

UNDERSTANDING REAL ESTATE BUBBLES:
AN ANALYSIS OF THE RECENT TRENDS
IN THE TURKISH HOUSING MARKET

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF ECONOMICS

JULY 2015

Approval of the Graduate School of Social Sciences

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ABSTRACT

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July 2015, 106 pages

The main aim of this thesis is to determine whether there is a real estate bubble in Turkey recently, where the house prices are increasing rapidly. In order to do this, the thesis tries to define the bubble concept, by reviewing literature. The common view among economists is that bubbles are deviation of prices from their fundamentals which is associated with sudden increases in prices. We usually witness harsh economic crises after the bursts of bubbles in economies and this constitutes the source of the motivation of this thesis. After examining several earlier examples and some common symptoms of real estate bubbles, the thesis documents the Turkish housing market indicators in order to be informed about the current state. Afterwards some econometric methods are performed. Using a 10 years long dataset (2005-2014), this is among the first comprehensive studies on housing bubble for Turkey. Even though the exposure of the real estate market on the financial sector is lower in Turkey compared to advanced countries, housing loans are significantly increasing. The results suggest that Turkish housing sector is quite active especially after 2012 and some symptoms of earlier examples match with the current situation. Therefore the year 2012 can be argued as the beginning of the current boom and it will be convenient to call it bubble if this trend continues for several years.

Keywords: Housing Bubble, Real Estate Markets, Economic Crises, Turkish Economy

ÖZ

KONUT BALONLARINI ANLAMAK: TÜRKİYE KONUT PİYASASINDAKİ YAKIN GELİŞMELERİN BİR ANALİZİ

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Temmuz 2015, 106 sayfa

Bu tezin temel amacı konut fiyatlarının hızla artmakta olduğu Türkiye’de bir konut balonu olup olmadığını tartışmaktır. Bunun için tezde öncelikle balon kavramı literatür yardımıyla ortaya konmaya çalışılmaktadır. Ekonomistler arasındaki yaygın görüşe göre balonlar fiyatların onları oluşturması beklenen temellerinden ayrılması ve ani yükselişleridir. Ekonomilerde genellikle balonların patlamasını ekonomik krizler takip etmektedir ve bu, bu tezin motivasyonunu oluşturmaktadır. Önceki çeşitli örneklerin ve bazı ortak belirtilerin incelenmesinden sonra tezde güncel durum hakkında bilgi edinmek için Türkiye konut piyasası göstergeleri ortaya konmaktadır. Sonrasında bazı ekonometrik metodlar uygulanmaktadır. 10 yıllık bir veri setinin kullanıldığı bu çalışma (2005-2014), Türkiye için konut balonu adına yapılan ilk kapsamlı çalışmalardan biridir. Türkiye’de konut sektörünün finansal sistem üzerindeki ağırlığı her ne kadar gelişmiş ülkelere kıyasla düşük görünse de, konut kredileri hızla artmaktadır. Sonuçlara göre Türkiye konut sektöründe özellikle 2012’den sonra hızlı bir artış olduğu görülmekte ve bazı göstergeler eski örneklerle eşleşmektedir. Bu nedenle 2012 son dönemdeki yükselişin başlangıç yılı olarak görülebilir ve bir kaç yıl daha devam ederse bu yükseliş trendine balon demek uygun olacaktır.

Anahtar Kelimeler: Konut Balonu, Gayrimenkul Piyasaları, Ekonomik Krizler, Türkiye Ekonomisi

To the Memory of My Grandfather

ACKNOWLEDGEMENTS

Before beginning this thesis, I wanted to work on a topic that is real and up-to-date. Therefore, I firstly would like to thank my supervisor Assist. Prof. Dr. Hasan Cömert for providing this opportunity to me. I think I benefited from his guidance, inspiration and approach to economics and I hope that his endless motivation always continues.

Since the topic I picked is an up-to-date one, I had the opportunity to make discussions with many people which was quite useful for me. Besides various valuable friends and teachers, I especially would like to thank my thesis committee, Assoc. Prof. Dr. Işıl Erol, Assoc. Prof. Dr. Ebru Voyvoda, Assist. Prof. Dr. Ozan Ekşi and Assist. Prof. Dr. İlhan Can Özen for their quite constructive and optimistic criticisms. I also would like to express my sincere thanks to Pelin for her interest, understanding and useful helps during several times although she was in a very intense period.

I would like to thank Orhan Vatandaş from REIDIN for his quick replies and encouragements.

My family was always with me in each point of my life. I would like to thank them for their encouragements and understanding.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributive Lag
ARM	Adjustable-Rate Mortgage
BDDK	Banking Regulation and Supervision Agency
BIST	Borsa Istanbul
BSADF	Backwards Sup Augmented Dickey Fuller
CPI	Consumer Price Index
DGE	Dynamic General Equilibrium
ECB	European Central Bank
ESP	Spain
FED	Federal Reserve System
FRM	Fixed Rate Mortgage
GDP	Gross Domestic Product
GNP	Gross National Product
GSADF	Generalized Sup Augmented Dickey Fuller
GSE	Government Sponsored Entities
GYODER	The Assoc. of Real Estate and Real Estate Inv. Companies
HQC	Hannan-Quinn Information Criterion
IMF	International Money Fund
IRL	Ireland
JPN	Japan
KPSS	Kwiatkowski–Phillips–Schmidt–Shin
LPPL	Log-Periodic Power Law
LTV	Loan to Value
MBS	Mortgage Backed Security
NACCA	National Aboriginal Capital Corporation Association

OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PLS	Private Label Securities
REIDIN	Real Estate Investment and Development Information Network
REIT	Real Estate Investment Trust
S&P	Standard and Poors
SADF	Sup Augmented Dickey Fuller
SIC	Schwarz Information Criterion
TCMB	Central Bank of the Republic of Turkey
TL	Turkish Lira
TOKI	Housing Development Administration of Turkey
TUIK	Turkish Statistical Institute
TUR	Turkey
UK	United Kingdom
US	United States
VAR	Vector Autoregression
VECM	Vector Error Correction Model

CHAPTER 1

INTRODUCTION

Recently the increase in the real estate prices is evident in emerging markets. This draws attentions of many economists and institutions since there is a doubt of the so called “bubble”. Many earlier examples show that asset prices can be harmful for the overall economy if they perform deviations and generate misinterpretations. It can be noticed that in most of the recent crises the real estate prices increase and then decrease. The upswing phase of this trend is called as “boom” and the fall phase is called as “bust”. The earlier examples suggest that this cycle can lead to harmful consequences in economies. A recent example is the 2008 financial crisis, where the burst of the real estate bubble in the US created an incredible financial distress in almost everywhere in the globe, whose effects couldn’t be completely removed even until now. Recently, many economists refocus on exploring why these prices increase or decrease by considering the linkages between real estate markets, financial markets and the overall economy.

The main aim of this thesis is to find out whether there is a real estate bubble in Turkey recently and if there is, how dangerous can it be for the economy. We try to clarify whether the recent surge in the house prices is a supply side or a demand side phenomenon, by examining the Turkish real estate supply and demand characteristics in the period 2005-2015. First of all, there are some important questions that should be asked. We should consider that almost each economic variable and price possesses a cyclical property. In other words prices always increase and decrease. Then the following questions arise: What is a bubble? Why and in which cases we prefer to call the price increases as bubble and how can we diversify it from the general cyclical process? Are high increases in house prices the only indicator of bubble or can there be other bubbles that are equally riskful, such as supply or credit bubbles? We try to answer some of these questions in this thesis.

As known, the notion bubble has negative connotations, which implies that the current prices are not sustainable. The phenomena cannot be explained only by the general price increases and decreases. If this type of trend is likely to create negative consequences in the overall economy, then it would be more meaningful to call this trend as bubble, rather than boom. Therefore it makes more sense for this study to search for the exposure of the real estate market in the general economy and we should clarify why it is important to discuss probable decrease in house prices.

Accordingly, we find it appropriate to understand what the real estate bubble really means first, by reviewing the literature. Therefore, before analyzing the Turkish real estate market, this thesis summarizes the importance of housing sector in an economy and discusses the main arguments over real estate bubble. Some crisis events are also examined from the real estate market perspective. We believe that examining the role of real estate markets during the economic upswings and downturns will widen our understanding about the linkage between real estate market and the rest of the economy. Hence, we will also have the opportunity to compare those activities with the recent Turkish case. Comparison is important since some economists argue that there can not be a bubble in Turkey. Firstly, they argue that in the earlier examples of foreign countries', bubbles were fueled mostly by the speculation motive whose role according to them must be quite low in Turkey. Secondly, some economists argue that since Turkish financial system is quite narrow compared to other big economies, it is not possible for Turkey to face any financial crisis related with the real estate sector. These explanations may be both correct and both wrong, since Turkey is getting used to the mortgage system which strengthen the linkage between real estate and financial sector. Each year the share of the number of houses sold by mortgage loans are increasing¹. At the same time, it shouldn't be forgotten that speculation can fulfill itself by the unrealistic optimism formed in the households. It is also important to note that the vital factor behind the

¹ For instance, more than half of the house sales are done by mortgages after 2013, according to TUIK.

recent growth in the Turkish economy is no doubt the construction sector and its linkages in creating wealth and employment.

We chose to investigate real estate bubble for this thesis since the real estate prices have been significantly increasing recently in Turkey according the various sources². Figure 1 shows the recent price increase. Additionally, it is possible to find news or articles about this issue almost each day recently. The question whether this increase is natural or indicates a bubble had better be clarified. We try to make it by a comprehensive approach and in an analytic way.

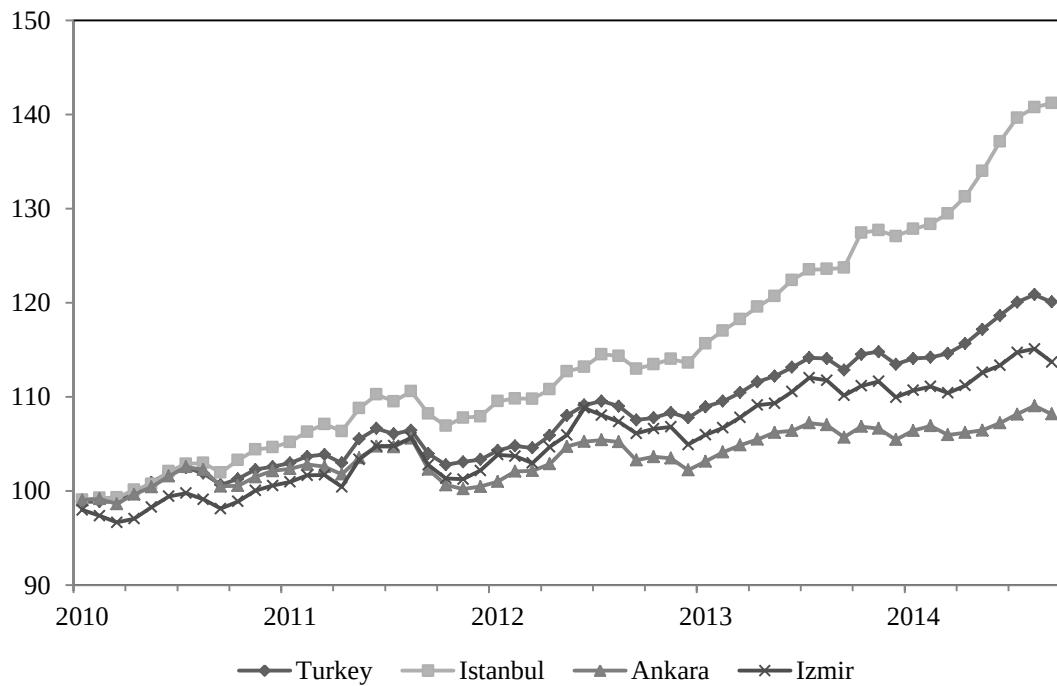


Figure 1. House Price Index for Turkey, Istanbul, Ankara and Izmir divided by CPI. (2010=100) Source: TCMB

To achieve this goal, this thesis evaluates the indicators of housing bubbles and some appropriate econometric methods used in detecting and forecasting. Each study on bubbles follows its own path and there is not a unique perspective of understanding the concept of bubble. At the same time, even though the general pattern in each

² Some of these sources are IMF, Knight Frank, TCMB and REIDIN.

bubble example is similar, each case has its own characteristics. Therefore, this thesis tries to touch upon the most relevant issues and point out the most important factors in its own way. More importantly, we acknowledge that some of the interior sections of this thesis can be candidate topics for other theses however, even though we focus on the “bubbles” and “real estate markets” it is necessary to mention some of them. Our aim is to determine the smart approaches of understanding bubbles and to give an intuition to others that analyze the real estate market in Turkey, rather than saying there is absolutely a bubble or there is not.

Even though local and international media mentions this topic very frequently, the concept of bubble hasn't been investigated directly or comprehensively in the academic literature for Turkey. To the best of our knowledge, the first attempt comes from Binay and Salman (2008) for Turkey using the data of Ankara, which suggests that it is hard to argue that there is a bubble in Turkish real estate market by investigating the period 2000-2005. In their analysis, Binay and Salman (2008) compare Turkey's and other countries' price-to-income and price-to-rent ratios³ and suggest that Turkey seems to be in a much better shape. Büyükduman (2012) makes a quite comprehensive study directly related with the topic. Examining a 25 years long data set of İstanbul's three big districts, the study also argues that the indicators do not imply a bubble in the Turkish real estate market. Another relevant study conducted by Erol (2015) again argues that there is not a bubble in Turkey in between 2007 and 2012. She suggests that the increase in housing prices are sufficiently supported by the fundamental factors and the magnitude of the increase in prices are quite low compared to bubble cases of Spain and US. Coskun (2010, 2013) further analyzes the Turkish real estate and mortgage markets and indicates that even though both of them are developing, when compared to US, Turkey has a quite smaller primary and secondary mortgage markets which makes Turkey less prone to crises related to real estate and securities.

³ These are the commonly used indicators of housing market performance whose details are discussed in Chapter 3.

The lack of academic research for Turkey is obviously due to the inadequacy of comprehensive data, especially in terms of long period time series and province based data⁴, and since the fact that it is quite difficult to define a bubble in the housing market. Therefore, the main contribution of this thesis is handling this important topic in a comprehensive way by making comparisons, interpretations and applying some econometric methodologies for Turkey. Even though the general dataset used in this thesis has similarities with previous studies, the period we use is from 2005 to 2015, which is the longest duration ever used in the studies that focused on house price dynamics for Turkey. To the best of our knowledge, this is among the first studies that interpret a Vector Error Correction Model (VECM) to understand the dynamics of the Turkish housing sector. At the same time, this is the first study that applies the Generalized Sup ADF (GSADF) test for the longest Turkish real estate data, developed by Phillips et al. (2012) in order to detect bubbles.

If we summarize our findings, we first find that recently Turkish construction sector is very active relative to the past. Especially after 2012, we can say that the increase in the house prices may be faster than the fundamental factors suggest. Additionally, the most important point for the recent case is the level of housing loans which is at record high. Since this experience is the first time for Turkey, it is not easy to foresee the results of a sudden decline in the house prices in the near future. Our data suggests that the possible beginning time of the recent boom is probably 2012 and prices have been increasing since then. Still, it seems early to call the recent trend as bubble for now, but if this trend continues for several years the discussions on bubble would be more meaningful.

This thesis is organized as follows. The next chapter examines the importance of housing markets in economies and examines some crisis events from the real estate market perspective. This chapter also represents the views on “bubble” in markets, documents the indicators of bubble and how can a bubble be detected in the real

⁴ TCMB started to publish a comprehensive house price index for Turkey officially but it's period is quite limited to be used in an analysis, which starts from 2010.

estate market. The third chapter documents the recent trends in the Turkish housing sector by examining the supply side and demand side characteristics. The expectations are also examined in this chapter and the exposure of the real estate market in the real economy is summarized. In the fourth chapter we try to examine whether bubble in house prices can be inferred from some econometric methods by applying some regressions and bubble tests. The fifth and the final chapter will provide some concluding remarks including a discussion about possible impacts of a sudden housing price decline in Turkey.

CHAPTER 2

WHAT IS A REAL ESTATE BUBBLE AND HOW CAN IT BE DETECTED?

According to some scholars, detecting a bubble in real estate prices is not an easy task and almost impossible until it bursts. However there are some indicators and methods that may indicate symptoms. This chapter attempts to introduce the bubble concept, evaluates the general views on the term “bubble” related with real estate and explains the commonly and recently used indicators and methods of detecting it.

2.1. Importance of Housing in Economies

To understand the importance of the real estate sector, we should define the linkages between housing and the macroeconomy. Real estate markets play an important role in most of the economies. In fact, private and public constructions constitute a good portion of GDP in almost every country. In economic terms, housing sector contributes to the aggregate demand through residential investments. More importantly, housing usually constitutes the biggest asset class in economies. The vital point here is the multiplier effect, which can be summarized by two points. Firstly, owning a house means a created wealth and security for the individual who is then able to spend more income and invest more in the economy. Secondly, housing transactions inevitably stimulate many other sectors in the economy too such as construction industries, furniture companies, real estate agencies and bankers. Combining these together, it is not hard to imagine how important the housing is in an economy in terms of creating wealth and employment. (NACCA, 2005) Accordingly, in the recent financial crisis of 2008, most of the OECD countries faced reductions in wealth, consumption and residential investment after the huge declines in house prices.

After the 1980s, the neoliberal trends and innovation of new financial products also affected the housing sector all over the world. In addition to sharp declines in interest

rates, financial deregulations such as increases in maximum loan-to-value ratios (or decreases in down payments when using loans) increased the availability of funds for buying houses. Especially relatively poorer and younger households started to become house owners. The increased demand due to eased credit conditions inevitably increased the house prices both in nominal and real terms. Another issue generated by these deregulations is the increased house price volatilities which endangers the macroeconomic stability. Besides, without sufficient banking supervision and prudential mechanisms it is seen that the portion of non-performing loans can become very high which is another threat for macroeconomic health. As a result, the importance of housing should not be underestimated by the policymakers; while it has the ability to create growth, employment and wealth in the economy, it also has the capability of dragging the economy down substantially (OECD, 2011).

Some studies investigated the relationship between housing and economic cycles. Janssen (2009) investigated the relationship between housing and business cycles and states that after the 2008 housing crisis of United States other countries experienced the same downturn and consequences in their economies. The study argues that when a developed country faces a housing crisis, this inevitably spreads to other countries through international transmission mechanisms. At the same time, it is argued that the most severe complications of housing crises are seen approximately 2 years after the peak and output gap does not revise until about 5 years. Aizenman and Jinjark (2008) study with 43 countries' data and show that there is a positive relationship between current account deficit and real house prices between 1990 and 2005. They argue that capital inflows can affect the real estate prices through several channels such as by directly increasing housing demand, increasing domestic wealth through appreciation of domestic assets and reducing interest rates. In addition, Punzi (2013) builds a realistic two sector two country model whose outcome is a large current account deficit under housing market boom together with low savings rate and a construction investment boom.

Furthermore, house prices changes also have wealth and collateral effect in the economy. Miller et al. (2011) argue that the housing creates both wealth and collateral effects in the economy. According to this study, wealth effect refers to the changes in desired consumption and the collateral effect refers to the changes in the actual consumption and they both affect the real economy through different channels.

2.2. The Dynamics of the Real Estate Market

DiPasquale and Wheaton (1996) develops a model in order to understand the dynamics of the real estate market. It is useful to understand how the real estate market is affected by the changes in the macroeconomy in a theoretical way. This well-known model is called as the four quadrant model and the implications from here are important in understanding the behaviors of the real estate market which we will discuss in the next sections. The graph of the model is as Figure 2.

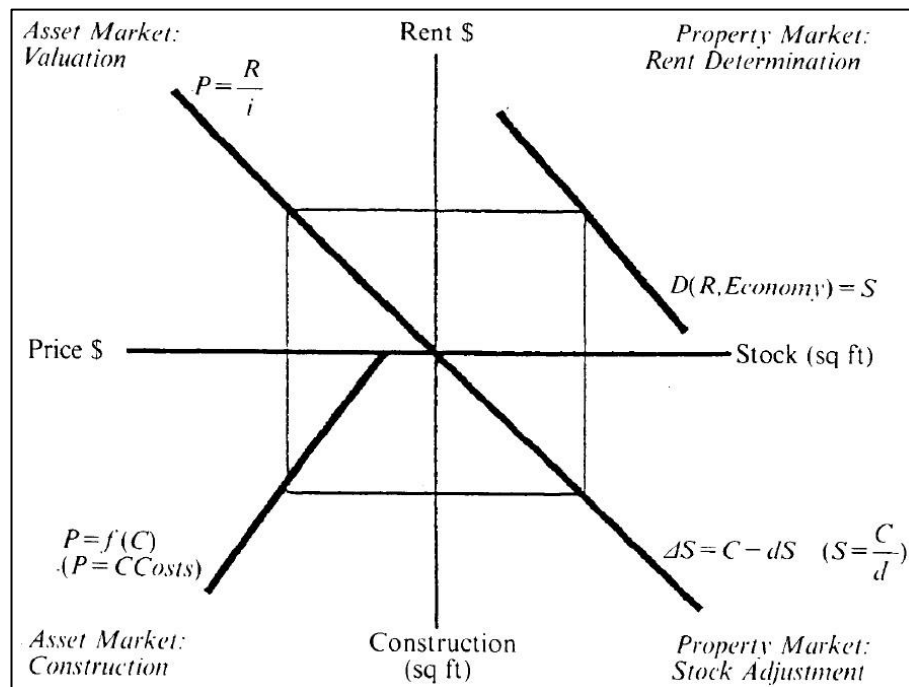


Figure 2. The four-quadrant model of real estate. Source: DiPasquale and Wheaton, 1992.

In this concept, markets are divided into two: One is the property market which is shown by the eastern quadrants and represents the real estate use and space. The other one is the asset market which is shown by the western quadrants and represents the real estate ownership.

The interpretation of the model begins from the northeast quadrant. The curve in this quadrant represents how the demand for space depends on rents given the stock. An economic growth shifts this curve upward, meaning that more space is demanded for the same rent. In the equilibrium demand is equal to supply and it is assumed that demand is a function of rents and economic conditions: $D(R, Economy) = S$. After the determination of the rent the price is determined in the northwest quadrant using the capitalization rate i , or rent-to-price ratio. Hence the price is determined by the equation $P = \frac{R}{i}$.

The southwest quadrant is the quadrant where the creation of new assets is determined. The $f(C)$ curve here represents the replacement cost of real estate. Taking the price from the northwest quadrant, the vertical axis gives the level of new constructions where replacement costs are equal to asset prices. Hence it is assumed that new constructions occur at level C where asset price is equal to replacement costs; $P = f(C)$.

In the southeast quadrant, the stock of real estate space is determined. The assumption here is that, the changes in the stocks are equal to new constructions minus depreciation rate or removals; $\Delta S = C - \delta S$. On the line, where the level of stocks are equal to the constructions, the stock of space is constant over time, meaning that $\Delta S = 0$. Hence $S = \frac{C}{\delta}$. This is the interpretation of the 360 degree rotation around the four quadrant diagram in order to understand how the real estate market works. Here are two examples of how the real estate market behaves according to this model under two different exogenous shocks.

Economic growth: An economic growth shifts the curve in the northeast quadrant upwards. For a given level of stock, rents rise since there is a greater demand. A higher level of rents results in higher level of prices in the northwest quadrant which also increases the amount of new constructions in the southwest quadrant. Therefore stocks increase according to southeast quadrant.

Reductions in long-term interest rate: A reduction in the capitalization rate increases asset prices in the northwest quadrant which results in an increase in constructions in the southwest quadrant. From the southeast quadrant the stocks increase and hence rents decrease from the northeast quadrant.

2.3. What is a Bubble and How Can It Be Detected?

Even though there is not a clear definition of the real estate bubble, the most accepted one is the deviation of the house prices from fundamentals that is associated with unusual high prices which lasts for a long period of time. The fear behind the bubble is obviously the likelihood of its burst, which is able to generate aggravated consequences not only in the real estate market but also in the financial markets and in the overall economy through transmission mechanisms. A clear definition of bubble was made by Case and Shiller (2003), who define the real estate bubble as the increasing real estate prices that is supported by the expectations of the public of future increases rather than fundamentals⁵. Mayer (2011) underlines the two common definitions of bubble. First, bubbles can be detected if house prices are quite volatile over the cycle, raising more than its fundamentals suggest in the boom phase, and falling faster than the fundamentals suggest in the bust phase. Secondly, in bubble phases house prices grow incredibly, such as increase by %20 or %30 each year for two or three years and falls at the same rate for two or three years can be observed. Mayer (2011) argues that this second definition fits for the some states in the US, Canada and Japan examples. Moreover, by summarizing the historical examples,

⁵ Fundamentals here represent the main determinants such as personal income, mortgage rates, housing costs and similar factors that affect housing prices.

Kindleberger and Aliber (2005) rigourously emphasize that bubbles always explode, because they follow an unsustainable pattern.

Interestingly, there is not a clear judgement over the bubble concept in the economic literature. Thornton (2009) documents the three general points of view on bubbles. According to this study, the dominant view among public and modern mainstream economics including the Chicago school and the proponents of the supply-side economics is denying the existence of bubbles. Supporters of this view believe that there is nothing as bubble and each result come up through real factors. Second view argues that bubbles occur because of psychological factors. The supporters of this are usually Keynesians and proponents of Behavioral Finance. Another view supports that bubbles are generated through manipulations of monetary policy and its effects on real and psychological factors. Moreover, Levitin and Wachter (2012) state that demand-side theories support that bubbles are caused by increases in the consumer demand for housing while supply-side theories advocate that bubbles are caused by the increases in the supply of housing finance. It is also important that if housing supply is inelastic (elastic), then house prices are influenced more (less) to the changes in housing demand.

In addition, the forms of bubbles can be characterized as momentum, explosive and intrinsic. Momentum investor behavior is driven by price alone as agents buy after price increases and sell after price decreases. In this behavior, people expect a further increase (decrease) when prices increase (decrease). This type of bubble constitutes evidence for irrational behavior in the market however the other two suggests evidence of rationality. Explosive rational bubbles occur when prices deviate from fundamentals and continuously diverge due to extraneous factors to asset value. Intrinsic rational bubbles, however, are generated due to completely exogenous

factors and the prices can periodically revert toward their fundamental values in this case⁶ (Black et al., 2006).

Additionally, bubbles usually follow three distinct phases in general. The first phase usually starts with financial liberalization or increases in lending opportunities by central bank or government. The resultant expansion in credits leads to increases in the prices of real estate and stocks. This increase continues for some years as the bubble inflates. Second phase is the burst of the bubble seen as the collapse of prices often in a short period of time but sometimes over a longer period. In the third phase many firms and other agents that have borrowed to buy assets at high prices go bankrupt. Most of the time this progress follow banking and foreign exchange crises which cause further problems also in the real sector that can last for a couple of years (Allen and Gale, 1999). An example for this can be the recent case of Spain, where the effects of the burst of the housing bubble in the early 2010s felt on many macroeconomic indicators.⁷ Accordingly, Helbling and Terrones (2003) argue that housing price bubbles last approximately five years and usually results in 8 percent loss in GDP. On the other hand, it is generally believed that real estate bubbles pose more threat for the economy than other equity price bubbles.

Stock and real estate bubbles may occur together in many countries which was for instance, evident in Japan in the late 1980s. Kindleberger and Aliber (2005) points out that it happens because most of the individuals that earn profits through real estate or stocks want to diversify their wealth through investing the other.

2.3.1. Theoretical Representation of Rational Bubbles

Under the efficient market hypothesis and no arbitrage condition, the price of a financial asset must be equal to the present value of discounted dividends in the future. In case of house prices we can argue that under no rational bubble

⁶ See Black et al. (2006) for details. In particular, this paper studies the UK housing market and finds existence of an explosive rational bubble due to non-fundamental factors mostly.

⁷ For instance unemployment rate reached the levels of above 20 percent in the early 2010s.

assumption, the price of housing prices must be equal to the present value of discounted earnings or rent. In mathematical terms, let p_t be the house price at time t , d_t be the rent of the house at time t , and let r be the discount rate ($r > 0$). The no arbitrage condition implies that:

$$\frac{d_t + E_t p_{t+1} - p_t}{p_t} = r$$

which can be written as:

$$p_t = \frac{1}{1+r} E_t p_{t+1} + \frac{1}{1+r} d_t$$

By solving this equation recursively forward, we have the fundamental solution:

$$p_t^* = \sum_{i=1}^{\infty} \left(\frac{1}{1+r} \right)^i E_t(d_{t+i})$$

However this is not a unique solution, the following can be a solution as well:

$$p_t = \sum_{i=1}^{\infty} \left(\frac{1}{1+r} \right)^i E_t(d_{t+i}) + b_t = p_t^* + b_t$$

or:

$$b_t = p_t - p_t^*$$

such that:

$$E_t(b_{t+1}) = (1+r)b_t$$

These equations imply that the actual price may deviate from its fundamentals without violating the no arbitrage condition. Given that the $r > 0$ so that $(1+r) > 1$, the deviation b_t is expected to grow over time.

This setup states that the asset price has now two different parts; the fundamental part p_t^* plus b_t ; the bubble part. In other words the bubble is the difference between the actual price p_t , and the fundamental price p_t^* . In this type of setting, it is important to note that the bubble part should not be considered as a mispricing factor, it should be judged as a component of the price. (Gurkaynak, 2008). Accordingly, Blanchard and Watson (1982) state that even if all the agents have the same

information, a speculative bubble may exist which likely to have real effects on the economy. It is common to call these types of bubbles as “rational bubbles”. This representation of bubble is important since the characteristics of the fundamental and the bubble part are assumed to be different from each other in many studies.⁸

2.4. Indicators of Real Estate Bubble

Each increase in the house prices may not indicate a bubble. In order to understand the dynamics of the real estate market evidences from econometric models, affordability indicators and asset-pricing approaches may be useful (Girouard et al., 2006). This chapter follows this definition and examines the indicators under two separate parts: Evidence from descriptive indicators and evidences from econometric models. To spot the deviations of housing prices from fundamentals, each of these methods usually focus on housing prices (sometimes house prices alone), rent prices, construction costs, credit volumes, mortgage rates, population trends, employment rates, income rates, housing starts and similar variables related with real estate supply and demand.

2.4.1. Descriptive Indicators

There are some commonly used indicators and ratios which are useful in understanding the real estate market activities. Real estate prices are exposed to the dynamics of demand side and supply side factors therefore, these indicators usually reveal the unexpected or furious behaviours of demand and supply. Although some papers such as Girouard et al. (2006), Lind (2009) and Sjöling (2012) try to give a list of these indicators of housing bubble it is hard to argue that there is a general rule. Moreover, even though there are some general indicators, the bubble formation in real estate prices is usually country-specific hence a single indicator may not be able to explain each bubble (Sjöling, 2012). Therefore, it would not be wrong to say

⁸ For instance, a recently introduced bubble detection method by Phillips, Wu and Yu (2011) is based on the assumption that the behaviour of the bubble component b_t is explosive, which also reflects to the behaviour of the actual price p_t .

that one needs to be careful while making cross-country analysis. Here is a list of some of the most commonly used informative ratios/indicators:

Price-to-income ratio: This is a commonly used indicator which is the basic affordability ratio for housing. It is usually the ratio of median house price to median disposable income of households (Binay and Salman, 2008). This indicator can be interpreted as the ability of buying home of the median or the average household. If this ratio is increasing over time this may indicate an overvaluation of housing prices over time. The increase in this ratio implies that house prices are growing much more than an average income of households. The cycle in price-to-income ratios for both cases of Japan and US can be seen in the below figure:

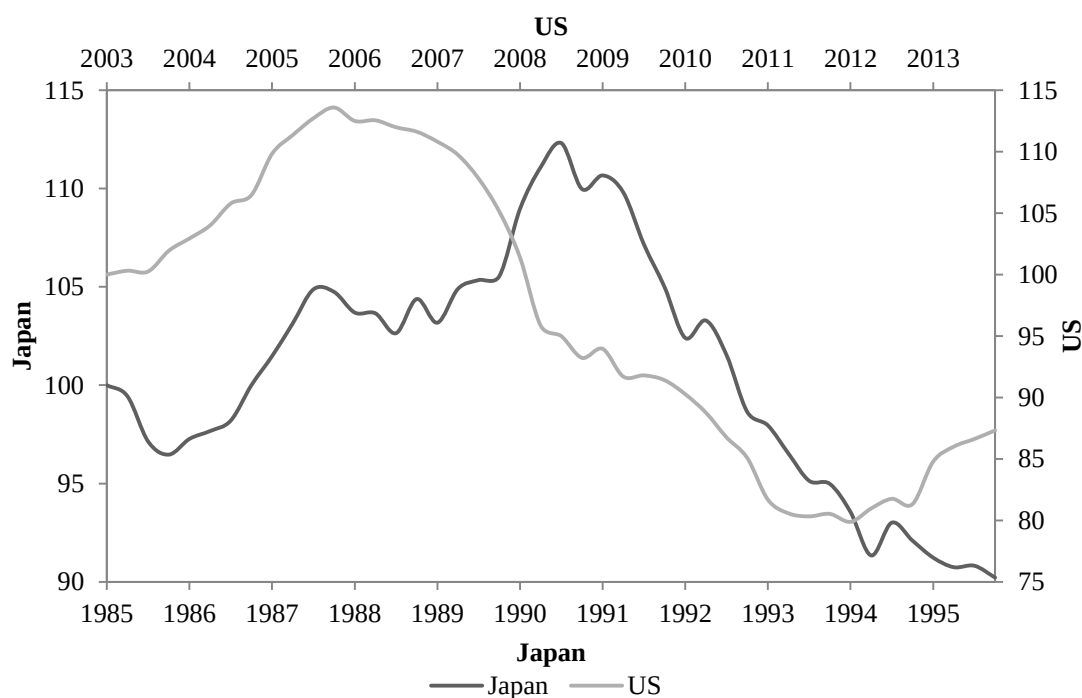


Figure 3. Price to income ratio for Japan and US in crisis events. Source: OECD

Price-to-rent ratio: This ratio is usually generated by simply dividing the house prices to the rent prices. It is believed that a bubble can be detected if this ratio increases rapidly above its historical average for a given area. This measure is similar to the price-to-dividend ratio in the stock market. It can also be interpreted as the cost

of owning versus renting a house. The increase of this ratio suggests that house prices are growing more than rent prices. If owning a house is more costly than renting then households usually tend to rent houses which will make a downward pressure in the housing prices in the future (Girouard et al., 2006). However some authors claim this indicator may not be informative in places like Europe where there are rent regulations (Lind, 2009). Figure 4 shows the booms and busts in price-to-rent ratios which were evident in both Japan and US cases. Sometimes this ratio is calculated by the following equation:

$$\text{Price to Rent ratio} = \frac{\text{Sale Price}}{\text{Monthly Rent Price} \times 12}$$

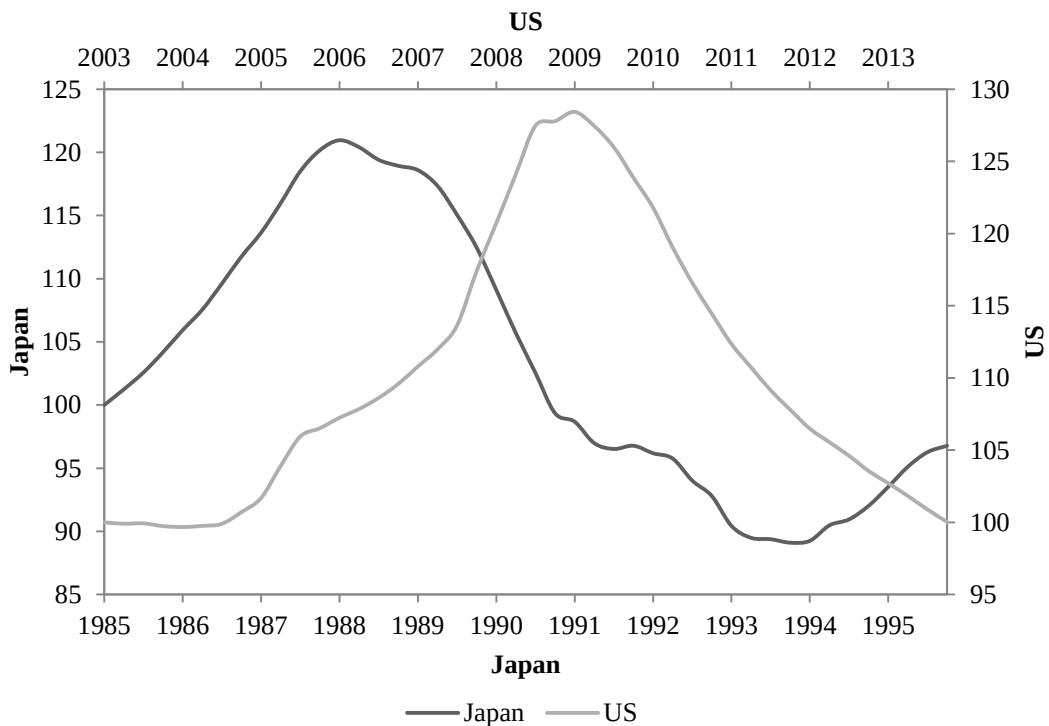


Figure 4. Price to rent ratio for Japan and US in crisis events. Source: OECD

Housing supply and vacancy rates: High and increasing vacancy rates as well as supply in the residential and office markets can be observed in countries that

experienced the boom and bust in prices. This was evident in the Japan and Southeast Asian countries in the 1990s and in the US in the mid 2000s. It is believed that high amount of vacant dwellings tend to create a downward pressure on prices which implies an excess supply (Sjöling, 2012). Belke and Wiedman (2005) suggest that booms in housing prices may occur due to shortage of supply at the beginning and busts occur due to excess supply when demand decreases. Another important feature of housing supply is that, when demand increases supply does not respond so quick since the constructions take time, hence an imbalance may exist in the short run. The boom and bust trends of the housing supply indicators for US and Ireland are evident in Figure 5.

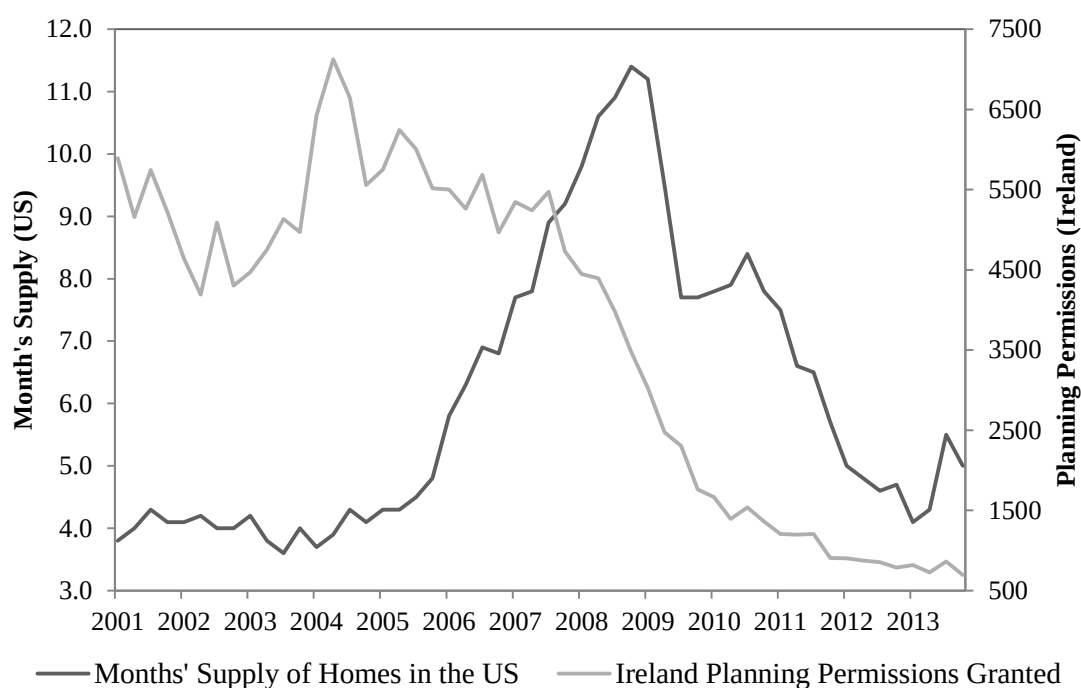


Figure 5. Housing supply indicators in the crises events of US and Ireland⁹. Sources: St. Louis FED and Irish Central Statistical Office

Interest Rates and Household Expenditure: Interest rates and especially mortgage rates are obviously effective on real estate prices and household decisions. Generally it is argued that there is a negative correlation between interest rates and real estate

⁹ Months' supply is the ratio of number of houses for sale to houses sold. Irish data is the number of planning permissions granted for new houses and apartments.

prices. The background is that, housing becomes more affordable when interest rates decrease and through increased demand prices go up given the supply, or vica-versa. At the same time if households' interest payments compared to their income are increasing this may indicate a bubble. The controversial point here is whether we should consider the nominal interest rate or the real interest rate. Because most of the households are not aware of the real cost of housing and they pay attention to nominal rates instead of real rates (Lind, 2009). The decreasing trends of the interest rates in the boom phases of US and Spain can be clearly seen in Figure 6.

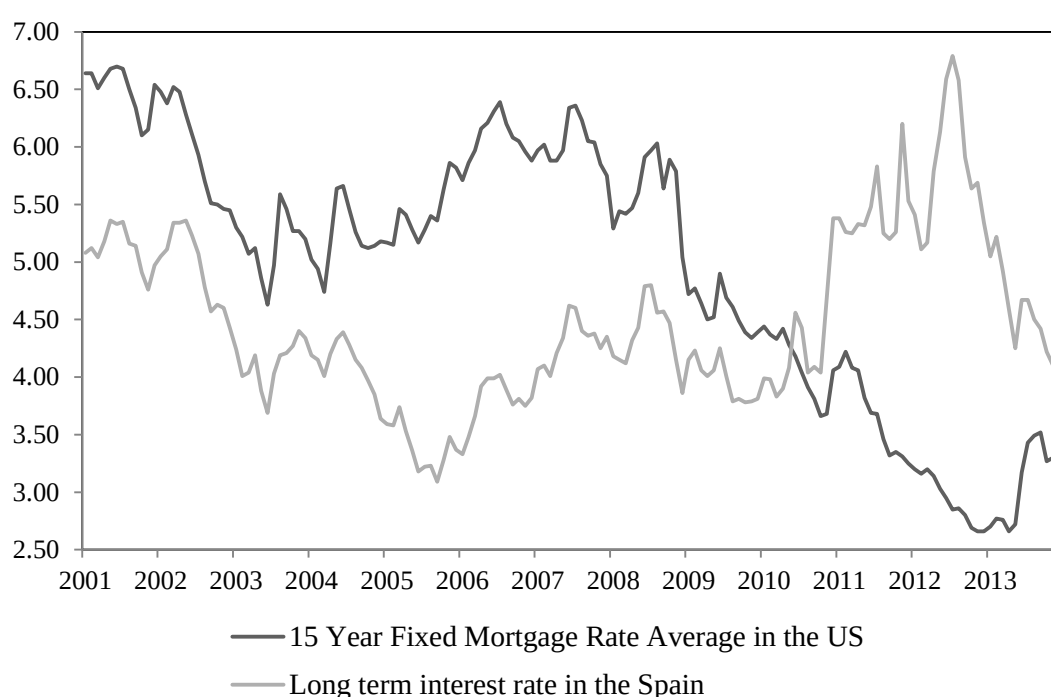


Figure 6. The interest rate trends in the US and Spain during bubble cases. Sources: St. Louis FED and ECB

Bank credit growth: High growths in credits are observed in cases of housing booms. For instance in the 1997 Asian crisis, an unusual growth in bank credits can be observed in many countries and additionally the portion of non-performing loans was also very high. (Quigley, 2002) Accordingly, Lind (2009) denotes that bubble can occur when banks increase or don't decrease loan to value ratios when prices increase and when banks behave recklessly in giving credits. For instance in the US, the median loan to value ratio was %100 for subprime mortgages in 2005, 2006 and

first half of 2007 while in the previous years this ratio was %90 (Mayer, 2011). Furthermore, it can be argued that this comfortable behaviour of banks may be fueled by the “lender of last resort” role of Central Banks which make banks feel safer. All in all, if the weight of real estate sector on the real economy and the financial system is high then whole economy becomes exposed to the activities in the real estate market.

Household expectations and speculative behaviour: Speculative behavior plays an important role in bubbles. If people start to buy houses and sell in a short period of time in order to get profits this increases demand and therefore prices. Actually, this may be more evident in stock markets, where trading is easier than real estate markets. It can be argued that speculative behavior implies an irrational demand in the markets which is not based on market fundamentals.

Case and Shiller (2003) point out that a bubble may occur if households expect future price increases even when the prices are above historical trends. Additionally they argue that a strong characteristic of a bubble is households’ increasing consideration of housing as an investment instrument and buying homes with the strong motive that prices will increase in the future. The numbers of secondary home sales may be informative on this behaviour. In order to be informed about households’ expectations they also conducted a survey which also supports their argument on bubble formation. Another straightforward explanation was made by Stiglitz (1990):

“If the reason that the price is high today is only because investors believe that the selling price will be high tomorrow –when “fundamental” factors do not seem to justify such a price- then a bubble exists.”

An interesting study, Kanık and Xiao (2014), investigates whether economic news can affect households’ expectations and play role in housing boom and bust cycles in

a DGE model. This study argues that economic news have the ability to create boom and bust cycles in housing market. It is indicated that when economic news are wrong the fluctuations does not generate from fundamentals and are corrected by the realization of the real shocks. Hence it is convenient to call these types of fluctuations as bubbles.

2.4.2. Evidences from Econometric Models

A simple but handy way of detection of bubbles by econometric methods is looking at the goodness of fit between house prices and other probable fundamentals. The authors that prefer this method argue that if the probable determinants are able to explain much of the change in the housing prices then it is hard to argue that there is a bubble.

In a more clear way, we can think of the house price relationship under the classical supply and demand framework. Prices in competitive markets are determined by the intersection of the supply and demand and in its most basic form we can represent it as:

$$P_{it} = f(Q_{it}^d, Q_{it}^s)$$

Where P_{it} represents housing prices for state i at time t and Q_{it}^d, Q_{it}^s represents quantities of housing that are demanded and supplied in state i at time t . For instance, Quigley (2002) constructs the supply and demand as:

$$Q_{it}^d = d(P_{it}, INC_{it}, POP_{it}, EMP_{it})$$

$$Q_{it}^s = s(P_{it}, VACANCY_{it}, CONST_{it})$$

Where the variables INC_{it} , POP_{it} , EMP_{it} , $VACANCY_{it}$ and $CONST_{it}$ represents income, population, employment, vacancies and construction permits (or housing starts) for state i at time t respectively. This framework indicates that for this case, housing demand is determined by prices, income, population and employment in an

area. Accordingly, housing supply is determined by prices, vacancies and housing starts. Putting these together we have:

$$P_{it} = P(P_{it}, INC_{it}, POP_{it}, EMP_{it}, VACANCY_{it}, CONST_{it})$$

This framework indicates that prices are determined by those factors. It should be noted that in real estate markets prices do not change immediately therefore many studies use lag operators in their estimations hence some studies benefit from ARDL approach. To sum, after some modification, it would be logical to estimate a regression similar to the last equation in order to understand if those factors really explain the actual price change. For instance, Quigley (2002) estimated this regression in various forms for US for between 1986 and 1994. He found that a simple model of economic fundamentals explain around 10 and 40¹⁰ percent of the changes in house prices. When he added the 1st and 2nd lags of house prices to model, the explanatory power of the model increased significantly but still the author points out that his models were not strong enough in predicting the timing of the “burst”. In addition to Quigley (2002), Case and Shiller (2003) estimated a similar regression and found that the fundamental factors and especially income are effective in explaining the price movements across most of the states except 8 ones in the US. They noted that these 8 states are likely to experience bubble. Moreover, Koetter and Poghosyan (2010) for Germany, Fraser et al. (2008) for New Zealand and Hott and Monnin (2008) for several countries developed several econometric methods to detect the deviations of real estate prices from fundamentals.

Hui and Yue (2006) and Jieng et al. (2011) follow a similar approach in order to determine the “amount” of bubble term in the prices. They regress the house price on the selected determinants and argue that the difference between actual and predicted prices can be represented as bubble. Further details and application for Turkey can be found in Chapter 5.

¹⁰ The numbers are R^2 's.

Some studies benefit from cointegration, VAR and VECM approaches and check Granger causalities, variance decompositions and impulse responses in order to see the strength of the relationships between the house prices and its determinants. Some studies that use these approaches are Dreger and Zhang (2013), Panagiotidis and Printzis (2015), Borowiecki (2008), Bulut (2009), Wong (2003), Wheaton et al. (2014). Some of these studies are investigated in detail in Chapter 5.

2.4.3. Detection by Time Series Characteristics

Some studies try to detect bubbles in prices by using the time series characteristics. Gurkaynak (2008) checks the robustness of many econometric tests that are used in detection of asset price bubbles and argues that for each study that is suggesting a bubble, there is another one that is suggesting there is no bubble, using the same data. This implies that these methods do not work with full certainty and open to controversy.

An earlier test of bubble is developed by Shiller (1981), which is based on the assumption that if a rational bubble exists, the variance of the actual price should exceed the bound that should be determined by the variance of the fundamental price. Another method is the West's two-step test developed by West (1987). This test compares the two different estimates of parameters that is needed in calculation of expected present discounted value of a given asset prices' dividend stream. Basically, the assumption behind this test is that, these two estimations should be equal if there is not a bubble, since they try to solve the same thing. Campbell and Shiller (1987), Diba and Grossman (1988) and Evans (1991) are the earliest studies that base their assumption on the explosive time series behavior. For instance, Diba and Grossman (1988) argue that seeking for the explosive behaviour in the difference between the actual and the fundamental price can be used in bubble detection, which can be identified by unit root and co-integration tests.

A recent method which started to be applied in many studies is called as the sup ADF test or the forward recursive ADF test developed by Phillips, Wu and Yu (2011) for detecting periodically collapsing bubbles. This test is a right-tailed unit root test that has an explosive alternative hypothesis which applies the unit root test repeatedly on a forward expanding sample sequence and make inference based on the sup value of the corresponding ADF statistic sequence. This test was further developed into a generalized sup ADF test (the GSADF test or sup sup ADF test) by Phillips, Shi and Yu (2012) which extends the sample sequence and improves the detection ability of the explosive behavior that is found by the sup ADF test, especially when there is more than one episodes. This test is being applied in this thesis and the technical detail of this test can be found in Chapter 5.

This recent GSADF methodology has started to be used by many of the studies that seek for bubbles. This method can be applied to any time-series however, some of the recent studies related with real estate bubbles are, Bond et al. (2014) for Ireland, Yiu et al (2012) for Hong Kong, Chen and Funke (2013) for China, Oliviera et al (2014) for Brazil and Pedersen and Schütte (2014) for several OECD countries.

We see that economists and econometricians try to develop different methods to detect bubbles in market prices for a good period of time. Their motivation is the increasing rates of harsh crises related mostly with the bubbles in stock markets and real estate markets. We can say that finding a robust method that clearly warns for bubbles is amongst the most important objections of this literature. These new methods not only focus on detecting bubbles, they also try to predict the time of collapse.

As an example of those recent attempts, some economists try to apply statistical physics methods to understand the behaviour of stock market and crashes (Vandevallé et al., 1998). In technical terms, some economists argue that during the bubbles, prices grow with faster than exponential rate. Among the studies that focus

on real estate bubbles, the commonly used method to detect the bubble and predict when the bubble will burst is the log periodic power law bubble (LPPL) model.¹¹ Liberatore (2010) indicates that this model is useful only if the data can be fitted to the model with algorithms that are accurate and computationally efficient. Additionally, this model assumes faster-than-exponential (power law with finite time singularity) acceleration in the prices with increasing oscillations as a symptom for a bubble. The forms of log periodic power law function may vary for the usage of the authors. One form can be represented as:

$$\log p(t) = A + B(t_c - t)^m + C(t_c - t)^m \cos(w \log(t_c - t) + \emptyset)$$

Where $p(t)$ is the house price or index, t_c denotes the most probable time of the crash, m is the exponential growth, w is the control parameter for the amplitude of the oscillations and A , B , C , and $\emptyset$ are coefficients for $B > 0$, $0 < m \leq 1$, $t < t_c$.

2.5. Historical Examples of Real Estate Bubbles

The history of economics is full of bubbles and bursts. Dutch tulip mania in the 17th century, the South Sea bubble in England and the Mississippi bubble in the 18th century can be shown as the earlier notorious examples in the bubble literature. The Great Depression that started in 1929 due to stock market crash in the US and the 1980s bubble of real estate and stock prices in the Japan can be shown as some noteworthy events of the 20th century. Norway, Finland and Sweden had similar experiences in the 1980s and early 1990s. Also, Western economies experienced different kinds of bubbles in the past such as information technology stock bubbles from 1996 to 1999, bond price bubbles of the 2000s (Sun & Zhang, 2007). The experiences of Argentina, Chile, Indonesia, Mexico, and South East Asian economies can also be given as other examples.

¹¹ Didier Sornette is amongst the most productive researchers of this field. Besides real estate markets, his studies on stock markets, gold and oil prices can be examined for further interest.

2.5.1. Japan in the 1980s

One of the most striking examples of housing bubble in recent times occurred in Japan, where land prices reached incredible levels in the early 1990s. In the late 1991 the total land value in Japan was estimated almost \$20 trillion which was estimated to be more than 20 percent of the world's total wealth.¹² The boom-bust cycle in Japan began in the mid-1980s with the huge increase in real estate prices that is linked to the increase in bank lending. The reason behind this credit expansion was believed to be mostly related with the financial liberalization in the 1980s and the desire for the US dollar (Allen & Gale, 2000). As can be seen from the Figures 7 and 8, the simultaneity between the boom bust cycle in real estate and stock prices and the economic downturn is quite striking.

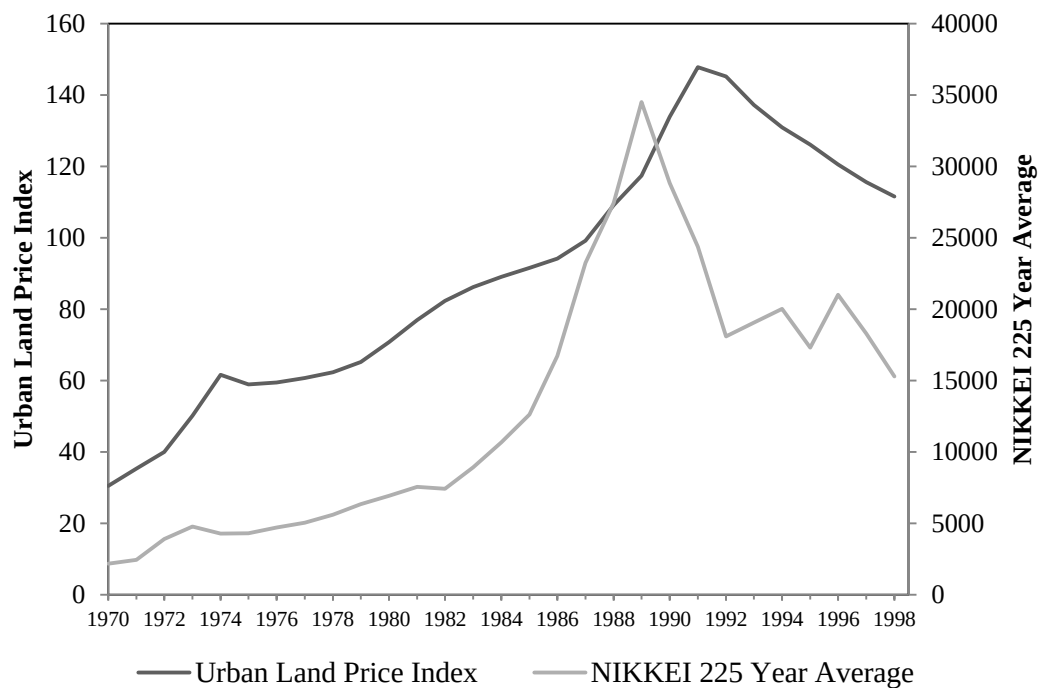


Figure 7. Japanese Urban Land Price Index (2000=100) and NIKKEI 225 Year Average. Source: Japan Real Estate Institute, NIKKEI and own calculations.

¹² See Stone & Ziemba (1993) for more details.



Figure 8. Unemployment and GDP Growth rates of Japan. Source: Statistics Bureau of Japan.

Actually, land prices and stock prices in Japan were strongly correlated to each other starting from 1955 and hence, the boom in property prices led to a stock market boom as the increased value of property owned by firms raised future profits and hence the stock prices. This rise in the land prices and stock prices increased firms' collateral thus bank loans and the boom increased more. While Nikkei 225 index was around 10,000 in 1985, it reached approximately 40,000 in 1989. It is believed that the bust phase might have been triggered by the Bank of Japan's shift to tight monetary policy in 1989. This asset price collapse in the next 5 years led to a collapse in bank lending with a decline in the collateral backing corporate loans. Specifically, the decline in asset prices decreased banking systems capital as their values were declined, and hence made many bank insolvent. Lastly, due to the high connections between asset prices, collateral, bank lending and banking capital, the boom-bust cycle in the Japan was highly related with the macroeconomic instability. As a result, the banking crisis couldn't be resolved completely for a long time and

the economy faced stagnation and deflation due to tight monetary policies even after long years from the boom.

The prominent causes of the boom are summarized by Ohnishi et al. (2012) as aggressive behavior of financial institutions, financial deregulation, inadequate risk management by financial institutions, the introduction of capital adequacy requirements for banks, late timing of monetary easing by the Bank of Japan, taxation and regulation, overconfidence and euphoria, demographic changes and Tokyo becoming a focus of the most economic transactions, leading to international financial center.

2.5.2. Asian Crisis

Most of the studies confirm that the activities in the real estate markets in East Asian economies were one of the important contributors of the financial crisis in 1997. The root of the bubble in this region was attributed to the surge in foreign capital inflows while East Asian economies were experiencing high economic growths in the early 1990s. Studies show that there were excessive bank lending to the real estate sector and unregulated financial institutions played important role in corruption which provided allowance for moral hazard problems (Koh et al., 2004). Quigley (2001) highlights the most important facts on Asian real estate markets during 1997 crisis:

- 1- The ratio of new office supply in total supply incredibly increased by 1996.
- 2- There was imbalance between new supply and vacancy rates in the residential market.
- 3- The ratio of asset prices to market rents for commercial and retail real estate, as well as residential properties was at historical high.
- 4- Bank credit growth rates in Southeast Asian countries had exceeded GNP growth and the ratio of nonperforming real estate loans to total loans was large.

- 5- The size of the real estate sector was large relative to other emerging economies in this region.
- 6- The nonperforming loans for real estate in Southeast Asian banks was large by mid 90s.
- 7- The depositors in the financial institutions which behaved recklessly were protected from loss in Thailand, Korea and Malaysia, which implies allowance for moral hazard.
- 8- The bubble in Asia property markets burst before the collapse of the rest of the economy, namely before the currency crisis.

Again Quigley (2001) draws attention to the high weight of real estate sector in the national economies of Southeast Asia around 1997. As can be seen from Figure 9, it is obvious that real estate loans and nonperforming loans have a high share in this region before the crisis.

Potential Exposure of National Economy to the Real Estate Sector, 1996						
Country	Real estate as percentage of bank loans	Private bank credit (US\$B)	Bank intermediation ratio	Moody's rating ^a	1996 GNP (US\$B)	Average exposure to real estate as percent of GNP
Hong Kong	40–55	300	1.68	C	154	76
Taiwan	35–45	400	1.46	D	274	58
Malaysia	30–40	120	1.66	D ⁺	94	58
Thailand	30–40	160	1.25	E ⁺	176	44
Singapore	30–40	130	0.85	C ⁺	94	30
Korea	15–25	440	0.86	D	480	17
Philippines	15–25	40	0.84	D ⁺	87	17
China	35–40	930	1.03	D	812	9
Indonesia	25–30	54	0.27	—	197	7

Sources. Renaud (1999, p.5) and J.P. Morgan (April 24, 1998, p.5).

^a Moody's Bank Financial Strength Rating.

Figure 9. The exposure of the national economy to the real estate sector in Asian countries just before the crisis. Source: Quigley (2001)

2.5.3. 2008 Global Financial Crisis

The significance of the real estate market activities in the subprime mortgage crisis in the US is unquestionable. It is important to mention the dynamics that led to one of the most noxious financial crises in the history which is characterized as the deepest recession after the Great Depression.

The certain cause of the crisis was the housing bubble, and the complex linkages with the housing finance system and the whole economy. Some economists argue that the housing bubble was a result of the excessive easy monetary policy of FED. In other words they believe that the reason was the FED who kept interest rates too low for too long which resulted in cheap mortgage credits and exacerbated demand. Others believe that the bubble was caused by the “irrational exuberance”. They argue that households unrealistically expected the prices to grow constantly even when the prices are too high. According to Levitin and Wachter (2012) the primary cause of the bubble came from the supply-side effects such as excessive supply in housing finance. They suggest that even though other factors were also exist, the substantial cause of the bubble was the transition from regulated, government sponsored securitization to unregulated private-labeled securitization which started to dominate the market after 2004.

Interestingly, most of the economists and even the FED governor Bernanke in 2007 didn't expect that the problems in the subprime market can spread to other parts of the economy considerably (Hardaway, 2011). However, there were some studies before the bubble burst, which found there were bubble symptoms. For instance Belke and Wiedmann (2005) examined the housing prices, mortgage rates, population and income trends of the US and argued that the increase in the real estate prices possessed bubble symptoms. Wheaton and Nachayev (2006) stressed that homeownership rates increased incredibly faster due to the developments in the subprime market in a short period of time and there is a considerable surge in tendency of buying homes as a 2nd residence or investment purposes. The authors

also warned about the probable serious consequences of a breakdown in housing prices. Zhou and Sornette (2005) further stressed that in 22 of the 50 states in the US sale prices grew with a rate “faster than exponential”, which is an indicator of bubble according to the authors. Using the S&P 500 Home Index the study even correctly forecasted the turnaround of the bubble by arguing the bust will occur in the middle of 2006.

Meanwhile, the patterns of the Japan crisis in the early 90s and the recent sub-prime mortgage crisis in the US were similar by some extent.¹³ As can be seen from the Figure 10 below, stock and housing prices are correlated to each other in US too. From 1997 to 2006 nominal US housing prices rose by %188 and by mid-2009 they had fallen by %33 from peak.

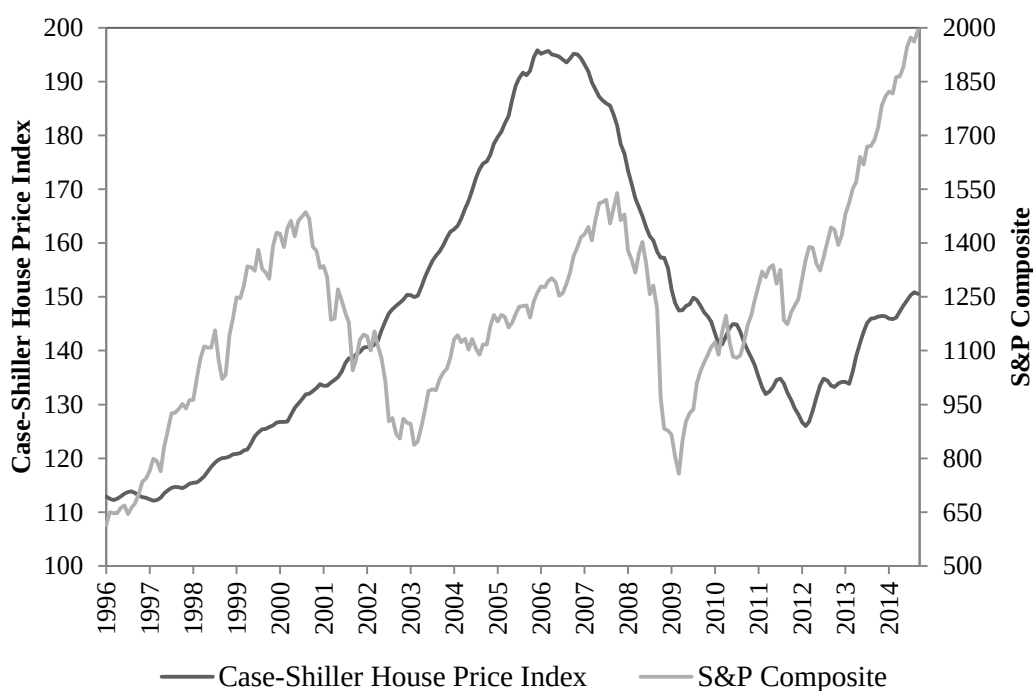


Figure 10. Monthly House Price and S&P Composite Stock Price Indexes in crisis.
Source: <http://www.econ.yale.edu/~shiller/data.htm>

¹³ In both countries the crises were triggered by the boom-bust cycles in the real estate prices; in addition, the policies (zero interest rate policy) they have followed after the crisis were also same. See Shirakawa (2013) for more details. Also, see Shimizu & Watanabe (2010) for a detailed comparative analysis between the experiences of Japan and the US real estate market.

There are numerous analyses of the crisis of 2008. Almost each of them underlines a different detail hence the roots and consequences of this crisis were revealed substantially. This section reviews the housing finance system in the US, which was obviously one of the main causes of the housing bubble, and the crisis.

Housing Finance in the US: As it is obvious, the unwanted consequences of the burst of the housing bubble in the US emerged in the housing finance system of the US. Most of the US mortgages are financed through securitization which is called mortgage-backed securities (MBS). The government sponsored entities¹⁴ (GSEs) securitize most of the mortgages they purchase by selling the mortgages to legally separate, specially created trusts which pay for the mortgages by issuing MBS. Thus the GSE's link mortgage borrowers with capital-market investors. After the 1990s private-label securitization (PLS) which is a less regulated form of securitization and offers larger loan limits began to replace the strongly regulated GSE's. These are usually operated by investment banks. The nonprime PLS's created allowance for complex and heterogonous dealing structures. Figure 11 shows that there are huge increases in these kinds of nontraditional mortgages before the crisis (Levitin and Wachter, 2012).

¹⁴ These GSE's are mainly the Fannie Mae (Federal National Mortgage Association), the Freddie Mac (Federal Home Loan Mortgage Association) and the Ginnie Mae (Government National Mortgage Association)

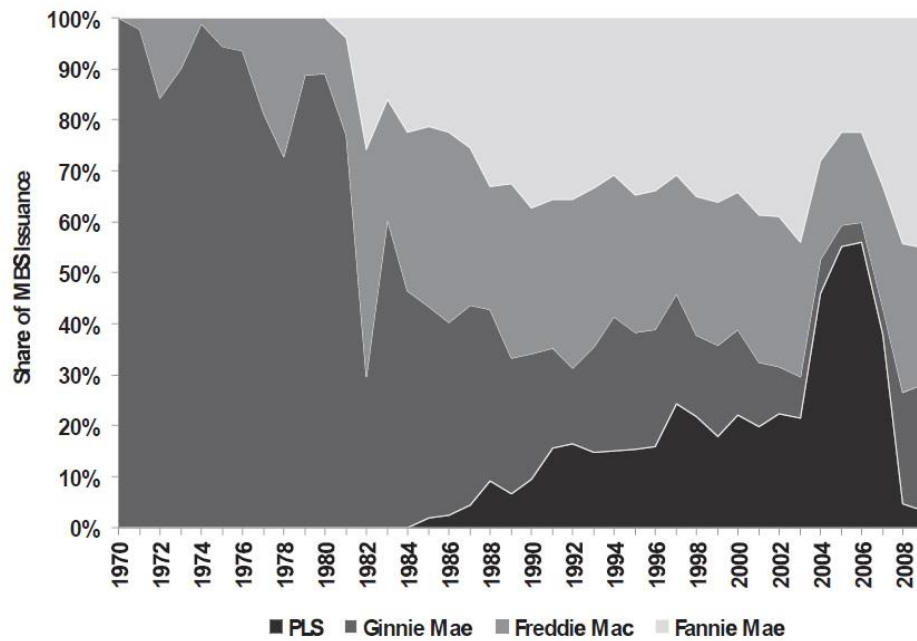


Figure 11. Share of MBS in US. (Source: Levitin and Wachter, 2012).

It is quite likely that the cause of the housing bubble in the US is mostly related with these structural changes in the housing-finance market in 2003 and 2004. Another important point is, many analyses showed that the trend in the market was shifting from traditional fixed-rate mortgages (FRM) to PLS of nontraditional adjustable-rate mortgages (ARM) during this period.



Figure 12. US GDP Growth and Unemployment Rate. Source: World Bank and US BLS

From Figure 12 we see that whole economy was affected after the burst of the bubble in the US like in the Japan example. Additionally, it is also noteworthy that just before the crisis, both Japan and the US performed well in unemployment and GDP growth, which may be another sign for an upcoming crisis. Additionally, these examples and especially the 2008 financial crisis constitute evidence that if credit growth of banks and the amount of low quality loans are allowed to expand uncontrollably -which indicates a risk accumulation- whole financial system is becoming under risk and the whole economy and the society are likely to pay the cost when the bubble bursts. It would also be right to say that the effects of a bursting bubble are more serious in countries where real estate and finance linkage is stronger.

2.5.4. Euro Area and China

As it was mentioned before, the rapid increases in real estate prices can be observed in many countries including Europe and China. In Europe, Spain and Ireland were

the most noteworthy examples of the 2000s. André (2010) documents the recent developments in the OECD housing market and seeks for the reasons of the incredible increase in the real estate prices in the world in general. For instance, the study argues that real house prices in Ireland almost tripled between 1995 and 2006 and two and half times multiplied in the UK. The author attributes this to the favorable financing conditions in the early stages of the recent expansion. Additionally, the paper stresses that the recent run-up is different from the other booms mainly because of 3 facts: (1) Other than nominal price increases, real prices also increased, (2) the period of expansion was considerably longer, and (3) too many countries experienced the housing boom simultaneously.

It should be more meaningful to compare the recent Turkish case with other countries that possess similar properties. Turkey is a developing country and its financial system is quite smaller compared to developed ones. For instance, Čadil (2009) states that the share of risky mortgages are smaller in Czech Republic –like Turkey- and it is claimed that Czech Republic cannot face any type of financial crisis similar to US due to this fact. Additionally, Čadil (2009) underlines the point that subprime mortgages only deepened the 2008 financial crisis and any type of housing downturn may affect the economy through different channels such as loss of consumer confidence, consumption and wealth.

Connor et al. (2010) compares the 2008 US crisis and 2008 Irish crisis, which were both stimulated by the housing bubble. They suggest that these two crises have 4 common characteristics as irrational exuberance, capital bonanza, regulatory problems and moral hazard.

Akın et al. (2014) examines the reasons behind the Spanish housing bubble, where the house prices tripled in nominal terms between 1998 and 2007. In addition, household mortgages accounted for %65 of the GDP and household debt reached %91 of GDP. The authors work with a dataset including real estate credit, price

conditions and borrower characteristics. The study indicates that lending opportunities were softer in the boom period than the bust period. It is argued that banks which have worst governing problems softened the credit standards more. All in all, the study argues that the housing bubble in the Spain were fueled by the low credit standards of the banking institutions, rather than speculative or expectation motives.

Dreger and Zhang (2013) seek for bubble in the Chinese housing market by focusing on 1998-2012 period. The authors argued that the recent surge in the house prices is mostly related with the fiscal stimulus package of government and massive credit expansion. They detected co-integration between real house prices and a pool of macroeconomic determinants hence they conclude that the dimension of the bubble in China is not that large. The study concludes that the burst of the recent bubble will not be able to create harm in the economy.

2.6. Policy Side

Some economists accused the central banks since they think the responsible of the crises are them. For instance, the FED was found guilty by a good number of economists in the 2008 global financial crisis since it kept interest rates too low for too long. On the other hand, some countries tried to intervene the market during crises such as Norway, Sweden and Finland in the early 1990s. However, for instance Japanese government thought that economic growth will recover and banking problem will be solved automatically, hence they didn't intervene. Many of the central banks including FED and ECB applied low interest policies after the crises they faced to provide liquidity to the system.

This section examines the recommendations of the economists on how to respond real estate market. Should the governments or policymakers intervene the real estate market? If that is so, should the policies be ex ante or ex post?

There are different views on how the policymakers should react the developments in the real estate market. For instance, Roubini (2006) states that the monetary policy should target the asset prices. It is argued that numerous analytical models show that optimal monetary policy should respond to the asset prices. Secondly, even though the existence of the bubble is uncertain there should be a targeting. Thirdly, this paper argues that no matter whether policymakers believe that the consequences of such a bubble are uncertain, there should be a reaction. It is stated that the results of these bubbles seem usually very costly. To sum, this paper argues that monetary authority should “prick” the bubbles with applying moderate interest rate policies. Allen & Carletti (2010) defends the same argument referring the seminal study Reinhart & Rogoff (2009) “*This Time is Different: Eight Centuries of Financial Folly*” which proposes there is a strong relationship between property prices and financial downturns. It further suggests that the traditional inflation targeting approach needs to be changed and pay more attention to the real estate prices.

In contrast, Posen (2006) suggests that central banks should not respond to bubbles. This paper argues that central banks should firstly try to sustain financial stability. It is stated that applying tightening policies due to the complications in the financial system can cause even wider problems in the real economy. Allen and Gale (1999) further stresses that central banks should avoid excess credit expansions and also financial liberalization should be done in a slow manner. Additionally, it proposes that to eliminate the problems regarding banking crisis after bursting such a bubble, the governments can provide huge liquidity to banking system. Kanik and Xiao (2010) states that if central bank does not respond to the fluctuations in the prices the effect of the cycle on the real economy is stronger. For the policy side it is suggested that targeting inflation and output gaps are enough for the central banks rather than directly targeting housing prices.

CHAPTER 3

THE DYNAMICS OF THE TURKISH HOUSING SECTOR

Up to now, we tried to define what the real estate bubble is, described the commonly used indicators of detecting it, and examined some crisis events from the real estate market perspective. In this chapter, Turkish real estate and mortgage markets are analyzed to be informed about whether there is a bubble and how serious it can be for the economy accordingly with the previous information.

Several papers investigated the relationship between housing and the overall economy for Turkey. For instance, Aydın et al. (2007) try to find out the relationship between macroeconomic variables and housing market for Turkey. The findings of this paper conflicts with the findings for developed countries implying that monetary aggregates have more important effect on housing investment than employment. In addition, the results indicate that shocks to macroeconomic variables such as interest rates, output and prices all have substantial effects on housing market. The study highlights the growing importance of monetary policies on the housing market after housing finance markets developed. It is also pointed out that even if targeting the housing market can not be a primary policy of the monetary authority, policy makers are able to develop housing markets and improve the qualities of property rights and contracts which will further support both the quality and quantity of the housing stock. In addition, Özçelebi (2014) investigates the determinants of the housing sector using VAR approach focusing on 1990-2010 period. The results of this study indicate that the construction sector is quite sensitive to the shocks in the macroeconomic variables. The study argues that an increase in the real GDP increases the construction activity. Moreover, the study finds the effect of the interest rate on construction activity is negative and the credits are found positively correlated with the construction activity. Özçelebi (2014) suggests that monetary and fiscal policy should focus on price stability and macroeconomic coordination is

necessary. At the same time, he recommends that credits to construction sector should be increased for sustainable progress of this sector. He points out the importance of credit standards and argues that there should not be a scissors between housing supply and demand in order to decrease the risk of credit defaults and he underlines that efficient credit rationing is important for the sustainability.

Another paper, Kargı (2013), also investigates the relationship between economic growth and the construction industry in Turkey using correlation relations, Granger causality analysis and multiple regression models focusing on 2000-2012 period. The study finds that in line with other developing countries the process of the growth supports the construction industry. Furthermore, it points out that construction sector is negatively affected by the inflation. In addition, interpreting Granger causality tests, impulse response functions and variance decompositions for the period 2002-2007, Hepşen and Kalfa (2009) finds that shocks to macroeconomic variables such as national income, interest rate and volume of housing loans all have impacts on housing market activities. In the same vein, the performance of the housing market is found significant for the overall macroeconomy. It is estimated that due to population growth and urbanization Turkish real estate market has the potential to develop. Bulut (2009) investigates the real estate supply and demand relationship in Turkey, working with an annual data from 1970 to 2007. By applying cointegration tests and VECM, the author finds expected signs for short-term and long-term relationships. The study further argues that the consumers are more sensitive than the builders by finding higher long-run price elasticity than long-run price supply elasticity. In a more recent study, Erdem and Varlı (2014) examines the housing demand and supply dynamics by making a cointegration analysis and constructing a VECM. Their results suggest that the demand side is affected by real house prices, real GDP per capita, expected inflation and nominal interest rate. For the supply side, they found a long run relationship between housing supply, real house prices, real construction costs and real interest rate. Their results suggest that the short term price elasticity of demand is -0.18 while the short term income elasticity of supply is -7.50.

Emlak Konut REIT published a comprehensive report on Turkish real estate sector in 2014 whose findings are quite important. The report suggests that after 2010 the construction sector has been growing faster than the GDP. At the same time, the multiplier effect of the real estate sector is emphasized by pointing out the fact that the construction sector in Turkey has the ability to stimulate other sub-sectors through its immense interactions with them. These sub-sectors are summarized as domestic and foreign builder services and certification, technical undersecretariat services, real estate, finance, construction machinery and materials. The report points out that the current account deficit in the Turkey is mostly due to energy imports whose more than half is consumed in residential and office dwellings.¹⁵ Another important factor denoted as the law that passed on 2012, which enables the acquisition of the immovable properties by admitted countries' foreigner citizens. It is argued that after 2013 the number of the sales of immovables to foreigners increased substantially, and it is seen that these agents usually prefer to buy immovables in touristic places and in bigger cities. The report suggests that it is hard to call as bubble to the recent increases in Turkey and especially in Istanbul because of some facts. The main facts that are summarized are, since there was a natural demand increase after the 2007 mortgage law and reciprocity law, there is a considerable increase in the GDP per capita in the last 10 years, there is a historical low interest rates, there is a quite low increase in house prices when adjusted for inflation and since there is not any mortgage backed security market. Accordingly the report states that when compared to other big cities, Turkey is one of the most investable places and has one of the lowest probabilities of having bubble.

Reaching an academic study that directly focuses on "housing bubble" for Turkey is quite hard. One of them, Büyükduman (2012), generates a new quarterly data for İstanbul's three big districts starting from 1988. The study finds that sales and rent prices are both moving around their long term average. It is found that the price-to-

¹⁵ The report stresses that in Turkey %70 of the energy is used for heating and cooling, while this number is only %30 for EU. Another important fact is that, only %15 of the housing stock in Turkey has thermal insulation and a possible increase in this ratio will likely to improve the current account.

rent ratio has been increasing after 2004 however, the author believes that this is related with the fall in the inflation rates.¹⁶ Additionally the author argues that real house price index and the real BIST 100 index are affected by the similar shocks and moving similarly in the long term. For the period 2003-2012, his OLS results suggest that the only significant variables are rent prices and real interest rates in explaining the real house prices.

An earlier study, Binay and Salman (2008), which is another related academic study on this topic, argues that there was not an evidence of a bubble in Turkish real estate market during 2000-2005. Using data for Ankara, the study shows that price to rent ratio was not that high and price to income ratio has grown same as the world average. Furthermore, Turkish mortgage system was not found as vulnerable as US by Coskun (2010), suggesting that mortgage loan/GDP ratio is quite smaller compared to that in US. This finding is valid also for the comparison between Turkey and Europe. This ratio was found %3.8 in 2006 for Turkey while it was %49.4 in the EU-27 countries. At the same time, it is noted that even though numbers are growing the volume of primary and secondary markets are quite low in Turkey compared to the US case.¹⁷ Coskun (2011) underlines that most Turkish households traditionally consider housing as the best way of investing.

The bubble hypothesis for Turkey is again rejected by Erol (2015) who argues that it is hard to call the upward trend in the housing prices in 2005-2012 period in Turkey as bubble, using a combined dataset of TUIK, TCMB and REIDIN. She suggests that the increase in the real house prices are quite low compared to the bubble cases of Spain and the US. Additionally, as Coskun (2010) suggests, the study states that the financial leverage of housing system in Turkey is quite low. The study applies several OLS models in order to understand the dynamics of house prices and whether

¹⁶ The author says that because of the fall in inflation rates, the volatile and risky atmosphere becomes ineffective and real prices become more clear.

¹⁷ The primary market is where the real estate credit is given and the secondary market is where the securitization process happens.

there is a bubble in prices. In the study, variables that mostly explain the house price growth are found as 2 years lag of GDP growth, urban population growth, 1 year lag of housing interest rate growth and rent price growth. In conclusion, Erol (2015) suggests that increases in house prices can be sufficiently explained mainly by demand side factors therefore it is hard to argue that there is a bubble in Turkey for 2005-2012 period. However, the study warns that if this trend continue for 5 or 6 years and the financial leverage of housing become higher then it will be more convenient to call it as bubble.

The importance of the activities of TOKI (Housing Development Administration of Turkey) should be mentioned here as an important structural factor in the Turkish housing sector. Recently, the purpose of TOKI is mainly providing affordable housing units for low and middle income households in Turkey. It has also other objects, such as urban transformation projects and restoration of housing in disaster areas etc.. The importance of TOKI can be understood by checking the numbers since it forms a quite high share in the housing supply. From 1984 to 2002 TOKI has completed around 44.000 dwellings. After 2002 the activities of TOKI incredibly accelerated. By December 2014 the amount of completed dwellings by TOKI reached around 650.000¹⁸. At the same time, the recently increasing vacancy rates in these dwellings are noteworthy. Palancıoğlu and Çete (2014) noted that in early 2014 the amount of TOKI owned buildings were 521.536 of which 501.041 were sold. However, by December 2014, it rises to 640,726 and 540.613 were sold among them. In percentages, the vacancy rate among the TOKI built dwellings jumped to %16 from %4 in 2014 (TOKI, Housing Production Reports and own calculations). Lastly, the amount of incompleting dwelling projects of TOKI is around 220.000 by February 2015.¹⁹

¹⁸ This increase is approximately %1200.

¹⁹ Source: TOKI website and own calculations.

3.1. Prices

One of the strong indicators of a bubble is the significant increase in housing prices. To check this, the Monthly Residential Sales and Rent Price Indexes for 7 cities were gathered from REIDIN.²⁰ The data covers the period that is from Jan-03 to Feb-15²¹. To represent Turkey, I took the weighted average of these 7 cities indexes according to their population²². Figures 13 and 14 show the pattern of the sale and the rent prices in both nominal and real terms²³:

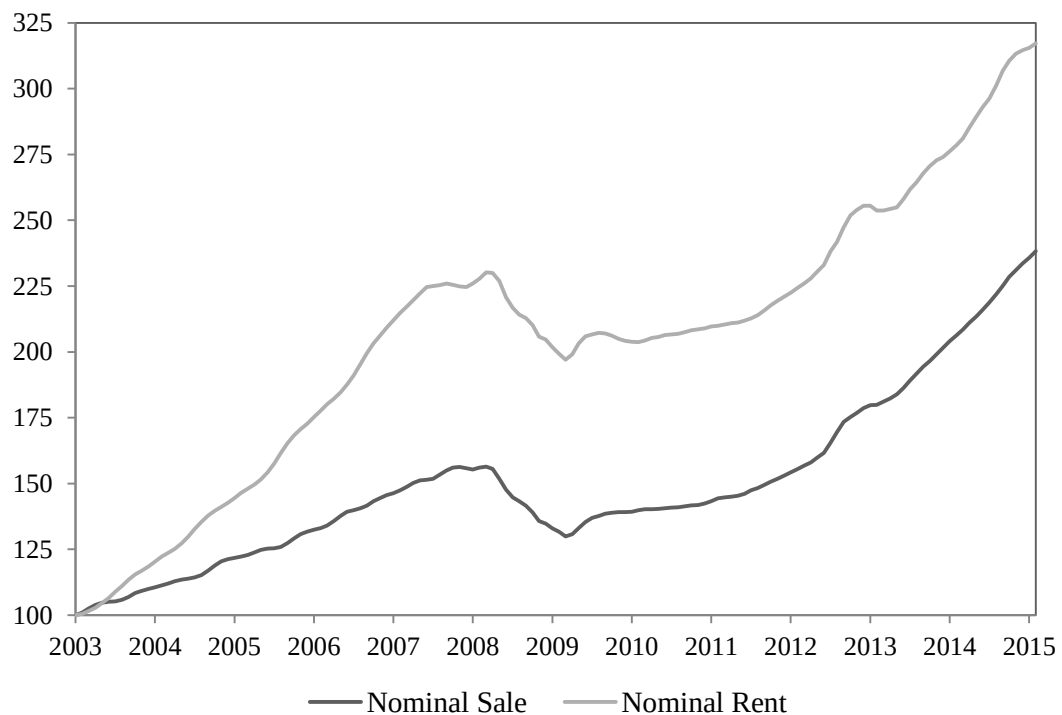


Figure 13. Sales and Rent Price Indexes for Turkey. Source: REIDIN and own calculations.

²⁰ These cities are Adana, Ankara, Antalya, Bursa, İstanbul, İzmir and Kocaeli. These constitute almost %70 of the population of Turkey. The index is a stratified median index. If not otherwise stated, the base year for all indexes is 2003. (2003=100).

²¹ Unfortunately, a longer period home price data is not available for Turkey which obviously constrains our analysis.

²² Between 2003 and 2014 the population shares of this cities between them are taken as: %7 for Adana, %16 for Ankara, %6 for Antalya, %9 for Bursa, %44 for İstanbul, %13 for İzmir and %5 for Kocaeli accordingly with TUIK.

²³ Real sale and rent price indexes were generated by dividing each months value to CPI of that month.

Although this is not a sufficient condition, one indicator of a probable bubble seems evident. The data suggests that both sale and rent prices are significantly increasing recently especially after 2012 in nominal terms. In nominal terms, the rent prices tripled and the sale prices doubled relative to their levels of 2003. Even though the trends seem quite stable in real terms, we can notice an appreciation there too after 2012.

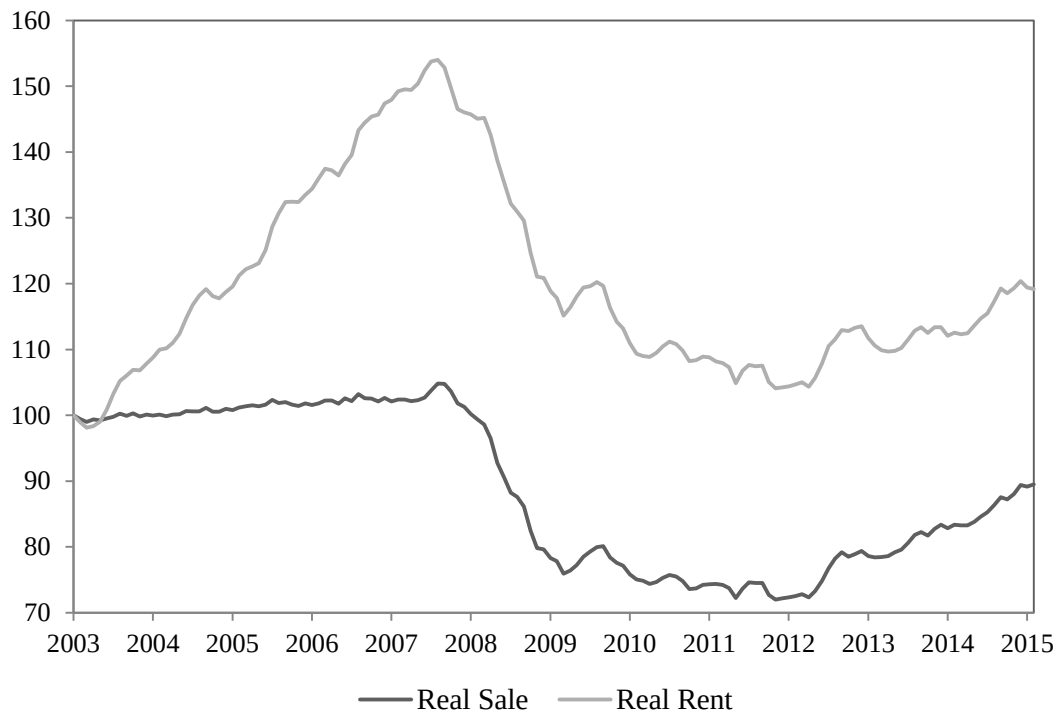


Figure 14. Sales and Rent Price Indexes for Turkey divided by CPI. Source: REIDIN, TUIK and own calculations.

Figures 13 and 14 suggest that both sale and rent prices started to decrease in late 2007 in both nominal and real terms. This may be a burst of an earlier bubble. From the Figures 15 and 16, it can be seen that both sales and rent prices are growing remarkably in the biggest Turkish cities in nominal and real terms, especially after 2012. Specifically for Istanbul, real sale prices seem to return its pre-2008 levels. However, as it was mentioned before, the increase in the prices are not enough to explain the bubble, it is only one of the indicators. We also need to check the fundamentals. But before, it is meaningful to compare the Turkish case with some of

the other countries' bubble experiences. For Turkey, we also look at an earlier possible bubble case, which seems to burst in 2007. We chose USA, Japan, Ireland and Spain to compare with.

Table 1. Comparison of Turkish real estate price dynamics relative to other countries. (t shows the peak year.) Sources: REIDIN, OECD and World Bank.

	Nominal Price % Changes						Real Price % Changes					
	USA	JPN	IRL	ESP	TUR	TUR	USA	JPN	IRL	ESP	TUR	TUR
	Peak Years						Peak Years					
(t)	2007	1991	2007	2008	2014	2007	2006	1991	2007	2007	2014	2007
(t-3)	9.5	5.8	11.2	14.6	4.7	9.4	5.6	5.4	9.3	14.2	-1.6	0.7
(t-2)	10.4	7.8	8.1	10.0	12.2	9.4	6.9	5.6	6.5	10.7	2.9	1.1
(t-1)	6.0	13.6	14.5	5.5	14.1	10.4	7.4	10.8	11.8	6.2	6.2	0.7
(t)	0.2	4.3	8.5	0.2	15.6	9.3	3.2	1.5	5.3	2.2	6.2	0.5
	Cumulative						Cumulative					
	26.1	31.6	42.3	30.3	55.0	44.4	23.1	23.3	32.7	33.4	14.2	3.1
	Price-to-income ²⁴ % Changes						Price-to-rent % Changes					
	USA	JPN	IRL	ESP	TUR	TUR	USA	JPN	IRL	ESP	TUR	TUR
	Peak Years						Peak Years					
(t)	2006	1990	2007	2007	2014	2007	2006	1991	2004	2007	2014	2007
(t-3)	3.7	5.4	5.6	13.1	-10.0	-9.8	5.2	3.7	-7.1	13.7	1.1	-9.9
(t-2)	4.1	0.0	0.7	8.4	4.1	-4.5	6.6	4.7	9.5	9.9	0.8	-8.7
(t-1)	6.7	1.1	9.8	4.7	4.4	-4.3	7.7	10.2	21.3	5.5	3.6	-9.0
(t)	0.3	5.6	4.2	0.8	4.7	-0.4	2.4	1.1	8.2	1.1	2.4	-6.0
	Cumulative						Cumulative					
	14.8	12.1	20.3	27.1	2.3	-17.9	21.9	19.7	31.9	30.1	8.2	-29.6

Table 1 shows a comparison between annual percentage changes of some house price indicators. It shows the each year's annual percentage changes from before the 4 years of their peak and their cumulatives. Any increase of these 4 indicators represents a threat for bubble, as we explained in Chapter 3 in detail.

²⁴ This ratio was calculated by dividing the yearly average of REIDIN nominal house price index to yearly nominal income per capita taken from TUIK. Other countries' data belong to OECD, which is available at http://www.oecd.org/eco/outlook/Focus%20on%20House_Prices_indices.xls.

Percentage changes of real prices, price-to-income and price-to-rent ratios suggest that Turkey is far from a bubble in terms of prices recently, when compared to other countries' bubble experiences. However we see that especially after 2012, all of the indicators are in an increasing trend, hence it would not be wrong to interpret this as a possible beginning time of the recent boom. Almost each indicator is rapidly increasing after 2012.

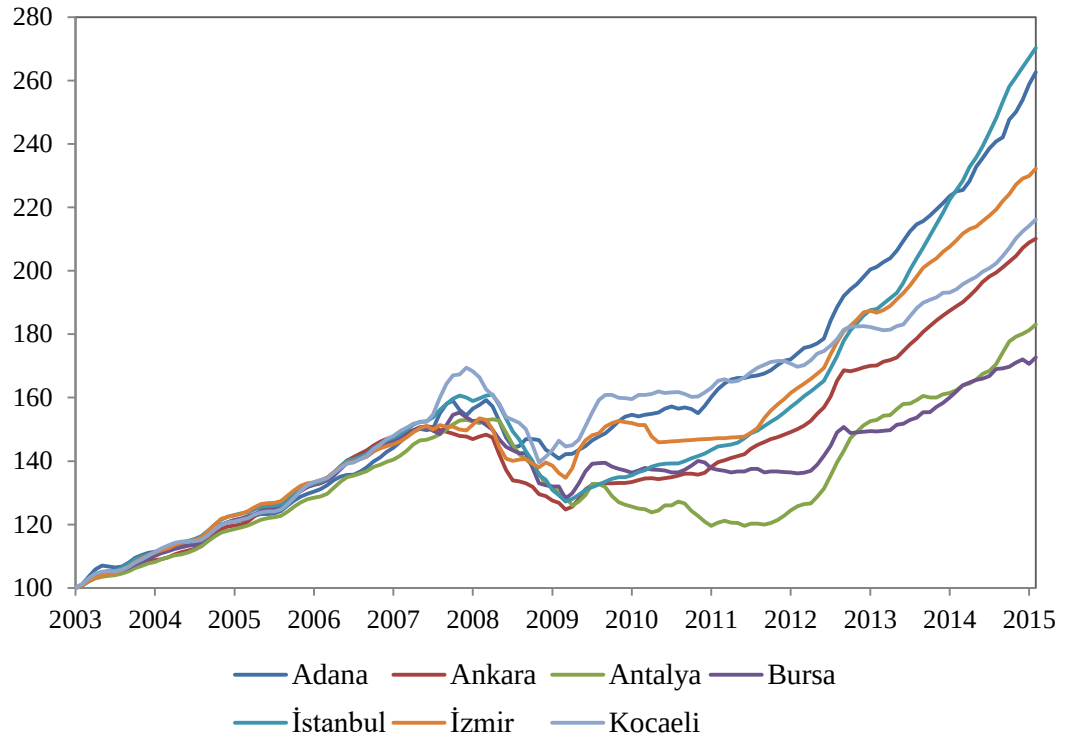


Figure 15. House Price Indexes of Turkish Cities. Source: REIDIN.

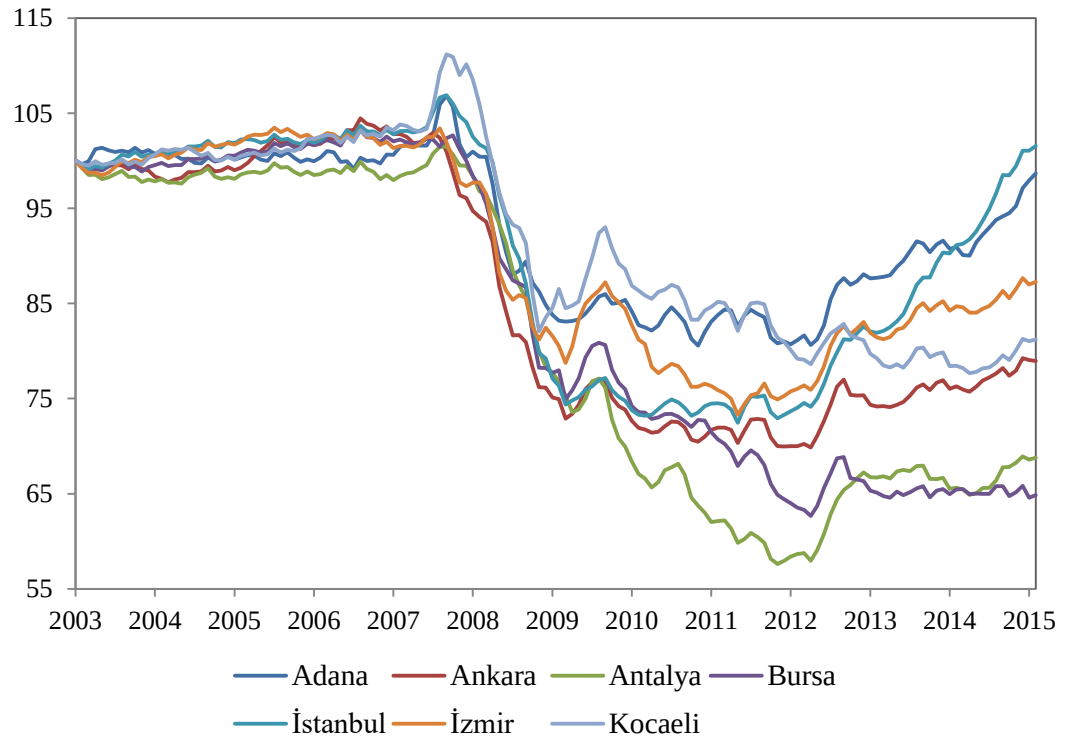


Figure 16. House Price Indexes of Turkish Cities divided by CPI. Source: REIDIN and TUIK.

3.2. Interest Rates and Loans

Interest rates for housing loans may explain the increase in the recent price changes. The theory suggests that the decrease in the loan rate is able to increase housing prices through increased demand. At the same time, significant increases in the amount of credits were a common issue in the earlier cases of housing bubble.

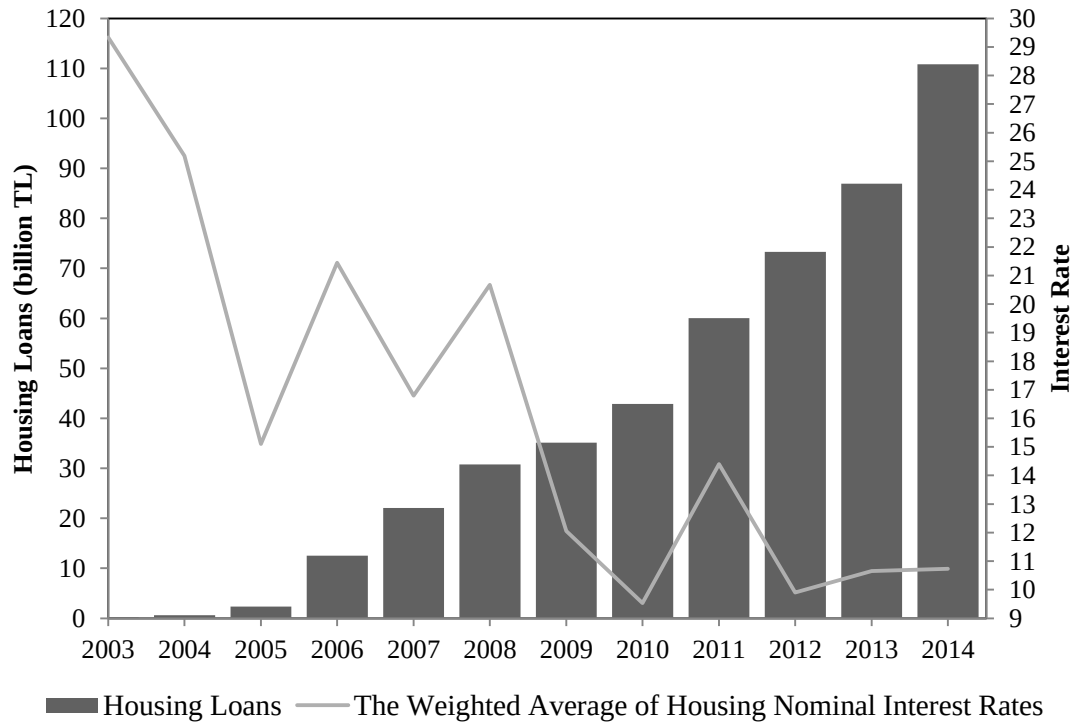


Figure 17. Housing Loans and Housing Interest Rates. Source: TCMB and BDDK.

Figure 17 suggests that housing loan rates decreased to around 10 percent from around 20-30 percents recently. Accordingly, we witness a significant increase in the amount of housing loans, whose level is above 100 billion TL recently and approximately 5 times more than the level of just 2007. These facts are consistent with the increase in prices, which implies that the decrease of the interest rate stimulated the housing demand. However the amount of loans seems to increase in a quite rapid way, which may not be safe in terms of risk accumulation.

3.3. Demographics and Income Trends

The demographic structure is obviously important in understanding housing activities. The increasing population (especially the population of 15-64) together with increasing employment levels tends to increase prices through demand side. In addition, income undoubtedly, is one of the most certain determinants of demand. Keeping others equal, we may expect that population rate is always in an increasing trend and housing demand always increases due to this reason. At the same time marriages, divorces and the increasing tendency of living individually are also playing role in housing demand. We should consider these facts as some of the fundamental determinants of housing prices due to natural increases in the housing demand. In particular, Figures 15 and 16 suggest that the housing prices are increasing faster than average in the biggest cities, namely Ankara, İstanbul and İzmir. It is foreseeable since employment, population and internal migration rates are increasing faster than the Turkey average in these big cities. The effects of recent immigration from Syria can also be seen in the housing prices in some Eastern and Southeastern parts of Turkey. Some of the cities where prices are significantly increasing are Gaziantep, Adıyaman, Kilis, Erzurum, Erzincan and Bayburt. (Source: TCMB)

From Figure 18 and 19 we see that Turkey recovered in many fields after the 2008 crisis. However, the important question here is whether this recent euphoria period is able to generate an unrealistic optimism in household expectations. The earlier examples show that the additional speculative demand due to unrealistic expectations is the main reason of bubbles and harsh consequences.

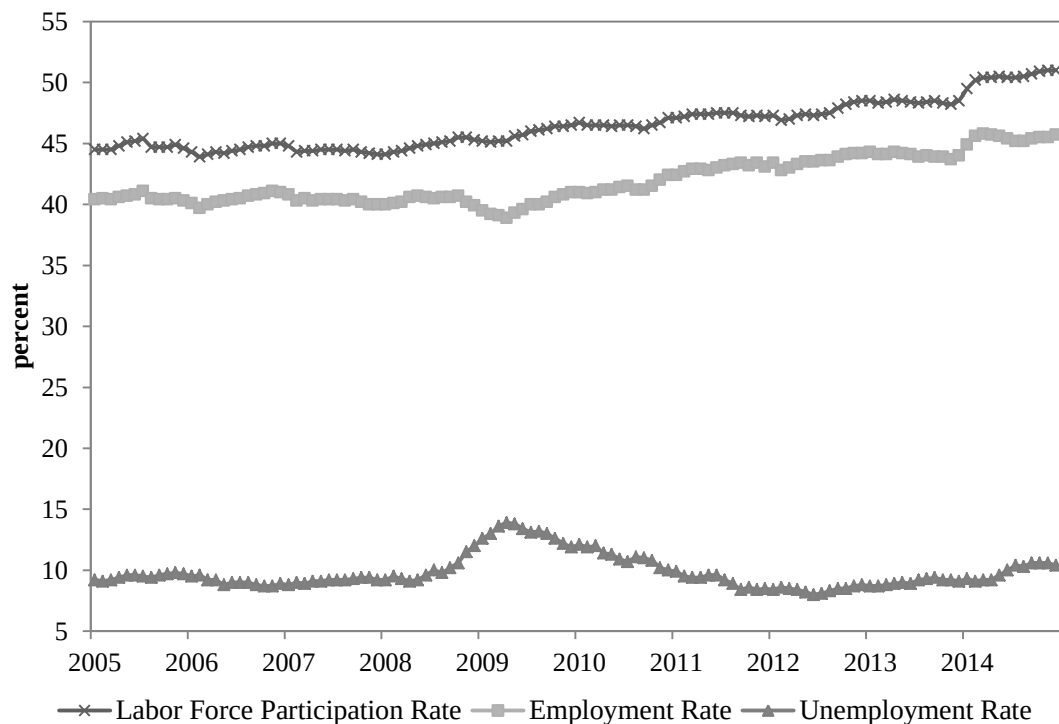


Figure 18. Employment Indicators of Turkey. Source: TUIK.

Figures 18 and 19 suggest that the employment trends are in an increasing trend in Turkey. However, GDP per capita seems to increase in a slower manner after 2011.²⁵ Especially after the 2008 global financial crisis Turkey performed relatively well in these economic indicators. At the same time, we see that consumer confidence is not that high compared to the prior levels of the 2008 financial crisis. These all suggest that housing demand is increasing in Turkey due to natural trends in population, employment and income levels and due to eased credit conditions especially after mid 2000s. However recent prices may be more overvalued than these demand side factors suggest.

²⁵ Meanwhile, Turkey has fallen into middle income trap according to some economists.

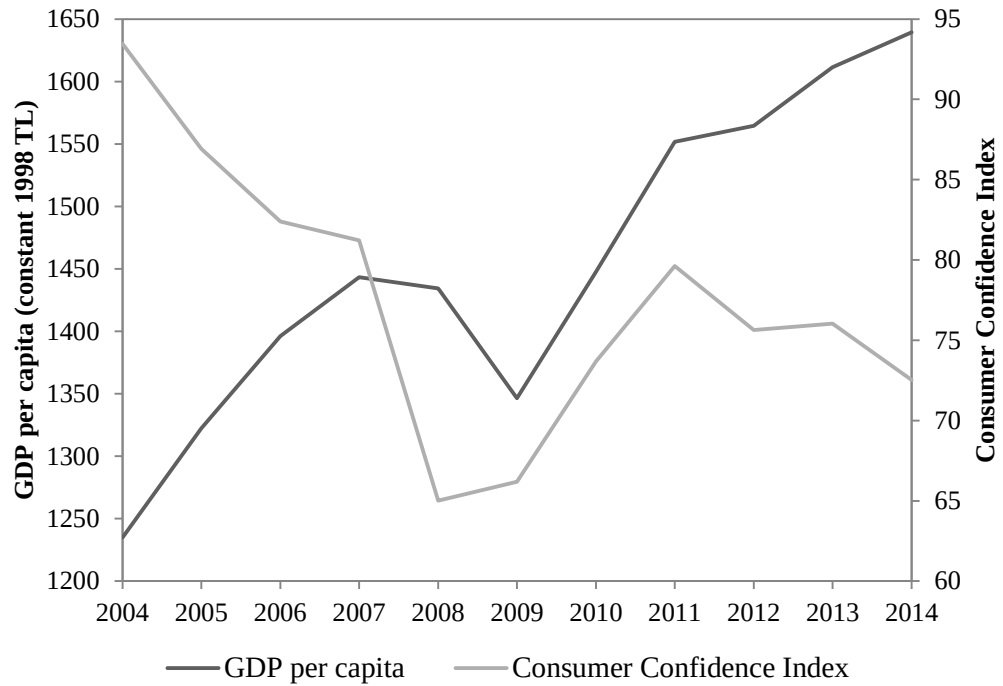


Figure 19. Real GDP per capita and Consumer Confidence Index for Turkey.
Source: TUIK and own calculations.

3.4. Housing Supply, Sales and Construction Costs

Construction permits can be used as a proxy for housing supply. In the earlier bubble examples, housing starts were in an increasing trend which soon tends to create an excess supply. The numbers of housing sales can also be informative. Lastly, increases in the construction costs may explain the increase in the prices.

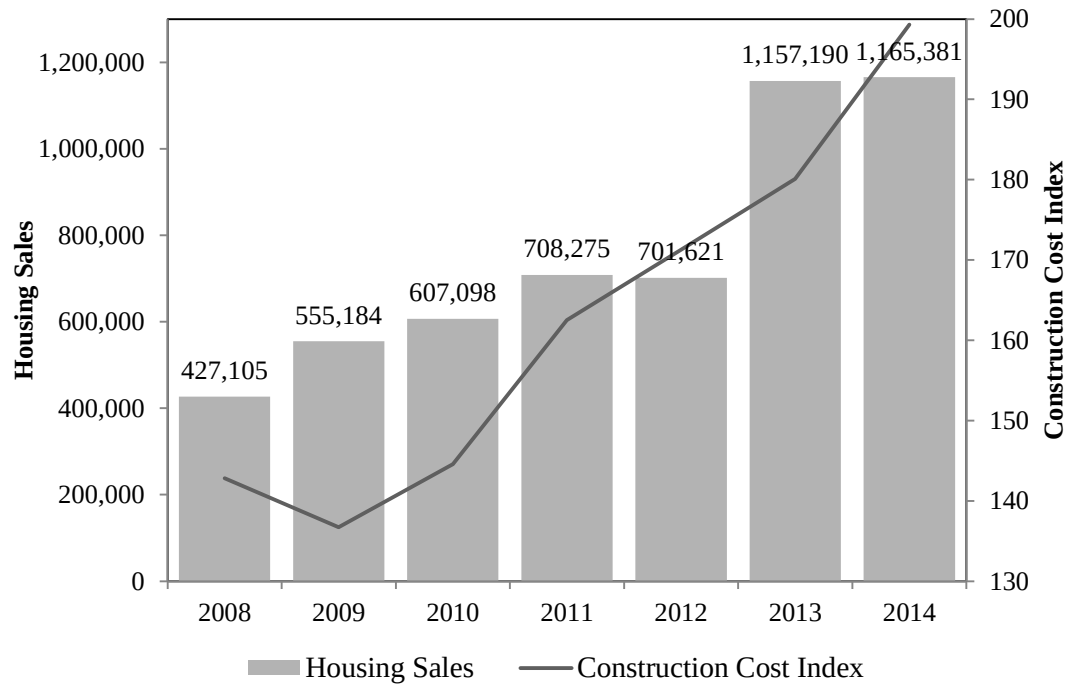


Figure 20. Housing Sales and Construction Cost Index. Source: TUIK

From Figure 20, we see that housing sales almost doubled in 2013 compared to previous year and reached the levels over 1 million. At the same time we see that construction costs are also increasing after 2009. Additionally the number of house sales to foreigners increased from around 12.000 to 19.000 between 2013 and 2014 in Turkey according to TUIK. This is a sign that with the recent law that simplifies the acquisition of houses by foreigners pushed the demand forward and therefore prices. At the same time, Figure 21²⁶ suggests that construction and occupancy permits are also increasing, that means, housing supply is in an increasing trend in Turkey, especially after 2012. These figures suggest that housing supply is reacting the increase in demand due to households' improved economic status and eased credit conditions relative to past. However, we observe a huge acceleration in housing supply after 2011 whose levels are higher than ever.

²⁶ The monthly frequency can be found in Appendix.

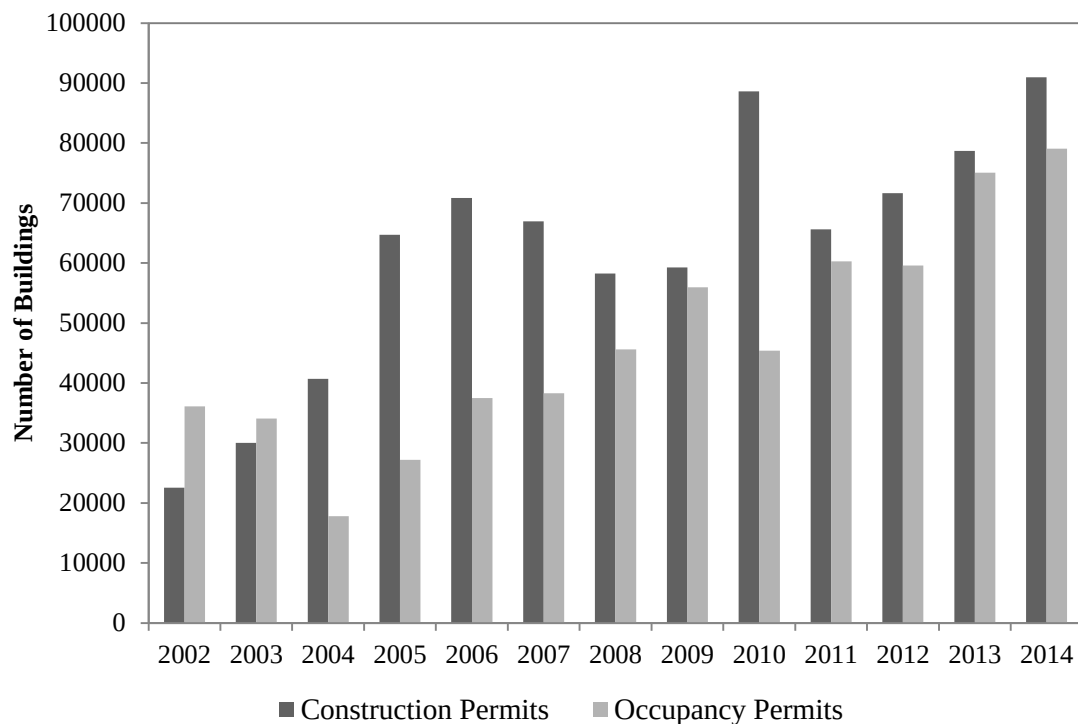


Figure 21. Construction and Occupancy Permits Statistics for Turkey. Source: TUIK

In addition, GYODER (The Association of Real Estate and Real Estate Investment Companies) reported their housing stock projection for 2023 based on population growth and urbanization, urban transformation, and restoration. According to their report the dwelling need will be approximately 6 million units for the 2015-2023 period in total, whose 3.7 million based on population and urbanization, 1.8 million based on urban transformation and 500 thousand based on restoration. The report suggests that the need in dwellings will slow down after 2015 due to a decline in population growth and urbanization.

The report also estimate that the ratio of housing loans/GDP will be between %12 and %21 depending on the level of GDP growth in 2023. For 2011 this ratio is found %5.7. According to the report this ratios are low mainly because Turkish secondary mortgage markets haven't developed. Another important detail here is that, after 2002 the share of the private sector in the production of dwellings has been

increasing significantly. While this ratio was around %80 in 2002, it jumped to %90 in 2011.

3.5. Alternative Investment Instruments

The returns of other assets in the economy can be informative on why the demand in housing is increasing. If housing returns are more than those or investing in house seems more secure, people may tend to invest more on housing rather than other assets such as gold, foreign exchange or bank deposits.

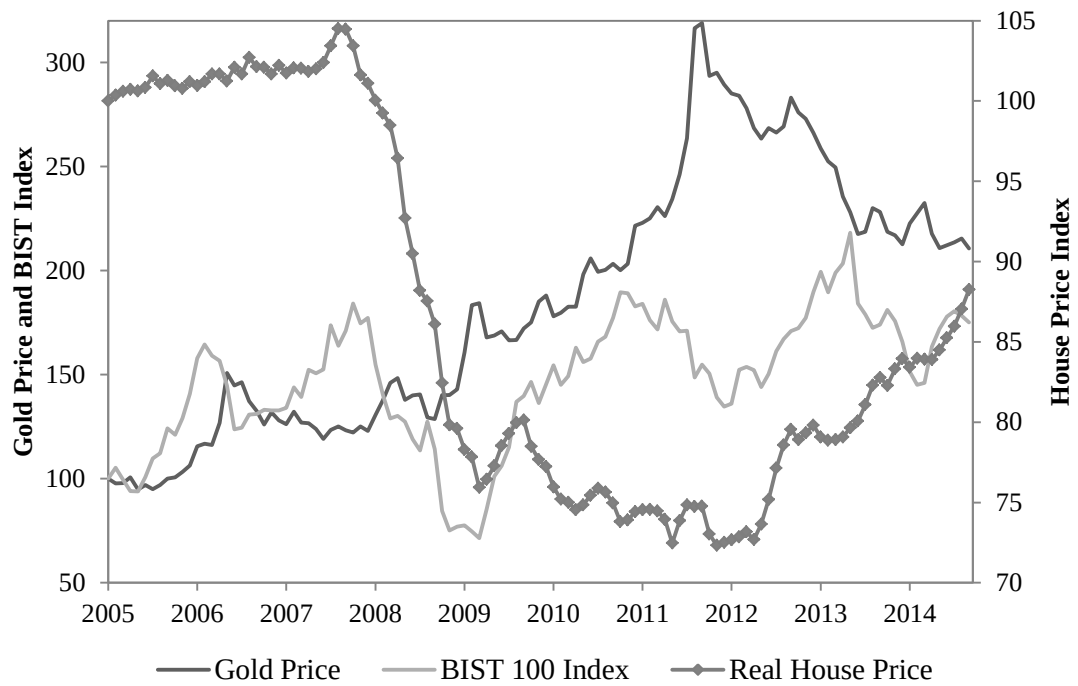


Figure 22. Gold Price, BIST 100 Return Index and House Price Index deflated by CPI. Source: TCMB

Figure 22 suggests that real house prices are quite less volatile²⁷ and has less structural breaks compared to gold and stock prices. This is probably the reason why households feel more confident while investing in houses rather than other alternatives. After 2012, we see that housing prices are increasing while gold and

²⁷ Standard deviation for house price index is 11.5 while it is 60 for gold price and 31.1 for stock price indexes.

stock prices are in a decreasing trend. This may be another reason why there occurred a huge demand for housing after 2012.

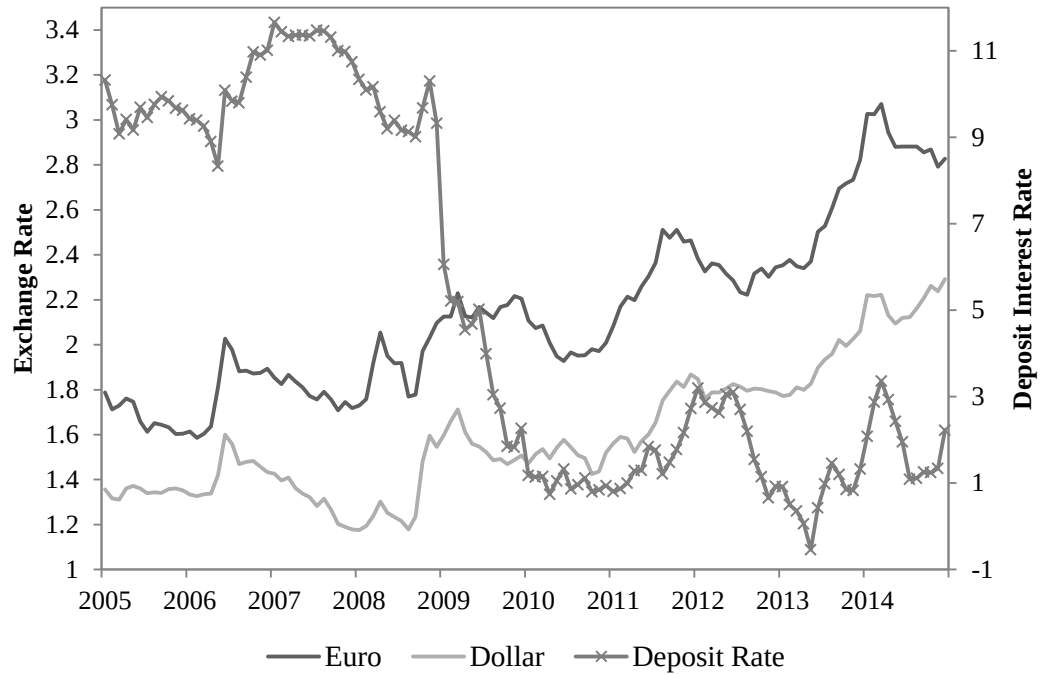


Figure 23. Foreign Exchange and Real Deposit Interest²⁸ Rates. Source: TCMB

The comments on volatility are also applicable for foreign exchanges and deposit rates which have a more volatile performance compared to house prices. Especially the real deposit rates are very volatile and around zero recently which makes investing in housing more secure and valuable. Even though the Dollar and Euro appreciated against Turkish Lira, they are also open to short term exogenous shocks and whose long term behaviour are more uncertain compared to real estate. In conclusion, probably the fact that investing in housing seems more secure for long term concerns makes it more attractive in investing decisions.

²⁸ Real interest rate was used to see the real return and the rate was calculated by deposit interest rate minus expected inflation rate.

3.6. Expectations

As mentioned before, Case and Shiller (2003) emphasized the importance of the expectations of households on economic behaviour. Moreover, most of the economists believe that the most important motive of bubble is “speculation” which undoubtedly is related with the expectations of households. In bubble cases, we see that households still tend to buy home even when the house prices are at quite high levels.

TUIK conducts a survey in order to be informed about the ideas of the Turkish households’ on the current economic situations and their expectations about the future.²⁹ The survey is conducted monthly and starts from 2004 however, after 2012 different method is being applied. Since they are not comparable we present the results of both. Examining this survey can inform us on whether really expectations and ideas of households are realistic and effective on house prices. Figures 24 and 25 show the households’ probability of buying or building a home³⁰.

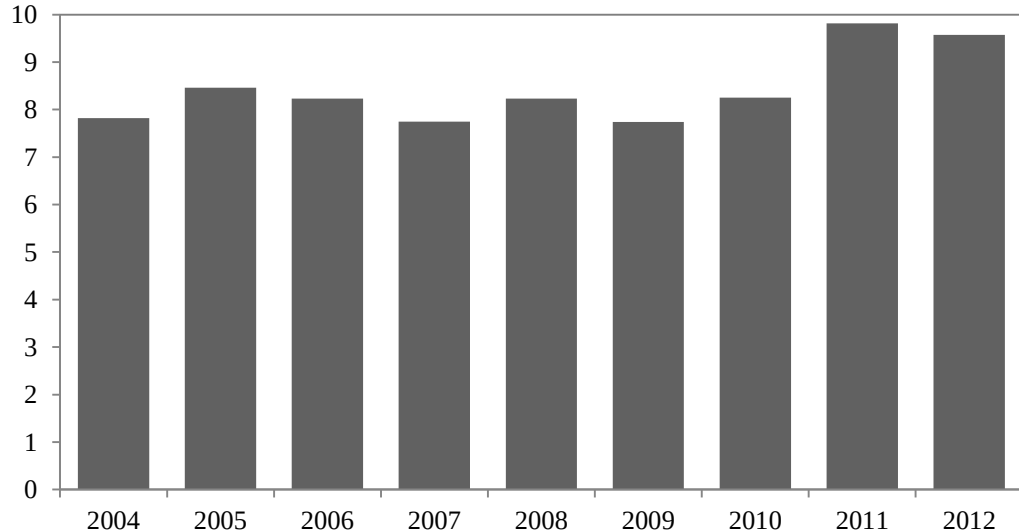


Figure 24. The percentages of the probability of buying or building a home of households over the next 12 months from 2004 to 2012. Source: TUIK consumer tendency statistics and own calculations.

²⁹ The results of these surveys can be found under TUIK consumer tendency statistics.

³⁰ The question asked to households is “What is your probability of buying or building a home over the next 12 months?”.

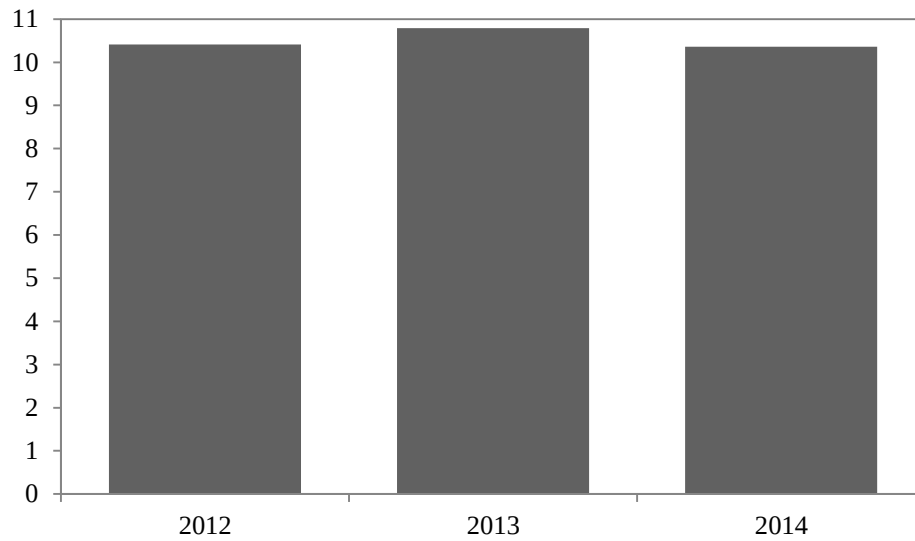


Figure 25. The percentages of the probability of buying or building a home of households over the next 12 months from 2012 to 2014. Source: TUIK consumer tendency statistics and own calculations.

We see that households' tendency of buying home significantly increased after 2010 for the 2004-2012 period. The important inference here is even though the house prices are increasing significantly since 2012, households' tendency to buy home is still more than pre-2011 levels in 2013 and 2014. This finding is the same what is found in earlier bubble cases however, this may be a reflection of the improvement in the economic conditions of households. Another point here is, since we do not have a longer period house price data, it is hard to argue that the recent increases in house prices are at historical high. Actually, Figure 14 and 16 suggest that the house prices are just returning their pre-2008 levels in real terms.

3.7. Exposure of the Real Estate Sector on the Economy and Finance

This section attempts to analyze the exposure of the real estate sector on the financial system and on the economy in Turkey. Even though the detailed financial risk investigation exceeds the scope of this thesis, we only attempt to show and underline some important facts. Table 2 informs about the weight of the housing sector in the Turkish economy:

Table 2. The weight of the housing sector in the Turkish economy. Sources: TCMB, TBB, BDDK.

Construction Sector / GDP (2014)	Housing Loans / GDP (2014)	NPL (2014) (million TL)	Housing Loans / Total Loans (2014)	LTV Ratio	GDP (2014) (constant 1998, billion TL)
10.0%	8.8%	663	44.5%	75%	126

For instance, if the share of housing credits is increasing in total credits and if the amount of non performing housing loans is increasing, it may imply an increasing risk for the financial sector from the housing side. Figure 26 suggests that recently the highest shares of total loans are housing and general purpose loans. After 2005 we see that the share of housing loans is stable around 40 percent each year.

The share of housing loans in total loans seems peaked in 2007 with around 47.5 percent and recently it is around 45 percent.³¹ These facts suggest that even though the importance of housing loans are increasing, it is still relatively stable and we cannot suggest that there is a significant boom in share of housing credits compared to total credits recently.³² In terms of non performing housing loans, the case seems relatively better. Figure 27 suggests that even though the amount of non performing housing credits increased significantly in 2009, they are smaller recently relative to the years 2009 and 2010. However, the question whether the current situation is sustainable is the scope of another analysis.

³¹ In addition the number of people that use housing loans in total loans are quite stable around %5-6 since 2006.

³² Though a notable boom in the share of housing credits in total credits occurred in 2005 (from 20 percent in 2004 to the levels of 45 percent in 2005).

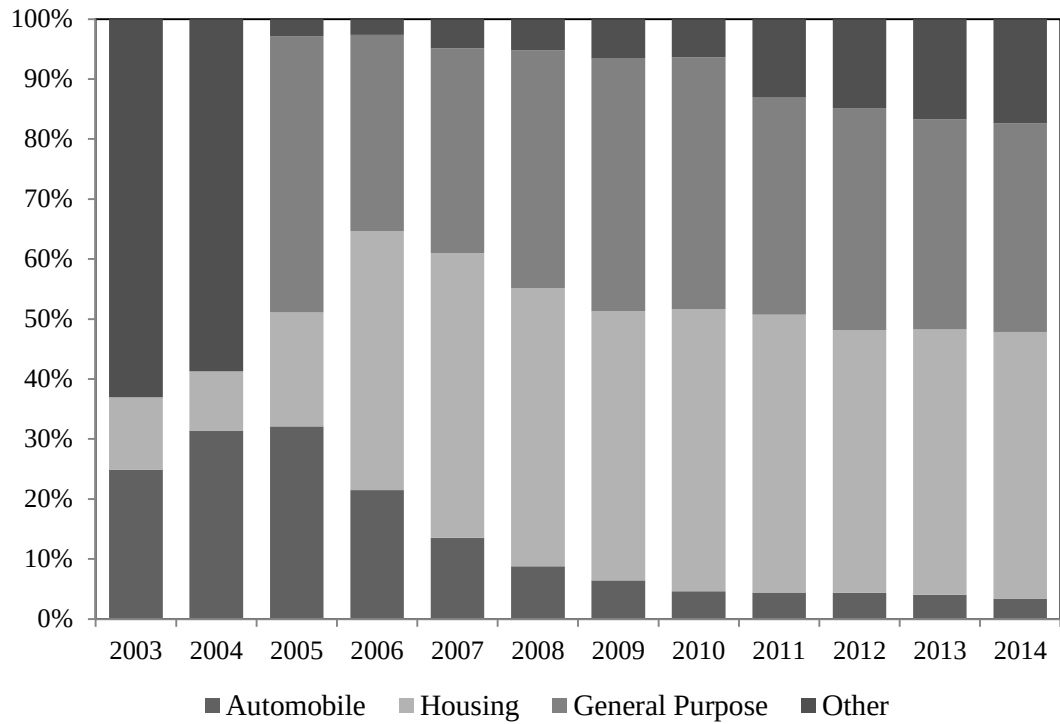


Figure 26. Percentage shares of automobile, housing, general purpose and other loans in total loans. Source: BDDK

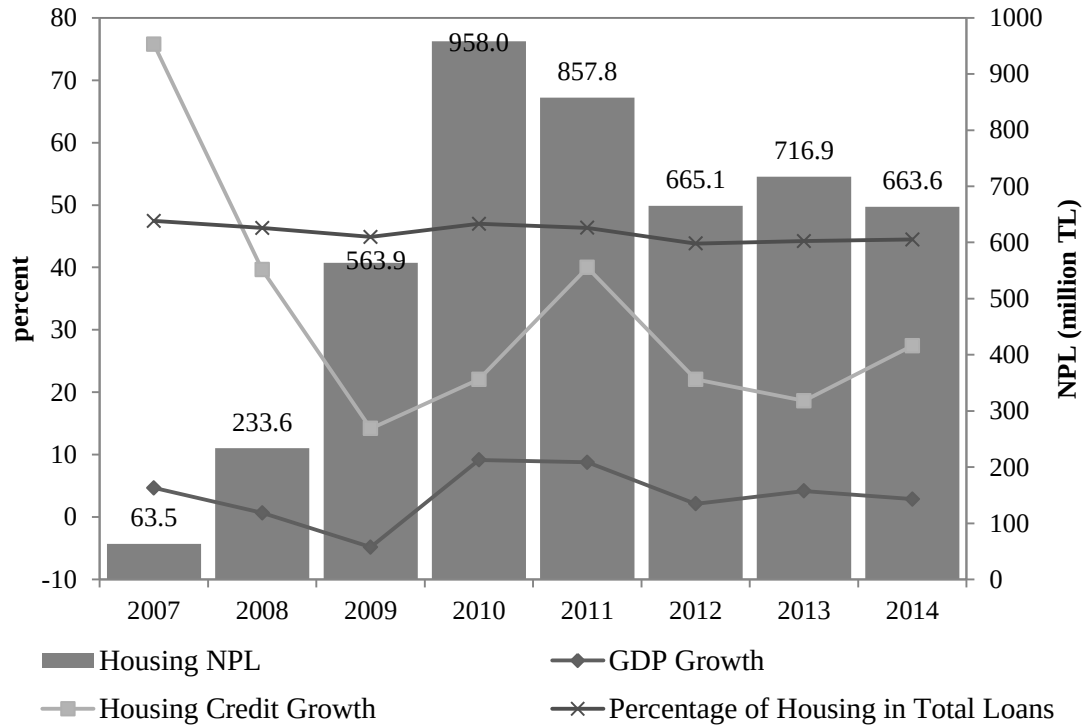


Figure 27. Non-performing housing loans, housing credit growth, real GDP growth and percentage of housing loans in total loans. Sources: BDDK and TCMB.

As it was mentioned before we witness that housing credit growth exceeds GDP growth in many of the examples of housing bubble crashes. The case is same for Turkey recently. Housing credit growth exceeds GDP growth each year since 2007. In 2013 and 2014 we see that while housing credit growth is not higher than 2012 the amount of non performing housing loans are not lower than 2012, which seems a bit suspicious.

In summary, it can be said that Turkish house prices are growing remarkably especially after 2012. Interest rates are low relative to past and housing supply is increasing significantly. Even though construction costs are increasing, income is increasing in a slower manner. At the same time, there is an increase in the demographic and employment trends which pushes the housing demand forward. We also see that the general tendency for buying home and housing sales dramatically increased in the recent years. There is a huge increase in housing loans but still non-performing loans are not so high. When compared to advanced countries, the exposure of housing sector on the financial system seems lower. All these results leave us with the conclusion that there is a boom in the housing sector recently due to the easing policies of the government which resulted in high prices. This pattern is quite similar to what is seen in the earlier cases of bubbles.

CHAPTER 4

TESTING BUBBLE

As mentioned in Chapter 3, there are several econometric models and tests to investigate the presence of bubble. A commonly used method is to investigate the relationship between house prices and its determinants. The main motive behind this approach is that, if the fundamental determinants of house prices or some macroeconomic indicators are weak in explaining the house price dynamics, or show anomalies, then this would be a signal of a presence of bubble. Therefore many economists benefit from several OLS models, VAR and VEC models, unit root and cointegration tests, Granger causality tests, variance decompositions and impulse response functions in order to determine the strength of the relationship between house prices and its determinants.

A second approach mainly focuses on the time series characteristics of house prices. For instance, recently developed tests assume that house prices grow with explosive or faster than exponential rate during bubble phases. Therefore these methods generally tests whether there is an explosive behaviour in the time series of house prices. Therefore we first apply some econometric models and methods in order to be informed about the relationship between house prices and its fundamentals. Secondly we apply the recently developed GSADF test on real house price index and price-to-rent ratio to check whether there is an explosive behaviour in the time series characteristic of house price indicators, which is assumed to be a sign of bubble.

4.1. Relationship between Prices and Fundamentals

In the literature different econometric methods are used to understand the relationship between house prices and fundamentals. There are also discrepancies between availability of data among countries, for instance, it is not available to reach long period time series or state based data for each country. In particular, it is not

always possible to reach each data in same frequency, therefore researchers sometimes need to apply averaging or interpolating data to work in same frequency. An econometric approach was made by Case and Shiller (2003), who study with a state based quarterly data which contains the period between 1985 and 2002. In their results, even income per capita solely is strong to explain the house price dynamics in most of the states. They further add other macroeconomic determinants into the regression such as population, employment, unemployment rate, housing starts and mortgage interest rates and show that for some states the explanatory power is still weak, therefore the authors argue there would be a bubble in those states.

Chen and Patel (1998) examine the dynamics of the Taipei housing market using Granger causality tests, variance decomposition and impulse response functions based on the vector error correction model they apply. They check the relationship between house prices, household income, short-run interest rates, stock price index, construction costs and housing completion using a quarterly data for 1973-1994 period. Their findings suggest that there is a long-run relationship between house prices and these determinants. Hui and Yue (2006) investigate the presence of bubble in Hong Kong, Beijing and Shanghai in 2003 using Granger causality tests and generalized impulse response analysis. They check the interactions between house prices and disposable income, local GDP, stock price indexes and stock of new vacant dwellings. The authors argue that there was probably a bubble in Shanghai in 2003 since they found anomalies between house prices and market fundamentals. For Beijing they found more significant relationships therefore they argue that there was not a bubble in Beijing. They attribute the price deviation of Shanghai to the speculation motive. The study further tries to estimate the weight of the bubble in the prices by using the difference between actual and predicted prices and argues that bubble term accounts for above 20 percent of the prices in Shanghai in 2003 which is quite high and strengthen the bubble claim. Panagiotidis and Printzis (2015) benefit from VECM approach to check the relationship between house prices and macroeconomic determinants for Greece. They work with a monthly data from 1997

to 2014 and they find a long run relationship between variables. The study also presents a detailed literature review on the studies that examine the relationships between house prices and macroeconomic determinants.

For Turkey, there are only a few empirical studies that apply econometric methods in investigating housing bubble. For instance, Erol (2015) employs several OLS models to check the relationship between house prices and its fundamentals. She looks at the relationship between house prices, GDP growth rate, population growth, urban population growth, housing starts, construction costs, mortgage interest rates, rental growth and employment growth. Her study covers the period 2007-2012. She suggests that her models sufficiently explain the relationship between house prices and determinants (with R^2 's between 0.42 and 0.52) and therefore it is hard to say there is a bubble in house prices. Büyükduman (2012) applies several OLS models to determine whether there is a bubble in Turkey recently. For the period from 1991 to 2012, his OLS results suggest that rents and construction costs are the only significant variables in explaining house prices. For the period between 2003 and 2012 he constructs an error correction model and his results show that the shock of residuals is not significant in the regression which is a proxy for bubble. Therefore he says that his regressions imply that there is not a bubble in Turkey.

4.1.1. Data and Description

This study follows the literature and tries to determine the relationships between house prices and its fundamentals. As the literature suggests, false relationships between them may indicate bubble and prices may be fueled by the speculation motive, rather than determinant factors. The determinant factors are chosen as income, construction costs, housing starts and the interest rates. We study with monthly frequency with 120 observations. Considering the fact that we have relatively short time period we prefer to choose 4 determinants which are mostly used in the literature. Even though the relationships between those are not so straightforward, income and interest rates represent the demand side factors while

construction costs and housing starts represent the supply side factors in general. We expect that the increases in income and construction costs will increase the house prices while increases housing starts and interest rates will decrease the house prices. Even though we consider that the causality relationship is from house price determinants to house prices, the direction may be different in some cases. For instance when house prices decrease, households become less wealthy and this reflects to consumption. Therefore it can be argued that there is a bilateral relationship between house prices and income. The longest measure of house prices is available at REIDIN. The house price index generated by REIDIN uses a monthly sample of asked prices covering over 200.000 house listings per month. The sample period is 2003:01 to 2015:02. The data for house price determinants are from TCMB and TUIK. Data inadequacy constrains our time period to 2005:01 to 2014:12. To represent income, we use industrial production index. The construction cost index is of quarterly frequency which was interpolated to monthly frequency. The variables in nominal values such as house price index and construction cost index were deflated by the consumer price index. To reach real interest rates, expected inflation rates were subtracted from nominal mortgage interest rates. All the variables are converted to natural logarithms except interest rates. The series are seasonally adjusted. Tables 3-4 and Figure 28 show the details of the data.

Table 3. The information about variables.

Variable	Definition	Period	Information	Source
lnHPI	Natural logarithm of Real House Price Index	2005M01 – 2014M12	REIDIN Residential Sale Price Index divided by CPI	REIDIN and TUIK
IR	Mortgage Interest Rates	2005M01 – 2014M12	Weighted Average of Housing Interest Rates minus Expected Inflation	TCMB
lnHS	Natural logarithm of Housing Starts	2005M01 – 2014M12	Construction Permits	TUIK construction statistics
lnIPI	Natural logarithm of Industrial Production	2005M01 – 2014M12	Industrial Production Index	TUIK industry statistics
lnCC	Natural logarithm of Construction Costs	2005M01 – 2014M12	Construction Cost Index divided by CPI	TUIK construction statistics

Note: Construction Costs variable was interpolated to monthly series by cubic spline interpolation.

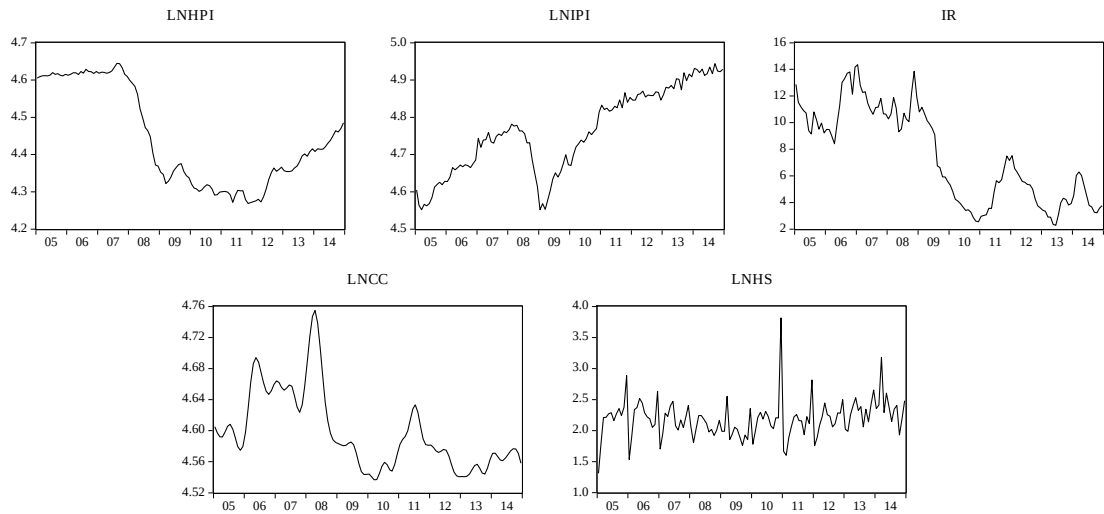


Figure 28. The time series graphs of each variable.

Table 4. Descriptive Statistics of Variables

	LNHP1	LNIP1	IR	LNCC	LNHS
Mean	4.44	4.76	7.50	4.60	2.19
Median	4.40	4.76	6.61	4.58	2.21
Maximum	4.64	4.94	14.36	4.75	3.82
Minimum	4.27	4.55	2.29	4.54	1.31
Std. Dev.	0.13	0.11	3.55	0.05	0.30
Skewness	0.32	-0.14	0.18	1.07	1.29
Kurtosis	1.47	1.88	1.62	3.58	9.67
Jarque-Bera	13.87	6.67	10.21	24.77	255.83
Probability	0.00	0.04	0.01	0.00	0.00
Sum	533.19	571.30	899.87	551.72	262.58
Sum Sq. Dev.	2.10	1.50	1501.70	0.30	11.06
Observations	120	120	120	120	120

4.1.2. Methodology

This study performs three different methodologies to investigate the bubble. In the first step, through a Vector Error Correction Model (VECM) I attempt to determine the strength of the relationship between house prices and selected macroeconomic determinants which may be informative on whether there is a bubble. VECM is a special case of VAR model and it is used when cointegrations are found between the variables. For the bivariate case the basic VECM is as below:

$$\begin{aligned}\Delta y_t &= \beta_{y0} + \beta_{y1}\Delta y_{t-1} + \dots + \beta_{yp}\Delta y_{t-p} + \theta_{y1}\Delta x_{t-1} + \dots + \theta_{yp}\Delta x_{t-p} \\ &\quad - \delta_y(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + u_t^y \\ \Delta x_t &= \beta_{x0} + \beta_{x1}\Delta y_{t-1} + \dots + \beta_{xp}\Delta y_{t-p} + \theta_{x1}\Delta x_{t-1} + \dots + \theta_{xp}\Delta x_{t-p} \\ &\quad - \delta_x(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + u_t^x\end{aligned}$$

Where Δ is the difference operator, p is the lag length, β and θ are the coefficients, δ is the error correction parameter, u is the error term and $y_t = \alpha_0 + \alpha_1 x_t$ is the long run cointegration relationship between variables. Firstly, I employed several unit root tests whose results imply that the variables used in this study are integrated of order one. Secondly I applied the Johansen cointegration test in order to determine the cointegration relationships between the variables. After interpreting the Granger causality results based on the model, impulse response and variance decomposition results are shown based on the structural model, where several short-run and long-run restrictions were put.

In the second step, similar to Hui and Yue (2006) and Jiang et al. (2011), I estimate a model including both demand and supply side variables and where house price is the dependent variable. I interpret the difference between actual and predicted house prices according to this model as bubble and show the amount of bubble in prices.

Lastly, I utilize the GSADF test to real house prices and price to rent ratio to determine whether recently house prices are performing explosiveness or not, which is a sign of a bubble.

4.1.3. Lag Length and Stationary Tests

Firstly we should determine whether our data is stationary. In addition we need to determine the order of differencing to achieve stationary data. Table 5 shows the summary of the ADF test results with only intercepts.

Table 5. ADF tests results for 2005:01 to 2014:12.

Variable	Level			First difference			Results
	ADF test statistics			ADF test statistics			
	k	t-Stat.	p-value	k	t-Stat.	p-value	
lnHPI	12	-1.98	0.30	0	-5.72	0.00	I(1)***
IR	3	-1.30	0.63	1	-8.36	0.00	I(1)***
lnHS	12	-1.29	0.63	11	-4.78	0.00	I(1)***
lnIPI	2	-1.53	0.52	1	-6.43	0.00	I(1)***
lnCC	12	-1.70	0.43	12	-3.27	0.02	I(1)**
<i>Critical Values: %1 level (***): -3.50</i>							
<i>%5 level (**): -2.89</i>							
<i>%10 level (*): -2.58</i>							
Note: Column k shows the lag length. The test includes only intercept term. Lag-selection criterion is AIC for maximum 12 lags allowed.							

From Table 5, we see that our variables are integrated of order one, which means they are not stationary in levels but stationary after first differencing. The results of KPSS test are also similar. Hence I assume that all of my variables are integrated of order one.³³

Second, we need to determine how many lags we should include in the VECM. False lag selections may generate overparametrization or oversimplification problems which decrease the power of estimation. I first estimated an unrestricted VAR and

³³ Since there is a possibility of a structural break I estimated Zivot Andrews unit root test for the levels of variables however the test rejected the null hypothesis that there is a unit root with a single break for all variables. The results of Zivot Andrews and KPSS tests can be found in Appendix.

check the lag length selection criterion based on it. Table 6 shows the lag selection criterions according to AIC, SIC and HQC. SIC and HQC suggests 4 lags, hence I select 4 lags which seem appropriate.

Table 6. Lag length selection according to unrestricted VAR system.

Lag Length	AIC	SIC	HQC
0	-2.88	-2.64	-2.78
1	-14.71	-13.87	-14.37
2	-16.39	-14.95	-15.80
3	-17.46	-15.42	-16.63
4	-18.27	-15.63*	-17.19*
5	-18.45*	-15.22	-17.14
6	-18.37	-14.53	-16.82

4.1.4. Cointegration

The detection of cointegration between nonstationary variables is important since if there is a cointegration, a VAR model with first differences is misspecified. If there is a cointegration, it is common to include one period lagged residuals from the vectors and apply VECM. If the time series are not stationary in levels but their linear combination is stationary after first differences, these series are called as cointegrated. To test cointegration, Johanssen cointegration test was employed. The lag length was selected according to SIC and HQC from the VAR system. For cointegration, both the trace and maximum eigenvalue tests indicate that there are 2 cointegration equations.

Table 7. Johansen cointegration test results.

Trace Test				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.
None *	0.45	125.12	69.82	0.00
At most 1 *	0.27	55.68	47.86	0.01
At most 2	0.10	20.01	29.80	0.42
At most 3	0.05	7.71	15.49	0.50
At most 4	0.02	1.75	3.84	0.19
Maximum Eigenvalue Test				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.
None *	0.45	69.43	33.88	0.00
At most 1 *	0.27	35.67	27.58	0.00
At most 2	0.10	12.30	21.13	0.52
At most 3	0.05	5.96	14.26	0.62
At most 4	0.02	1.75	3.84	0.19

Table 7 shows that both tests reject the hypothesis of no cointegration at the %5 level. The test results indicate that there are 2 stationary relationships between the levels of the variables. Since cointegrations were found we progress with the application of VECM.

4.1.5. The Vector Error Correction Model

The model has five endogenous variables in first difference ($\Delta \ln \text{HPI}$, $\Delta \ln \text{IPI}$, ΔIR , $\Delta \ln \text{HS}$, $\Delta \ln \text{CC}$). The exogenous variables include constant and a dummy³⁴ to control for structural break. In summary we have 5 endogenous and 2 exogenous variables and 5 equations estimated with 120 observations.³⁵

³⁴ Dummy takes the value 1 for between 2008M01-2009M12 and 0 elsewhere.

³⁵ The model has passed from several autocorrelation, heteroscedasticity and nonnormality tests. Details can be found in Appendix.

4.1.6. Granger Causalites

In time series econometrics, if the past values of x contains information that helps in the prediction of y , it is said that x Granger causes y (or $x \rightarrow y$).

Table 8. Granger causality results based on VECM.

	Chi-square	P value	Result
$\Delta \ln IPI \rightarrow \Delta \ln HPI$	3.80	0.43	N
$\Delta IR \rightarrow \Delta \ln HPI$	10.39	0.03	Y
$\Delta \ln CC \rightarrow \Delta \ln HPI$	22.52	0.00	Y
$\Delta \ln HS \rightarrow \Delta \ln HPI$	9.79	0.04	Y
$\Delta \ln HPI \rightarrow \Delta \ln IPI$	2.66	0.62	N
$\Delta \ln HPI \rightarrow \Delta IR$	2.39	0.66	N
$\Delta \ln HPI \rightarrow \Delta \ln CC$	6.20	0.18	N
$\Delta \ln HPI \rightarrow \Delta \ln HS$	16.41	0.00	Y
→ shows the null hypothesis that there is no Granger causality. Y means the rejection of the null hypothesis.			

Table 8 shows the test results. We see that interest rates, housing starts and construction costs Granger cause house prices while income does not. The results are true for five percent level of significance. Income does not seem an effective factor in explaining house prices. The results suggest that housing starts Granger cause house prices with a feedback effect, as expected. Another point is that, house prices does not seem effective in explaining income, in other words, the results do not suggest a wealth effect due to housing prices, which is surprising.

4.1.7. Structural Model

Structural VAR and VEC models are frequently used in the economic literature. The purpose of using these models is to produce more reliable results depending on the economic theory. These models allow adding some structural short-run and long-run restrictions on the estimations based on the theory. The structural models can be classified as A, B and AB models (Lütkepohl, 2005). I will follow the approach suggested by Lütkepohl (2005) for SVEC models, which is a B model.

Lütkepohl (2005) proposes identifying 2 different matrices, B for the contemporaneous effects and ΞB for the long run effects where $u_t = B e_t$. The matrix of long run effects of the u_t residuals is:

$$\Xi = \beta_{\perp} \left(\alpha'_{\perp} (I_K - \sum_{i=1}^{p-1} \Gamma_i) \beta_{\perp} \right)^{-1} \alpha'_{\perp}.$$

Where β and Γ are parameter matrices. For the just-identification of the structural innovations in the B model $K(K - 1)/2$ independent restrictions are required, where K is the number of endogenous variables. Additionally, a further $\frac{1}{2}K(K - 1) - r(K - r)$ further restrictions should be put in order to just-identify the structural innovations, where r is the number of cointegration relationships. It is suggested that $r(r - 1)/2$ additional restrictions are necessary for transitory shocks and $(K - r)((K - r) - 1)/2$ restrictions are required to identify the permanent shocks. Lastly, there can be at most r zero columns in the ΞB matrix. This leaves us with 10 independent restrictions, 3 additional restrictions for the long-run and 1 additional restriction for the short run. The restrictions on matrices are as:

$$B = \begin{bmatrix} \ln hpi & \ln ipi & ir & \ln cc & \ln hs \\ * & * & * & * & * \\ * & * & * & * & * \\ * & * & * & * & 0 \\ * & * & * & * & * \\ * & * & * & * & * \end{bmatrix} \quad \Xi B = \begin{bmatrix} \ln hpi & \ln ipi & ir & \ln cc & \ln hs \\ * & * & 0 & * & 0 \\ * & * & 0 & 0 & 0 \\ * & 0 & 0 & * & 0 \\ 0 & * & 0 & * & 0 \\ * & * & 0 & * & 0 \end{bmatrix}$$

I assume that interest rates and housing starts do not permanently effect other variables in the long run hence we have two zero columns in the long run impact matrix. It is assumed that in the long run construction costs do not affect income, income does not affect housing interest rates and house prices do not affect construction costs. For the short run it is assumed that housing starts do not have any contemporaneous effect on housing interest rates. After these restrictions, the matrices were estimated as follows:

$$B = \begin{bmatrix} \ln hpi & \ln ipi & ir & \ln cc & \ln hs \\ 0.0052 & -0.0033 & -0.0042 & 0.0008 & -0.0021 \\ 0.0058 & 0.0143 & -0.0028 & -0.0004 & -0.0007 \\ 0.3571 & -0.0472 & 0.3393 & 0.3921 & 0.0000 \\ -0.0010 & 0.0004 & -0.0004 & 0.0012 & -0.0008 \\ 0.0563 & -0.0177 & -0.0615 & 0.0634 & 0.2029 \end{bmatrix}$$

$$\Xi B = \begin{bmatrix} \ln hpi & \ln ipi & ir & \ln cc & \ln hs \\ 0.0231 & -0.0142 & 0.0000 & 0.0065 & 0.0000 \\ 0.0138 & 0.0136 & 0.0000 & 0.0000 & 0.0000 \\ 0.0436 & 0.0000 & 0.0000 & 0.8734 & 0.0000 \\ 0.0000 & 0.0034 & 0.0000 & 0.0145 & 0.0000 \\ 0.0274 & -0.0101 & 0.0000 & -0.0230 & 0.0000 \end{bmatrix}$$

4.1.8. Forecast Error Variance Decomposition

Variance decomposition analysis shows us the percentage of variation in house prices from the shocks of its determinants. Two years long time horizon is under analysis. The results on Table 9 suggest that most of the variation of house prices comes from itself, by an average of 84 percent in 24 months. This implies that most of the changes in house prices are based on the people's expectations of future price changes. This finding is consistent with Erdem and Varlı (2014).

However the 16 percent of house price variation comes from the determinants in average. Interest rates seem the second biggest component that affect the house price variance. This is not surprising since households may tend to make short-term decisions when interest rates change. Construction costs and housing starts constitute a total 8 percent change in the variance of house price. Lastly, our results suggest that industrial production index that represents income has the lowest effect on house price variance. This finding strengthens the argument that income is not a significant determinant of household decisions.

Table 9. Variance decomposition analysis of House Prices.

Month	lnHPI	lnIPI	lnIR	lnCC	lnHS
1	0.63	0.00	0.29	0.00	0.07
2	0.70	0.00	0.22	0.00	0.07
3	0.73	0.00	0.20	0.01	0.06
4	0.72	0.00	0.19	0.05	0.04
5	0.73	0.00	0.17	0.07	0.03
6	0.75	0.00	0.14	0.09	0.03
7	0.77	0.00	0.10	0.10	0.02
8	0.79	0.01	0.08	0.10	0.01
9	0.81	0.01	0.06	0.11	0.01
10	0.82	0.01	0.05	0.11	0.01
11	0.84	0.01	0.04	0.10	0.01
12	0.85	0.01	0.03	0.10	0.01
13	0.87	0.01	0.03	0.09	0.01
14	0.89	0.01	0.02	0.07	0.01
15	0.90	0.01	0.02	0.07	0.01
16	0.91	0.01	0.02	0.06	0.00
17	0.92	0.01	0.01	0.05	0.00
18	0.92	0.01	0.01	0.05	0.00
19	0.93	0.01	0.01	0.05	0.00
20	0.93	0.01	0.01	0.05	0.00
21	0.94	0.01	0.01	0.04	0.00
22	0.94	0.01	0.01	0.04	0.00
23	0.94	0.01	0.01	0.04	0.00
24	0.94	0.00	0.01	0.04	0.00
Average	0.84	0.01	0.07	0.06	0.02

4.1.9. Impulse Response Analysis

Based on the structural model, we now analyze the impulse responses. We see that the response of house prices has a strong effect on itself. One standard deviation shock in current house prices generates approximately 3 percent increase in the first year. This is a sign of speculative activity, which means that current changes in house prices have strong permanent effect on people's expectations. The results suggest that the impact of income dies out after the first year and the effect is not so

strong. One standard deviation shock from income results in less than 0.5 percent increase in the house prices in 12 months.

The interest rate shock generates a negative pressure on prices up to one year. We expect that the effect of housing starts should be negative since it is a supply side variable. However, the impact of housing starts on house prices is quite small and lasts only for about six months. This may be a sign that the demand side is so strong that the housing supply is unable to answer it. Lastly construction costs have a permanent positive impact on house prices which is expected. Besides other supportive factors for demand such as population growth, employment growth and migration, the recent decreases in mortgage interest rates and eased credit conditions seems to resulted in an exacerbated demand which outperforms the supply. In terms of “bubble”, we can conclude that current house prices are the best significant factor in explaining the future house prices which confirms the possibility of speculative activity.

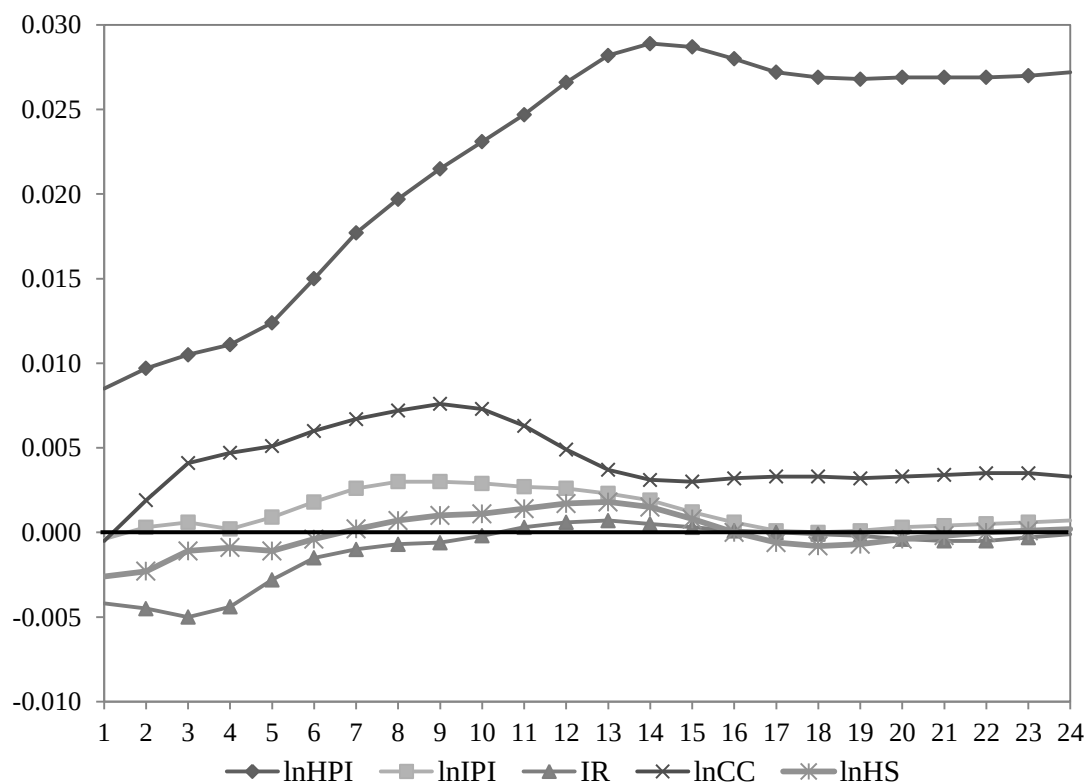


Figure 29. Impulse Responses of House Prices from selected determinants.

4.2. Bubble Identification

In this section, following Hui and Yue (2006) and Jiang et al. (2011) I will attempt to determine the size of the bubble. They start by the assumption that in housing markets the prices occur through the equilibrium of supply and demand. For our case this can be figured as:

$$P_t = P(P_t, IPI_t, IR_t, CC_t, HS_t)$$

Where housing demand of Turkey consists of house prices (P_t), income (IPI_t) and interest rates (IR_t) and housing supply of Turkey consists of house prices (P_t), construction costs (CC_t) and housing starts (HS_t).

These studies argue that the difference between actual house prices and predicted house prices can be argued as bubble term. Table 10 presents the regression results:

Table 10. Regression results based on supply and demand approach.

Variable	Coefficient	St. Error	t-Stat.	Prob.
C	0.10	0.13	0.75	0.45
LNHPI(-1)	1.02	0.01	82.55	0.00
LNPI	0.01	0.01	1.04	0.30
IR	0.00	0.00	-0.97	0.34
LNCC	-0.06	0.03	-1.79	0.08
LNHS	0.00	0.00	1.24	0.22
R-squared		0.99		
Adjusted R-squared		0.99		

The studies suggest that the percentage accumulated housing price bubbles can be calculated by the following equation:

$$B_t\% = \frac{\Delta B_t}{P_t} = (P_t - P_t^*)/P_t$$

Where B_t represents additional bubble term in month t , P_t represents the actual measured housing price and P_t^* represents the predicted housing prices. This equation calculates how much of the house prices can be attributed to bubble term.

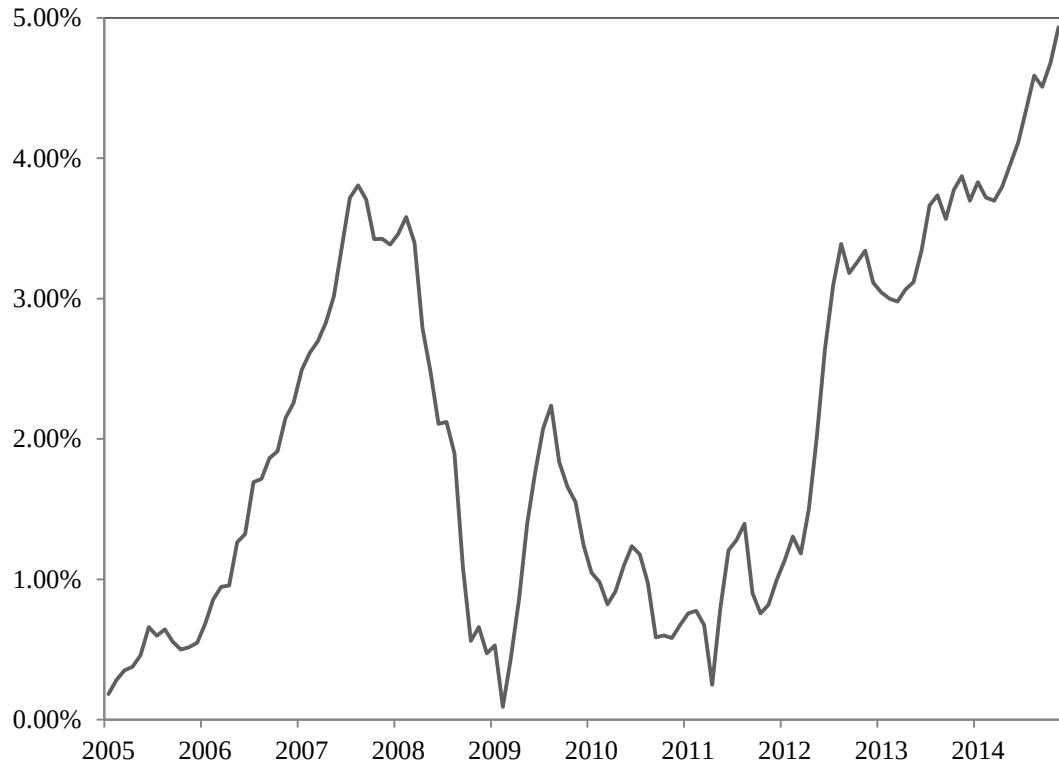


Figure 30. Estimated housing price bubbles for Turkey from 2005 to 2015.

Figure 30 shows the estimated housing price bubbles in Turkey. We see that the accumulated percentages of house price bubble first peaked around mid-2007 and then decreased substantially. We see that the bubble term significantly increased after 2012 and it is even higher than the levels of 2007 after 2014 with above 5 percent. This may be a confirmative suggestion of a bubble in Turkey recently. However for Hui and Yue (2006) argue that there is a bubble in Shanghai in 2003 where the estimated housing bubble represents above 20 percent of the actual price. Likewise, Jiang et al. (2011) argued that there was a house price bubble in Perth (an Australian city) in 2006 where the bubble represents around 25 percent of the house price. In conclusion, these numbers are quite higher than the Turkish case where we found only around 4-5 percent of the house price can be represented as bubble. Still,

it is clear that the bubble component is bigger than the past and there is a possibility that the weight of bubble can become bigger in the future, such as in one or two years.

4.3. Generalized Sup ADF Test

The assumption behind this test is that, when bubble occurs, prices follow an explosive behavior. Hence this test is a transformed version of the ADF test and a right tailed unit root test which tries to capture the explosive behavior of the time-series variable. The generalized sup ADF test (GSADF here after) is the extended version of the sup ADF test (SADF here after) developed by Phillips, Wu and Yu (2011). Phillips, Shi and Yu (2012) showed that the GSADF test significantly improves the bubble detection ability especially when there are more than one bubble episodes. Consider the classical Augmented Dickey Fuller test:

$$\Delta p_t = \mu + (\rho - 1)p_{t-1} + \sum_{i=1}^k \beta_i \Delta p_{t-i} + \varepsilon_t$$

Where the null hypothesis is $H_0: \rho = 1$ and the alternative hypothesis is $H_1: \rho < 1$. This method is based on changing the alternative hypothesis for explosive behavior and in this case the alternative hypothesis is $H_1: \rho > 1$.

The main motive behind the SADF test is calculating the ADF test repeatedly on a forward expanding sample sequence. Assume that the regression sample begins from the r_1^{th} fraction of the total sample and ends at fraction r_2 , where $r_2 = r_1 + r_w$ and $r_w > 0$ is the window size of the regression. The SADF statistic is defined as $\sup_{r_w \in [r_0, 1]} ADF_{r_w}$. In other words the backward sup ADF (BSADF) statistic is defined as the sup value of the ADF statistic sequence, denoted by

$$BSADF_{r_2}(r_0) = \sup_{r_1 \in [0, r_2 - r_0]} \{ADF_{r_1}^{r_2}\}.$$

The GSADF test however, repeatedly calculates the BSADF statistic for each $r_2 \in [r_0, 1]$. The GSADF statistic is defined as the sup value of the BSADF statistic, denoted by:

$$GSADF(r_0) = \sup_{r_2 \in [r_0, 1]} \{BSADF_{r_2}(r_0)\}.$$

4.3.1. Data

To check bubble formation, we use real sale price index (nominal sale price index divided by CPI) and price-to-rent ratio (nominal sale price index divided by nominal rent price index) for 7 provinces and Turkey. The monthly sale and rent price data belong to REIDIN and the monthly CPI data belongs to TUIK. The period is from Jan-03 to Feb-15.

4.3.2. Results

The tests were applied for $r_0=0.1$. The regressions were repeated for 2000 times. Test statistics are given in Table 11. The shaded areas show the periods of bubble that is predicted by the GSADF test. According to the test for real house prices, there is a long period of negative bubble between 2008M03 and 2012M04. After that, there are positive bubbles in between 2012M08 and 2012M10, 2013M11 and 2014M01 and between 2014M06 and 2015M02. In conclusion the results of the GSADF test suggest that there is a bubble in real house prices recently. For price-to-rent ratio, the test detected 3 negative bubble periods before 2009M10 and 3 positive bubble periods after. The test results imply that Turkish price-to-rent ratio is performing a bubble recently beginning from 2013M02. In summary, GSADF test results confirm the recent exuberance in the house prices which is a sign of a bubble.

Table 11. GSADF test statistics for Turkish real house prices and price-to-rent ratio.

Data	Test Stat.	Critical Values		
		90%	95%	99%
Real House Price	6.54	2.03	2.34	3.02
Price-to-rent Ratio	2.95			

Note: Calculations are based on 2.000 replications. The sample size is 146 and the minimum window has 15 observations.

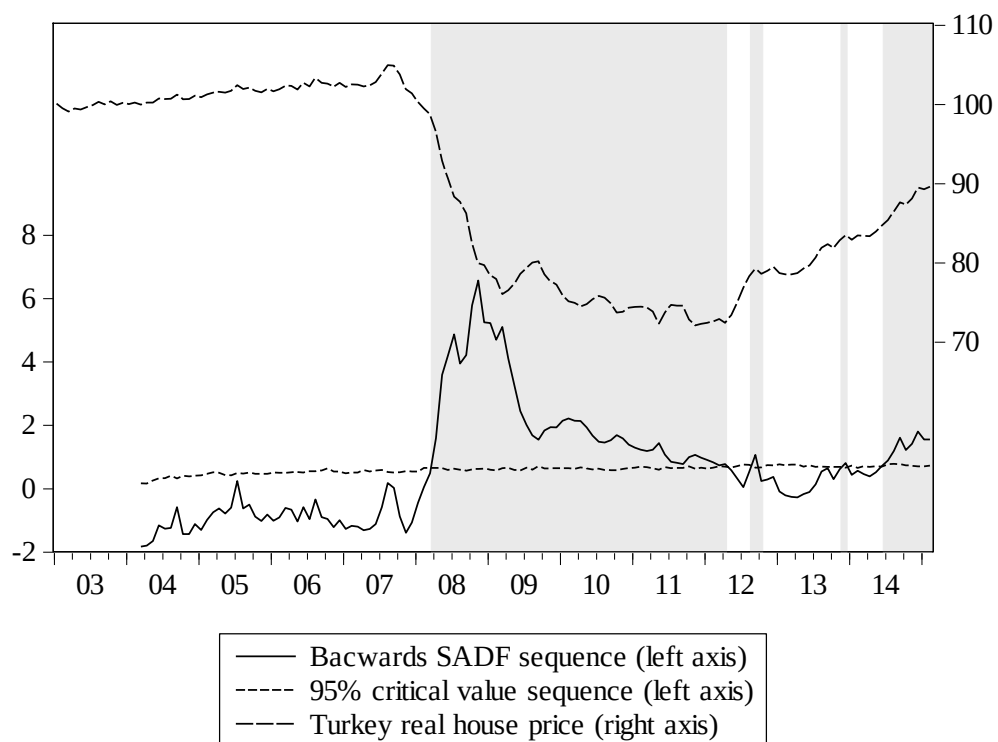


Figure 31. Bubble periods in Turkish real house prices.

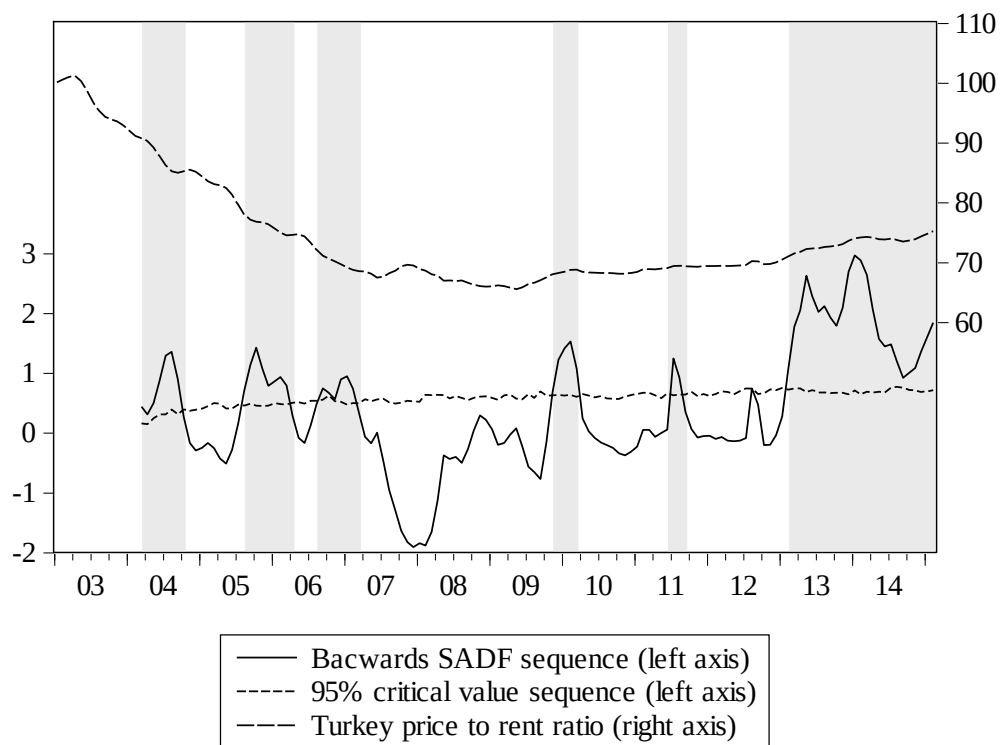


Figure 32. Bubble periods in Turkish price-to-rent ratio.

CHAPTER 5

CONCLUSION

In this thesis the main aim was to find out whether there can be a bubble in the Turkish housing market recently, where the house prices are increasing rapidly. In order to do this, we first tried to define what is a bubble in real estate markets and how can it emerge. The most common literature suggest that bubbles are deviations of prices from market fundamentals which are fueled by the speculative activity where most of the consumers behave with the motive that prices will always increase in the future. We utilize this approach to understand the phenomena. Evidences from earlier examples show that easing policies such as decreases in interest rates or increases in LTV ratios are the triggering factors in stimulating demand at the beginning of the boom phases, which soon result in price increases. The examples also prove that since there are strong relationships between real estate markets and the overall economy, bubbles usually end with economic crises whose effects cannot be removed for a long period of time.

Firstly, we interpreted the current state of the demand and supply characteristics of the Turkish housing market by focusing on several indicators such as prices, housing loan rates, housing credits, demographics and income trends, expectations of households, construction permits and costs. Second, we applied and interpreted a VECM in order to determine the strength of the relationships between house price determinants and prices. Then we constructed a model to see how the “fundamentals” can explain the house prices over time, utilizing the approach used in Hui and Yue (2006) and Jiang et al. (2011). Lastly we applied the GSADF test on real house prices and price-to-rent ratio, which is a recently developed test by Phillips et al. (2012) in order to detect bubbles in time series.

The main findings of this study are as follows. Firstly, recently nominal house prices seem to have increased very sharply in Turkey in general. However, when adjusted for inflation, this increase is much lower, especially when compared to the experiences of US, Japan, Spain and Ireland. Additionally, price-to-income and price-to-rent ratios do not seem to be at very high levels, which are the main indicators for bubble detection. It is important to highlight that after 2012 all of these indicators are increasing, which possibly is the beginning time of the recent boom. The results of GSADF test confirm the explosiveness of the real house prices in Turkey especially after 2014. Additionally the descriptive power of the model we constructed based on the fundamentals is decreasing after 2012. Lastly in Adana, İstanbul and İzmir prices seem to have increased much more than the Turkey average. It is important to note that in the earlier examples we see that the existence of price bubbles in just a few big cities is sufficient in terms of creating danger.

Secondly, the results of VECM imply that income is the less significant factor in determining household decisions. Additionally, it is seen that the strongest effect of house price changes came from house prices itself, which may be interpreted as a sign of speculative activity. Thirdly, prior to this recent boom in prices, we witness significant decreases in housing interest rates and some laws which eased the credit conditions in the late 2000s. These deregulations seem to have strengthened the demand for housing. From the expectations survey of Turkstat we see that people became more intended to buy home after 2011. As in almost everywhere, investing in house seems the less risky decision in Turkey compared to other alternative investment instruments. What's definitely different this time is that, housing loans became record high levels with above 100 billion TL recently. Even though the non-performing loans and housing loans/GDP ratio does not seem very high especially when compared to advanced countries, they are not decreasing. This relatively high accumulation of loans is the first time for Turkey, whose consequences after the decrease in prices are unknown for the financial sector.

Fourth, we witness significant increase in house sales after 2012 to the levels of 1.5 million, from the levels of around 500 thousand each year from 2008. Housing supply is increasing very rapidly after 2009. Fifth, the demand for housing is increasing due to natural improvements in employment and income levels. Both employment and income are increasing after the improvement from the 2008 financial downturn. At the same time we can see the effect of recent immigration from Syria, where prices are rapidly rising in the Southeastern regions of Turkey. However, GDP per capita seems to increase in a slower manner after 2011 while the house prices are increasing in a rapid way.

Sixth, in terms of financial exposure, we see that housing loans constitute almost half of the consumer loans. Housing loans/GDP ratio is increasing but still low compared to advanced countries. As emphasized by Coskun (2013), the secondary mortgage markets are not developed in Turkey which significantly constrains the financial weight of the housing loans. Additionally, we see that housing credit growth exceeds GDP growth in the recent years. To sum up, a high risk for the financial sector from the housing sector does not seem to exist as in the advanced countries however, the exposure is increasing and in the following years it may reach to more dangerous levels.

In consequence, it is clear that recently Turkish construction sector is very active. Constructions are increasing rapidly which are followed by price increases. Housing sales and loans are increasing. It is for sure that prices can not increase permanently and there is a possibility of a decrease in the near future. Therefore, the credit conditions should not be eased further in order to avoid from possible risks.

Last but not least, this study is amongst the first comprehensive studies that directly focus on bubble in the housing market for Turkey. To the best of our knowledge, this is the first study that interprets the results of a VECM and the GSADF test to understand whether there is a real estate bubble in Turkey using a long period data.

For further studies, the housing credit conditions of the banking sector may be checked to better understand the financial exposure of the housing market. It should be noted that the main limitations of this study are the lack of longer and province based data. Therefore, we are constrained to focus on a country based study.

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APPENDIX A

DATA RELIABILITY: HOUSE PRICE INDEXES

We have two different house price indexes for Turkey. One is from REIDIN that starts from Jan-03 and one is from TCMB that starts from Jan-10. TCMB data uses the expertise price, which is generated by using the valuation reports from bank's housing credits. REIDIN data uses the asked price, which they generate it through collecting prices from many different sources. Unfortunately, it not available to reach an index that is generated by the transaction price, which would be more informative in understanding the actual price changes (Erol, 2015). If we check these 2 data, we see some differences. Even though the general trend is the same between them, there are some differences in levels. This implies that even if these sources are reliable, they do not show the exact price with %100 certainty. These are shown in Figure A-1 for three cities data, where the first row shows the indexes and the second row shows the percentages changes from previous month.

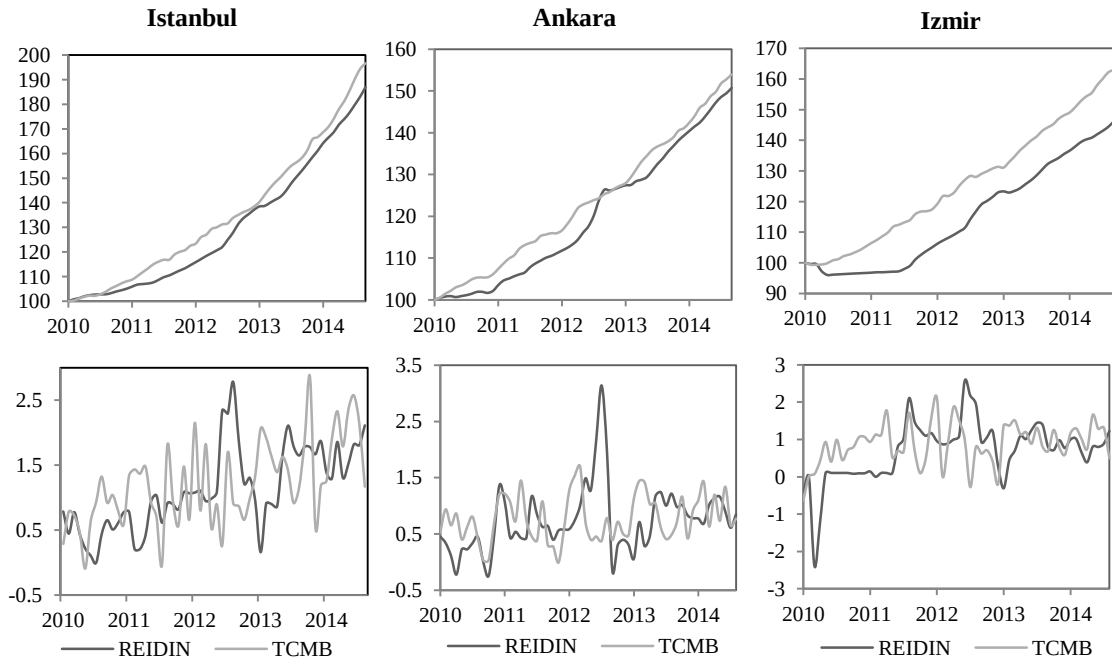


Figure A-1. The comparison of REIDIN and TCMB house price index (2010=100). Sources: REIDIN and TCMB

APPENDIX B

HOUSING SUPPLY: CONSTRUCTION AND OCCUPANCY PERMITS

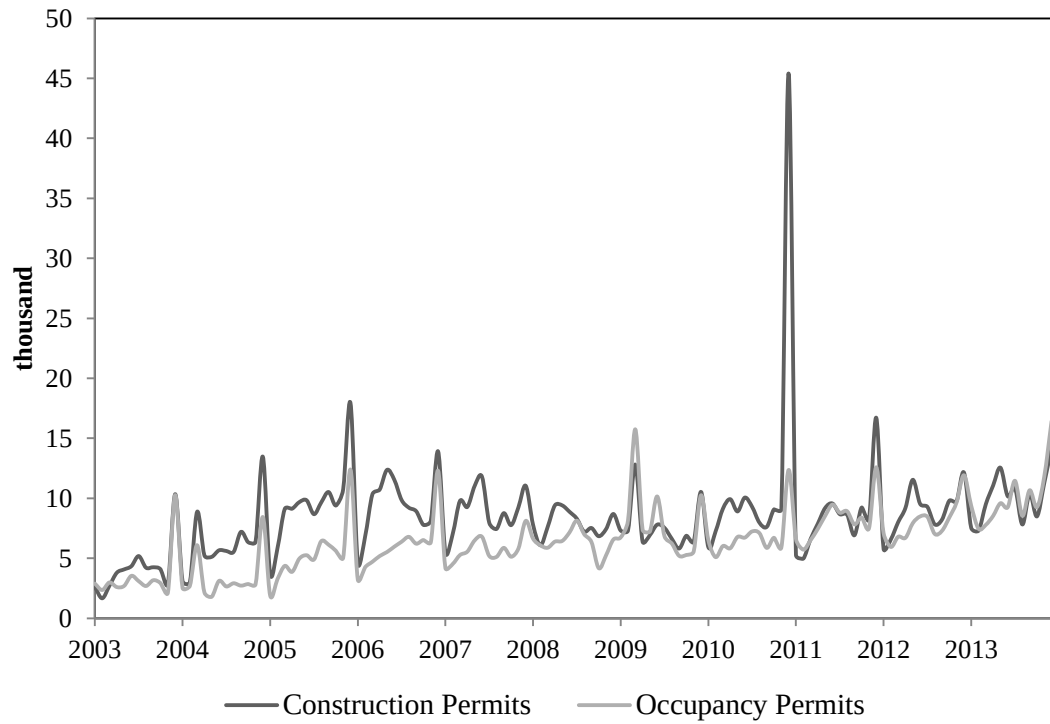


Figure B-1. Construction and Occupancy Permits Statistics. Source: TUIK

APPENDIX C

TEST RESULTS

Table C-1. Zivot Andrews unit root test results.

	Lag Length	t-Stat	Break Date
lnHPI	1	-3.59	2008M04
lnIPI	2	-4.37	2008M08
IR	3	-4.11	2009M08
lnCC	4	-3.45	2008M07
lnHS	0	-10.94	2008M01

Null hypothesis is unit root with break. The test includes only intercept term.

Critical Values: %1 level: -5.34

%5 level: -4.93

%10 level: -4.58

Table C-2. KPSS unit root test results.

Level				
	Intercept		Trend and Intercept	
	Bandwidth	LM-Stat.	Bandwidth	LM-Stat.
lnHPI	9	0.83	9	0.26
IR	9	1.01	9	0.10
lnHS	2	0.54	1	0.20
lnIPI	9	1.05	9	0.11
lnCC	9	0.66	8	0.09
<i>Critical Values</i>	<i>%1 level</i>	<i>%5 level</i>	<i>%1 level</i>	<i>%5 level</i>
	<i>0.74</i>	<i>0.46</i>	<i>0.22</i>	<i>0.15</i>

First Difference				
	Intercept		Trend and Intercept	
	Bandwidth	LM-Stat.	Bandwidth	LM-Stat.
lnHPI	7	0.41	7	0.17
IR	5	0.06	5	0.05
lnHS	40	0.21	40	0.16
lnIPI	5	0.06	5	0.05
lnCC	2	0.06	2	0.05
<i>Critical Values</i>	<i>%1 level</i>	<i>%5 level</i>	<i>%1 level</i>	<i>%5 level</i>
	<i>0.74</i>	<i>0.46</i>	<i>0.22</i>	<i>0.15</i>

Table C-3. VECM Diagnostic Tests.

Test	Test Statistic	p-value
Portmanteau Test	393.6623	0.0000
LM Test for Autocorrelation	661.4467	0.0000
Jarque Bera Test (lnHPI)	5.8863	0.0527
ARCH-LM Test (lnHPI)	1.0633	0.4028
Multivariate ARCH-LM Test	1171.2984	0.1643

APPENDIX D

TURKISH SUMMARY

Bu tezde son dönemde hızlı bir şekilde artmakta olan konut fiyatlarından hareketle Türkiye’de bir konut balonu olup olmadığı sorusuna yanıt aranmaya çalışılmıştır. Son yıllarda dünyada yaşanan ekonomik krizlere baktığımızda pek çoğunun konut balonları nedeniyle tetiklendiğini görmekteyiz. Bu nedenle konut balonlarının tespit edilebilmesi ve konut sektörünün finansal ve reel sektör üzerindeki ağırlığının tespit edilmesi önem taşımaktadır. Literatürde varlık balonları özetle fiyatların onları oluşturması beklenen temellerinden ayrışarak ani bir yükseliş geçmesi olarak tanımlanmaktadır. Bu ani yükselişlerden sonra fiyatlarda meydana gelen ani düşüş neticesinde iflaslar yaşanmakta ve ekonomi zincirleme olarak bir daralmaya gitmektedir. Bazı ekonomistler balonların çeşitli yöntemlerle önceden tespit edilebileceğini düşünmekte ve durum daha tehlikeli hale gelmeden çeşitli politikaların yapılmasını önermektedirler. Bazı ekonomistlerse balonların tespit edilemeyeceğini savunmakta ve patladıktan sonra bazı politikalar yapılması gerektiğini düşünmektedirler. Literatüre baktığımızda bu konu üzerinde pek çok farklı görüş olduğu görülmektedir. Bu tezde konuyu anlamak için öncelikle konut balonu kavramı literatür yardımıyla ortaya konmaya çalışılmaktadır. Daha sonra konut sektörünün ekonomi içindeki önemi tartışmakta, çeşitli geçmiş örneklerden hareketle balonların nasıl oluştuğu, nasıl patladığı ve ekonomide neden krize yol açtığı sorularına yanıt aranmaya çalışılmaktadır. Konut balonlarının tespitinde yaygın olarak kullanılmakta olan bazı belirleyiciler ve ekonometrik metodlar tanımlanmaktadır. Sonrasında Türkiye konut piyasası göstergeleri ortaya konmakta ve güncel durum ile ilgili çıkarımlar yapılmaktadır. Son olarak bazı ekonometrik metodlar yardımıyla konut fiyatlarında bir balon olup olmadığı tespit edilmeye çalışılmaktadır. Sonuçları kısaca özetleyecek olursak özellikle 2012’den sonra pek çok göstergenin daha hızlı bir trend ile ilerlediği görülmekte ve bir balon varsa bu

tarihten itibaren harekete geçtiği düşünülmektedir. Bu trend birkaç yıl daha devam ettiği takdirde söz konusu artışa balon nitelemesi yapmak daha doğru görünmektedir.

Konut piyasaları pek çok ülkede ekonomi üzerinde önemli bir role sahiptir. Özel ve kamu inşaatlarının pek çok ülkede GSYİH içindeki payı büyüktür. Gayrimenkul yine pek çok ekonomide en büyük varlık sınıfını oluşturmaktadır. Aynı zamanda gayrimenkul sektörünün ekonomi içinde çarpan etkisi yarattığını söylemek mümkündür. Yarattığı çarpan etkilerinden biri, konut sahibi olduktan sonra insanların sahip olduğu güvence ve varlıktan dolayı daha güvenli tüketim ve yatırım yapabilmesinden kaynaklanmaktadır. İkincisi ise gayrimenkul sektörünün beraberinde inşaat sanayiisi, mobilyacılık, emlakçılık ve bankacılık gibi sektörleri beraberinde tetiklemesidir. Bu haliyle düşündüğümüzde, konut sektörünün bir ekonomide servet ve istihdam yaratma açısından ne kadar önemli bir sektör olduğunu görebilmekteyiz. Buna paralel olarak, 2008 finansal krizinden sonra pek çok OECD ülkesinde servet ve tüketim davranışlarında ciddi daralmalar meydana gelmiştir.

Konut talebinin özellikle 1980'lerden sonra artmasının temel sebebi olarak uygulanmakta olan neoliberal politikalar gösterilmektedir. Bu politikaların en önemlileri arasında maksimum LTV oranlarının yükseltilmesi ve kredi faiz oranlarının ciddi oranda düşürülmesi vardır. Böylece hanehalkının konuta olan talebi önemli oranda artmış ve neticesinde fiyatlarda nominal ve reel olarak global anlamda bir yükseliş meydana gelmiştir. Bunun yanında yeterli bankacılık denetlemelerinin olmadığı durumlarda takipteki kredilerin önemli miktarda arttığı ve bunun makroekonomiyi tehlike altına soktuğu görülmektedir. Bütün bunları göz önünde bulundurursak konut sektörünün bir ekonomide servet ve istihdam üzerinde itici bir gücü olmasına rağmen ekonomiyi daraltabilecek bir özelliği bulunduğunu da görmek gerekir.

Konut balonları patladıkları zaman sadece konut piyasası üzerinde değil, aktarım mekanizmaları yoluyla finansal piyasalar ve reel ekonomi üzerinde de kötüleşmelere

sebebiyet vermektedir. Balonun açık bir tanımı Case ve Shiller (2003) tarafından verilmiştir. Yazarlara göre konut balonu, konut fiyatlarının ekonomik temellerin yerine insanların beklentileri ve spekülasyon davranış sebebiyle artmasıdır. Allen ve Gale (1999) ise konut balonlarının genelde 3 ayrı zaman diliminden oluşan bir örüntüye sahip olduğunu belirtmektedir. Buna göre ilk zaman diliminde çeşitli finansal serbestleşmeler ve borçlanma durumlarında iyileşmeler meydana gelmektedir. İkinci dilimde fiyatlar hızla arttıktan sonra hızlı bir biçimde azalmaktadır. Üçüncü dilimde ise pek çok firma ve hanehalkı iflaslar yaşamaktadır. Kindleberger ve Aliber (2005) fiyatlarda oluşan balonların mutlak olarak patlayacağını çünkü sürdürülemez bir örüntüyü takip ettiklerini öne sürmektedir.

Konut piyasasında oluşan balonların tespit edilmesi için çeşitli göstergelerden yararlanılmaktadır. Bunları açıklayıcı göstergeler ve ekonometrik göstergeler olarak ikiye ayırmak mümkündür. Açıklayıcı göstergelerin en önde gelenleri fiyat-gelir ile fiyat-kira oranıdır. Bu rasyolarda yaşanan artışlar bir balonun varlığını işaret ediyor olabilir. Bunun yanında pek çok örnekte gözlemlenen şeyler mevcuttur. Örneğin inşaat yapımında hızlı bir artışın olması ve boşluk oranlarının yükselmesi, faiz oranlarının oldukça düşük seyretmesi, konut kredilerinde hızlı artışların yaşanması ve hanehalkında oluşan gerçek dışı beklentiler bunların en önde gelenleridir. Bu trendleri Japonya, ABD, İspanya ve İrlanda örneklerinde yakalamak mümkündür. Ekonometrik metodlar ise fiyatların arz ve talebin kesişmesi ile meydana geldiği varsayımından hareketle fiyatların konut arz ve talebini meydana getiren değişkenlerle arasındaki ilişkiyi incelemektedir. Örnek olarak, kurulan modelin fiyat değişimlerini açıklama gücü yüksek değilse bu bir balona işaret ediyor olabilir. Hui ve Yue (2006) ile Jiang ve diğerleri (2011) de kullanılan bir metodda yazarlar fiyatları arz ve talep değişkenleriyle tahmin etmeye çalışmış ve gerçek fiyatlar ile tahmin edilen fiyatlar arasındaki farka tahmin edilen konut fiyat balonları demişlerdir. Bunun yanında bazı çalışmalar zaman serisi metodlarından yararlanmakta, VAR ve VEC modelleri yardımıyla konut fiyatlarının çeşitli değişkenlerle arasındaki ikili ilişkileri yorumlayarak balon hakkında bilgi edinmeye

çalışmışlardır. Bazı yeni metodlar ise zaman serisi davranışlarından faydalanarak zaman serilerinin balon olduğu dönemlerde patlayıcı veya üstelden daha hızlı bir şekilde arttığını varsayarak bunu test etmektedirler. Örneğin LPPL model ile zaman serisi davranışından bir balon olup olmadığı veya ne zaman söneceği tahmini olarak ölçülebilmektedir. Phillips ve diğerleri (2012) tarafından geliştirilen GSADF test ile balon dönemlerinde zaman serisinin patlayıcı (explosive) bir davranış sergilediği varsayımından hareketle fiyatların hangi zaman dilimlerinde bu davranışa sahip olduğu test edilmektedir.

Türkiye konut piyasasını inceleyen az sayıda ampirik çalışma bulunmaktadır. Bunun en önemli nedeni uzun süreli ve il bazında konut piyasasıyla ilgili verilerin kısıtlı olmasıdır. Çalışmalar arasında Aydın ve diğerleri (2007), Hepşen ve Kalfa (2009), Kargı (2013) ve Özçelebi (2014) makroekonomik değişkenlerle konut piyasası arasında ilişki bulmuşlardır. Erdem ve Varlı (2014) ise VEC modeli yardımıyla konut sektörü için kısa dönemli talebin fiyat esnekliğini -0.18, kısa vadeli arz gelir esnekliğini ise -7.50 bulmuşlardır. Emlak Konut GYO ise 2014 çalışmasında 2007 yılında yürürlüğe giren mortgage ve karşılıklılık yasası ile 2012’de yürürlüğe giren yabancılara konut satışını kolaylaştıran yasanın konut talebi ve arzı üzerindeki yarattığı etkiye dikkat çekmektedir. Türkiye için konut piyasasıyla ilgili çalışma bulmak olanaklı olsa da, direkt olarak konut balonuna odaklı çalışma bulmak zordur. Bunlardan ilki Binay ve Salman (2008) tarafından yapılmış ve çalışmada temel olarak Ankara verisini kullanan yazarlar Türkiye ile başka ülkelerin fiyat-gelir ve fiyat-kira oranlarını karşılaştırmış ve Türkiye’de 2000-2005 döneminde konut balonunun olmadığını savunmuşlardır. Coskun (2010) ise Türkiye’de mortgage kredilerinin GSYİH’e oranının gelişmiş ülkelere oldukça düşük olduğunu söyleyerek Türkiye’de konut sektörüne dayalı bir finansal krizin çıkma ihtimalinin çok düşük olduğunu belirtmiştir. Büyükduman (2012) İstanbul için yeni bir konut fiyat endeksi oluşturmuş, satış ve kira fiyatlarının uzun dönem ortalamasına yakın olduğunu söylemiştir. 2003-2012 arası için yaptığı regresyonda yalnızca kira fiyatlarını ve reel faiz oranlarını anlamlı bulan yazar, kurduğu hata düzeltme modelinin sonuçlarına da

dayanarak Türkiye’de 2012 yılı için bir konut balonu olamayacağını iddia etmiştir. Erol (2015) ise 2007-2012 arası dönem için çeşitli SEK modelleri oluşturarak Türkiye’de konut balonu varlığını anlamaya çalışmıştır. Yazar çalışmasında fiyat ile konut arz ve talep unsurları arasında yeterince açıklayıcı bir ilişkinin saptandığını belirterek Türkiye’de o dönem için bir konut balonu varlığından söz edilemez olduğunu iddia etmiştir. Ancak fiyat artışının birkaç sene daha devam etmesi halinde bir balondan bahsedilebileceğini belirtmiştir.

Açıklayıcı değişkenlere bakarak elde edilen sonuçlara bakacak olursak, REIDIN verisine göre Türkiye’de nominal konut fiyatlarının 2003-2015 arasında yaklaşık 2.5 kat arttığı görülmektedir. Reel olarak bakıldığında ise bu artış çok daha düşük seviyededir. ABD, Japonya, İrlanda ve İspanya örnekleriyle Türkiye’yi kıyasladığımızda, Türkiye’de nominal fiyatların rekor seviyede arttığını, ancak reel fiyatların, fiyat-gelir ve fiyat-kira oranının cüzi oranlarda arttığı görülmektedir. Burada önemli olan bir nokta, tüm bahsedilen göstergelerin 2012 yılından itibaren hızlı bir şekilde artmasıdır. Konut kredi faizlerine baktığımızda, nominal faizlerin özellikle 2008 yılından itibaren eskiye kıyasla oldukça düşük seviyede olduğunu görülmektedir. 2003’te %120’lerde olan konut kredisi faizi, 2014’te %10 seviyelerine inmiştir. Bu da konut talebini arttırmış, konut kredilerinde ciddi bir artış meydana gelmiştir. 2006’da 10 milyar TL olan konut kredi miktarı 2014 yılında 110 milyar TL seviyesinde gerçekleşmiştir. Demografik özelliklere baktığımızda, Türkiye’de özellikle büyük illerdeki fiyat artışının Türkiye ortalamasından yüksek olduğunu görmekteyiz. Bunun bir sebebi bu illerdeki iç göç hızının yüksek olması, nüfus ve istihdamın bu illerde daha hızlı artmasıdır. Ayrıca son dönemde Suriye’den gelen göçmenlerinde konut fiyatına etkisi olmuştur. TCMB verisine göre özellikle Gaziantep, Adıyaman, Kilis, Erzurum, Erzincan ve Bayburt gibi illerde fiyatlarda anormal bir yükseliş görülmektedir. Ayrıca TÜİK verisine baktığımızda istihdam ve işgücüne katılım oranının 2009’dan beri devamlı yükseliş içinde olduğu görülmektedir. Kişi başı gelirin de artmasına rağmen 2011’den sonra daha yavaş bir şekilde arttığı görülmektedir. Hatta bazı ekonomistlere göre Türkiye orta gelir

tuzağındadır. Yine TÜİK verilerinden hareketle konut satışlarının özellikle 2012'den sonra neredeyse iki kat arttığı görülmektedir. 2008-2012 konut satış ortalaması yaklaşık 600 bin iken, 2013-2014 ortalaması 1 milyon 150 bin civarındadır. Bunun yanında inşaat maliyet endeksinin de 2009 yılından itibaren hızlı bir biçimde arttığı görülmektedir. TÜİK yapı kullanım belgeleri ve yapı ruhsatları verilerinden hareketle Türkiye'de 2010 yılından itibaren konut arzının hızla arttığı görülmektedir. Ayrıca balon dönemlerinde insanların konut alma eğilimlerinin hızla arttığı ve yatırım amaçlı ev satışlarında da artışların olduğu görülmektedir. TÜİK tüketici eğilim istatistiklerinin oluşturulmasında kullanılan bir ankette sorulan sorulardan biri "önümüzdeki 12 ay içerisinde bir ev alma veya yaptıрма ihtimaliniz nedir?" sorusudur. Bu anketin sonuçlarına göre 2004-2014 periyodunu incelediğimizde özellikle 2010'dan sonra hanehalkının konut alma eğiliminde bir artışın olduğu görülmektedir.

Önemli olan bir diğer konuda Türkiye'de konut sektörünün ekonomi içindeki ağırlığının tespit edilmesidir. Bakıldığında konut kredilerinin toplam krediler içindeki payı %45 civarındadır. Konut kredilerinin GSYİH'e yüzdesi %9 civarında olmakta olup, bu oran pek çok gelişmiş ülkenin oldukça altındadır. Takipteki kredilere baktığımızda ise son dönemlerde ciddi bir artış gözlemlenmemektedir. 2014 yılında gerçekleşen seviye 663.6 milyon TL iken bu seviye 2009 ve 2010 yıllarında ortalama 900 milyon TL'dir. Bunun yanında konut kredilerindeki artış 2007-2014 döneminde reel GSYİH artışından daha yüksektir. Bu sonuçları kısaca özetleyecek olursak Türkiye'de konut sektörünün finansal sisteme yarattığı ağırlık özellikle konut balonuna dayalı kriz yaşayan gelişmiş ülkelere kıyasla daha düşük görünmektedir. Ancak son dönemde bu ağırlığın giderek arttığı gözlemlenmektedir.

Daha önce de bahsedildiği gibi, konut balonunu araştıran çalışmalarda çeşitli ekonometrik yöntemler de kullanılmaktadır. Bu çalışmalar genelde konut fiyatlarının temelleriyle olan ilişkisini incelemektedir. Çoğunlukla makroekonomik temellerle desteklenmeyen ani fiyat artışları balon olarak yorumlanmaktadır. Bu nedenle

fiyatların temellerle olan ilişkisini incelemek için SEK, VAR ve VEC modellerinden, birim kök ve eşbütünleşme testlerinden, Granger nedenselliğinden, varyans ayrıştırması ve etki-tepki fonksiyonlarından yararlanılmaktadır. İkinci bir yaklaşım ise konut fiyatlarının zaman serisi özelliklerinden yararlanmaktır. Daha öncede bahsedildiği gibi, balon olduğu dönemlerde fiyat zaman serisinin patlayıcı (explosive) veya üstelden daha hızlı bir artış içinde olduğu varsayımı altında testler geliştirilmiştir.

Bu tezde ampirik olarak öncelikle VEC modeli yardımıyla konut fiyatlarının temelleriyle olan ilişkisine açıklık getirilmeye çalışılmıştır. İkinci olarak Hui ve Yue (2006) ile Jiang ve diğerleri (2011) çalışmalarında kullanılan yaklaşımın benzeri bir uygulama yapılmıştır. Son olarak ise Phillips ve diğerleri (2012) tarafından geliştirilmiş olan GSADF testi ile reel konut fiyatlarının ve fiyat-kira oranının son dönemde patlayıcı bir davranış sergileyip sergilemediğine bakılmıştır.

VEC modeli için konut fiyatlarını belirleyici değişkenler gelir, inşaat maliyetleri, inşaat yapı ruhsatları ve faiz oranları olarak seçilmiştir. Veriler aylık şekildedir ve 2005-2015 aralığını kapsamaktadır. Gözlem sayısı 120'dir. Temel olarak, gelir ve faiz oranının talep yönlü, inşaat maliyeti ve yapı ruhsatının ise arz yönlü faktörler olduğu düşünülmüştür. Önsel olarak gelir ve inşaat maliyetlerindeki artışın konut fiyatını arttıracak beklenmektedir. Yapı ruhsatları ve faiz oranlarındaki artışın ise konut fiyatını azaltacak beklenmektedir.

Veriler çeşitli kaynaklardan elde edilmiştir. En uzun süreli konut fiyat endeksine REIDIN'den ulaşılabilinmektedir. REIDIN konut fiyat endeksi yaklaşık 200.000 ev üzerinden talep edilen fiyatlar üzerinden aylık olarak oluşturulmaktadır. Bu endekse 2003:01 ve 2015:02 aralığı için ulaşılabilinmiştir. Diğer veriler TÜİK ve TCMB kaynaklıdır. Veri yetersizliği nedeniyle çalışmada 2005:01 ile 2014:12 arası dönem incelenmiştir. Geliri temsilen sanayi üretim endeksi kullanılmıştır. İnşaat maliyet endeksine çeyreklik olarak ulaşılabilindiğinden, bu veri iç değerlendirme yöntemiyle

aylığa çevrilmiştir. Konut fiyat endeksi ve inşaat maliyet endeksi gibi nominal olan veriler TÜFE kullanılarak reel hale getirilmiştir. Reel faiz oranlarına ulaşmak için beklenen faiz oranı nominal mortgage faiz oranından çıkartılmıştır. Faiz oranları haricindeki tüm değişkenlerin doğal logaritması alınmıştır. Verisel mevsimsellik düzeltilmelidir. Tablo 3 ve 4 ile Figür 28’de verilerin detayları sunulmuştur.

VEC modelini tahmin etmeden önce verilerin birim kök içerip içermediğine bakılmıştır. ADF ve KPSS test sonuçlarına göre veriler birim kök içermektedir ve birinci farkları alındığında bu durum ortadan kalkmaktadır. Modelin gecikme uzunluğu SIC ve HQC sonuçlarına bakılarak 4 seçilmiştir. Johansen eşbütünleşme testine göre 2 eşbütünleşme bulunmuştur. VEC modeli tahmin edilirken verilerde bariz bir şekilde görülen 2008-2009 aralığındaki yapısal kırılmaya müdahale etmek için 2008M01 ile 2009M12 aralığı için kukla değişken dahil edilmiştir.

Tablo 8’de özetlenen Granger nedenselliği sonuçlarına baktığımızda gelir hariç diğer değişkenlerinin konut fiyatının Granger nedeni olduğu görülmektedir. Bu da gelirin insanların konut alımı davranışı üzerinde çok büyük bir etkisi olmadığına bir işaret olabilir. Varyans ayrıştırması ve etki-tepki fonksiyonlarını daha doğru incelemek için yapısal VEC modeli tahmin edilmiştir. Bu modelin nasıl tahmin edildiğine dair bilgiler 4.1.7’nci kısımda bulunabilir. 24 dönemlik (iki senelik) varyans ayrıştırması sonuçlarına baktığımızda konut fiyatlarının en çok kendisi tarafından açıklandığını görüyoruz (ortalama %84). Bu sonuca göre konut fiyatındaki değişmelerin kişilerin gelecekteki fiyat değişimi beklentisinden etkilendiğini görmekteyiz. %13’lük kısım ise faiz oranları ve inşaat maliyetleri ile açıklanmaktadır. Konut arzı ve gelirin ise çok az bir etki yaptığı görülmektedir (%3). Gelirin konut fiyatı üzerindeki etkisi yine oldukça düşük görünmektedir.

Etki-tepki fonksiyonlarını incelediğimizde konut fiyatlarının en büyük etkisinin yine kendisine olduğu görülmektedir. Konut fiyatları tarafından verilen bir standart sapmalık şok konut fiyatlarını ilk sene %3 arttırmaktadır. Bu spekülasyon bir olgunun işareti olarak kabul edilebilir. Gelirin yarattığı etki oldukça düşük olup, bir senede

konut fiyatları üzerinde yalnızca %0.5’lik bir yükseltme yapmaktadır. Bu sonuç da konut alma eğiliminin ve konut fiyat artışının gelir ile pek ilişkili olmadığını göstermektedir. Genel bir sonuç olarak konut sektörüne olan yüksek talebi artan gelir, popülasyon, istihdam veya göçler yerine kredi faizlerinin düşmesi ve konut alımını kolaylaştıran bazı yasalara bağlamak daha doğru görünmektedir.

İkinci olarak Hui ve Yue (2006) ile Jiang ve diğerleri (2011) çalışmalarından hareketle konut fiyatlarının yüzde kaçının balon olarak tanımlanabileceğine bakılmıştır. Bu çalışmalarda uygulanan yöntem öncelikle konut fiyatlarını arz ve talep yönlü değişkenler ile SEK yöntemiyle tahmin etmektir. Daha sonra gerçek fiyatlar ile bu model tarafından tahmin edilen fiyatlar arasındaki farka “balon” denmektedir. Bu yöntemle ilgili detaylara ve tahminlere 4.2.’nci kısımdan bakılabilir. Bu yöntemin sonuçlarına göre 2005-2014 arası için modelin açıklayıcı gücü 2012 yılından sonra hızla azalmaktadır. Ayrıca yine bu yöntemle göre 2014 sonunda konut fiyatlarının %5’i balon olarak gözükmektedir. Yine de önceki çalışmalarda balon saptaması yapılan şehirler için bu yüzdeler %20’nin üstünde bulunmuştur. Bu nedenle henüz Türkiye’de bir balon varsa bile bunun başlangıç aşamasında olduğunu söyleyebiliriz.

Son olarak Phillips ve diğerleri (2012) tarafından balonları tespit etmek üzere geliştirilen GSADF test, Türkiye reel konut fiyatları ve fiyat-kira oranı üzerine uygulanmıştır. Bu test fiyatlardaki patlayıcılığı (explosiveness) bir balon göstergesi olarak varsaymaktadır. Test sonuçlarına baktığımızda reel konut fiyatlarının 2014’ten sonra, fiyat-kira oranınsa 2013’ten itibaren patlayıcı özellik taşıdığı görülmektedir. Bu bulgu da son dönemde fiyatların normalden daha hızlı bir yükseliş içerisine girdiği şeklinde yorumlanabilir.

Özetle, bu tezde Türkiye’de son dönemde bir konut balonu olup olmadığı sorusuna analitik ve kapsamlı bir şekilde yanıt aranmaya çalışılmıştır. Balon kavramı genellikle ekonomik krizlerle ilişkilendirilmekte olup, belli bir varlık fiyatındaki ani

yükseliş ve düşüşlere denmektedir. Ayrıca bu dönemlerde fiyatlar onu oluşturması beklenen temellerden ayrılmakta ve spekülative davranış biçimi tarafından desteklenen farklı bir örüntüyü takip etmektedir.

Çalışmanın genel olarak bulguları şunlardır. İlk olarak Türkiye’de nominal konut fiyatları son dönemde rekor düzeyde artmış görünmektedir. Ancak enflasyon ile düzeltildiğinde bu artış özellikle ABD, Japonya, İspanya ve İrlanda örnekleriyle karşılaştırıldığında çok daha cüzi seviyelerdedir. Aynı zamanda balonları tespit etmekte kullanılan fiyat-gelir ve fiyat-kira oranlarına baktığımızda henüz çok yüksek seviyelerde olmadıklarını görüyoruz. Burada önemli olan nokta bütün bu değişkenlerin 2012’den sonra hızlı bir artış içerisine girmesidir, bu nedenle 2012 yılını son dönemdeki yükselişin başlangıç yılı olarak görmek mümkündür. GSADF test sonuçları da bu dönemdeki patlayıcılığı tespit etmiştir. Yine 2012 yılından sonra fiyatlar ile makroekonomik temeller üzerinde yapılan regresyonun açıklayıcı gücü azalmaktadır. Aynı zamanda Adana, İstanbul ve İzmir gibi büyük şehirlerdeki fiyat artışları Türkiye genelinden daha hızlı artmaktadır. Bu noktada ABD ve Japonya gibi örneklerden hareketle bir ülkede balon var demek için yalnızca birkaç büyük şehirde bunun oluşmasının yeterli olduğunu hatırlamak gereklidir.

İkinci olarak, VEC modeli sonuçlarına göre konut alımında gelir hanehalkı kararlarını en az etkileyen faktör olarak görünmektedir. Ek olarak konut fiyatındaki değişimin en büyük katkısının geçmiş konut fiyatları olması nedeniyle bir spekülative davranıştan bahsedebiliriz. Üçüncü olarak, yakın zamandaki fiyat yükselişinin öncesinde konut kredisi faiz oranlarında ciddi düşüşler ve konut alımını kolaylaştıran yasalar görmekteyiz. Bu serbestleştirme politikalarının konut talebini ciddi oranda arttırdığı görülmektedir. TÜİK beklentiler anketi sonuçlarına göre de hanehalkının konut alma eğiliminin 2011’den sonra eskiye kıyasla bir artış içerisine geçtiği görülmektedir. Aynı zamanda, pek çok ülkede olduğu gibi Türkiye’de de konut alternatif yatırım araçlarına kıyasla en garanti yatırım aracı olarak görünmektedir. Türkiye’nin bu kez yaşadığı en önemli farklılık ve tecrübe konut kredilerinin 100

milyar TL üzerinde bir seviyede olmasıdır. Takipteki krediler ve konut kredilerinin GSYİH'e oranı yüksek oranlarda olmasa da bir azalış içerisinde değillerdir. Bu kredi birikimi Türkiye için yeni bir tecrübedir ve fiyatlar düştükten sonra finansal sektör üzerinde nasıl bir baskı oluşacağını önceden kestirmek kolay değildir.

Dördüncü olarak, konut satışları 2012'den sonra 1.5 milyon seviyesindedir, halbuki 2008-2012 arası için bu rakam her yıl için yaklaşık 500 bin'dir. Konut arzının 2009'dan bu yana hızlı bir şekilde arttığı görülmektedir. Beşinci olarak, gelir ve istihdamın 2008 krizinden sonra düzelmesiyle birlikte konut talebinde doğal bir artış meydana geldiğini söylemek mümkündür. Aynı zamanda Suriye'den gelen göçmenlerin özellikle Güneydoğu Anadolu bölgesinde fiyatları arttırdığı gözlemlenmektedir. Ayrıca kişi başı GSYİH 2011'den sonra daha yavaş bir artış içindeyken konut fiyatları hızla artmaktadır.

Altıncı olarak, konut piyasasının finansal sektör üzerinde yarattığı ağırlığa baktığımızda konut kredilerinin toplam tüketici kredilerinin hemen hemen yarısına denk geldiğini görmekteyiz. Konut kredilerinin GSYİH'e oranı artmakta olsa da, gelişmiş ülkelere kıyasla halen düşük düzeydedir. Coşkun (2013) tarafından da belirtildiği gibi ikincil mortgage piyasasının varlığının olmaması konut sektörünün yarattığı finansal baskıyı kısıtlamaktadır. Ek olarak, son yıllarda konut kredisi artışlarının GSYİH artışlarından daha hızlı olduğunu görmekteyiz. Bu maddeyi özetleyecek olursak konut sektörünün finansal sektör üzerinde yarattığı baskı gelişmiş ülkelere kıyasla tehdit unsuru olmayacak düzeyde olsa da her geçen yıl artmakta ve önümüzdeki yıllarda daha tehlikeli bir hale gelme ihtimali bulunmaktadır.

Sonuç olarak Türkiye'de inşaat sektörünün son yıllarda oldukça aktif olduğunu görmekteyiz. İnşaatlar hızla artmakta ve bunu takiben fiyat artışları meydana gelmektedir. Konut satışları ve krediler hızla artmaktadır. Kesin olan fiyat artışlarının sonsuza dek artamayacağıdır ve yakın bir gelecekte fiyatların düşme ihtimali

bulunmaktadır. Bu nedenle olası risklerden kaçınılması için özellikle kredi koşullarında gevşeme yapılmamasına dikkat edilmelidir.

Bu çalışma Türkiye için konut balonu üzerine hazırlanmış ilk kapsamlı çalışmalardan biridir. Bildiğimiz kadarıyla bu çalışmayla birlikte bu konuyla ilgili ilk kez uzun dönemli bir veri kullanılarak VEC modeli ve GSADF test sonuçları yorumlanmıştır. İleriki çalışmalarda konut sektörünün finansal sektör üzerindeki ağırlığını incelemek için konut kredisi koşulları incelenebilir. Unutulmamalıdır ki bu çalışmanın en büyük kısıtı daha uzun ve il bazında verinin olmamasıdır. Bu nedenle ülke bazında bir çalışma yapılabilmiştir.

APPENDIX E

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü	☐
Sosyal Bilimler Enstitüsü	☒
Uygulamalı Matematik Enstitüsü	☐
Enformatik Enstitüsü	☐
Deniz Bilimleri Enstitüsü	☐

YAZARIN

Soyadı : KARASU
Adı : MUSTAFA NUSRET
Bölümü : İKTİSAT

TEZİN ADI (İngilizce) : UNDERSTANDING REAL ESTATE BUBBLES: AN ANALYSIS OF THE RECENT TRENDS IN THE TURKISH HOUSING MARKET

TEZİN TÜRÜ : Yüksek Lisans ☒ Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☒
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☒
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ☐

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