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The Impact of Economic Activity and Unemployment Rate on Housing Demand: Estimating a Vector Error Correction Model for Turkey

İktisadi Aktivite ve İşsizlik Oranının Konut Talebi Üzerine Etkileri: Türkiye için Vektör Hata Düzeltme Modeli Tahmini

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Abstract

This study investigates the relationship between the probability of buying a house, industrial production index, and unemployment rate in Turkey. This paper tests whether there is a long-run relationship among above-stated variables by conducting a cointegration analysis and estimating a vector error correction model with a monthly data over the period between 2010:01 and 2019:12. While the test results suggest a negative and statistically significant relation between the probability of buying a house and the unemployment rate, the results suggest a positive but statistically insignificant relation with economic activity. Moreover, the deviation from the long-run equilibrium is corrected towards equilibrium by 24% within a period.

Keywords: *Probability of Buying a House, Unemployment Rate, Economic Activity, Vector Error Correction Model (VECM)*

Öz

Bu çalışma Türkiye'de konut satın alma ihtimali, sanayi üretim endeksi ve işsizlik oranı arasındaki ilişkiyi araştırmaktadır. Makale, eş bütünleşme analizi ve vektör hata düzeltme modelini 2010:01 ile 2019:12 arasındaki aylık verilerle tahmin ederek belirtilen değişkenler arasındaki uzun dönemli ilişki olup olmadığını test etmektedir. Test sonuçları, ev satın alma ihtimalinin işsizlik oranı ile arasında negatif ve istatistiksel olarak anlamlı ilişki olduğunu ortaya koyarken iktisadi aktivite ile arasında pozitif fakat istatistiksel olarak anlamsız ilişki olduğunu ortaya koymaktadır. İlaveten, konut satın alma ihtimalinde meydana gelen uzun dönem dengesinden sapma her bir dönem içinde %24 oranında düzelmektedir.

Anahtar Kelimeler: *Konut Satın Alma İhtimali, İşsizlik Oranı, İktisadi Faaliyet, Vektör Hata Düzeltme Modeli*

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Introduction

Although housing has limitations on short selling, illiquid, and highly leveraged nature it is an important financial asset that generally makes up the largest share in households' wealth. Analyzing the conditions in the housing market is important because it is linked to consumers' choice of consumption and investment. Moreover, first-hand sales in the housing market directly contribute to the national GDP through several channels. Additionally, the housing market could also reflect the effects of monetary policy implementations. There are several factors including interest rate, financial intermediaries, and inflation that link the developments in the housing market and monetary policy (Kenny, 1998). Changes in the money supply and interest rates affect housing prices with a certain lag, which is determined by the speed of the amplification mechanism (Coşkun, 2016). The level of the policy rate in the economy has an impact on housing loan rates offered by the financial corporations, which makes buying a house more (or less) affordable. The changes in the loan rates have a direct impact on demand for housing because housing tenure depends on the cost of owning a house relative to the rental rate (Gnan, 2021; Koeniger et al., 2021). If the rates are low (high), the probability of buying a house is likely to increase (decrease) and thus the demand. Moreover, the transmission of monetary policy in the housing market has an impact on consumer price inflation mainly through rental prices. (Koeniger et al., 2021). Additionally, low interest rate environment due to lax monetary policy conditions raises real estate prices. An increase in the value of housing generates a positive wealth effect and leads households to feel richer and to consume more. On the other hand, an increase in housing prices causes a negative wealth effect for those who are required to spend a higher fraction of the disposable income on housing (Gnan, 2021). Given these features, analyzing the housing market dynamics has always been attractive for academicians and policy makers.

This paper investigates whether there is a long-run relationship between demand for housing, economic activity, and labor market conditions in Turkey. Analyzing the Turkish case is interesting for several reasons. First, housing prices experienced an upsurge in recent years. According to the Knight Frank Global House Price Index, the growth rate of housing prices was at the top and led the rankings several times. Second, according to the population statistics released by the TURKSTAT and Eurostat (URL 1), the population in Turkey was around 83 million in 2019, which was higher than all EU-27 countries except for the Germany. Third, the youth unemployment ratio was around 6% (11%) in the EU-27 (Turkey) in 2019. When considering the member countries, the youth unemployment ratio in Turkey exceeded all the EU-27 countries according to data released by Eurostat (URL 2).

Housing market dynamics in Turkey have been extensively studied (Coşkun and Jadevicius, 2017; Cagli, 2019; Ceritoğlu, 2020; Coşkun et al., 2020). There are several studies to detect whether the housing market in Turkey is in a bubble. Coskun and Jadevicius (2017) investigated whether the housing market was in a bubble over the period between January 2010 and December 2014 by using affordability ratios including price to income and price to rent ratios. They also run a series of regressions with GDP per capita, population, employment, unemployment, housing starts, and mortgage rates as explanatory variables. They found that there was no clear evidence of the existence of the bubble in the Turkish housing market. Coskun et al. (2020) conducted a cointegration analysis to explore the long-run relation between house prices and their determinants in Turkey in two sub-periods, January 2010 and December 2014, and June 2007 and December 2014. They investigated a cointegration among variables and found that there was a positive relationship between housing rent and construction cost and a negative association between mortgage rates and housing prices. Additionally, they suggested that the housing market in Turkey has experienced overvaluation rather than the bubble. However, the number of studies on demand-side developments in the Turkish housing market is limited. The income level of the household, the price level of residential units, social and demographic characteristics of the household can be counted as the determinants of housing demand (Ceritoğlu 2020: 1148). There are candidate indicators that capture the demand side in the housing market. Residential building floor area according to occupancy permits (Coşkun et al., 2020) and first-hand house sales (Ceritoğlu and Ganioğlu, 2020) are used as housing demand indicators. However, a survey-based indicator has not yet been used as an indicator of housing demand. To the best of our knowledge, this is the first study that quantifies the housing demand with survey-based data in an emerging market context. We use the probability of buying a house, which is a publicly available data set obtained through consumer tendency surveys applied to 4884 households with monthly frequency by the Turkish Statistical Institute (TURKSTAT). Since the time series of this data reflects what the consumer expectations are about their likelihood of consumption, we believe that the probability of buying a house could represent the demand side of the housing market.

This paper poses the following questions: 1) Is there any long-run relationship between probability of buying a house, industrial production index[2]and unemployment rate? 2) What is the speed of adjustment to long-run equilibrium in case of a deviation from the equilibrium? To answer the above questions, we conduct a cointegration test and estimate a vector

[2] It is used as an indicator of economic activity. Since the GDP per capita is not available in monthly frequency, we use industrial production index instead.

error correction model. Our main findings are three-fold. First, there is long-run relationship between the housing demand, economic activity, and unemployment rate. Second, the relation between the housing demand and economic activity is positive but statistically insignificant. Third, the relationship between the demand for housing and the unemployment rate is negative and statistically significant. This finding is consistent with the findings of Gan et al. (2018) and Akdoğan et al. (2019).

The remainder of this paper is organized as follows: Section 1 presents theory, reviews empirical literature, and states the hypotheses. Section 2 provides some facts about the housing market and economic conditions in Turkey. Section 3 introduces the data, construction of variables, and the econometric methodology. Section 4 provides empirical evidence. The Conclusion finalizes the paper.

1. Theoretical Framework and Literature

1.1. Theoretical Framework

According to economic theory, the consumers maximize their utility function in a life-cycle model subject to an intertemporal budget constraint they face in the economy. The demand for housing can be derived through such optimization problem where the objective function includes housing as an argument and budget constraint consists of income and price-related factors (Muth, 1960; Lee, 1964; Olsen, 1968; Harrington, 1989; Megbolugbe et al., 1991; Kenney, 1998).

The price is a function of demand and supply in the economy and the general form of the price function can be shown as below

$$\mathrm{P} = \mathrm{f}\left(\mathrm{Q}^{\mathrm{D}}, \mathrm{Q}^{\mathrm{S}}\right)$$

Following Reichert (1990) and Megbolugbe et al. (1991), the demand for housing can be formulated as follows

$$\mathrm{Q}^{\mathrm{D}} = \mathrm{q}\left(\mathrm{P}^{\mathrm{H}}, \mathrm{P}^{\mathrm{O}}, \mathrm{I}, \mathrm{other}\right)$$

where Q^{D} is the demand for housing, P^{H} is the price of housing, P^{O} is the price of goods, I is the affordability-related measures including income and credit, and other is the characteristics in the economy including demographic and regional factors that have impact on the demand for housing. Regarding the demand function above, economists or practitioners examine the determinants and developments in the housing market.

Theoretically, the demand for housing is a positive function of falling interest rates, rising expected income, and strong economic activity. A decrease in the interest rate affects housing loan rates, which leads to a decrease in the cost of buying a house. Under such a situation, the demand for housing is expected to be affected positively. Additionally, an increase in income positively affects and gives rise to the housing demand. The theory also suggests that demand for housing is expected to increase during periods in which the economic activity increases. In the presence of strong economic activity, the unemployment rate is likely to be low, and the expected future income of households would be high (Reichert, 1990; Kenny, 1998).

Housing price is also an important factor in shaping the demand for housing. Increasing housing prices leads to an expectation of further price increases. Thus, the housing demand increases due to potential capital gain from housing investment. On the other hand, expectations of a decline in housing prices can fuel a decrease in demand for housing due to capital loss from housing investment (Reichert, 1990; Megbolugbe et al., 1991).

1.2. Empirical Literature and Hypotheses

This paper is related to the following strands of the literature. First, it is related to studies that examine the relationship between housing demand and labor market conditions. Baffoe-Bonnie (1998) analyzed the dynamic effects of macroeconomic variables on housing stock and prices at both national and regional levels in the US over the period between 1973:01 and 1994:04. Based on the impulse response functions estimated through a VAR model, he found a negative association between housing prices and housing demand and a positive relation between unemployment rate and demand for housing at both national level and regional levels. Sari et al. (2007) analyzed the relationship between housing market dynamics and macroeconomic activity for the period between 1960 and 2000 with a VAR model by employing time series of house construction permits for private use, interest rates, prices, output, money supply, and employment in Turkey. According to their estimation results, the shocks to interest rates, output, and prices had a significant impact on housing demand. Moreover, they showed that the changes in the money supply had a more pronounced effect than the employment on housing investment. Dotti Sani and Acciai (2017) found that lower employment

security decreases the probability of being a homeowner in six European countries by using multinomial logistic regression. Gan et al. (2018) developed a search and matching model to investigate the impact of the unemployment rate on the housing market in Texas city by using data from 1990, 2000, and 2010. They found that an increase in the unemployment rate led to a decrease in sales in housing market. Akdoğan et al. (2019) investigated the relationship between employment protection and housing demand by estimating a panel regression with data for 23 countries over the period between 1990 and 2016. They found a positive relationship between job security and demand for housing. Akkay (2021) analyzed the long-run relationship between nominal GDP, employment level, exchange rate, housing interest rate, and housing prices over the period between 2010 and 2020 in Turkey by estimating an ARDL model. He also applied the Granger Causality testing procedure to reveal the direction of causalities between variables. The findings suggested that there was a negative relation between housing prices and interest rates. Appreciation of exchange rate and an increase in the level of employment had an increasing impact on housing prices. Causality test results showed that all explanatory variables except for the nominal GDP Granger Cause housing prices.

Second, this paper is also related to studies that analyze the impact of income on housing demand. Holly and Jones (1997) found that the real income was the most important factor at work in explaining the housing prices in the UK over the period between 1939 and 1994. They also showed that the higher income had positive impact on housing demand. Lebe and Akbaş (2014) showed that the per capita income, marital status, and industrialization affect housing demand positively in Turkey for the period between 1970 and 2011 based on the results of an estimated VECM. On the other hand, house prices, interest rate, and agricultural employment have negative effects on housing demand in the same period. Additionally, they found that income was the main determinant of the demand in the housing market in Turkey. Regarding the direction of causality, there was a one-way causality running from per capita income, interest rate, and industrialization to demand for housing. Solak and Kabadayı (2016) examined the housing demand over the period between 1964 and 2014 in Turkey by estimating an ARDL model. In their model, they used total square meters of houses sold to measure housing demand as the dependent variable. As explanatory variables, they employed real house prices, income level, and population. They found that income significantly affected the demand for housing and there was a positive relationship between real house prices and demand for housing. Halıcıoğlu (2017) conducted an autoregressive distributed lag model (ARDL) to investigate the impact of income on housing demand in Turkey over the period between 1964 and 2004. He found that income has a significant impact on housing demand. Ceritoglu (2020) estimated permanent income elasticity, price elasticity, and interest elasticity of housing demand by using microdata from the Household Budget Survey (HBS) released by TURKSTAT from 2003 to 2016. They suggested that only the permanent income elasticity of housing demand was statistically significant. Moreover, their estimation results revealed that income was the main determinant of housing demand in Turkey.

Based on the studies conducted, it is revealed that the possibility of individuals purchasing a house is likely to be related to their employment status. Individuals who are guaranteed to be employed have more advantageous positions compared to individuals who have low employment security or who are unemployed. While the financial intermediaries evaluating the creditworthiness of potential borrowers, job-secured individuals appear to be more reliable. In other words, employed individuals have lower credit risk than individuals with low employment security or unemployed. Thus, these individuals are assumed to have low credit default risk.

Regarding the above discussion and literature review, this paper tests the following hypotheses:

Hypothesis 1: There is a long-term relationship between the probability of buying a house, the industrial production index, and the unemployment rate in Turkey.

Hypothesis 2a: There is a positive relationship between the probability of buying a house and the industrial production index.

Hypothesis 2b: There is a negative relationship between the probability of buying a house and the unemployment rate.

2. The Housing Market Developments and Economic Conditions in Turkey

Starting in the 1950s, industrialization in big cities in Turkey required an increasing demand for labor and there was a population migration from villages to cities. The growing population increased the demand for housing, which became a problem especially after the 1980s. During that time, the developers in the private sector played a primary role in meeting the housing supply while the central government had a passive role (Sarıoğlu Erdoğdu, 2010: 96). Early in 2000s, the government started take an active role on supply side in the housing market and introduced several incentives to households to have them to buy their own housing. Although there has been an increase in the housing supply since the 2000s, buying a house has continued to be a fundamental problem, especially for low-income people. The instability in the financial markets and real economy, the level of economic activity, labor market conditions, the overvaluation of lands, and

the appreciation in housing prices can be counted as main indicators of housing demand in Turkey (Alkay and Övenç 2019: 260).

This paragraph presents some recent developments in housing markets in Turkey. In 2019, total housing sales in Turkey were around 1,340 million. The number of first-hand sales was around 511 thousand, while the second-hand sales were around 837 thousand, according to statistics released by the General Directorate of Land Registry and Cadaster. 330 thousand sales are financed by loans. According to Turkish Bank Association, the total housing credit volume was around 188 (199) billion TL in 2018 (2019). The tenure status of households, whose income is below the median income by 60%, has been changed in recent years. According to the income and living conditions survey, the share of the owner (tenant) decreased (increased) to 52% (30%) in 2019, whereas the share was 59% (23%) in 2013. According to a report released in 2019 by the association of Real Estate and Real Estate Investment Companies (GYODER), the share of the construction sector in GDP realized its lowest value by 5.4% in 2019. The industrial production index in Turkey recorded its worst performance in the third quarter of 2018 after the global financial crisis. The yearly unemployment rate increased dramatically from September 2018 to September 2019 by 21%.

3. Empirical Analysis

3.1. Data, Sample, and Variable Construction

In this study, we use monthly data over the period between 2010:M1 and 2019:M12. We consider the probability of buying a house[3] (prob) as the dependent variable and industrial production index (ipi) and unemployment rate (unemp) as explanatory variables[4]. Table 1 presents the construction of variables with their data sources.

Table 1. Variable Construction and Data Source

Variables	Construction	Source
prob	First difference of monthly probability of buying a house, in percent	TURKSTAT
ipi	First difference of logarithm of monthly industrial production index, in percent	CBRT
unemp	First difference of monthly unemployment rate, in percent	CBRT

The data on the probability of buying a house (an indicator of housing demand) used in this study as target variable is publicly available data set, which is obtained through a consumer tendency survey applied to 4884 households with monthly frequency by TURKSTAT (URL 3; URL 4).

When we look at the time series of the probability of buying a house as displayed in Figure 1, we observe a decreasing trend. While the probability of purchasing a house, on average, was around 10% between the period 2012 and 2014, it was approximately 6.5% in recent years. Financial, economic, and political uncertainties can be counted as the possible reasons behind this decreasing trend in the probability of buying a house.

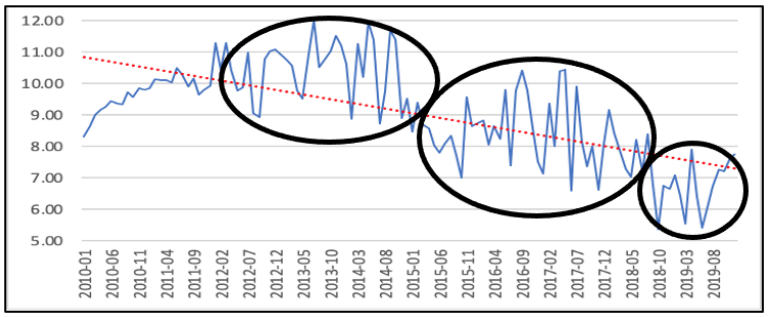

Figure 1. Time Series of Probability of Buying a House in Turkey
Source: TURKSTAT

[3] Time series of probability of buying a house have been released since 2012. The correlation between probability of buying a house and consumer confidence index is around 80% between 2012 and 2020. Thus, we extend the series of probability of buying a house back to 2010 by relying on the strong correlation between these two series.

[4] Although housing prices are assumed to be one of the most important determinant of housing demand, the correlation coefficient between these two variables over the span covered in this paper is very low. Therefore, we do not consider housing prices in our analyses. See Table A2.

3.2 Methodology

Our estimation technique in this study is a vector error correction model (VECM). The advantages of using VECM are as follows: 1) it deals with the problems of variables from being nonstationary and endogeneity, 2) the estimation results of the model provide information about both the short and long-term interactions of the variables.

To investigate the relationship between variables, we estimate the following models:

Cointegration Equation:

$$z_{t-1} = y_{t-1} - \beta_0 - \sum_{i=1}^{k} \beta_i x_{i,t-1} \quad (1)$$

VECM:

$$\Delta y_t = \beta_0 + \sum_{i=1}^{n} \beta_i \Delta y_{t-i} + \sum_{i=0}^{n} \gamma_i \Delta x_{t-i} + \varphi z_{t-1} + \mu_t \quad (2)$$

In the first step, we use Augmented Dickey-Fuller (ADF) and Kwiatkowski, Philips, Schmidt, and Shin (KPSS) unit root tests to check the stationarity of the time series of the variables. In the second step, we determine the lag length of the model. We conduct the Johansen (1991) cointegration test to check whether there is a long-term relationship between the dependent and explanatory variables. In the third step, we estimate a VECM if the variables were I (1), and cointegration among variables was confirmed by the Johansen test. Once the VECM is estimated, the long-term causality relationship is examined via interpretation of the error correction term. Short-term causality is analyzed through the Wald test, which is applied to the short-term coefficients.

4. Empirical Results

Several statistical tests are used to check for the stationarity of the times series. Among others, the ADF unit root test is for the null hypothesis that a time series is I (1), whereas the KPSS unit root test is for the time series is assumed to be I (0) under the null hypothesis. The decision rule for the ADF test is to reject the null hypothesis that there is a unit root in the time series if the associated p-value of the test statistic is less than 0.05. The decision rule for the KPSS test is to reject the null hypothesis of the time series is stationary if the computed LM test statistic is greater than the critical value.

An explanation deserves attention at this point. We observe seasonality in the time series of ipi and unemp. Therefore, a decomposition is required for these variables before conducting a unit root test. As a seasonal adjustment method, we use Seasonal, and Trend Decomposition using LOESS regression (STL) and decompose these series into seasonal, trend, and remainder components.

Panel A in Table 2 displays the results of the ADF unit root test. While conducting the ADF test, the lag length selection was carried out using Schwarz Information Criterion (SIC) As suggested by the ADF test results, we fail to reject the null hypothesis of a unit root in all the series at their levels. Therefore, we test for a unit root in the first difference and reject the null hypothesis of a unit root in the first-differenced series. We conclude that the variables are stationary at the first difference, I (1). Panel B in the same table exhibits the results of the KPSS unit root test. Since the computed LM statistics for the time series at their level are greater than the critical value at 0.05, we reject the null hypothesis of the time series are stationary. So, we reconduct the KPSS unit root test with the first differences of the time series and conclude that all series are first difference stationary. Thus, the prerequisite for the cointegration test is provided.

Table 2. Unit Root Test Results

Panel A: ADF

Variables	Probability		Order
	Level	1st Difference	
prob	0.74	0.00	I(1)
ipi	0.97	0.00	I(1)
unemp	0.56	0.00	I(1)

Panel B: KPSS

Variables	LM test statistic		Order
	Level	1st Difference	
prob	0.90	0.19	I(1)
ipi	0.95	0.36	I(1)
unemp	0.68	0.41	I(1)

*Critical Value at 5% is 0.46 for the decision in the KPSS test.

Table 3 displays the suggested lag length offered by various information criteria. To stick with the parsimony principle, we select the lag length offered by the SIC. Therefore, our model is constructed with two lags.

Table 3. Suggested Lag Lengths

Lag	LogL	LR	FPE	AIC	SIC	HQ
1	-13.14	448.83	3.15e-4	0.44	0.74	0.56
2	30.62	82.06	1.69e-4	-0.17	0.33*	0.03*
3	41.3	19.46	1.64e-4*	-0.2*	0.52	0.09
4	44.39	5.45	1.83e-4	-0.09	0.85	0.28
5	54.39	17.15	1.8e-4	-0.11	1.05	0.35
6	60.35	9.89	1.91e-4	-0.06	1.32	0.5
7	71.72	18.26*	1.8e-4	-0.1	1.49	0.54
8	76.04	6.7	2.02e-4	-0.01	1.8	0.72

Selected lag length from each information criterion is shown by an asterisk.

Since the variables are I(1), the VAR-based cointegration test can be carried out by the methodology developed by Johansen. There are two cointegrating tests for the VECM context, the trace test, and the maximum eigenvalue test. The null hypothesis for the trace test is that there are r cointegrating vectors against the alternative of n cointegrating relations, where n is the number of variables. On the other hand, the null hypothesis for the maximum eigenvalue test is that there are r cointegrating vectors against the alternative of r+1 cointegrating relations.

Table 4 displays the results of the Johansen cointegration test. According to the two types of test statistics, we reject the null and conclude a cointegrating relation among variables. This result suggests that Hypothesis 1 holds.

Table 4. Johansen Cointegration Test Results

Trace				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	%5 Critical Value	Prob.**
r=0*	0.17	36.53	29.70	0.00
r≤1	0.11	14.29	15.49	0.07
r≤2	3.7e-4	0.04	3.84	0.83

Trace test indicates no cointegration at the 0.05 level
*Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis p-values

Maximum Eigenvalue				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	%5 Critical Value	Prob.**
r=0*	0.17	22.24	21.13	0.03
r≤1	0.11	14.24	14.26	0.05
r≤2	3.7e-4	0.04	3.84	0.83

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
*Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis p-values

The stationarity and cointegration test results suggest that a VECM[5] can be established and estimated. The estimation of a VECM has two steps. First, the cointegrating relation is estimated. Second, error correction terms are constructed from the first step. Table 5 displays the cointegrating relation, which is obtained from the estimation of Equation (1). Table 6 presents estimation results of Equation (2), which is a VAR model in first differences, including the error correction term.

According to Table 5, the cointegration equation is as follows:

$$z_{t-1} = prob_{t-1} - 37.01 - 3.55ipi_{t-1} + 1.1unemp_{t-1} \quad (3)$$

Setting $z_{t-1}= 0$ yields us the relation between dependent and independent variables as in the following fashion:

$$prob_{t-1} = 37.01 + 3.55ipi_{t-1} - 1.1unemp_{t-1} \quad (4)$$

[5] Residual diagnostics test results are available in the Appendix.

Table 5. Estimation Results of Cointegration Equation

Coefficients	z_{t-1}
$prob_{t-1}$	1.00
ipi_{t-1}	3.55 (3.48) [1.02]
$unemp_{t-1}$	1.1* (0.29) [3.8]
constant	-37.01

() standard errors
[] t-statistics
*Statistical significance

According to Eq. (4) and Table 5, there is a positive but statistically insignificant relationship between the probability of buying a house and the industrial production index, which is a proxy for income. On the other hand, the relationship between the probability of buying a house and unemployment is negative and statistically significant. According to these two results, Hypothesis 2a and 2b hold.

Moreover, the impulse response functions displayed in Figure 2 support the direction of relations between the dependent variable and independent variables. The response of probability of buying a house when there is a shock to the industrial production index (unemployment rate) is blue (orange). When the unemployment rate increases, the probability of buying a house decrease, as shown in Figure 2.

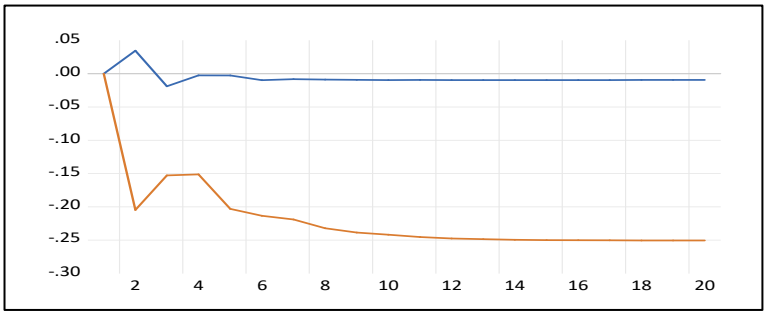

Figure 2. Impulse Response Functions

According to Table 6, the VECM can be written as below:

$$\Delta prob_t = -0.24z_{t-1} - 0.37\Delta prob_{t-1} - 0.23\Delta prob_{t-2} - 1.69\Delta ipi_{t-1} - 0.09\Delta ipi_{t-2} - 0.61\Delta unemp_{t-1} + 0.36\Delta unemp_{t-2} - 0.01 + \mu_t \quad (5)$$

The error correction term (φ=-0.24) has a negative sign between 0 and -1, as expected. It is also statistically significant. The interpretation of the error correction term is as follows: the deviation from the long-run equilibrium is corrected towards the equilibrium in each period by 24%.

We can also test for the short-term causality. From Table 6, when we consider short-term coefficients with their statistical significance levels, we find that none of our independent variable grangers causes the probability of buying a house as suggested by the Wald constraint test.

Table 6. Estimation Results of VECM

Coefficients	Δprob	Δipi	Δunemp
EC	-0.24* (0.09) [-2.7]	0.08 (0.0) [1.7]	-0.06* (0.02) [-2.93]
Δprob_{t-1}	-0.37* (0.1) [-3.54]	-0.0 (0.0) [-1.27]	0.05* (0.02) [2.26]
Δprob_{t-2}	-0.23* (0.09) [-2.4]	-0.01* (0.0) [-2.2]	0.03 (0.02) [1.47]
Δipi_{t-1}	1.69 (1.78) [0.94]	-0.9* (0.09) [-9.6]	-1.03* (0.41) [-2.45]
Δipi_{t-2}	-0.09 (1.76) [-0.05]	-0.3* (0.09) [-3.31]	-0.02 (0.41) [-0.05]
$\Delta unemp_{t-1}$	-0.6 (0.4) [-1.5]	-0.07* (0.02) [-3.8]	0.47 (0.09) [-0.07]
$\Delta unemp_{t-2}$	0.36 (0.38) [0.9]	0.02 (0.02) [1.27]	-0.00 (0.09) [-0.07]
Constant	-0.01 (0.09) [-0.12]	-0.0 (0.0) [-1.31]	0.0 (0.02) [0.11]
$\overline{R}^2$	0.26	0.57	0.32
F-statistics	6.96	23.17	8.87
() standard errors [] t-statistics *Statistical significance			

Conclusion

The dual role of housing as a consumption and an investment good highlight its increasing socio-economic status in the economy. Changes in social and economic conditions in daily life have significant impact on housing market. Migration, urbanization, industrialization, demographic changes in the population, financialization, developments in the financial system, and economic activity can be counted as factors that have impact in shaping the demand for housing.

This study investigates the relationship between housing demand (measured by the probability of buying a house), income (measured by economic activity), and unemployment rate in Turkey over the period between 2010:M1 and 2019:M12. To do so, we conduct a cointegration analysis and estimate a vector error correction model (VECM). According to cointegration analysis, we find that there is a long-run relation among the variables. The VECM estimation results suggest that there is a positive relation between the probability of buying a house and economic activity. However, this result is statistically insignificant. One plausible explanation of this result may be the fact that the housing demand is sensitive to financing conditions. Self-funding may not be sufficient to buy a new house, but housing loans could support it financially. On the other hand, we find that the demand for housing has a negative relationship with unemployment rate in the economy. This negative relation is statistically significant. The higher (lower) the unemployment rate, the lower (higher) the likelihood of buying a new house is. The employment situation affects the borrowing ability of the household. There is a positive relationship between employment security and housing credit. The financial intermediaries consider the employment situation of the borrower while determining the creditworthiness. Moreover, deviation from the long-run equilibrium corrected by 24% within a month. The speed of adjustment indicates that the total correction requires approximately four months.

In line with the literature, this paper reveals that macroeconomic factors have impact on housing demand. Our finding on the relationship between unemployment rate and demand for housing is consistent with the findings of Gan et al. (2018), Akdoğan et al. (2019), and Akkay (2021). Additionally, findings in previous studies including Halıcıoğlu (2017) and Ceritoğlu (2020) support our finding on the positive relationship between income and demand for housing.

Demand for housing is highly dependent on employment and funding opportunities. Therefore, policymakers should consider labor market enhancing policies at first. Once the labor market conditions improve, the creditworthiness of potential home buyers would be affected positively. Thus, housing demand gets stronger.

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Appendix

We examine residual diagnostics, including serial correlation and heteroskedasticity. The results are displayed in Table A1. Diagnostics show that the residuals do not suffer from serial correlation and heteroscedasticity.

Table A1. Results of Serial Correlation and Heteroscedasticity Tests

Test	H_0	Prob.	Decision
Breusch-Godfrey LM	No serial correlation	0.13	Fail to reject H_0
Breusch-Pagan-Godfrey	Equal variance	0.54	Fail to reject H_0

Table A2. Correlation Table

Variables	prob	ipi	unemp	hpi
prob	1			
ipi	0.66	1		
unemp	-0.64	-0.74	1	
hpi	-0.27	-0.10	0.11	1

Residuals are normally distributed as suggested by Jarque-Bera normality test results displayed on Figure A1.

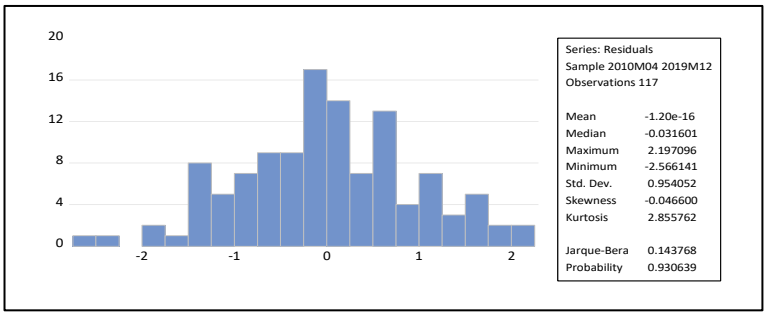

Figure A1. Normality Histogram

The stability in the equation during the sample period is confirmed by the CUSUM test as shown by Figure A2.

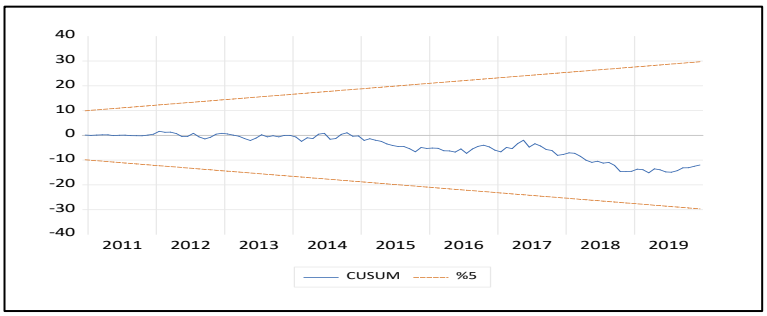

Figure A2. Result of the CUSUM Parameter Stability Test