The Role of House Prices in Monetary Transmission Mechanism: Evidence from Turkish Economy

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ABSTRACT

It is possible for central banks to carry out their policies effectively by making the correct assessment of the reflection of their monetary policy decisions on real economic activities. For this reason, it is important to examine the effects of applied policies on real economic activities and inflation. Accordingly, the 2008 global financial crisis revealed the importance of the relationship between monetary policy, house prices, and real economic activity, in other words, the channel of transmission of house prices. As a matter of fact, developments in the housing industry have a significant impact on the process leading up to the 2008 Global financial crisis. In this context, after the 2008 Global financial crisis, both the role of house prices in monetary policy implementation and the function of house prices in the transmission mechanism has begun to be questioned. In this study, the effectiveness of the house prices transmission channel, a subgroup of the asset prices channel based on the experience of the 2008 Global financial crisis, was empirically analyzed based on the Turkish economy. The VAR model has been preferred as a method of empirical analysis. The analysis covers the period 2010-2019, and the monthly data set is used in the analysis. The results of the analysis show that monetary policy affects house prices, but house prices do not have a statistically significant effect on housing investment, industrial production index, and inflation. Related results show that the housing prices transmission channel is not active in the Turkish economy.

***Key Words**: Monetary Transmission Mechanism, House Prices, VAR Model*

***JEL Classification:** E52*

Parasal Aktarım Mekanizmasında Konut Fiyatlarının Rolü: Türkiye Ekonomisi Kanıtlar

ÖZ

Merkez bankalarının politikalarını etkin bir şekilde yürütebilmeleri para politikasına ilişkin kararlarının reel ekonomik faaliyetlere yansımaları konusunda doğru değerlendirme yapmaları ile mümkün olmaktadır. Bu nedenle de uygulanan politikaların reel ekonomik faaliyetlere ve enflasyona etkilerinin incelenmesi önem arz etmektedir. Bu doğrultuda 2008 küresel finansal krizi tecrübesi para politikası, konut fiyatları ve reel ekonomik faaliyetler arasındaki ilişkinin diğer bir ifadeyle konut fiyatları aktarım kanalının önemini ortaya çıkarmıştır. Nitekim 2008 Küresel Finansal krizine giden süreçte konut sektöründe yaşanan gelişmelerin önemli bir etkisi bulunmaktadır. Bu çerçevede 2008 Küresel Finansal Krizinden sonra hem konut fiyatlarının para politikası uygulamalarındaki rolü hem de aktarım mekanizmasında konut fiyatlarının işlevi sorgulanmaya başlamıştır. Bu çalışmada, 2008 küresel finansal krizi tecrübesinden hareketle varlık fiyatları kanalının bir alt grubu olan konut fiyatları aktarım kanalının etkinliği Türkiye ekonomisi temelinde ampirik olarak analiz edilmiştir. Ampirik analiz yöntemi olarak VAR modeli tercih edilmiştir. Analiz 2010-2019 dönemini kapsamakta ve analizde aylık veri seti kullanılmaktadır. Analiz sonuçları; para politikasının konut fiyatlarını etkilediği ancak konut fiyatlarının konut yatırımı, sanayi üretim endeksi ve enflasyon üzerinde

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istatistiki olarak anlamlı bir etkisinin olmadığını ortaya koymaktadır. İlgili sonuçlar, Türkiye ekonomisinde konut fiyatları aktarım kanalının etkin olmadığını göstermektedir.

Anahtar Kelimeler: *Para Politikası Aktarım Mekanizması, Konut Fiyatları, VAR Yöntemi*
JEL Sınıflandırması: *E52*

INTRODUCTION

The high cost to economies of crises caused by asset price bubbles after the 1980s has increased central banks' interest in asset prices. Especially with the experience of the 2008 Global financial crisis, the role of asset prices in monetary policy practices and the effectiveness of house prices in the transmission mechanism were up for questioning. As a matter of fact, in the process leading up to the 2008 Global financial crisis, the Fed's low interest rate policy to mitigate the effects of the 2001 recession and Japan's low interest rate policy to exit the deflationary process since the 1990s have significant implications. A close relationship between expansionary monetary policy and the house price bubble, which played a central role in the formation of the crisis, has been demonstrated by the findings of theoretical and empirical studies (Taylor, 2007; Shiller, 2008; Bernanke, 2009; Holt, 2009). However, the fact that developments in the housing industry have led to a significant contraction in economic activity has raised the importance of house prices in the transmission mechanism.

Especially in the economies where inflation targeting strategy is applied, central banks aims to change market interest rates and credit rates by changing nominal interest rates; and to shape the real economic activities and rate of inflation by affecting monetary policy expectations and *asset prices*. Therefore, decisions made by central banks on policy interest rates or a policy change, change consumption and investment expenditures through these channels, and thus the level of total demand and total revenue. Changes in the level of total demand and total product affect the inflation rate. In other words, monetary policy decisions are transferred to real economic activities through the interest rate channel, credit channel, expectations channel, and asset prices channels. (Macit and Durgun, 2019: 77-78). Asset prices, one of the channels of monetary transmission, are the main source of collateral in the banking sector. This makes asset prices an important source of macroeconomic fluctuations. Secondly, asset prices are forward-looking variables. Therefore, asset prices can help central banks as indicator variables in policy making by reflecting private sector expectations. Finally, asset prices can include not only their core value but also a bubble formed when they exceed their core value. This causes asset prices to affect economic variables more than they should (Bjørnland and Jacobsen, 2013: 1084 - 1085).

In the house prices channel, which is a subgroup of the asset prices channel, monetary policy decisions first affect house prices. Furthermore, the changes in house prices affect real economic activities such as consumption, investment, and inflation. Therefore, addressing house prices in the transmission mechanism requires addressing both the impact of monetary policy on house prices and the impact of house price changes on real economic activity and inflation. There are six channels through which monetary policy decisions affect the housing market

and real economic activity with regards to house prices. These channels are the capital use cost channel, the house price expectations channel, the housing supply channel, the wealth effect channel, the credit channel that is effective on consumer spending and housing demand. The cost of capital use channel, the house price expectations channel, and the housing supply channel refer to channels where changes in monetary policy directly affect house prices. Other channels are the channels where changes in monetary policy affect house prices through housing demand and housing supply (Mishkin, 2007: 5).

In the cost of capital use channel, monetary policy affects interest rates, which have a significant impact on the cost of capital use, thus leading to changes in housing investments. Because falling capital costs increase housing investments by raising Tobin Q value (Nocera and Roma, 2017: 9). In the channel of house price expectations, monetary policy affects housing demand by changing house price expectations, which affect the cost of using capital. In this context, a decrease in house price expectations leads to an increase in the cost of capital use and thus a decrease in housing demand (Mishkin, 2007: 6-8). In the housing supply channel, the relationship between monetary policy and the cost of financing housing construction is discussed. The fact that interest rates affect the cost of financing housing construction can significantly affect the level of housing supply. Therefore, increasing interest rates increase the cost of producing new housing, leading to a decrease in housing construction activities (Bourne, 1981).

In the wealth effect channel, the impact of house price change on consumption is discussed. The theoretical substructure of the wealth effect channel is based on the Life Cycle Hypothesis, first put forward by Modigliani and Brumberg (1954) and later developed by Ando and Modigliani (1963). According to the Life Cycle Hypothesis, consumption is not a function of current income, but of income to be obtained over a lifetime. In this direction, household consumption expenditures are associated with lifetime income consisting of stocks, real estate, and other assets. The fact that household consumption expenditures depend not only on current income but also on Lifetime Income ensures that wealth is included in the short-term consumption function. This causes the monetary policy to affect consumption expenditures and the total level of demand over the value of assets. (Modigliani, 1986: 310). Accordingly, an expansionary monetary policy encourages housing demand, leading to increased house prices. House price growth increases household wealth depending on the importance of housing in the household portfolio. This increase in household wealth increases total consumption expenditures by increasing demand for housing and other assets (Mishkin, 1996: 8). The credit channel, which affects consumer spending and housing demand, can be explained by improving the amount of credit available to households and loan conditions as house price growth reduces problems caused by asymmetric information. Fund providers may be reluctant to lend because they do not know whether fund claimants have the resources to repay the loan or whether the borrower will engage in risky behavior that will reduce the likelihood of the loan being repaid. In such a case, the collateral reduces the problems caused by

asymmetric information. Because collateral significantly reduces the lender's losses if the borrower defaults on the loan and prevents the borrower from engaging in excessively risky behavior. Rising house prices can lead to a reduction in the bank's loan losses, leading to improved credit conditions. The improvement in credit conditions increases household consumption spending and raises the housing demand (Boivin et al. 2010; Mishkin, 2014).

This study aims to address the effectiveness of the house prices transmission channel in the Turkish economy. Housing occupies an important place in the household asset portfolio due to reasons such as the traditional structure of investors and social status in Turkey. It can also be stated that housing is an important consumer product. However, developments in the housing and real estate sector in the US economy during the 2008 Global financial crisis showed the importance of the relationship between monetary policy, house prices, and real economic activity. These issues are the main motivator of the monetary transmission mechanism to address the asset prices channel over house prices.

In this context, the second part of this study deals with the relevant literature. The third part details the methodology and data set. The fourth part focuses on the results of econometric analysis, and, finally, the fifth part presents the results of the study.

I. LITERATURE REVIEW

In the literature, there are studies aimed at determining the effectiveness of monetary transmission mechanisms. But the literature on addressing house prices within the asset prices channel attracted the attention of researchers, especially with the 2008 Global financial crisis. For this reason, the relevant literature has started to form extensively since 2008. In Turkey, the lack of a long-term series of price indices related to the house price index has led to more limited studies of the Turkish economy. A large part of the research on the role of house prices in the monetary transmission is aimed at developed countries' economies. It is noting that studies done for developing countries are quite limited.

When the studies on the economies of developed countries are taken into account, Lacoviello and Minetti (2003), expressed, in their studies that use the VAR method, that in a monetary contraction, Finland, Switzerland, and the United Kingdom significantly reduce housing prices in their economies and the housing market played a key role in the transmission of monetary policy. Giuliodori (2004) analyzed the role of house prices in the monetary transmission mechanism in nine European countries using the VAR method. The results of the analysis show that house prices in most of the countries covered were significantly affected by monetary shocks. It has been concluded that changes in house prices have significant effects on consumption expenditures and that the transmission mechanism is more effective in countries with developed housing and housing market. In his study of the UK economy Elbourne (2008), found that a shrinking monetary policy led to a decline in house prices. The study, which used the SVAR method, concluded that the decrease in house prices reduced consumption expenditures and that about 12-15% of the decrease in consumption was caused by

a decrease in house prices. Bjørnland and Jacobsen (2010) discussed the role of the monetary transmission mechanism in Norway, Sweden and the United Kingdom by the SVAR method. The results of the analysis show that the response of house prices to monetary policy shocks in the countries covered is rapid and severe. However, monetary policy has been found to respond systematically to house prices. It has been concluded that the effectiveness of the house price transmission mechanism was largely influenced by institutional differences. In his study for the United States and the Eurozone, Musso et al. (2011), concluded that monetary policy shocks affect house prices more strongly in the United States than in the Eurozone. Accordingly, it was found that the housing market transmission channel in the United States is more effective compared to the eurozone. Calza et al. (2009) analyzed the role of house prices in the monetary transmission mechanism in 19 developed countries. The results of the analysis found that monetary policy has significant effects on house prices and housing investment in countries that conduct more adjustable interest rate policies. In addition, it has been found that the transmission from house prices to consumption is stronger in economies where home loan interest rates are more flexible in terms of the countries covered. Nocera and Roma (2017) report that monetary policy with the Bayesian SSVS-VAR method in seven European economies has a strong and lasting impact on house prices. In addition, their studies have shown that house prices play an important role in the monetary transmission mechanism. Wilhelmsson (2020) analyzed the effectiveness of the house prices transmission channel in the Swedish economy using the SVAR method. According to the results of the study, monetary policy has both direct and indirect effects through bank loans. However, monetary policy shock has been found to permanently affect GDP through the housing market. In other words, it is concluded that the transmission channel of house prices in the Swedish economy is quite effective. Looking at studies on the Chinese economy, Koivu (2010) found in his study that an expansionary monetary policy led to increases in both housing and stock prices. It also concluded that rising housing and share prices had boosted household consumption, but that the impact was rather weak. In another study for the Chinese economy, Yang et al. (2017) examined the effectiveness of the house prices transmission channel nationally and regionally. According to the results of the study using the Panel VAR method, monetary policy has a significant impact on consumption expenditures. However, there were regional differences in size and house prices. In China's central southern and western provinces, monetary policy has a significant impact on consumption, but the contribution of house prices to the transmission is quite low. In contrast, in Tier-1 and eastern provinces, the contribution of house prices to the transmission was significant, while household consumption was shown to be less sensitive to monetary policy. Wu and Bian (2018) analyzed the role of house prices in the monetary policy transmission mechanism for different regions of China by the SVAR method. The results of the analysis reveal that a shrinking monetary policy in first-tier cities has led to a significant reduction in private consumption spending through house prices. However, in second-and third-tier cities, the response of

house prices to interest rate shocks was relatively weak. Because of these differences, it has been stated that policymakers should make customized policies for different cities.

Looking at studies of Yıldırım and Erdoğan (2014) on the Turkish economy using the VAR method, it has been concluded that house prices do not respond to monetary policy shocks, in other words, the house price transmission channel is not effective. Mercan and Canbay (2017), in their study using the VAR method, conclude that house prices affect GDP. Erdoğan et al. (2018), concluded that house prices were active in the BRICT countries in their work using the Panel VAR method. Mercan (2019), who took 34 developed and 10 developing countries, including Turkey, into account in his study which used the Panel VAR method, concluded that housing prices transport channel is effective in both developed and developing countries. However, it has been found that the impact of house prices on GDP in developed countries is stronger.

II.METHODOLOGY AND DATA SET

A. Methodology

In the VAR method put forward by Sims (1980), all variables are considered endogeneous, and it is assumed that each variable in the model is affected by the past values of both its own and other variables (Gujarati and Porter, 2009: 784-785). Therefore, the VAR method is defined as a model of simultaneous equations that does not contain any problems of determination, and the dynamic relations of internally accepted variables with each other are revealed. The VAR method's usage the Cholesky method, which is sensitive to the variable ordering of the covariant matrix; in other words, not imposing any restrictions on the structural model, provides some advantages in testing economic relations (Tarı and Bozkurt, 2006: 4). However, the choice of restrictions in modeling economic relations is often one of the issues that researchers have difficulty with. One reason why the VAR method is often used in economic research is the ease it brings about restrictions.

The standard form of the VAR model with two variables and a period lag can be expressed as:

$$y_t = a_1 + \sum_{i=1}^{p} b_{1i} y_{t-i} + \sum_{i=1}^{p} b_{2i} x_{t-i} + v_{1t} \quad (1)$$

$$x_t = c_1 + \sum_{i=1}^{p} d_{1i} y_{t-i} + \sum_{i=1}^{p} d_{2i} x_{t-i} + v_{2t} \quad (2)$$

In equations (1) and (2), (p) shows the length of the lag. As can be seen from the equations, the dependent variable is related to both its own and of the other variable's lags. v represents the terms of random error contained in the equation. Error terms are unrelated to their own lagged values and the values of variables contained in the model. Although the fact that error terms are unrelated to their lagged values does not impose any restrictions on the model, the problem of autocorrelation can be eliminated by increasing the lag length of variables (Özgen and Güloğlu, 2004: 96)

The results obtained in the VAR method are not directly interpreted. Rather than interpreting the resulting coefficients, the results of impulse response function and variance decomposition are used to interpret the relationships between

variables. In this context, the effects of a standard deviation shock occurring in error terms of endogenous variables with impulse response functions on other variables are measured (Sevüktekin and Çınar, 2017: 510-515). Another method used in interpreting relationships between variables is analysis of variance decomposition. In analysis of variance decomposition, it can be seen as a percentage of how much of the changes that occur in a variable are caused by itself and other variables. (Brooks, 2008: 290-292).

In the VAR method, decomposition of the covariance matrix using the Cholesky method, which is sensitive to variable ordering, results in a change of the results depending on the order. The first variable in the model affects all other variables simultaneously, but is not affected by other variables. Similarly, the second variable in the model is simultaneously affected by the first variable, while it is not affected by the variables that come after it. Therefore, the order of variables is of great importance when using the VAR method. In this study, the ranking of variables was determined in accordance with economic theory.

B. Data Set

In the study, the VAR method was used to determine the role of house prices in the monetary transmission mechanism in the Turkish economy. In the study, BIST interbank overnight repo interest was used to represent the monetary policy interest rate. The series of House Price Index (2017=100), representing house prices, used a series of building license permits as an indicator of the housing investment variable. Industrial Production Index (2015=100) was used to represent the product series. Consumer Price Index (2003=100) variable is included in the model representing inflation. The period of the study was determined as 2011:01-2019:11, so that maximum observation can be obtained for all variables.

Variables used in the study, symbols used to represent variables, and data source of the variables are seen in Table 1. House price index, housing investment, industrial production index and consumer price index variables are included in the model in logarithmic form. In addition, the industrial production index variable was adjusted seasonally with Tramo/Seats.

Table 1. Variables, Symbols of Variables, and Data Sources

Variable	Symbol	Data Source
BIST interbank overnight repo interest	MPIR	CBRT
House Price Index	HPI	CBRT
Housing Investment	HI	TurkStat
Industrial Production Index	IPI	TurkStat
Consumer Price Index	CPI	CBRT

III. ANALYSIS RESULTS

In econometric models where time series are used, the problem of spurious regression can be encountered if variables contain unit roots. Therefore, first, the stationarity states were tested with the Augmented Dickey-Fuller (ADF) test, in other words, whether the variables contain a unit root. ADF unit root test results are in Table 2. As a result of the unit root test, it is observed that MPIR, HPI, HI, IPI and CPI variables are stationary in their first differences (prob<0.05).

Table 2. ADF Unit Root Test Results

Variables		ADF Test statistics (Level)		ADF Test statistics (First difference)	
		Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
MPIR		-1.930688 [0.3172]	-2.375888 [0.3899]	-5.800869 [0.0000]	-5.782540 [0.0000]
HPI		-0.845683 [0.8015]	-1.180241 [0.9089]	-3.341559 [0.0155]	-5.387957 [0.0001]
HI		-2.287972 [0.1778]	-2.690642 [0.2427]	-12.01426 [0.0000]	-12,06423 [0.0000]
IPI		-1.315901 [0.6200]	-2.861939 [0.1792]	-14.46799 [0.0000]	-14,43520 [0.0000]
CPI		2.377725 [1.0000]	-0.489604 [0.9826]	-5.923057 [0.0000]	-6.567174 [0.0000]
Critical Values	%1	-3.495677	-4.050509	-3.495677	-4.050509
	%5	-2.890037	-3.454471	-2.890037	-3.454471
	%10	-2.582041	-3.152909	-2.582041	-3.152909

Notes: *The values in [ ] show probability values. The critical values are derived from MacKinnon (1996).*

A lag length test was performed to determine the appropriate lag length for the installed model. Lag length was found to be 2, in line with Likelihood Ratio Test (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQ).

Table 3. Lag Length Test Results

Lag	LogL	LR	FPE	AIC	RS	HQ
0	641,6360	NA	1.57 e-12	-12,99257	-12,86069	-12,93923
1	751,8798	206,9882	2.75 e-13	-14,73224	-13.94092*	-14,41217
2	***797,7755***	***81.48843****	***1.80 e-13****	***-15.15868****	***-13,70794***	***-14.57189****
3	816,3866	31.14495	2.08 e-13	-15,02830	-12,91812	-14,17477
4	830,9177	22.83465	2.62 e-13	-14,81465	-12,04504	-13,69440
5	846,7314	23.23641	3.26 e-13	-14,62717	-11,19813	-13,24020
6	870,1195	31.97965	3.53 e-13	-14,59427	-10,50581	-12,94057
7	888,5094	23.26889	4.33 e-13	-14,45938	-9.711476	-12,53895
8	907,7225	22.34999	5.35 e-13	-14,34128	-8.933946	-12,15412

In order to determine whether the model contains a structural problem, LM (Lagrange Multiplier) autocorrelation test was first performed. Table 4 contains LM test results. Since the probability value is > 0.05, it can be stated that the model does not have an autocorrelation problem up to 8 lag lengths.

Table 4. Autocorrelation Test Results

LM Autocorrelation Test		
Lag	**LM statistics**	**Probability value**
1	27.05281	0.3539
2	33.14308	0.1280
3	30.88269	0.1935
4	23.98510	0.5209
5	31.58515	0.1709
6	12.87976	0.9780
7	18.93089	0.8008
8	36.27141	0.0679

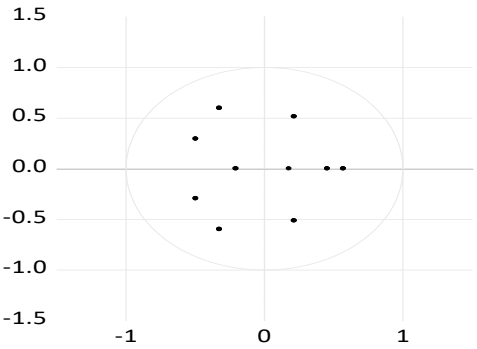
In order to determine whether there is a problem with heteroscedasticity in the model, the White Heteroscedasticity Test was performed. Table 5 contains the results of the White Heteroscedasticity Test. The test results show that the model (since 0.0560> 0.05) does not contain any heteroscedasticity problems.

Table 5. White Heteroscedasticity Test

Chi-Square	Degree of freedom	Probability value
339,9194	300	0.0560

Figure 1 shows the inverse roots of the AR characteristic polynomial for the predicted model. As can be seen from the graph, the inverse roots of the AR characteristic polynomial are contained within the unit circle. It can be stated that the model established in this direction does not contain any problems in terms of stationarity and stability conditions are provided.

Figure 1. Inverse Roots of the AR Characteristic Polynomial



After evaluating whether the established VAR model meets econometric criteria, we evaluated the relations between the variables and the results of the decomposition of the impulse response and variance. Figure 2 includes effect response functions that show the reactions of other variables to monetary policy. Accordingly, the response of the housing investment and industrial production index to a standard deviation shock that occurs in policy interest is statistically meaningless. However, the reaction of the house price index and the consumer price index is statistically significant. Accordingly, a standard deviation in policy interest reacts negatively to the shock of house prices and positively to the consumer price index.

Figure 2. Variables' Response to the Monetary Policy Shock

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

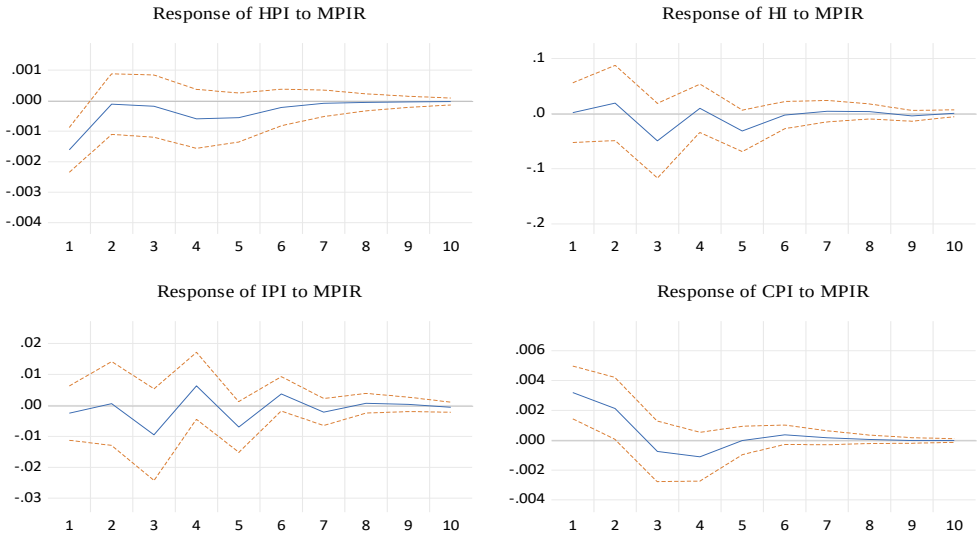
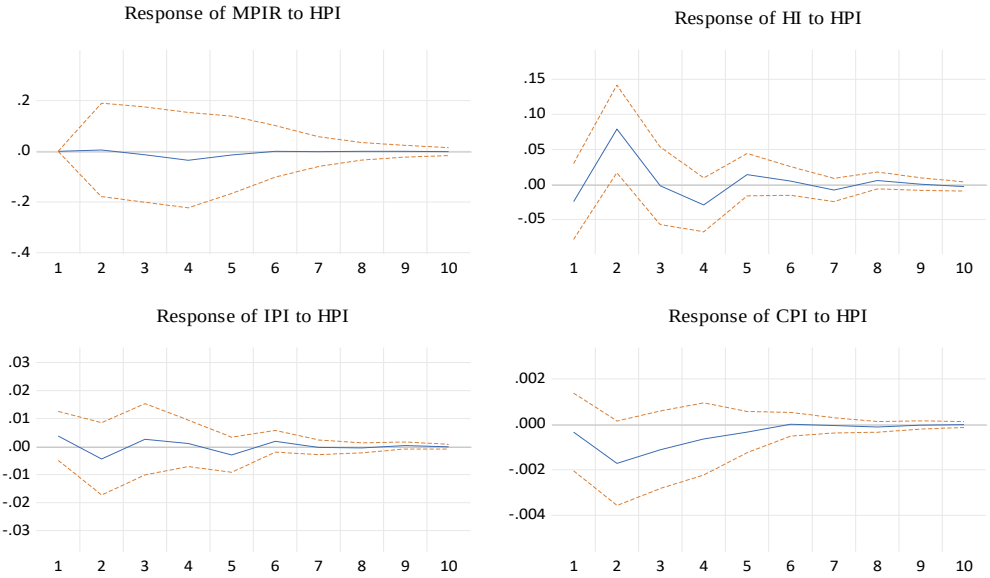


Figure 3 shows the variable response to house price shocks. Accordingly, the response of monetary policy, housing investment, industrial production index and consumer price index to a positive standard deviation shock occurring in house prices is statistically meaningless.

Figure 3. Variables' Response to the House Price Shock



In VAR models, the variance decomposition method is used to determine how much of the change in a variable is caused by its own shocks and how much of it is caused by other variables included in the model (Brooks, 2008: 290-292). Table 5 contains the results of analysis of variance parsing for variables used in the model. Table 5(a) shows the results of monetary policy variance decomposition. Accordingly, the entire change in monetary policy interest in the first period is explained by the variable itself. In the following periods, it is seen that most of the change in monetary policy is again caused by itself.

Table 5(a). Monetary Policy Variance Decomposition Results

Period	S.E.	MPIR	HPI	HI	IPI	CPI
1	0.936593	100,0000	0.000000	0.000000	0.000000	0.000000
2	1.067865	96.80137	0.002482	0.116935	0.018820	3.060392
3	1.097206	95.73590	0.017143	0.455091	0.022212	3.769652
4	1.099404	95.64580	0.119948	0.454588	0.024874	3.754793
5	1.100258	95.50603	0.136744	0.455569	0.025125	3.876533
6	1.100298	95.50001	0.136735	0.460213	0.026411	3.876630
7	1.100470	95.48701	0.136838	0.460882	0.028562	3.886704
8	1.100509	95.48664	0.136833	0.460947	0.028578	3.887005
9	1.100518	95.48534	0.136831	0.462192	0.028686	3.886952
10	1.100520	95.48500	0.137011	0.462289	0.028765	3.886937

Table 5(b) contains the results of the house price index variance decomposition. Accordingly, 82% of the change in the house price index in the first period is due to itself and 17% is due to the change in monetary policy. In the

following periods, it can be stated that the power of monetary policy to explain the change in house prices has decreased, and the power of housing investment to explain the change in house prices has begun to increase.

Table 5(b). House Price Index Variance Decomposition Results

Period	S.E.	MPIR	HPI	HI	IPI	CPI
1	0.003906	17.07652	82.92348	0.000000	0.000000	0.000000
2	0.004787	11.42529	85.26933	0.041095	0.003792	3.260491
3	0.004995	10.63065	85.36554	0.922183	0.003713	3.077914
4	0.005139	11.39842	83.10659	0.871780	0.098499	4.524713
5	0.005197	12.29041	82.05179	0.852795	0.114223	4.690781
6	0.005212	12.40619	81.80341	0.943099	0.117181	4.730121
7	0.005217	12.41110	81.78589	0.942116	0.122346	4.738544
8	0.005218	12.41678	81.78039	0.943325	0.122285	4.737222
9	0.005219	12.42042	81.76999	0.949971	0.122425	4.737191
10	0.005219	12.42211	81.76185	0.949832	0.123104	4.743108

Table 5(c) shows the results of the analysis of the variance decomposition of housing investment. As can be seen from the table, it can be stated that a significant part of the change in housing investment in the first period was caused by itself. Similarly, a significant part of the change in housing investment in subsequent periods is due to itself. However, it is possible to say that house prices and the consumer price index have increased in explanatory power.

Table 5(c). Housing Investment Variance Decomposition Results

Period	S.E.	MPIR	HPI	HI	IPI	CPI
1	0.276665	0.003125	0.779100	99.21778	0.000000	0.000000
2	0.328521	0.340169	6.359209	92.22617	0.818677	0.255777
3	0.353866	2.243829	5.484313	79.48809	2.191213	10.59255
4	0.366903	2.154908	5.741583	75.82792	3.762772	12.51282
5	0.372091	2.820405	5.723941	73.90059	4.653305	12.90176
6	0.373389	2.806522	5.700914	73.70459	4.683556	13.10442
7	0.374716	2.799948	5.706426	73.72796	4.715404	13.05026
8	0.375241	2.801833	5.713685	73.57967	4.782534	13.12228
9	0.375439	2.811563	5.707762	73.54026	4.790385	13.15003
10	0.375573	2.809647	5.710416	73.55201	4.787261	13.14067

Table 5(d) contains the results of analyzing the variance decomposition of the industrial production index. Accordingly, although most of the change in the Industrial Production Index is due to itself, it can be said that there is an increase in housing investment and the explanatory power of monetary policy in the following periods.

Table 5(d). Industrial Production Index Variance Decomposition Results

Period	S.E.	MPIR	HPI	HI	IPI	CPI
1	0.044890	0.313977	0.722427	3.033494	95.93010	0.000000
2	0.066541	0.150270	0.762990	2.591818	96.39379	0.101131
3	0.075917	1.678715	0.704125	4.868603	91.99257	0.755986
4	0.079237	2.174777	0.665851	8.136755	87.60926	1.413356
5	0.080700	2.845951	0.775249	9.858873	84.54195	1.977976
6	0.081203	3.018746	0.819840	10.00748	83.59116	2.562778
7	0.081356	3.078079	0.817711	9.984310	83.38405	2.735845
8	0.081411	3.081227	0.819837	10.06420	83.30209	2.732644
9	0.081437	3.080738	0.821523	10.09176	83.25371	2.752267
10	0.081446	3.085890	0.821397	10.09008	83.23589	2.766741

Table 5(e) contains the variance decomposition results of the consumer price index variable. Accordingly, 84% of the change in consumer price index in

the first period is due to itself, and 11% is due to a change in monetary policy. In subsequent periods, the power of monetary policy and house prices to explain the change in consumer price index increases.

Table 5(e). CPI Variance Decomposition Results

Period	S.E.	MPIR	HPI	HI	IPI	CPI
1	0.009295	11.79705	0.131901	0.896812	2.398670	84.77557
2	0.009961	14.80714	3.074975	1.279517	2.290136	78.54823
3	0.010221	14.60234	4.105154	1.559191	2.459220	77.27409
4	0.010322	15.46848	4.412820	1.638075	2.411066	76.06956
5	0.010338	15.42200	4.508320	1.803918	2.421211	75.84455
6	0.010346	15.52092	4.501252	1.810958	2.417933	75.74894
7	0.010353	15.52468	4.497210	1.826760	2.415535	75.73582
8	0.010354	15.52376	4.508585	1.833938	2.415772	75.71795
9	0.010355	15.52183	4.508775	1.834410	2.416517	75.71846
10	0.010355	15.52200	4.508753	1.835672	2.416463	75.71711

CONCLUSION

Decisions of central banks on monetary policy affect the level of total demand and production through the monetary transmission mechanism. The monetary transmission mechanism, which shows the reflections of applied monetary policies on real economic activities, is generally discussed through four channels. Central banks' decisions on monetary policy are transferred to the real economy through interest rates, loans, expectations and asset prices. In this study, the effectiveness of the house prices channel, a subgroup of the asset prices channel, was investigated in the Turkish economy. The study covered the period 2011:1-2019:11 and used monthly data in the analysis. The VAR method was used in the study. In order to determine the effectiveness of house prices in monetary transmission, monetary policy, house prices, housing investment, industrial production index and inflation variables were used in the study. Variables used in the analysis were evaluated in the context of economic theory and included in the model. According to the study's conclusion, monetary policy shocks negatively affect house prices. This conclusion shows that monetary policy is strong and effective in influencing house prices. However, no statistically significant effect of house prices on real economic activities such as housing investment and industrial production index and inflation has been determined. Accordingly, it is possible to say that the house prices transmission channel is not effective in the Turkish economy.

According to the empirical findings obtained from the study, housing prices are affected by monetary policy. This result reveals that the CBRT should consider housing prices in the policy making process. In addition, the findings show that housing prices do not have any effect on housing investment, industrial production index and inflation in the Turkish economy. This result can be expressed as the recommendations of the study to use different variables to represent real economic activities and to work with a more comprehensive data set.

Araştırma ve Yayın Etiği Beyanı

Makalenin tüm süreçlerinde Yönetim ve Ekonomi Dergisi'nin araştırma ve yayın etiği ilkelerine uygun olarak hareket edilmiştir.

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REFERENCES

Ando, A., Modigliani, F. (1963). The 'Life-Cycle' Hypothesis of Saving: Aggregate Implications and Tests. American Economic Review, Vol53 (March),55- 84.

Bernanke, B. S. (2009). *Four Questions about the Financial Crisis*. Board of Governors of the Federal Reserve System Speech 14 April 2009.

Bjørnland, H. C., Jacobsen, D. H. (2013). House Prices and Stock Prices: Different Roles in the US Monetary Transmission Mechanism. *The Scandinavian Journal of Economics*, Vol. 155, Iss. 4, 1084- 1106.

Bjørnland, H.C., Jacobsen, D.H. (2010). The role of house prices in the monetary policy transmission mechanism in small open economies. *Journal of Financial Stability*, 6, 218-229.

Boivin, J., Kiley, M.T. and Mishkin, F.S. (2010). How has the Monetary Transmission Mechanism Evolved over Time?. *NBER Working Paper Series*, No. 15879.

Bourne, L. S. (1981). *The geography of housing*. Wiley & Sons, London, 1-24

Brooks, C. (2008*). Introductory Econometrics for Finance*. Cambridge University Press.

Calza, A., Monacelli, T. and Stracca, L. (2009). Housing finance and monetary policy. *European Central Bank Working Paper Series*, No 1069

Elbourne, A. (2008). The UK housing market and the monetary policy transmission mechanism: An SVAR approach. *Journal of Housing Economics*, 17, 65-87.

Erdoğan, S., Mercan, D. and Gedikli, A. (2018). An Analysis on the Housing Price Channel: The Case of BRICT. Journal of Economics Library, Vol. 5, Iss. 4, 358-370.

Giuliodori, M. (2004). Monetary Policy Shocks and the Role of House Prices Across European Countries. *Scotland Journal of Political Economy*, Vol.54, Iss.4, 519-543.

Gujarati, D., Porter, D. C. (2009). *Basic Econometrics* (5th Edition). McGraw-Hill Education.

Holt, J. (2009). A Summary of the Primary Causes of the Housing Bubble and the Resulting Credit Crisis: A Non-Technical Paper. Journal of Business Inquiry, Vol. 8, Iss. 1, 120-129.

Lacoviello, M., Minetti, R. (2003). Financial Liberalization and the Sensitivity of House Prices to Monetary Policy: Theory and Evidence. The Manchester School, Vol. 71, No. 1, 20-34.

Koivu, T. (2010). Monetary Policy, Asset Prices and Consumption in China. European Central Bank Working Paper, No 1240.

Macit, D., Durgun Ö. (2019). Parasal Aktarım Mekanizmasının Reel Ekonomi Üzerine Etkisi: Uluslararası Kredi Kanalına Yönelik Bir Literatür Araştırması. *Balkan Sosyal Bilimler Dergisi*, Vol.8, Iss. 15, 77-87.

Mercan, D. (2019). Para Politikasının Varlık Fiyatlarına Etkisi: Seçilmiş Ülke Örnekleri*, İstanbul Medeniyet Üniversitesi Lisansüstü Eğitim Enstitüsü İktisat Anabilim Dalı*, Yayınlanmamış Doktora Tezi, İstanbul Medeniyet Üniversitesi.

Mercan, D., Canbay, Ş. (2017). Türkiye'de Konut Fiyatları Kanalının Etkinliği. *International Congress of Management, Economy and Policy*, 2017.

Mishkin, F. S. (1996). The Channels of Monetary Transmission: Lessons for Monetary Policy. NBER Working Paper, No 5464.

Mishkin, F. S. (2007). *The Economics of Money, Banking and Financial Markets* (8th Edition). Boston: Published by Pearson.

Mishkin, F. S. (2014). *Para Politikası Stratejisi* (1 st Edition). Çev. Necat Çoşkun, İstanbul: Bilim Teknik Yayınevi.

Modigliani, F. (1986). Life Cycle, Individual Thrift and the Wealth of Nations. *The American Economic Review*, Vol.76, Iss.3, 279-313.

Modigliani, F., Brumberg, R. (1954). Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data. (Edited by *Kenneth K. Kurihara). Post Keynesian Economics*, New Brunswick, N.J: Rutgers University Press, 388-436.

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

Nocera, A., Roma, M. (2017). House Prices and Monetary Policy in the Euro Area: Evidence from Structural VARs. ECB Working Paper, No 2073.

Nocera, A., Roma, M. (2017). House Prices and Monetary Policy in the Euro Area: Evidence from Structural VARs. *ECB Working Paper*, No 2073, 1-39.

Özgen, F. B., Güloğlu, B. (2004). Türkiye'de İç Borçların İktisadi Etkilerinin Var Tekniği ile Analizi. *Metu Studies In Development*, 1, 93-114.

Sevüktekin, M., Çınar, M. (2017). *Ekonometrik Zaman Serileri Analizi* (5th Edition). Bursa: Dora Yayıncılık.

Shiller, R. (2008). The Subprime Solution: How Today's Global Financial Crisis Happened, and What to Do about It. Princeton, NJ: Princeton University Press.

Tarı, R., Bozkurt, H. (2006). Türkiye'de İstikrarsız Büyümenin VAR Modelleri ile Analizi (1991.1-2004.3). *Ekonometri ve İstatistik Dergisi*, 4, 12-28.

Taylor, J. B. (2007). Housing and Monetary Policy. *NBER Working Paper*, No 13682**.**

Wilhelmsson, M. (2020). What role does the housing market play for the transmission mechanism?. Working Paper, No 2020:5.

Wu, L., Bian, Y. (2018). Housing, consumption and monetary policy: how different are the first-, second- and third-tier cities in China?. *Applied Economics Letters*, Vol. 25, Iss. 15, 1107-1111.

Yang, Z., Wu, S. and Shen, Y. (2017). Monetary Policy, House Prices, and Consumption in China: A National and Regional Study. *International Real Estate Review*, Vol. 20, Iss. 1, 23-49.

Yıldırım, D.Ç., Erdoğan, S. (2014). Parasal Aktarım Mekanizması Konut Fiyatları Kanalı Üzerine Ampirik Bir Analiz. Sosyal Bilimler Araştırma Dergisi, 23, 19-32