Macroeconomic Shocks and Housing Market in Turkey: SVAR Approach[1]

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Abstract: *After the recent financial turmoil, housing market has become a discussing issue around world. In this paper, it is investigated relationship between macroeconomic shocks and house market dynamics in Turkey over period 2005M12 to 2016 M06.To apply the study, we have used consumer price index, industrial production index, interest rate, money supply and real exchange rate variables in the terms of representing macroeconomic shocks, on the other hand, building prices and number of buildings variableshave been used for house markets by utilizing SVAR (Structural Vector Autoregression) Model. The results show that macroeconomic shocks have little effect on the housing market, and these findings are supported by results of previous studies.*
Key Words:*Macroeconomic Shocks, Housing, Structural Var,*
JelClassification:*E52, C32*

I. Introduction

After the recent 2008-2009 financial crises aroused from mortgage turmoil, housing markets has become an issue that discussing around world. During these periods, collapsing in the mortgage system were considered as the main triggering factor of crises that happened around world. The idea that states developments in house market affect business cycles has become common among academic researches. From this viewpoint, many studies have been conducted to investigatedevelopments in housing market and its effects on economy. For example, Leamer (2007) carried out a study that examined links between recessions and house market collapsing.

According to results of his study, except for 2003 recession, all recessions have a significant relationship with house market collapsing. In another study, Fairchild et.al (2015) stated that all housing market affected by aggregate variables such as monetary policy and national income.

In the housing market that recently has gained importance, supply and demand have followed rather volatile way in Turkey. Housing demand increased between 1990s and 2000s years and as of 2001 banking crises this demand considerably decreased. During the economic recovery process, house demanding has increased in accordance with optimistic economical atmosphere. With the new regulations that made by government and low housing costs contribute to increase value of housing market in turkey. In the terms of developing countries, housing market is not affected by external circumstances in Turkey.

From this viewpoint, in our study we strive to determine how a sudden development in main macroeconomic indicators affect housing market in Turkey. To conduct this study, we have used SVAR (Structural VAR) approach. The findings of our study show that developments in the main macroeconomic indicators have small effects on housing market.

II. Methodology

The foundation of VAR models based on simultaneous equation model, where there are many endogenous variables in the model at the same time. In the estimating simultaneous equations system using broad macroeconomic models, each of structural equations should estimate separately and estimations should be made by gathering equations. These type models make estimate difficult because of including many restrictions. Sims (1980) assumed all variables which used in the model as endogenous in his study. In this way, Sims resolved difficulties that encountered in predicting simultaneous equation systems and he lay foundations of VAR models. VAR models are easily predictable and flexible models for time series analysis.Since all the

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variables are accepted endogenous without the distinguishing variables as endogenous or exogenouswhile VAR model constructing, assumptions that put forwarded by economic theory is not considered. As it is difficult to create the constraint matrix in reduced VAR models in accordance with preliminary information from the economic theory, interpretation of estimates becomes difficult. Moreover, the changes in the results depending on the ordering of the variables in the modelhas become an important issue for VAR models. Sims and Bernanke (1986) developed Structural VAR method and thus they struggle to suppress adverse consequences of the VAR model's prediction. In the SVAR model, the restrictions based on the theory of economics can impose on the system contrary to VAR model.

VAR can be written as following:

$$Y_t = AY_{t-1} + \ldots\ldots + A_p Y_{t-p} + \psi D_t + \mu_t \quad (1)$$

In equation (1), p is optimal lag for VAR model, Y is endogenous variable nx1 matrix and $\mu_t$is residuals matrix. By abstracting Dt that states deterministic variable we can write SVAR model;

$$Y_t = AY_{t-1} + \ldots\ldots + A_p Y_{t-p} + B\mathcal{E}_t \quad (2)$$

In the equation (2), while matrix A uses to model instantaneous relationships, matrix B includes structural parameters of model. Ɛt is nx1 residuals matrix.

2.1 Data
In this study, we have used monthly consumer price index, interest rate, industrial production index, real exchange rate, money supplynumber of buildings and price of buildings data that obtained from Central Bank of Turkey. These data range from 2005:12 to 2016:06. Number of buildings and buildings price data that formed construction permits and includes public, private and construction cooperatives represent house market dynamics. The consumer price index, industrial production index and money supply variable seasonally adjusted.

HPRICE: Value of Buildings (TL)
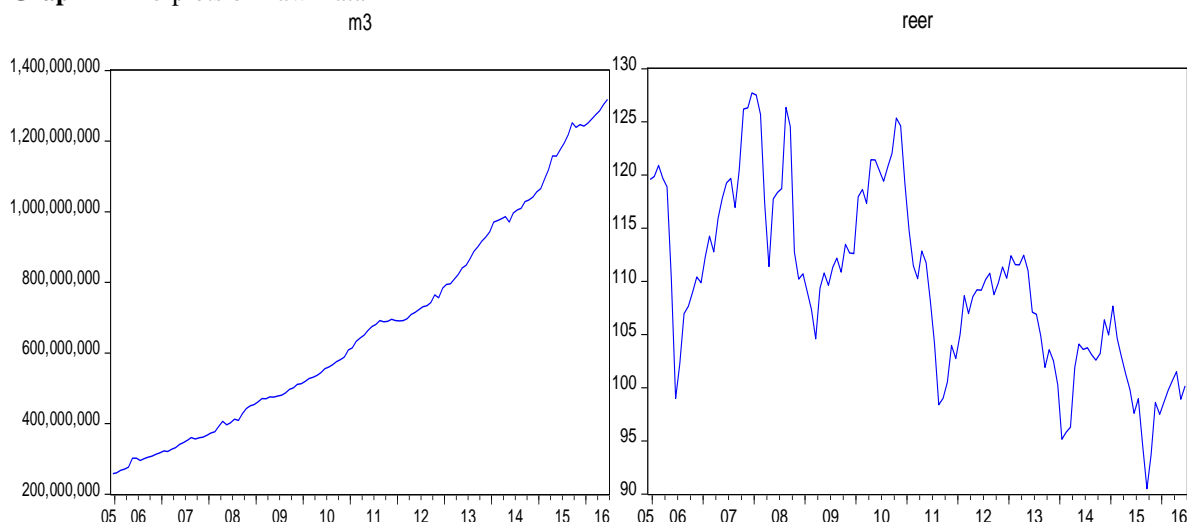CPI: Consumer Price Index
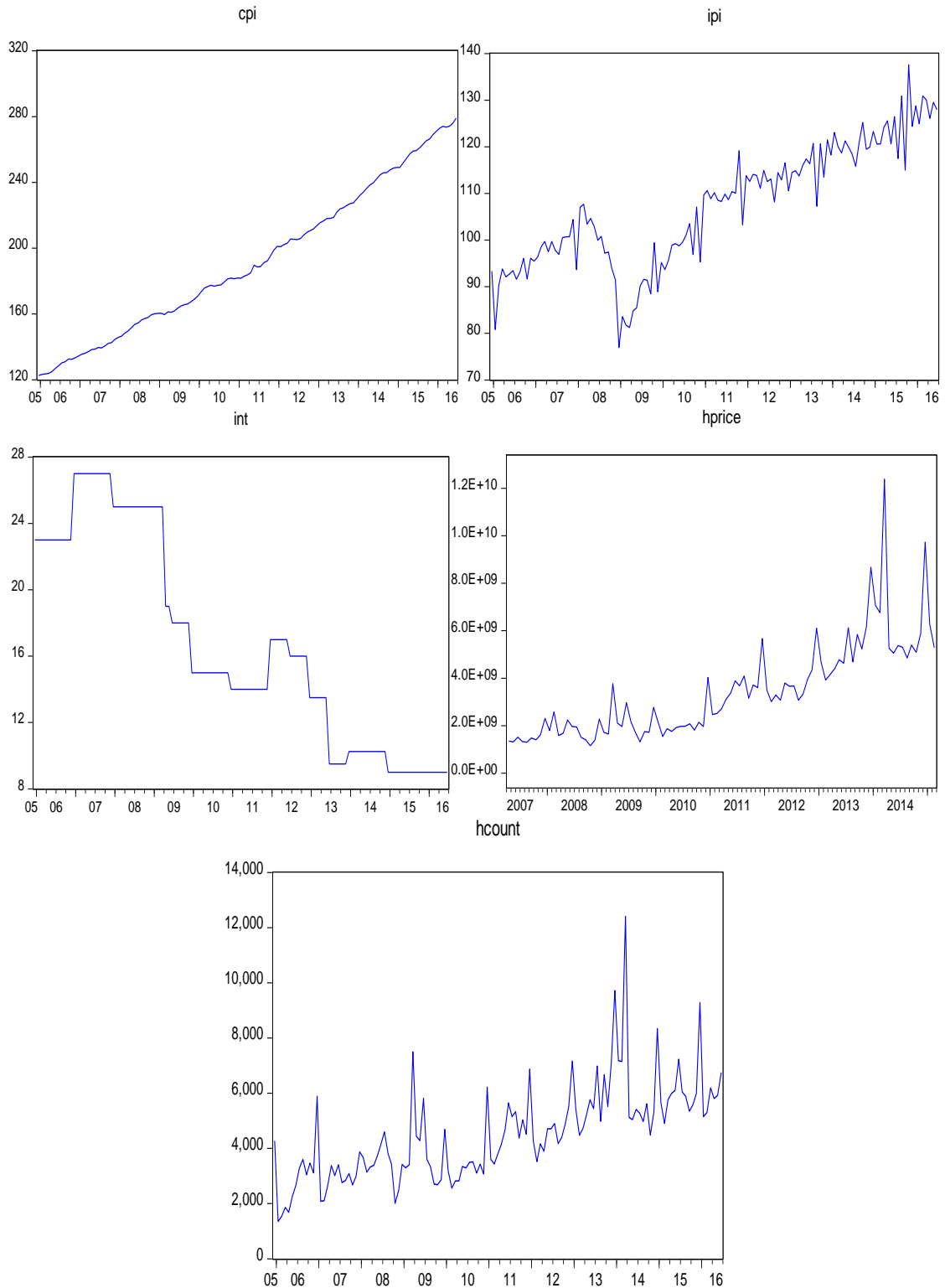IPI: Industrial Price Index
M3: Money Supply
HCOUNT: Number of Buildings
INT: Interest Rate
REER: Real Exchange Rate

Graph-1 Line-plots of Raw Data

As seen from graphs, all variables have linear trend, we have used to determine whether these series are stationary or not. To test stationary, ADF (Augmented Dickey Fuller) and Philip PP (Philip Perron) unit testes have been applied.

| Variable	**ADF**	**PP**	**ADF**	**PP**
Series in Level			Series in First Difference	
CPI	-0.674006	-0.584049	-9.500076***	-10.04653***
HPRICE	-1.217646	-2.567024	-13.81400***	-80.55248***
HCOUNT	-2.624271	-0.864514	-13.70269***	-47.44606***
INT	-2.266895	-2.326966	-11.22531***	-11.22531***
IPI	-2.440884	-1.836439	-26.84043***	-29.22490***
M3	-0.158260	-0.153810	-11.66343***	-11.66209***
REER	-2.710086	-3.215761	-8.684860***	-8.610172***

Table – 1 Unit Root Test Results

Note: ADF and PP denote the Augmented Dickey-Fuller unit root test and the Phillips-Perron unit root test respectively. When determining appropriate lag length for ADF test, Schwarz information criteria has been used and also Newey-West Bandwidth criteria has been used to select appropriate bandwidth for PP*** indicates that series are stationary at level 1%, 5% and 10%.

In order to apply SVAR analysis, all variables should be stationary. To determine stationary level of series, we have used ADF and PP unit root testes. According to test results, all variables have unit root at the level, though they are stationary at the first difference. Since all variables have unit root at the level, we have used these variables at the first difference.

III. Empirical Results
Graph -2 Impulse-Response Graph
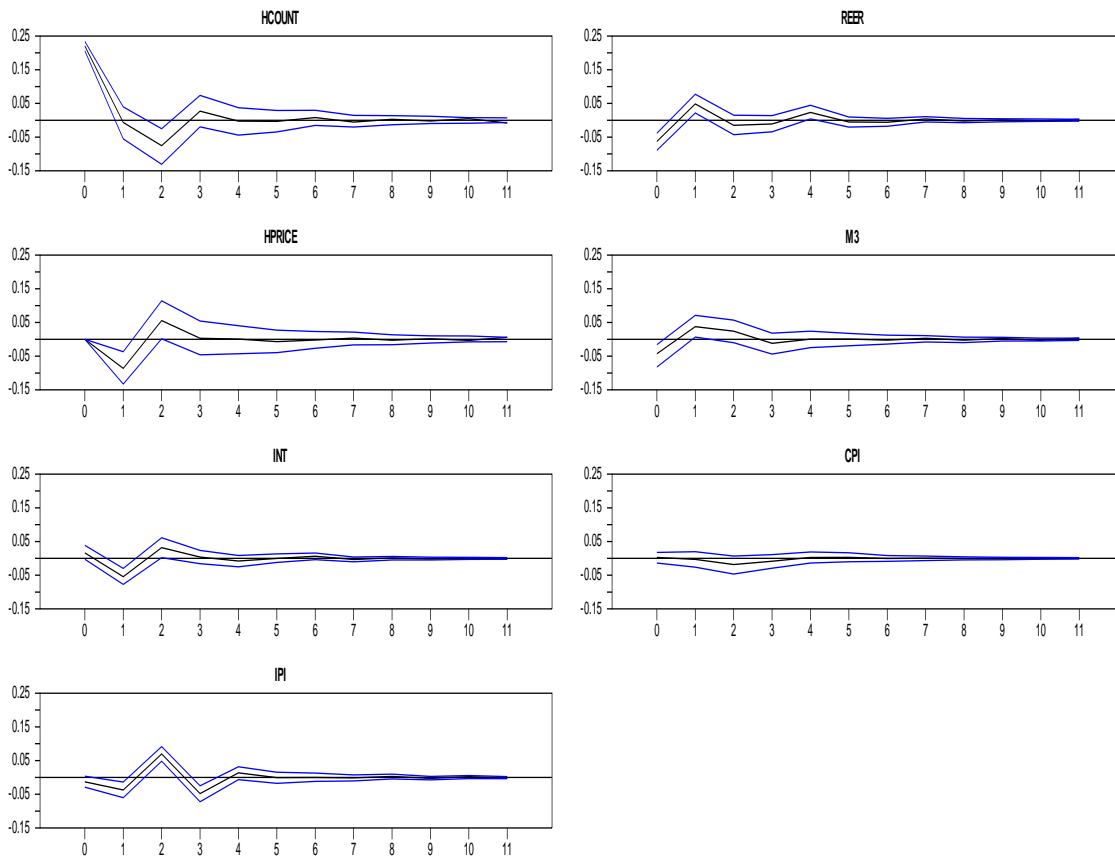
Responses of HCOUNT
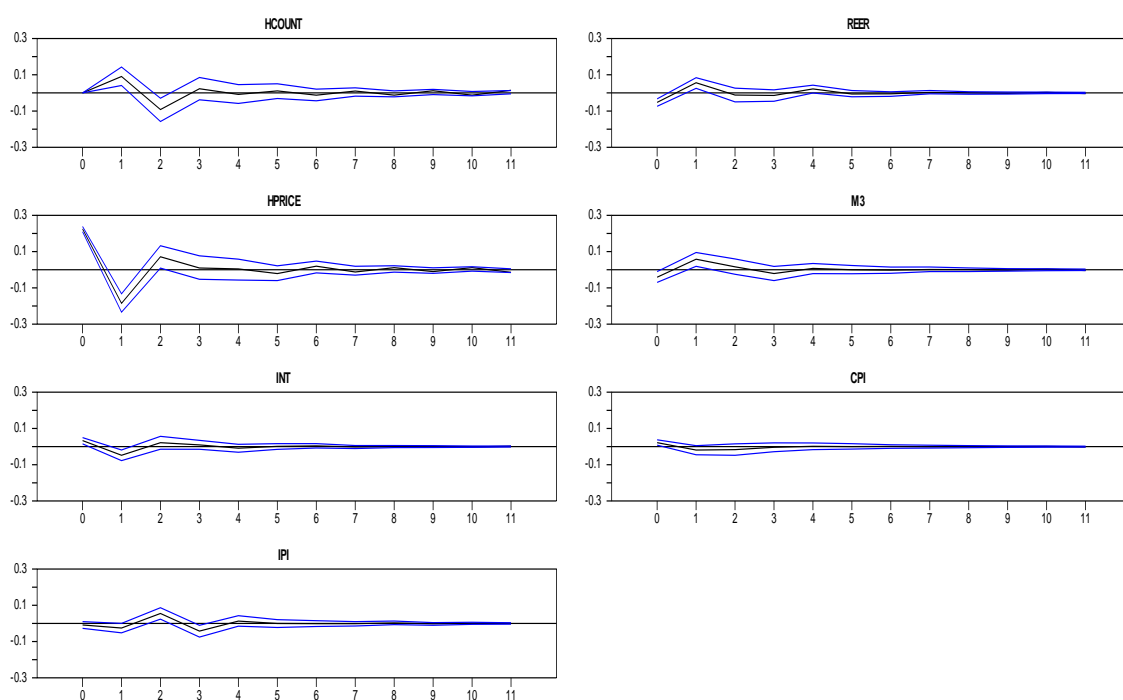
Responses of HPRICE

These impulse-response graph show response of number of buildings and value of building against shocks that came from consumer price index, industrial price index, money supply, real exchange rate and interest rate. From the value of buildings (HPRICE), initially interest rate has rather small short-term positive effecton value of buildings and over time this effect is turning negative. The real exchange rate has negative effect on value of buildings about one period. Also, consumer price index has positive effect on value of buildings. In the terms of number of buildings, as seen from graph, real exchange rate has negative effect on number of buildings about one period. Industrial production has positive effect on number of buildings.

IV. Conclusion

In this study, it is investigated relationship between macroeconomic shocks and house market dynamics by using SVAR method over the period 2005:12 to 2016:06. In order to make this analysis firstly unit root testes have been conducted. According to unit root test results, all variables have unit-root at the level that's why we have used them at the first difference. From the SVAR analysis results, real exchange rate has negative effects on both number of buildings and value of buildings. These results may arise from demand changes in response to appreciation of domestic money. Generally, all variables have fairly short duration effects on house market dynamics. Industrial production has positive effects on both number of buildings and value of buildings. The reason of this result may be requirements for new buildings in accordance with increasing production.

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