Finans Ekonomi ve Sosyal Araştırmalar Dergisi, Cilt.8 Sayı.3, Eylül 2023
Research of Financial Economic and Social Studies, Vol.8 No.3, September 2023
ISSN : 2602 – 2486

SEÇİLMİŞ MAKROEKONOMİK DEĞİŞKENLERİN TÜRKİYE'DEKİ KONUT FİYAT ENDEKSİ ÜZERİNDEKİ ETKİSİ

THE EFFECT OF SELECTED MACROECONOMIC VARIABLES ON THE HOUSING PRICE INDEX IN TURKEY[1]

Tülay Yazar ÖZTÜRK [*] *Melike AKÇA* [**]

Araştırma Makalesi / *Geliş Tarihi: 20.06.2023*
Kabul Tarihi: 30.09.2023

Öz

Bu çalışmada konut fiyatının faiz oranı, döviz kuru, para arzı ve enflasyon oranı gibi makroekonomik değişkenlerden nasıl etkilendiği araştırılmaktadır. Konut arzı ve konut talebi konut fiyatını belirleyen faktörlerdir. Bir yanda konut arzının boyutları; inşaat maliyetini, yatırıma hazır haldeki arsayı ve konut stokunu kapsamaktadır. Diğer yanda ise konut talebi boyutu; faiz oranı, enflasyonun göstergesi olan tüketici fiyat endeksini, geliri, nüfus artışını ve istihdam oranını içermektedir. Makroekonomik değişkenlerin etkilerinin daha doğru ölçülebilmesi amacıyla Merkez Bankası tarafından belirlenen konut fiyat endeksi değişkeni kullanılmıştır. Türkiye'de 2010-2023 dönemine ait aylık verilere dayalı olarak VAR modelleri kullanılmaktadır. Bu şekilde etki tepki fonksiyonu ve varyans ayrıştırma analizi yapılarak seçilen makroekonomik değişkenlerin konut fiyat endeksi üzerindeki etkisinin yönü ve derecesinin bulunması amaçlanmaktadır. Bu analiz bulgularına göre faiz oranı ve döviz kurunun konut fiyat endeksi üzerinde anlamlı etkisi olmuştur. Varyans ayrıştırma analizi sonrasında elde edilen sonuçlar doğrultusunda 10. dönem sonunda konut fiyat endeksi üzerinde faiz oranının %19, döviz kurunun ise %14 etkisinin olduğu tespit edilmiştir.

Keywords: Konut Fiyat Endeksi, Tüketici Fiyat endeksi, M1 Para Arzı, Reel Faiz Oranı, Reel Döviz Kuru

JEL Sınıflaması: G12, G21, E51, E31

Abstract

This study investigates how the house price is affected by macroeconomic variables such as interest rate, exchange rate, money supply and inflation rate. Housing supply and housing demand determines house price. On the one hand, housing supply dimensions covers contruction cost, existing land, housing stock. On the other hand, housing demand dimension involves interest rate, consumer price index as the indicator of inflation, income, population growth and employment rate. In order to measure the effects of macroeconomic variables more accurately, the housing price index variable determined by the Central Bank was used. Depending upon monthly data for the period 2010-2023 in Turkey, VAR models are used. In this way it is intended to find the direction and degree of the effect of selected macroeconomic variables on the house price index by performing impulse response function and variance decomposition analysis. According to this analysis findings, interest rate and exchange rate had a significant effect on the house price index. In line with the results obtained after the variance decomposition analysis, it was determined that the interest rate had a 19% effect and the exchange rate had a 14% effect on the house price index at the end of the 10th period.

Keywords: House Price Index, Consumer Price Index, M1 Money Supply, Real Interest Rate, Real Exchange Rate

JEL Classification: G12, G21, E51, E31

[1] **Bibliyografik Bilgi (APA):** FESA Dergisi, 2023; 8(3) ,802 - 813 / DOI: 10.29106/fesa.1363822

[*] Dr. Öğr. Üyesi, Yeditepe Üniversitesi UBYO, tyazar@yeditepe.edu.tr, İstanbul – *Türkiye*, ORCID: 0000-0003-3800-7649
[**] Arş. Gör., Yeditepe Üniversitesi İİBF, melike.akca@yeditepe.edu.tr, İstanbul – *Türkiye*, ORCID: 0000-0002-4431-3717

1. Introduction

In this paper, the link between house prices and the macroeconomic variables is analyzed in multi-dimensional way. As known, the effect of macroeconomic variables in building up house price have been investigated many times. To be able make sure about which variables are more effective than the others, in this study monthly data for the period 2010-2023 in Turkey is used. In order to standardize the comparison in a sound way, house price index is used. Housing Price Index (HPI) is created using the hedonic regression method in order to monitor price fluctuations excluding the quality effect depending on the observable characteristics of the houses which represent Turkey in general (CBRT). Supply and demand for housing may have fluctuations over time depending on the economic, social, cultural, geographical and democratic factors of each country. Global recession since 2008 has sourced from housing market. Therefore, European Commission accepted house price as a new warning indicator for macroeconomic imbalances (European Commission, 2012). Besides that, there may be a house price bubble which is described as quite higher current price level than historical one. In order to overcome this disadvantage, two methods are suggested. The first one is related to the cost of ownership that contains mortgage expenses, taxes, maintenance cost and the risk premium. The other one depends upon the relationship with house price and macroeconomic factors in the long run (Hofmann, 2004; Tsatsaronis & Zhu, 2004).

When looking at the variables affecting homeownership; population growth, per capita income, unemployment rate, housing stock, construction costs, real wage, interest rate (Bucchianeri, 2008). As of 2003, construction-based economic policies were preferred for growth in Turkey. Based on this, the government provides support through many local and central regulations as well as housing supply for low/high income people by the Mass Housing Administration (HDA/TOKİ). In line with this view, the private construction sector receives constant support in terms of housing supply (Coşkun, Housing development agency (TOKI) model and its financial sustainability [TOKİ Modeli ve Finansal Sisteminin Sürdürülebilirliği], 2015).

First of all, house market contains consumption and investment functions together. Therefore it has different characteristics than the other financial assets such as common stock. Besides that, in the long term, the price of the house is determined depending upon the sum of the present value of future earnings which are called as rents and the discounted resale value. However, in the short term, house diversity, down payment and asymmetric information may cause house price differences (Glindro et al., 2021). From a theoretical perspective, the relationships between monetary variables, housing prices and macroeconomics may have many aspects. There may be a link between mortgage loan and housing prices sourced from the housing abundance and the effect of collateral. In other words, on the one side loan demand sourced from wealth effect and Tobin's q effect and the other side collateral related to loan supply (Goodhart & Hofmann, 2008). It is seen that the effect of monetary policy on house prices is very large. On the other hand, the response of the credit variable to the monetary policy shocks seems more moderate (Bjørnland & Henning, 2010). In the long term, the effect of money supply policies rather than interest rate may be greater on house prices. In this way central bank can easily adapt money supply policies to be able to regulate housing market (Feng, 2022).

The rest of the paper is organized as follows in the next part literature review is mentioned. In part 3, methodology is given and findings are given in the part 4, and in the last part, the results are mentioned.

2. Literature Review

In related literature many different views and findings have been declared. One of them investigated the relationship among house price, interest rate and income in fifteen OECD countries for the period of 1975-2013. In majority of the countries, fluctuations in house price is independent from income and interest rate in the short term but subject to them in the long term. There is a positive relationship between income and house price and a negative one between interest rate and house price (Kishor & Marfatia, 2017). The study related to 18 OECD countries during the period od 1970-2011 indicates that real interest rate and risk premia were more effective with respect to house market volatility and especially low interest rates had led to housing boom until 2006 (Engsted & Pedersen, 2014). According to the study realized in seven European countries in period of 1972-2009, a real long term interest rate as an indicator of borrowing cost is the most effective one on housing price when compared others such as real per capita income (Vansteenkiste & Hiebert, 2011). Similarly, in another study, Interest rate, unemployment, etc. which are key determinants of housing market price (Balcilar et al., 2014; Chang et al., 2015).

When the effects and reactions of house prices to macroeconomic shocks are compared in terms of two developed countries, it is seen that technology shocks are effective in America and monetary policy is effective in England. On the other hand, temporary housing supply shocks are not effective in both countries (Plakandaras et al., 2020).

The mortgage interest rate is an important indicator in making decision to buy a house. In case of an increase in mortgage rate, the demand for house decreases. A study in Greece during 1991-2000, the mortgage interest rate,

inflation and employment are important factors in investment of housing sector respectively (Apergis, 2003).The movement of inflation is determined by the Consumer Price Index (CPI), and mismeasurement of CPI may cause negative impact about housing affordability (Dougherty & Order, 1982). Especially in high inflation regime, to make investment in real estate provides hedging against inflation (Erol & Tirtiroğlu, 2014). Inflatıon and housing market are highly dependent each other. Therefore, to make investment in housing sector may protect capital against inflation. On the one hand, In Turkish market, gold, foreign exchange and inflation are effective factors compared with the others. On the other hand, in developed countries such as USA, mortgage rate is dominant factor (Yilmaz & Selçuk-Kestel, 2019). The study related to the relationship between inflation and house prices in 26 regions in Turkey, regional differences are important and the policies must be adapted accordingly. Not only high inflation in recent years affected a rise in house prices but also migration movements and population density must be taken into account in determining the level of house price (Korkmaz, 2020).

In the 1970s, the cash flows related to mortgage with fixed interest rate brought about an increase in expected nominal payments to rise, an increase in household savings and assets, and a decrease in housing demand (Kearl, 1979).

In some emerging markets house prices increased considerably in recent years. A study about housing market in Turkey analyzed whether housing bubble was built up or not depending upon two different house price indexes for two different time periods. The findings show that a long term cointegration of house price index, rent, the cost of construction real mortgage interest rate and instead of bubble, overvaluation has been seen in some cases (Coskun et al., 2017)

According to the Tobin's q theory, the additional resource created by the increase in money supply may be invested to stock and real estate markets (Mishkin, 1992). From the investor's perspective, housing is different from other financial assets because it is a durable consumer good and insurable. Housing investment is much safer than other investment instruments because it is seen as the psychological equivalent of gold and is more tangible. In addition to these advantages, housing is also an irreversible form of investment. In case of returnable, it is realized at a high cost (Trimbath & Montoya, 2002).

As with other assets, the movement of house prices can be an indicator of the future direction of inflation, which can be a useful tool for both housing market participants and monetary policy authorities (Gupta et al., 2010).

In Turkey, income and monetary policies have a great importance on housing prices and housing permits. In addition to that, adjustments in interest rates of loans directly lead to fluctuations in housing prices (Yıldırım & Ivrendi, 2018).

3. Methodology

This chapter offers the evaluation of the model and results of the data and model evaluation. Then, the house price index rate will be discussed, and the factors affecting it will be explained. In this study, the effects of these variables on the house price index and the direction of these effects were examined by using inflation, money supply, exchange rate and interest rates.

This analysis consisted of monthly data between the 2010-2023. In the first four months of data were included in the model and a total of 160 periods were examined. The data of the variables used in the econometric analysis were obtained from TUIK and TCMB-EVDS. In the study, firstly, the stationarity of the time series used was examined with unit root tests, and then the appropriate lag length for the VAR model was found. The suitability of the model used was tested with the autocorrelation LM and White tests. Finally, impulse-response and variance decomposition analyses were conducted using VAR models to reveal the relationship between the variables. The study was made using the EViews program. All variable descriptions are determined in Table 1.

Table 1. Dataset Description

Series	Description of the series
HPI	House Price Index
CPI	Consumer Price Index
MS	M1 Money Supply
INT_RATE	Real Interest Rate
EXCH_RATE	Real Exchange Rate

It was examined whether the variables used in the analysis had a certain trend, and the logarithm of all data was taken to normalize the variables as much as possible. By converting data to logarithms, skewness in the original data is reduced or eliminated. The monthly logarithmic changes used in our models are obtained with the following calculation.

$$r_t = ln\left(\frac{S_t}{S_{t-1}}\right) = ln(S_t) - ln(S_{t-1}) \quad (1)$$

Before starting the analysis, whether the data whose logarithms are taken show a normal distribution should be tested. To determine the normal distribution, the kurtosis and skewness values of the variables are examined. While interpreting the skewness and kurtosis coefficients, the series shows a normal distribution if the skewness coefficient is 0. If the skewness coefficient is negative, it indicates a right-skewed distribution; if the skewness coefficient is positive, it indicates a left-skewed distribution. If the kurtosis coefficient is 3, the series shows a normal distribution. If the kurtosis coefficient is positive, it indicates a sharp distribution; if it is negative, it indicates a flat distribution. According to the descriptive statistics values given in Table 2, it was determined that the series included in the model showed normal distribution.

Table 2. Descriptive Statistics

	LHPI	LEXCRATE	LCPI	LINTRATE	LMS
Mean	4,6118	4,4641	2,4938	2,2162	19,8525
Median	4,5277	4,5621	2,2746	2,0794	19,6617
Maximum	6,7421	4,8400	4,4486	4,2591	22,0265
Minimum	3,8155	3,8647	1,3837	1,5040	18,4412
Std. Dev.	0,6882	0,2571	0,6745	0,4784	0,9614
Skewness	1,3556	-0,5678	1,4882	1,0223	0,6102
Kurtosis	4,5315	2,0273	4,6915	4,0795	2,3786
Jarque-Bera	64,6472	14,9057	78,1372	35,6440	12,5055
Probability	0,0000	0,0005	0,0000	0,0000	0,0019
Sum	737,8957	714,2619	399,0134	354,6035	3176,411
Sum Sq. Dev.	75,3261	10,5178	72,3409	36,3921	146,9733

Source: own calculations in Eviews

4. Findings

4.1. Unit Root Tests

Financial time series often show non-stationary characteristics. If time series are stationary, they converge to a particular value over time. Stationary data have a constant variance and covariance to the mean depending on the lag values (Gujarati & Porter, 1999). If time series are not stationary, spurious regression problems arise in models using these series (Granger & Newbold, 1974). In the case of spurious regression, the t and F tests are invalid as the true relationship between the variables cannot be reached as a result of the analyses made. For this reason, the variables should be made stationary to avoid the spurious regression problem and reach an accurate and consistent result. In this study, the stationarity of the series was examined with the Augmented Dickey-Fuller (ADF) test, which is widely used in the literature, and appropriate lag lengths were determined according to Schwarz Information Criteria (SIC). According to Table 3, where the ADF test results are shown, it was determined that the HPI variable became stationary when its second difference was taken, I(2), and the EXCRATE, CPI, INTRATE, and MS variables became stationary when their first difference was taken, I(1). In the analysis, the variables were included in the model by taking their differences.

Table 3. Augmented Dickey Fuller Test Results

Variables	Level		1st Difference		2nd Difference	
	Intercept	Trend&Intercept	Intercept	Trend&Intercept	Intercept	Trend&Intercept
LHPI	1,7557	0,0413	-1,9979	-2,7883	-6,8699	-6,8505
	(0,9997)	(0,9965)	(0,2876)	(0,2039)	(0,0000)	(0,0000)
LEXCRATE	-0,5624	-2,7936	-10,0155	-9,9911	-	-
	(0,8742)	(0,2019)	(0,0000)	(0,0000)		
LCPI	-1,0836	-2,8245	-9,1997	-9,2401	-	-
	(0,7216)	(0,1908)	(0,0000)	(0,0000)		
LINTRATE	-2,3105	-2,9826	-18,4257	-18,3774	-	-
	(0,1699)	(0,1404)	(0,0000)	(0,0000)		
LMS	-2,6266	0,2021	-12,0839	-12,6028	-	-
	(1,0000)	(0,9979)	(0,0000)	(0,0000)		

Source: own calculations in Eviews

4.2. Estimating the VAR Model

Sims (1980) considered the variables in the system as a whole by including the variables in the model without distinguishing between internal and external and developed vector autoregressive (VAR) models in which the lagged values of both the variables themselves and other variables in the system are determined. In VAR models, each variable is included in the system using its own lagged values, and each equation is analyzed separately, allowing predictions for the economic future to be made (Tarı & Bozkurt, 2006).

Appropriate lag lengths must be determined to predict the analysis of VAR. To find the lag lengths, the series must be stationary. In our study, non-stationary series were made stationary and included in the VAR analysis. LR, AIC, HQ, FPR, and SC information criteria are used to specify lag length. The results of the relevant criteria for determining the appropriate length of lags are specified in Table 4.

Table 4. Lag Length Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1152,722	NA	1.55e-13	-15,30296	-15,20260*	-15,26219
1	1208,917	107,8947	1.03e-13	-15,71889	-15,11677	-15,47427
2	1254,011	83,57434	7.86e-14	-15,98681	-14,88291	-15,53833
3	1295,654	74,40130	6.31e-14*	-16,20871*	-14,60304	-15,55638*
4	1309,775	24,28806	7.33e-14	-16,06366	-13,95622	-15,20747
5	1330,338	33,99838	7.85e-14	-16,00451	-13,39529	-14,94447
6	1354,178	37,82646*	8.07e-14	-15,98904	-12,87805	-14,72515
7	1378,869	37,52970	8.25e-14	-15,98492	-12,37216	-14,51717
8	1396,135	25,09280	9.36e-14	-15,88179	-11,76726	-14,21019

Note: LR: Sequential modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criteria, SC: Schwarz information criteria, HQ: Hannan-Quinn information criteria
Source: own calculations in Eviews

When determining the optimum lag length, the lag length containing the most * is considered the appropriate lag length. However, autocorrelation problems may sometimes arise in the VAR model estimated with this lag length. An autocorrelation LM test was performed to determine the existence of an autocorrelation problem in lag lengths.

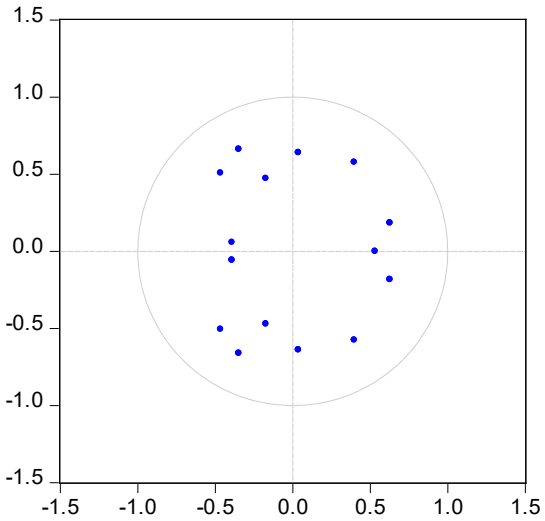
Table 5. Autocorrelation LM Test

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	71,55647	25	0,0000	3,001178	(25, 506.7)	0,0000
2	46,65729	25	0,0054	1,909548	(25, 506.7)	0,0054
3	47,15153	25	0,0047	1,930710	(25, 506.7)	0,0047
4	42,00088	25	0,0180	1,711160	(25, 506.7)	0,0180
5	38,96392	25	0,0371	1,582726	(25, 506.7)	0,0372
6	27,73470	25	0,3202	1,114322	(25, 506.7)	0,3205

Source: own calculations in Eviews

According to the Autocorrelation LM test results, Lag 0 was not included in the list, and Lag 3 and Lag 6 were examined. Since the probability of Lag 6 was bigger than 0.005, it was rejected, and Lag 3 was selected. The lag length is determined to 3. As a result, the VAR model was estimated with three lags, VAR (3).

After determining the optimum lag length and examining the autocorrelation problem in the lag, it is checked whether the VAR model is stable or not. An Autoregressive Unit Root Test was performed to ensure the VAR(3) model was stable. According to the inverse roots graph of the AR characteristic polynomial given below, the AR roots must be within the unit circle. According to the graph, since the roots are within the unit circle, the stability condition in the VAR model is met, and it is concluded that the model is stationary.



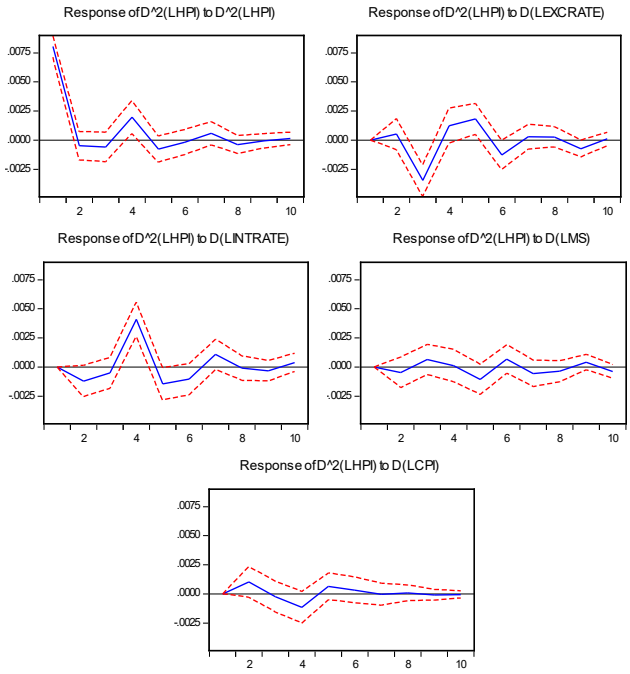
Graph 1. Inverse roots of AR characteristic polynominal

In this study, graphs of the action-response functions of each variable will be presented and interpreted, but the emphasis will be on the graphs of the women's labor force participation rate and economic growth variables. Then, with variance decomposition, it will be interpreted what percentage of the variable change is endogenous and how much is caused by different variables.

4.3. Impulse-response analysis

Impact-response analyses are functions found by VAR analysis. It shows the effect of a standard deviation shock on endogenous variables' present and future values in one of the error terms. Action-response analyses of all variables with endogenous and other variables will be examined; only the effects of variables on the house price index will be interpreted.

Given a one-unit random shock to inflation, interest rate, exchange rate, and money supply, the responses of the house price index to these shocks are shown in the chart below over ten periods. The solid lines in the graph (shown in blue) show the response of the endogenous variable over time to a one-unit standard deviation shock in the model's error term. Dashed lines (shown in red) represent the confidence intervals obtained for ± 2 standard deviations.



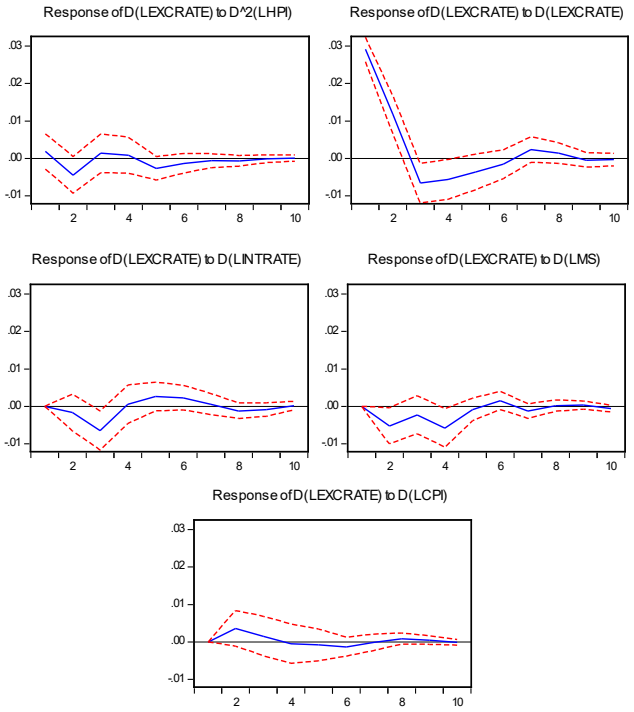
Graph 2. Impulse-response analysis of D^2(LHPI)

When graph 2 is examined, the fact that the coefficients of the HPI variable in the impulse-response analysis are within the 95% confidence interval shows that the impulse-response functions are statistically significant. The HPI variable reacted positively to an endogenous one-unit standard deviation shock in the first period, and then the reactions fluctuated from negative to positive or vice versa. It was observed that this effect, which was examined for approximately ten periods, became stable after the eighth period and the effect disappeared at zero level over time.

When the reaction of D^2(LHPI) to the D(LEXCRATE) variable is examined periodically, it is seen that the response is mostly positive; in some periods, it reacts negatively and then turns positive again, and at the end of nine periods, the response starts to remain at zero level, stagnates and disappears.

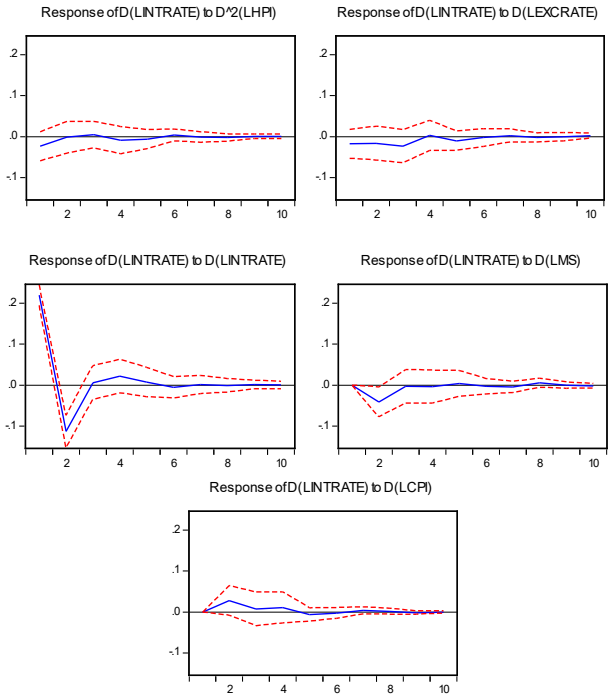
When the reaction of the D^2(LHPI) variable to the D(LINTRATE) variable was examined, it was observed that the effect, which was negative in the first period, turned positive in the following periods and then turned negative again, showing a fluctuating process.

When the response of the D^2(LHPI) variable on the D(LMS) and D(LCPI) variables was examined, it was observed that the responses showed a more stable fluctuation at the zero level. In addition, the effect of D^2(LHPI) on D(LCPI) stabilizes after approximately seven periods and disappears over time.



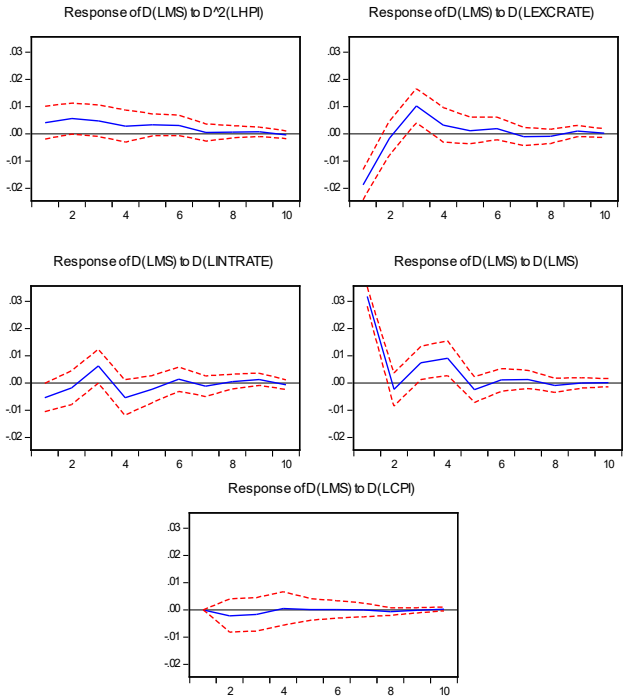
Graph 3. Impulse-response analysis of D(LEXCRATE)

When the response of the D(LEXCHRATE) variable to the HPI variable is examined, it is concluded that the effect shows a positive trend for a short period of time, then a negative effect for three periods, then a stable effect at the zero level. When examined on a period basis, it was observed that D(LEXCHRATE) mostly had a negative effect on D2(LHPI) became stable after the eighth period, and disappeared over time.



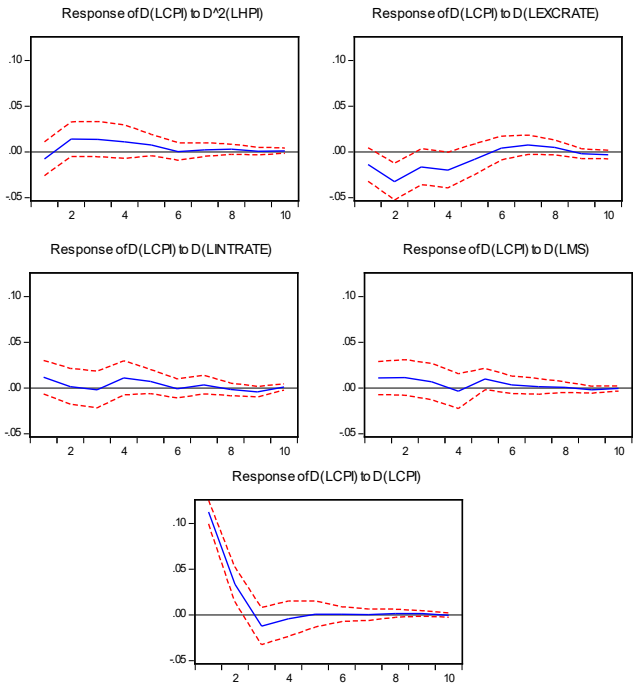
Graph 4. Impulse-response analysis of D(LINTRATE)

According to the result of D(LINTRATE)'s impact response analysis on D^2(LHPI), the negative impact in the first period showed slight fluctuations at zero level after the second period and disappeared from the seventh period.



Graph 5. Impulse-response analysis of D(LMS)

The effect of the D(LMS) variable on D^2(LHPI) is positive and shows a decreasing effect over time. This positive effect disappears after approximately the seventh period, becoming stagnant at zero level



Graph 6. Impulse-response analysis of D(LCPI)

The effect of CPI on HPI starts with an adverse effect for a very short period but then shows a positive reaction. It is seen that the impact becomes stationary and disappears after the sixth period.

4.4. Variance decomposition analysis

Variance decomposition analyses are used to determine the effect of the variables included in the VAR model on other variables as a percentage and to decompose the sources of the changes in the variances of the variables. In addition, variance decomposition analysis results also provide information about the degree of causality relationships between the variables included in the model. With the decomposition analysis of variance, it can be concluded how much of the percent changes in the variables originate from itself endogenously and how much is caused by other variables in the model (Aktaş, 2010).Variance decomposition results for D^2(LHPI) are given in Table 6.

Table 6. Variance Decomposition Results of DLHPI

Period	S.E.	D^2(LHPI)	D(LEXCRATE)	D(LINTRATE)	D(LMS)	D(LINF)
1	0,008038	100,0000	0,000000	0,000000	0,000000	0,000000
2	0,008236	95,59616	0,390054	2,137801	0,317452	1,558535
3	0,008987	80,71101	15,01390	2,112042	0,778061	1,384986
4	0,010212	66,20790	13,09460	17,74066	0,617690	2,339149
5	0,010577	62,24220	15,19411	18,41891	1,587804	2,556973
6	0,010731	60,48531	16,13501	18,84530	1,954562	2,579818
7	0,010819	59,79478	15,94577	19,53452	2,185539	2,539402
8	0,010837	59,72858	15,95843	19,47930	2,295498	2,538184
9	0,010875	59,31341	16,29833	19,43023	2,432003	2,526029
10	0,010890	59,16632	16,26172	19,50656	2,544315	2,521091

Source: own calculations in Eviews

The effects of all variables in the model on HPI were examined over a 10-period period. In the first period, the entire effect on the D^2(LHPI) variable stems from itself. While 95% of the effect on the D^2(LHPI) variable in the second period is due to itself, the results of other variables show the most significant effect on D(LINTRATE) with 2%, D(LCPI) with 1%, D(LEXCHRATE) with 0.39% and MS with 0.31%. It was observed that the variable that significantly affected the house price index in the tenth period was the interest rate with a rate of 19%. Later,

it was seen that the ratio of exchange rates to the housing price index was 16%. These findings reveal the importance of volatility in interest and exchange rates in terms of the house price index. The variables that have a low impact on the house price index at the end of ten periods are inflation and money supply, with 2.52% and 2.54%, respectively.

5. Results

This study was prepared to test the effects of interest rate, exchange rate, money supply and inflation rates on the house price index. In this study conducted for Turkey with 160 periods of monthly data within the scope of the 2010-2023 period, VAR models were used and it was aimed to determine the direction and degree of the effect of selected macroeconomic variables on the house price index by performing impulse response function and variance decomposition analyses.

According to the analysis findings, it has been observed that interest rate and exchange rate have a significant effect on the house price index. When examined based on the D^2(LHPI) variable within the 10-period period examined in the analysis, the effect of the exchange rate variable on the house price index was positive at the beginning and then showed a negative effect. In subsequent periods, it disappeared, showing effects from positive to negative or vice versa. The same applies to the effect of the interest rate variable on the house price index. Although it initially seemed to have a negative effect, it later fluctuated to positive and vice versa. According to the findings after the variance decomposition analysis, it was observed that the interest rate had a 19% effect and the exchange rate had a 16% effect on the housing price index at the end of the 10-period period examined. The increase in demand for housing after the decision to reduce loan interest rates on mortgaged house sales in Turkey in 2021 is compatible with the result we obtained in our analysis, which indicates that interest rates have an effect on the house price index.

Depending on the another study realized in China by means of the cointegration test, it is thought that the real estate price has a stable long-term relationship with the interest rate and broad money supply. Therefore the central bank and government officials may ensure stability in the housing market by making the necessary legal regulations regarding money supply and interest rates.(Feng 2022). Besides that, in the case about Turkey's house price dynamics, the house bubble risk is analysed through cointegration test and the findings state that construction cost and rent are positively but mortgage interest rate is negatively related to house price.(Coşkun et al., 2020)

According to the research realized in 18 OECD countries, the relationship between exchange rate and house price is observed. The findings show that in half of those countries exchange rate due to its inflationary effect may cause a change in house price.On the other side,in remaining countries, house price may affect the exchange rate. In other words, due to the impact of rising housing prices on consumption and imports causes an increase in demand for foreign exchange.(Bahmani-Oskooee and Wu 2018) It has been found to cause If there is a negative change in the exchange rate and especially if imported construction inputs are used extensively in the construction sector, housing prices may increase rapidly.

In this study, the possible effects of selected macroeconomic variables on the house price index used in Turkey are analyzed by examining the existence and the level of the relationship. The contribution of this study to the literatüre is to determine the most effective ones on the HPI. As a result, housing loan interest rates and foreign exchange are accepted as the most effective ones when compared the others. Considering the direct relationship between inflation and exchange rate, the central bank and the government should focus on policies and regulations that will keep inflation under control, and in addition, financial institutions should reduce the housing loan interest and increase the housing loan volume, ensuring the soundness of the construction and housing sector, which is the locomotive of the economy. will provide. In case of implementation properly, the intersection of housing supply and demand will occur in a more equitable and accessible point, both sector stakeholders and society may reach a higher level of welfare.

, in this study, the effects of interest rate, exchange rate, money supply and inflation rates as the most important factors on the house price index are analysed. In future studies, the effects of all factors affecting housing supply and demand can be investigated for a longer period.

References

Aktaş, C. (2010). Türkiye'de Reel Döviz Kuru ile İhracat ve İthalat Arasındaki İlişkinin VAR Tekniğiyle Analizi. Z.K.Ü. Sosyal Bilimler Dergisi, 6(11), 123-140.

Apergis, N. (2003). Housing Prices and Macroeconomics Factors: Prospects within the European Monetary Union. nternational Real Estate Review, 6(1), 63-74.

Balcilar, M., Gupta, R., & Miller, S. M. (2014). Housing and the great depression. Applied Economics, 46(24), 2966-2981.

Bahmani-Oskooee, M., & Wu, T. P. (2018). Housing prices and real effective exchange rates in 18 OECD countries: a bootstrap multivariate panel Granger causality. Economic Analysis and Policy, 60, 119-126.

Bjørnland, H. C., & Henning, J. D. (2010). The role of house prices in the monetary policy transmission mechanism. Journal of Financial Stability, 6(4), 218-229.

Bucchianeri, G. W. (2008). The Anatomy of a Housing Bubble: Overconfidence, Media and Politics. SSRN Electronic Journal.

CBRT. (tarih yok). CBRT. https://www.tcmb.gov.tr adresinden alındı

Chang, T., Balcilar, M., Gupta, R., Miller, S. M., & Li, X. L. (2015). The co-movement and causality between the US housing and stock markets in the time and frequency domains. Int Rev Econ Finance, 38, 220-223.

Coşkun, Y. (2015). Housing development agency (TOKI) model and its financial sustainability [TOKİ Modeli ve Finansal Sisteminin Sürdürülebilirliği]. Muhasebe Bilim Dünyası Dergisi, 17(3), 617-638.

Coskun, Y., Seven, U., Ertugrul, H. M., & Alp, A. (2020). Housing price dynamics and bubble risk: the case of Turkey. Housing Studies, 35(1), 50-86.

Dougherty, A., & Order, R. V. (1982). Inflation, Housing Costs, and the Consumer Price Index. The American Economic Review, 72(1), 154-164.

Engsted, T., & Pedersen, T. Q. (2014). Housing market volatility in the OECD area: Evidence from VAR based return decompositions. Journal of Macroeconomics, 42, 91-103.

Erol, I., & Tirtiroğlu, D. (2014). The inflation-hedging properties of Turkish REITs. Applied Economics(42), 91-103.

European Commission. (2012). Alert Mechanism Report 2013. Brussels: European Commission.

Feng, P. (2022). The Correlation between Monetary Policy and Housing Price Change Based on a VAR Model. Mathematical Problems in Engineering, 04, 1-8.

Glindro, E. T., Subhanij, T., Szeto, J., & Zhu, H. (2021). Determinants of House Prices in Nine Asia Pacific Economies. International Journal of Central Banking, 7(3), 163-204.

Goodhart, C., & Hofmann, B. (2008). House prices, money, credit, and the macroeconomy. Oxford Review of Economic Policy, 24(1), 180-205.

Granger, C. W., & Newbold, P. (1974). Spurious regressions in econometrics. Journal of econometrics, 11-120.

Gujarati, D. N., & Porter, D. C. (1999). Basic Econometrics. New York: The McGraw-Hill Series Economics.

Gupta, R., Jurgilas, M., & Kabundi, A. (2010). The effect of monetary policy on real house price growth in South Africa: A factor-augmented vector autoregression (FAVAR) approach. Economic Modelling, 27(1), 315-323.

Hofmann, B. (2004). Bank Lending and Property Prices: Some International Evidence. Working Papers from Hong Kong Institute for Monetary Research.

Kearl, J. R. (1979). Inflation, Mortgage, and Housing. Journal of Political Economy, 87(5), 1115-1138.

Kishor, N. K., & Marfatia, H. A. (2017). The Dynamic Relationship Between Housing Prices and the Macroeconomy: Evidence from OECD Countries. The Journal of Real Estate Finance and Economics(54), 237-268.

Korkmaz, Ö. (2020). The relationship between housing prices and inflation rate in Turkey: Evidence from panel Konya causality test. International Journal of Housing Markets and Analysis, 13(3), 427-452.

Mishkin, S. F. (1992). The economics of money banking and financial markets. New York: Harper Collins Publisher.

Plakandras, V., Gupta, R., Katrakilidis, C., & Wohar, M. E. (2020). Time-varying role of macroeconomic shocks on house prices in the US and UK: evidence from over 150 years of data. 2249-2285.

Sims, C. A. (1980). Macroeconomics and Reality. Econometrica, 48(1), 1-48.

Tarı, R., & Bozkurt, H. (2006). Türkiye'de İstikrarsız Büyümenin Var Modelleri İle Analizi. Ekonometri ve İstatistik(4), 12-28.

Trimbath, S., & Montoya, J. (2002). A New Kind of Gold? Investment in Housing in Times of Economic Uncertainty. Milken Institute Working Paper No.30.

Tsatsaronis, K., & Zhu, H. (2004). What Drives Housing Price. BIS Quarterly Review (March), 65-78.

Vansteenkiste, I., & Hiebert, P. (2011). Do house price developments spillover across euro area countries? Evidence from a global VAR. Journal of Housing Economics, 20(4), 299-314.

Yıldırım, M. O., & Ivrendi, M. (2018). House prices and the macroeconomic environment in Turkey: The examination of a dynamic relationship. Economic Annals-XXI, 62(215), 81-110.

Yilmaz, B., & Selçuk-Kestel, A. S. (2019). Computation of hedging coefficients for mortgage default and prepayment options: Malliavin calculus approach. The Journal of Real Estate Finance and Economics, 59(4), 673-697.