoretical simulations. *Journal of Housing Economics*, 11(1), 40-74. <https://doi.org/10.1006/jhec.2002.0309>
- Leamer, E. (2007). *Housing is the business cycle*. NBER Working Paper 13428. <https://doi.org/10.3386/w13428>
- Lebe, F., & Akbas, Y. (2014). Türkiye'nin konut talebinin analizi. *Ataturk Universitesi Iktisadi ve Idari Bilimler Dergisi*, 28(1), 57-83. <https://izlik.org/JA85ER65DY>
- Luciani, M. (2015). Monetary policy and the housing market: A structural factor analysis. *Journal of Applied Econometrics*, 30(2), 199-218. <https://doi.org/10.1002/jae.2318>
- McDonald, J., & Stokes, H. (2013). Monetary policy and the housing bubble. *The Journal of Real Estate Finance and Economics*, 46(3), 437-451. <https://doi.org/10.1007/s11146-011-9329-9>
- Mishkin, F. (2007). Housing and the monetary transmission mechanism. In *Housing, housing finance, and monetary policy* (Federal Reserve Bank of Kansas City Symposium Proceedings, pp. 359-413). Federal Reserve Bank of Kansas City. <https://doi.org/10.3386/w13518>
- Musso, A., Neri, S., & Stracca, L. (2011). Housing, consumption and monetary policy: How different are the U.S. and the euro area? *Journal of Banking & Finance*, 35(11), 3019-3041. <https://doi.org/10.1016/j.jbankfin.2011.04.004>
- Ozturk, N., & Fitoz, E. (2009). Türkiye'de konut piyasasının belirleyicileri: Ampirik bir uygulama. *ZKU Sosyal Bilimler Dergisi*, 5(10), 21-46. <https://izlik.org/JA86YC42ZU>
- Paksoy, S., Yontem, H., & Buyukcelebi, H. (2014). Konut fiyat endeksi ve enflasyon arasındaki ilişki. *Assam Uluslararası Dergi*, 1(2), 54-69. <https://izlik.org/JA92BC55UR>
- Panagiotidis, T., & Printzis, P. (2016). On the macroeconomic determinants of the housing market in Greece: A VECM approach. *International Economics and Economic Policy*, 13(3), 387-409. <https://doi.org/10.1007/s10368-016-0345-3>
- Poterba, J. (1984). Tax subsidies to owner-occupied housing: An asset-market approach. *The Quarterly Journal of Economics*, 99(4), 729-752. <https://doi.org/10.2307/1883123>
- Sa, F., Towbin, P., & Wieladek, T. (2014). Capital inflows, financial structure and housing booms. *Journal of the European Economic Association*, 12(2), 522-546. <https://doi.org/10.1111/jeea.12047>
- Sahin, A. (2025). Structural modelling of asset prices and consumption: the role of the wealth effect. *Anadolu University Journal of Economics and Administrative Sciences*, 26(2), 244-261. <https://doi.org/10.53443/anadoluibfd.1576974>
- Sari, R., Ewing, B., & Aydin, B. (2007). Macroeconomic variables and the housing market in Turkey. *Emerging Markets and Trade*, 43(5), 5-19. <https://doi.org/10.2753/REE1540-496X430501>

Siklar, I., & Akca, A. (2020). Exchange market pressure and monetary policy: The Turkish case. *Ekonomika*, 99(1), 110-130. <https://doi.org/10.15388/Ekon.2020.1.7>

Sims, C. (1986). Are forecasting models usable for policy analysis? *Federal Reserve Bank of Minneapolis Quarterly Review*, 10(1), 2-16. <https://doi.org/10.21034/qv.1011>

Tanrivermis, H., Aliefendioglu, Y., Tanrivermis, Y., & Celik, M. (2022). Türkiye'de konut fiyatlarının makroekonomik belirleyicileri: Esbutunlesme ve nedensellik analizi (1971–2019). *Sosyoekonomi*, 30(54), 215-248. <https://doi.org/10.17233/sosyoekonomi.2022.04.10>

Tsatsaronis, K., & Zhu, H. (2004). What drives housing price dynamics: Cross-country evidence. *BIS Quarterly Review*, March, 65-78. [Online] Available: [https://www.bis.org/publ/qtrpdf/r\\_qt0403f.pdf](https://www.bis.org/publ/qtrpdf/r_qt0403f.pdf)

Tuncsiper, C., & Akgunduz, K. (2022). House market in Turkey and in the context of hedonic pricing model: The example of Istanbul. *Yonetim ve Ekonomi Arastirmalari Dergisi*, 20(4), 428-446. <https://izlik.org/JA58BL96BK>

Ucdogruk, S. (2001). Izmir ilinde emlak fiyatlarına etki eden faktorler-hedonik yaklasim. *Dokuz Eylul Universitesi Iktisadi ve Idari Bilimler Fakultesi Dergisi*, 16(2), 149-161. [Online] Available: <https://dergipark.org.tr/tr/download/article-file/211371>

Yildirim, M., & Ivrendi, M. (2017). House prices and the macroeconomic environment in Turkey: The examination of a dynamic relationship. *Economic Annals*, 62(215), 81-110. <https://doi.org/10.2298/EKA1715081Y>

Yildirim, M., Kirmizi, M., & Zeren, F. (2021). Türkiye'de konut fiyatlarını belirleyen makroekonomik göstergelerin analizi. *Uluslararası Ekonomi, İşletme ve Politika Dergisi*, 5(1), 281-15. <https://doi.org/10.29216/ueip.754483>

## Appendices

### Appendix 1. Unit Root Tests

Variable	Augmented Dickey-Fuller Test			Phillips-Perron Test			Breakpoint Dickey-Fuller Test			Result
	lag**	t	p	bant***	t	p	lag	t	p	
<i>i</i>	1	-2.381	0.148	5	-2.155	0.224	1	-4.027	0.164	I(1)
$\Delta i$	0	-10.04	0.000	5	-9.882	0.000	0	-11.77	0.000	
<i>lcns</i>	7	-0.109	0.946	4	-0.049	0.952	7	-3.956	0.171	I(1)
$\Delta lcns$	6	-4.901	0.000	8	-7.631	0.000	0	-8.974	0.000	
<i>lcpi</i>	1*	1.558	0.999	11*	1.969	0.999	2*	-1.097	0.999	I(1)
$\Delta lcpi$	2	-4.553	0.000	4	-6.338	0.000	1	-10.18	0.000	
<i>lhpi</i>	2*	-0.282	0.991	13*	-0.355	0.998	5*	-4.540	0.219	I(1)
$\Delta lhpi$	1	-4.185	0.001	10	-5.277	0.000	0	-7.052	0.000	
<i>lipi</i>	0	-1.224	0.665	6	-0.791	0.820	1	-3.068	0.646	I(1)
$\Delta lipi$	0	-22.87	0.000	7	-25.42	0.000	0	-28.24	0.000	
<i>lm1</i>	0*	-0.094	0.994	8*	-0.267	0.991	0*	-3.415	0.741	I(1)
$\Delta lm1$	0	-17.31	0.000	9	-17.35	0.000	0	-21.19	0.000	

Notes: \* Indicates the presence of a trend. \*\* Appropriate lag length was determined according to the Schwarz Information criterion. \*\*\* Appropriate bandwidth was determined according to the Newey-West criterion.

Appendix 2. Cointegration Tests

Number of Cointegrating Vector(s)	Eigenvalue	Trace Test	Marginal Significance	Maximum Eigenvalue Test	Marginal Significance
0	0.142	115.891	0.012	41.394	0.082
1	0.101	74.497	0.110	28.623	0.340
2	0.068	45.874	0.256	18.882	0.640
3	0.059	26.992	0.276	16.431	0.379
4	0.038	10.561	0.428	10.530	0.351
5	0.0001	0.031	0.859	0.031	0.859

Note: Both the Trace and Maximum Eigenvalue tests indicate no cointegration at the 0.01 level.

Appendix 3. Optimal Lag Length Selection

Lag	Log. Likelihood	Likelihood Ratio	Final Prediction Error	Akaike Information Criterion	Schwarz Information Criterion	Hannan-Quinn Information Criterion
0	-193.255	--	1.78E-07	1.48697	1.56737	1.519267
1	2956.731	6135.42	1.44E-17	-21.7517	-21.1889	-21.5257
2	3204.353	471.221	2.97E-18	-23.3309	-21.2342	-21.6736
3	3266.241	114.999	2.45E-18	-23.5241	-21.9967	-21.9985
4	3304.964	70.2221	2.45E-18	-23.5445	-22.0015	-22.7372
5	3341.046	63.8168*	2.41E-18*	-23.5451*	-22.2859*	-22.9112*
6	3354.024	22.3724	2.88E-18	-23.3733	-21.3343	-22.1786
7	3383.561	49.5954	3.04E-18	-23.3251	-19.8681	-21.9366
8	3408.580	40.8899	3.32E-18	-23.2431	-19.3038	-21.6609

Note: \* indicates lag order selected by the criterion.

Appendix 4. Reduced Form VAR Diagnostics

Inverse Roots of AR Characteristic Polynomial

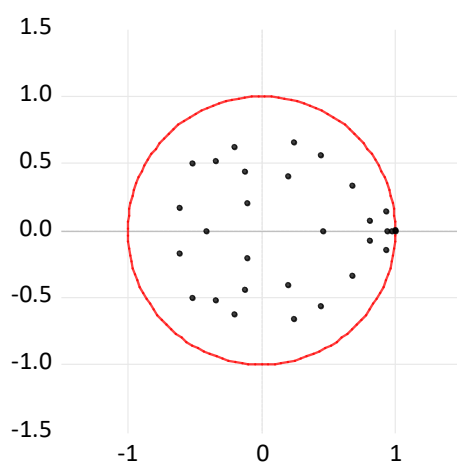


Figure Appendix 4.1. VAR Model Stability Test

Table App 4.1. VAR Residuals Serial Correlation LM Test

Lag	Likelihood Ratio Statistic	Degrees of Freedom	Probability	F Statistic	Degrees of Freedom	Probability
1	21.653	36	0.972	0.598	36, 1008.4	0.972
2	36.483	36	0.446	1.015	36, 1008.4	0.446
3	38.057	36	0.423	0.932	36, 1008.4	0.424
4	29.571	36	0.767	0.820	36, 1008.4	0.767
5	33.522	36	0.587	0.931	36, 1008.4	0.587
6	34.516	36	0.539	0.959	36, 1008.4	0.539

Table Appendix 4.2. VAR Residuals Normality Test

Component	Jarque-Bera Statistic	Degrees of Freedom	Probability
1	3.941	2	0.139
2	2.039	2	0.361
3	3.438	2	0.179
4	3.360	2	0.186
5	2.671	2	0.263
6	2.850	2	0.241
Joint	18.299	12	0.107

Table Appendix 4.3: VAR Residuals Heteroscedasticity Test

$\chi^2$ Statistic	Degrees of Freedom	Probability
780.233	756	0.263