

## **A CRITICAL REVIEW ON THE EFFECT OF HOUSING INDUSTRY TO THE GLOBAL FINANCIAL CRISIS: THE CASE OF TURKEY**

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### **Abstract**

*The overall aim of the research presented is to investigate the relationship between the macroeconomic factors linked with financial crises and housing industry in Turkey. The research includes empirical investigation in a regression based model using mostly the Turkish market data. The ability of public intervention, indicated by central bank reserves and corporate bankruptcies are statistically effective in the performance of housing market. There is weak statistical dependence of housing on financial crisis. The research is based on Turkish market data between the period 2002-2009. The research can be extended with global market data especially from the emerging market for a comparative study. Research in this field should focus more to industry dynamics rather than macroeconomic variables explaining crisis to explore housing sector dynamics. The real estate managers should look to central bank reserves and corporate bankruptcies more closely as a macroeconomic variable affecting housing industry. The effect of macroeconomic variables in the period of financial volatility is limited in the housing market, whereas industry factors should be analyzed. Central bank reserves and corporate bankruptcies are important indicators of housing industry growth that can be used as an instrument. To the author's knowledge, the paper is the first study to investigate the link between financial crisis and housing market in Turkey.*

**Key Words:** *Housing Market, Financial Crisis, Asset Bubble*

**JEL Classification:** GO1

### **1. INTRODUCTION**

This paper provides an empirical approach in estimating the relation between the housing industry and macroeconomic variables that are investigated in literature as linked to financial crisis. By doing this the paper analyzes the connection between the financial crisis and housing industry in Turkey. Housing industry has been criticized to having caused the global financial crisis. Macroeconomic data mostly from the Turkish local market as well as housing industry statistics have been used in explaining this phenomenon. The main findings of this paper are the central bank reserves as an indicator of financial crisis are the only factors in this paper that can be associated with housing industry growth and there is a weak dependence of housing industry on macroeconomic variables.

The remainder of the paper is organized as follows. Section 2 is the literature review. Section 3 includes the definition of the methodology used. Section 4 explains the data and the preliminary tests for the analysis. Section 5 consists of estimation and results. Finally section 6 covers the conclusion chapter.

## 2. LITERATURE REVIEW

Aizenman and Jinjark (2009) have explored current account patterns and national real estate markets. According to them, financial liberalization had a major role in current account deficits by increasing capital inflows in the emerging economies. This process ended following the global financial crisis. They argue that income of capital has raised economic booms and real estate was one of them. The writers also argue that the real estate volatility risk is higher in the emerging economies since developed economies can borrow in their currencies. (Aizenman,2009:81)

Bunda and Zorzi (2009) argue that commonalities can be found in financial crisis, although explaining the crisis is a dynamic process since there are new factors in every crisis. The authors consider presence of large liquidity, increased access to World capital markets and loan originations may lead to finance of inefficient activities as in the case of large housing boom. The authors consider large loan stock to GDP ratios especially in the central and south Eastern Europe as it is 15% in Estonia, 21% in Lithuania, and 25% in Bulgaria and Latvia. (Bunda,2009:13)

## 3. METHODOLOGY

The variables are collected from the mostly from Turkish market details of which will be described in the next section. Two variables are dependent variables explaining housing industry of Turkey, and 8 variables are independent variables which are macroeconomic factors explaining financial crisis. Pearson correlations among the variables will be first obtained to explore the relations among variables.

Pearson correlation measures the strength and direction of the linear relationship between two variables under both variable (variables  $Y_m$  and  $Y_{est}$ ) are interval or ratio variables and are well approximated by a normal distribution, and their joint distribution is bivariate normal where  $Y_{m-i}$  is the value of the measured inhibitory activity for compound  $i$  ( $i = 1, 2..$ )  $Y_m$  is the average of the measured inhibitory activity,  $Y_{est-i}$  is the value of the estimated inhibitory activity for compound  $i$ , and  $Y_{est}$  is the average of the estimated inhibitory activity. (Bolboaca,2006:185)

$$r_{Prs} = \frac{\sum (Y_{m-i} - Y_m)(Y_{est-i} - Y_{est})}{\sqrt{\sum (Y_{m-i} - Y_m)^2 \sum (Y_{est-i} - Y_{est})^2}}$$

The data will then be tested for non stationary by the Augmented Dicky Fuller test. Let  $x$  be a time series. Deriving from an AR(k) representation, the ADF test has the following regression where  $d$  is the difference operator,  $u_t$  is a white noise innovation. The test examines the negativity of alpha based on its regression t ratio. Dicky and Fuller (1979) derived the asymptotic description of the statistic. Hall (1984) showed that the asymptotic distribution is unaffected by the data based model selection using standard information criteria.(Cheung,1995:277)

$$D_{x_t} = \mu + y_t + \alpha X_{t-1} + \sum B_j D X_{t-j} + u_t$$

The variables will then be checked for Johansen's cointegration analysis. Theory of cointegration has been developed by Engle and Granger (1987), Stock (1987). The test of cointegration includes residual of a regression model:  $Y = \alpha + \beta X + ut$  By using Dickey-Fuller test, variable X and Y in equation will be known whether it is random walk or not.

Finally multiple linear regression model will be used. In a linear model representing the variation in a dependent variable Y as a linear function of several explanatory variables, interaction between two explanatory variables X and W can be represented by their product: that is, by the variable created by multiplying them together. Algebraically such a model is represented by Equation :  $Y = a + b_1X + b_2 W + b_3 XW + e$  . When X and W are category systems, Eq. describes a two-way analysis of variance (AOV) model; when X and W are (quasi-) continuous variables, Eq. describes a multiple linear regression (MLR) model.

#### 4. DATA DESCRIPTION

The data is obtained mostly from the Turkish Central Bank Database. The data is monthly for the period January 2002 and June 2009. The data includes 2 dependent variables and 8 independent variables. The dependent variables are certificate of building permits and certificate of occupancy. For a building, to function as a dwelling; it has to obtain these certificates in Turkey issued by the municipalities. The certificate of building permit is considered as a factor that signals positive expectations for the industry as it would require investments in the near future. The certificate of occupancy on the other hand is a sign of real demand since people are expected to move in this house in the near future.

There are 8 independent variables of the model. The independent variables are Central bank reserves, corporate bankruptcies, CPI, current account, foreclosure, gold, ISE volume, and overnight interest rates.

Before the regression analysis Pearson correlations were checked between the variables in Table 1. There is 83 % correlation between central bank reserves and certificate of building permit, 95% correlation with central bank reserves and gold, 81% between certificate of building permit and certificate of occupancy, and 88 % between certificate of occupancy and gold.

**Table 1: Pearson Correlations among variables**

	CENTRAL ...	CERTIFICA...	CERTIFICA...	CORPORA...	CPI_DMO...	CURRENT...	FORECLO...	GOLD_O...	ISE TRAD...	OVERNIG...
CENTRAL ...	1.000000	0.833040	0.833241	0.459072	-0.379878	-0.708257	-0.105242	0.947768	0.786459	-0.739509
CERTIFICA...	0.833040	1.000000	0.814347	0.324965	-0.391128	-0.721828	-0.287760	0.757387	0.676385	-0.732454
CERTIFICA...	0.833241	0.814347	1.000000	0.385167	-0.302222	-0.603489	0.100119	0.880869	0.623789	-0.603614
CORPORA...	0.459072	0.324965	0.385167	1.000000	-0.220596	-0.194105	0.022526	0.430687	0.391962	-0.375145
CPI_DMO...	-0.379878	-0.391128	-0.302222	-0.220596	1.000000	0.290253	0.203134	-0.343171	-0.330846	0.541611
CURRENT...	-0.708257	-0.721828	-0.603489	-0.194105	0.290253	1.000000	0.383211	-0.634097	-0.588352	0.585076
FORECLO...	-0.105242	-0.287760	0.100119	0.022526	0.203134	0.383211	1.000000	0.095366	-0.226956	0.483905
GOLD_O...	0.947768	0.757387	0.880869	0.430687	-0.343171	-0.634097	0.095366	1.000000	0.732001	-0.684094
ISE_TRAD...	0.786459	0.676385	0.623789	0.391962	-0.330846	-0.588352	-0.226956	0.732001	1.000000	-0.765954
OVERNIG...	-0.739509	-0.732454	-0.603614	-0.375145	0.541611	0.585076	0.483905	-0.684094	-0.765954	1.000000

The variables are tested for stationary in Table 2 Augmented Dicky Fuller Analysis. The number of lags is determined based on Schwarz Information Criterion. As is seen in the table central bank

reserves, certificate of building permit, and certificate of occupancy foreclosure and gold have test statistics greater than 5% critical value. We cannot reject null of non stationary for these variables. These variables are non stationary and will be differenced in the regression. On the other hand corporate bankruptcy, CPI, current account, ISE volume and overnight interest rates are stationary variables.

**Table 2: Augmented Dicky Fuller Results**

Variable	Lag	t-Stat	Critical Value
CB Reserves	5,00	-1,35	-2,90
Building Permit	5,00	-1,35	-2,90
Occupancy	2,00	-1,06	-2,89
Bankruptcy	0,00	-8,41	-2,89
CPI	0,00	-6,60	-2,89
Current Account	0,00	-3,20	-2,89
Foreclosure	3,00	-1,75	-2,89
Gold	0,00	0,01	-2,89
ISE	0,00	-3,06	-2,89
Overnight	1,00	-3,27	-2,89

Johansen's cointegration test is also applied for the data. According the trace statistics there are 7 cointegration equations as at most 7 hypothesis can not be rejected seeing trace value is lower than 5% critical value. The results are summarized in Table 3.

**Table 3: Cointegration Test Results**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.626522	368.4837	239.2354	0.0000
At most 1	0.608332	282.7978	197.3709	0.0000
At most 2	0.459211	201.2492	159.5297	0.0000
At most 3	0.385066	147.7680	125.6154	0.0011
At most 4	0.291520	105.4651	95.75366	0.0091
At most 5	0.270354	75.48193	69.81889	0.0164
At most 6	0.189996	48.05991	47.85613	0.0478
At most 7	0.149726	29.72760	29.79707	0.0509
At most 8	0.096168	15.61654	15.49471	0.0479
At most 9	0.075395	6.819807	3.841466	0.0090

Trace test indicates 7 cointegrating eqn(s) at the 0.05 level

## 5. ESTIMATION AND RESULTS

The variables are tested in multiple regression. The dependent variable of the first model is certificate of building permit. The independent variables are corporate bankruptcy, CPI, current account, foreclosure, gold, interest rate, ISE volume, and central bank reserves. The regression formula and coefficients are given below and in Table 5. According to the results, corporate bankruptcy and central bank reserves are statistically significant in explaining certificate of building permit.

$$D(\text{Certificate of Building Permit}) = c + b_1 * \text{Corporate Bankruptcy} + b_2 * \text{CPI} + b_3 * \text{Current Account} + b_4 * D(\text{Foreclosure}) + b_5 * D(\text{Gold}) + b_6 * \text{Interest Rate} + b_7 * \text{ISE Volume} + b_8 * D(\text{Central Bank Reserves})$$

Where c is a constant and b's are the loadings

**Table 4: Regression Results of Model 1**

Dependent Variable: D(Certificate of Building Per)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.39E+08	5.93E+08	0.402904	0.6881
Corporate Bankruptcy	-63.35249	29.84487	-2.122726	0.0369
CPI	-8.15E+09	1.28E+10	-0.637019	0.5259
Current Account	-136748.9	83764.19	-1.632546	0.1065
D(Foreclosure)	-384.7133	664.6976	-0.578779	0.5644
D(Gold)	2518486.	3458295.	0.728245	0.4686
Interest Rate	1470121.	13970032	0.105234	0.9165
ISE Volume	-0.007158	0.015670	-0.456817	0.6490
D(Central Bank Reserves)	-156793.7	60946.02	-2.572665	0.0119
R-squared	0.162539	Mean dependent var		30100586
Adjusted R-squared	0.078793	S.D. dependent var		9.58E+08
S.E. of regression	9.19E+08	Akaike info criterion		44.21205
Sum squared resid	6.76E+19	Schwarz criterion		44.46371
Log likelihood	-1958.436	F-statistic		1.940855
Durbin-Watson stat	2.789878	Prob(F-statistic)		0.065049

The dependent variable of the second model is certificate of occupancy. The independent variables are corporate bankruptcy, CPI, current account, foreclosure, gold, interest rate, ISE volume, and central bank reserves. The regression formula and coefficients are given below and in Table 6. According to the results, central bank reserves is statistically significant in explaining certificate of occupancy.

$$D(\text{Certificate of Occupancy}) = c + b_1 * \text{Corporate Bankruptcy} + b_2 * \text{CPI} + b_3 * \text{Current Account} + b_4 * D(\text{Foreclosure}) + b_5 * D(\text{Gold}) + b_6 * \text{Interest Rate} + b_7 * \text{ISE Volume} + b_8 * D(\text{Central Bank Reserves})$$

Where c is a constant and b's are the loadings

**Table 5: Regression Results of Model 2**

Dependent Variable: D(Certificate of Occupancy)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.95E+08	3.82E+08	0.511281	0.6106
Corporate Bankruptcy	-31.59691	19.22726	-1.643339	0.1042
CPI	2.84E+08	8.24E+09	0.034440	0.9726
Current Account	-71014.35	53964.24	-1.315952	0.1919
D(Foreclosure)	-206.9682	428.2247	-0.483317	0.6302
D(Gold)	1369825.	2227972.	0.614831	0.5404
Interest Rate	-2599272.	9000053.	-0.288806	0.7735
ISE Volume	-0.004785	0.010095	-0.474015	0.6368
D(CentralBank Reserves)	-91404.09	39263.86	-2.327944	0.0224
R-squared	0.122667	Mean dependent var		28264918
Adjusted R-squared	0.034934	S.D. dependent var		6.03E+08
S.E. of regression	5.92E+08	Akaike info criterion		43.33268
Sum squared resid	2.81E+19	Schwarz criterion		43.58434
Log likelihood	-1919.304	F-statistic		1.398179
Durbin-Watson stat	2.951651	Prob(F-statistic)		0.210118

## 6. CONCLUSION

Real estate sector in Turkey has a dominant role in output growth and employment in Turkey. Specifically in the field of housing, there is a high demand due to new marriages, urban transformation, and earthquake resistant residences whereas the supply is low. The government company, TOKI provides affordable housing whereas the private companies build for higher income class however the supply is not adequate.

Construction sector, particularly housing has long been criticized for having caused global financial crisis. This paper provides an empirical approach in order to determine the role of housing industry in causing the macroeconomic determinants often linked with financial crisis in literature. The findings point out that management of central bank reserves has an important role in housing sector growth. Corporate bankruptcies that decreases the economic wealth, and wealth of shareholders that can invest in housing is also a factor that affects housing. The macroeconomic

factors explaining crisis has low relation with housing industry because of high demand and sector dynamics in Turkey. Building permits have more explanatory factors of crisis than occupancy because it is more of a sign of future economic expectation rather than real demand.

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