BEHAVIORAL DYNAMICS IN TURKISH HOUSING MARKET: THE ROLE OF INFLATION

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

BY

MUHSİN ÇİFTÇİ

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

AUGUST 2019

Approval of the Graduate School of Social Sciences

_____

Assoc. Prof. Dr. Sadettin Kirazcı
Director (Acting)

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

_____

Prof. Dr. Meltem Dayıoğlu Tayfur
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

_____

Assoc. Prof. Dr. Esma Gaygısız
Supervisor

Examining Committee Members

Prof. Dr. Ozan Eruygur (Gazi Uni., IKTI) _____

Assoc. Prof. Dr. Esma Gaygısız (METU, ECON) _____

Assoc. Prof. Dr. Gül İpek Tunç (METU, ECON) _____

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name: MUHSİN ÇİFTÇİ

Signature :

ABSTRACT

BEHAVIORAL DYNAMICS IN TURKISH HOUSING MARKET: THE ROLE OF INFLATION

Çiftçi, Muhsin
M.S. Department of Economics
Supervisor: Assoc. Prof. Dr. Esma Gaygısız

August 2019, 73 pages

This study investigates the behavioral effects of money illusioned individuals on the Turkish housing market. When individuals make a decision between buying or renting a house, they compare the monthly burden of buying a house and the rent payment. Although rational individuals make a decision based on real interest rates, the money illusioned agents use real and nominal interest rates interchangeably. Therefore, a potential inflation shock makes them think of real and nominal rates moving together. By amplifying the magnitude of nominal rates, this shock will seemingly increase the cost of buying housing and agents, in turn, decline the housing demand. An empirical investigation shows that a proxy for money illusion is largely explained by inflation itself and proves the existence of money illusioned behaviors in the housing market. Further robustness checks and analysis for market frictions also empower the results.

Keywords: Money Illusion, Housing Market, Behavioral Economics, Turkey.

ÖZ

TÜRKİYE'DE KONUT PİYASASI DİNAMİKLERİNE DAVRANIŞSAL BİR YAKLAŞIM: ENFLASYONUN ROLÜ

Çiftçi, Muhsin
Yüksek Lisans, İktisat Bölümü
Tez Yöneticisi: Doç. Dr. Esma Gaygısız

Ağustos 2019, 73 sayfa

Bu akademik çalışma, parasal illüzyona maruz kalan birey davranışlarının Türk konut piyasası fiyatları üzerindeki etkilerini incelemektedir. Bireyler, konut almak veya kiralamak gibi iki seçeneklerden birisine karar verdiklerinde, aylık konut taksidi ödemesi ile kira ödemesini karşılaştırırlar. Böyle bir durumda, rasyonel bireyler reel faiz haddi, parasal illüzyona maruz kalan bireyler ise nominal faiz haddine göre karar vermektedir. Bu nedenle, potansiyel bir enflasyon şoku bu bireyleri, reel ve nominal faiz hadlerinin beraber hareket edeceği düşüncesine sevk ederek, konut alım maliyetini görünürde arttırmaktadır. Böylece, bu bireyler konut talebini düşürmekte ve dolayısıyla göreli konut fiyatlarının gerilemesine neden olmaktadır. Ampirik bulgular, parasal illüzyon ölçüsünün teori ile uyumlu bir şekilde enflasyon tarafından önemli ölçüde açıklandığını göstermekte, sağlamlık testleri de bunları teyit etmektedir.

Anahtar Kelimeler: Parasal İlluzyon, Konut Piyasası, Davranışsal İktisat, Türkiye

To My Mother

and

To Özge, The Lady of Blue Sky

ACKNOWLEDGMENTS

I would like to express my gratitude to my thesis supervisor Assoc. Prof. Dr. Esma Gaygısız whose strong motivation, support, guidance, insight and knowledge allowed me to write this thesis. I want to further thank Assist. Prof. Dr. Pınar Derin Güre who helped me to shape my thesis and finalize the topic. I have benefited greatly from the valuable contributions of my advisor and professors while writing my thesis. Finally, I also wish to show my gratitude for the examining committee members Prof. Dr. Ozan Eruygur and Assoc. Prof. Dr. Gül İpek Tunç for their valuable feedbacks and comments.

I am indebted to Prof. Dr. Markus Brunnermeier and Christian Julliard for providing me the codes for Bayesian analysis and to perform model robustness checks. The codes helped me to save more time and focus on other topics in the thesis.

I would like to thank all the faculty members of the Economics department at Middle East Technical University who have enhanced my knowledge, interest during my graduate study. I want to further thank my colleague and friend, Elif Feyza Özcan, for reading my thesis and sharing her feedbacks with me.

Lastly, I would like to express my gratitude to my sister who gave me the support and morale to tackle the challenges I faced. Without her back up, it would be much harder to write this thesis and finalize it. She deserves my best feelings.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF	Augmented Dicky Fuller Test
CPI	Consumer Price Index
FED	Federal Reserve Bank
MCH	Modigliani Cohn Hypothesis
TVC	Populist-Authoritarianism
MCI	Modigliani Cohn Individuals
OLS	Ordinary Least Squares (OLS) Regression
CLT	Central Limit Theorem
TR	Trend
INT	Intercept
PP	Phillips Perron Test
WD	Wishart Distribution
IWD	Inverse Wishart Distribution

CHAPTER 1

INTRODUCTION

In the aftermath of the global financial crisis in 2008, the general attitude toward the housing market has dramatically changed. The reason is that this crisis itself mainly originated from the housing market and the collapse of the asset bubble brought about large-scale macroeconomic consequences. After this crisis, the main bodies responsible for the economic policies started to emphasize that financial stability may be as important as the macroeconomic stability due to its widespread consequences on the real economy. For instance, after the burst of housing market bubble in the United States, the unemployment rates jumped from 6 percent to nearly 10 percent within a year and the economy shrank by more than 2 percent in the last quarter of 2008. Following the global financial crisis, many academics and economists began to question the underlying fundamentals of the housing markets, the dynamics behind large upswings of the house prices, the connection with the financial markets and the consequences on the real economy.

Following the contraction in the US economy, Federal Reserve Bank (FED) began pumping money into the markets in order to boost the economy and thus the excess liquidity drag down the corresponding market interest rates. Lower interest rates increased the risk appetite and paved a way for the financial capital to move to the countries that continuously give current account deficit and that are dependent on foreign capital. Large-scale capital flows to such countries, namely emerging markets, caused the local currencies to appreciate, made the national economies to grow at faster rates and brought the inflation rates down since these economies were largely import dependent. Among those countries, Turkey also benefited from the capital flows in large amounts and its currency, Lira, began to appreciate against US

Dollar. Then the rate of inflation declined and the market interest rates also followed the same course which paved the way for a boom in credit markets.

Among those, perhaps housing market stood out as the most important one since it has been seen as a pivotal market to invest in. Hence the demand for housing in the low-interest loan environment increased and housing prices also recorded a jump compared to the consumer price index. Figure 1.1 which clearly documents this result reveals a significant fact. While the house price index and consumer price index (CPI) move in lockstep until the beginning of 2012, these indexes began to diverge from then on. Not only newly built house prices but also that of old houses increased quite rapidly, very closely following the new house prices. Especially, the overall increase in houses prices as of 2018 is 162%, while that of consumer prices remained at 93%.

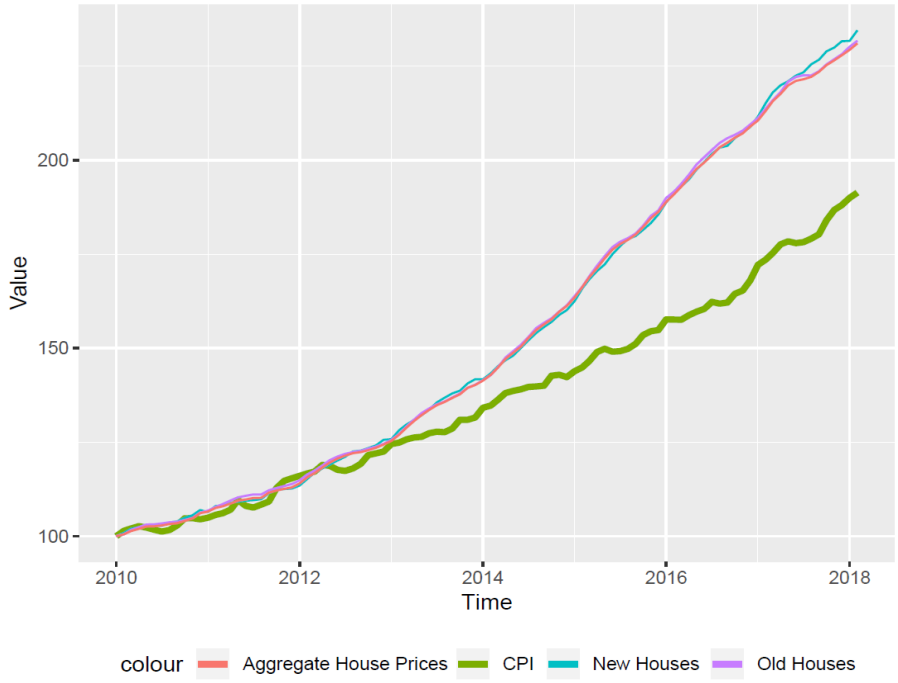


Figure 1.1 House Price Indexes and CPI

During this period, low levels of inflation accompanied by capital inflows were translated into the lower levels of nominal interest rates and strong aggregate

demand, hence propagating into the rapid increases in houses prices. Figure 1.2 demonstrates the strong negative correlation between interest rates and mortgage sales index, further approving the fact that house prices are largely affected by nominal interest rates.

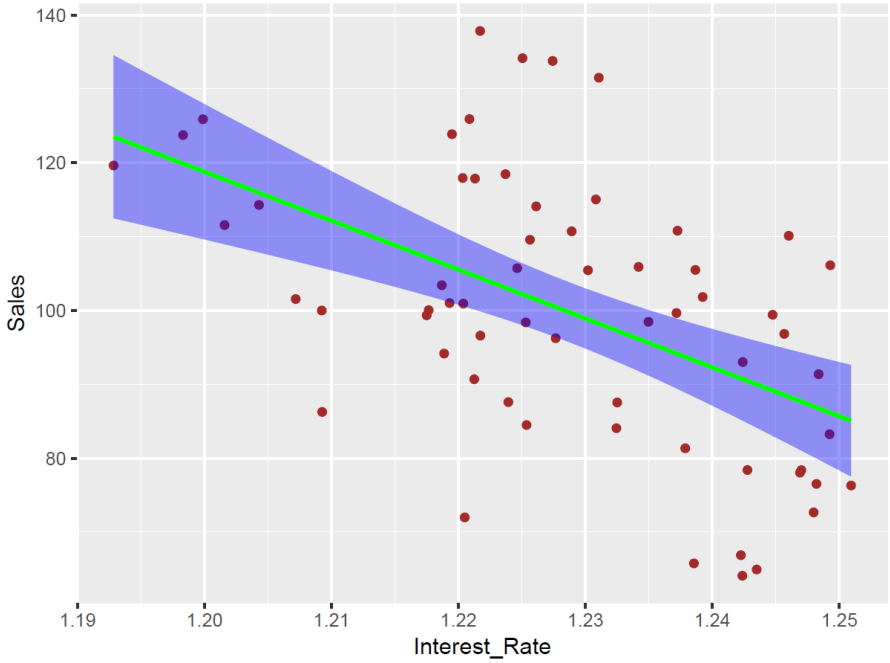


Figure 1.2 Housing Market Loan Rates and Sales

Against this background, there have been many studies to understand the reasons behind house price movements with different theories and empirical methodologies. For the Turkish housing market, the most important attempt has been to check for the existence of the housing market bubble by correlating the macroeconomic fundamentals with the explained component of house prices. The unexplained part has been found not to provide sufficient evidence in favor of the housing market bubble. For instance, the studies of Erol (2013), Karasu (2015), Coskun and Jadevicius (2017) have employed such empirical methodologies by concluding that house prices in Turkey are largely explained by the macroeconomic fundamentals, giving no evidence in favor of a bubble. However, all these studies have focused on the results of a pricing mechanism rather than investigating the true dynamics which

pave the way for mispricing (unexplained component) in the housing market and hence its effects on the real economy. This study aims to fill this gap.

The main motivation and contribution of this thesis are to understand the factors behind the house price dynamics by employing a behavioral approach. Specifically, we will attempt to concentrate on the role of inflation on the interaction between housing and credit markets and its effects on house prices. Case and Shiller (1988) documents that change in house prices can be predictable referring to inefficiency in the housing market, contrary to the efficient market hypothesis. In this regard, we will explore the source of this efficiency in the housing market by taking the Modigliani-Cohn hypothesis as a reference. Main arguments of this hypothesis rely on the fact that individuals are generally subject to the money illusion that they do not make a distinction between nominal and real variables while making an investment decision. When individuals decide whether to buy a house or to rent one, they generally compare monthly mortgage payments with the rental costs. At this point, the monthly interest rate of mortgage payments becomes important since it will determine the decision of agents towards one of these alternatives. Since agents are supposed to make the decision on real variables in general, they ought to only consider the real rate of interest. However, as MCH suggests, these individuals are not always as such, but they might well suffer from the money illusion.

This premise, in turn, means that instead of the real interest rate, they directly consider the nominal rates. Considering the Fisher equation, a potential jump in inflation (overall price level increase) will be translated into nominal interest rates but the real rates generally tend to stay still assuming no significant changes in risk premium. However, since these agents are subject to the money illusion and they have some beliefs, they think of real rates moving with the nominal rates; and make a decision based on their beliefs. As a result, the effect of this jump will make agents reduce their housing demand since the corresponding nominal rates will seemingly go up as well. This belief-based decision making will be translated on the

housing market as a whole, reducing the aggregate demand for mortgage credits and hence dragging down the house prices.

To empirically check for the existence of money illusion and whether it can be explained with inflation as proposed by the MCH, we will derive a mispricing proxy and correlate it with inflation and nominal interest rates data. To do that we will decompose price-rent ratio using Case and Shiller (1988) methodology and by elaborating further on that, we get the empirical mispricing proxy as the difference between objective and subjective rent growths or return on housing. While for the objective expectations we use historical elasticities derived from vector autoregressions, we cannot directly employ such an econometric methodology on the subjective part since these expectations are not observable. Therefore, we correlate the subjective part with some empirical risk factors that are meant to catch belief-based decisions. Lastly, the difference between those two parts will be our empirical mispricing proxy and by regressing this proxy on inflation and smoothed inflation we get statistically significant results. The empirical conclusions are consistent with the behavioral finance/economics theory and our expectations that inflation will reduce the relative housing prices. To avoid the monthly idiosyncratic shocks, we will also use the smoothed inflation and it captures a very close relationship, as inflation does. What is more, regression results indicate that an important part of the mispricing is solely explained by the inflation itself.

There might be some criticisms against these empirical findings since the expected returns on housing investments and rents cannot be directly observed but they are rather estimated. To tackle these issues and give more clear messages, we check whether these empirical results are robust enough to our empirical estimations. For these robustness checks, we employ a Bayesian estimation methodology and then we set the mispricing measure using the posterior distributions of our variables. After getting the mispricing measure; separately regressing it on inflation and

smoothed inflation, Bayesian estimation results further confirm the existence of money illusion.

Another special case that must be taken into account is whether market frictions can engender a similar effect that we might have mistakenly attributed to the money illusion. To check for it, we consider a specific case of liquidity constraints which is sometimes called the *Tilt Effect*. Under this specification, when there is no inflation (zero inflation rate), the cost of mortgage payments does not vary over time. On the other hand, in an inflationary environment, real mortgage payments will decline across time since the discounted value of future cash payments goes down. Thus, to compensate for this decline the real mortgage payments at the beginning must be higher than the fixed mortgage payments. This situation, in turn, makes the cost curve to be tilted to the left. For the empirical investigation, we employ a recursive estimation procedure. Under this setting when we run the regressions, estimated coefficient pretty much stays constant across time. However, in case of a tilt effect, we could expect the elasticity to go down in magnitude. This finding of relatively flat coefficient clearly refutes the existence of tilt effect. Put it differently, this inflation illusion cannot be explained by the tilt effect, it is rather because of the money illusion. Furthermore, the coefficient always remains negative meaning that an increase in inflation causes the house prices to go down relatively. As a result, we can say that the mispricing proxy is not caused by tilt effect but it rather captured by the behavior of individuals that proves the existence of money illusion.

To sum up, all the empirical results lead to the fact, people may be subject to money illusion the effect of which can be significant. This, in turn, can affect the whole economy, as proposed by Keynesian economic doctrine. The main contribution of this study is its philosophical approach as well as the empirical technicalities. Considering the fact that empirical studies on the housing market in Turkey generally focus on the macro and microeconomic determinants of housing prices and seek for the existence of housing market bubble using different econometric

methodologies, this study clearly shows its unique contribution. To the best of the author, this is the first study that specifically investigates the effects of money illusion on housing prices in Turkey by employing a behavioral approach.

The structure of the thesis will be as follows: The next chapter will deeply investigate the institutional background and makes an extensive literature review on the money illusion. Within this chapter, the stocks markets, as well as the housing markets will be connected with the effects of money/inflation illusion. In chapter 3, we will take a glance at the Turkish housing market. First, we will touch upon the empirical studies conducted on the Turkish housing market and document their general results. Then, we will describe the data and document its summary statistics with their implications. Chapter 4 will show the theoretical derivations together with the empirical results. This chapter also includes the robustness checks and further analysis for market frictions. The fifth and last chapter will provide policy implications and conclude the thesis. Regarding the regression diagnostics of both the Classical and Bayesian estimation, several diagnostic tests together with density plots of coefficients in Bayesian estimation for both inflation and smoothed inflation are provided in appendix A. Furthermore, a comprehensive Turkish summary of the thesis is available in the appendix B.

CHAPTER 2

INSTITUTIONAL BACKGROUND

2.1 Definition

Since the early 20^{th} century, the concept of money illusion has begun to gain importance with the studies of the prominent scholars in the field and they, being in line with each other, put forward different definitions for this term to shed light on the topic. For the very first time the term *money illusion* was used by J.M. Keynes in the academic literature and following Keynes, Fisher (1928) extended the related literature in his book called "The Money Illusion". In this book, Fisher (1928) defines this term as "the failure to perceive that the dollar, or any other unit of money, expands or shrinks in value". In other words, it is emphasized that the nominal value of money can change over time and money illusion prevents individuals to distinguish between the value of money as of today and that it had some time in the past. On the other hand, Patinkin (1956) brings an alternative definition that "An individual is said to be suffering from such an illusion if his excess demand functions for commodities do not depend solely on relative prices and wealth". As we understand well from his argument an individual without a money illusion does not make decisions based on absolute prices but the decisions rather ought to be dependent on relative/real values. This statement alone put forwards the importance of relative or real prices rather than the absolute ones since the real or relative prices are of concern in the decision-making process. On the other hand, during the 1970s, the concept of money illusion had been criticized since this was the beginning of the neoclassical economics that emphasized the importance of utility-maximizing rational agents. In this regard, a much more ambitious definition put forward by Tobin (1972) points out that "An economic

theorist can, of course, commit no greater crime than to assume money illusion" and this famous premise explicitly dictates the way an economist shall pursue in a decision-making process. In support of money illusion, the statement by Akerlof et al. (2000) that "In fact, I am persuadable — indeed, pretty much persuaded — that money illusion is a fact of life." sums up the possible definitions we have covered so far in a brief manner and takes the money illusion as a fact rather than an assumption or hypothesis. Against this background, the existence of money illusion has been widely recognized in academia and has taken its place in the literature. Following the early studies in the literature, there has been a tremendous work on the theory to shed light on the money illusion, the factors behind it and its implications for the aggregate economy.

2.2 Psychological Factors Behind the Economic Decision-Making Process

The economic decision-making process has a lot to do with the psychological effects faced by individuals. Despite the fact that individuals are subject to the same information set, they can make different decisions based on their judgment. This fact, well documented by the studies of Tversky and Kahneman (1981), has come to be known as the *framing effect* and it asserts that agents' decisions, to a large extent, depend on whether the choice or problem is denominated in real or nominal terms. And this effect is a potential trigger for individuals to make alternative choices based on the denomination of the terms. For example, when the income and the aggregate prices all get tripled, one would have expected no change in the decision of a rational agent. On the contrary, Tversky and Kahneman (1981) asserts that agents are prone to the denomination of the problem and they generally prefer a less risky decision that is denominated in nominal terms rather than a much less risky denominated in real terms and his trait largely stems from the risk aversion. A survey study which is quite parallel to the aforementioned effect is conducted by Shafir et. al (1997) that deeply investigates the backgrounds of psychological effects

feeding into the money illusion. According to this study, in spite of the fact that people are well aware of nominal and real variables they tend to think of calculations in nominal terms. The reason is that the fundamental theory of economics has assumed that equilibrium prices do not depend on the absolute values but rather the relative prices. As such, in case of a price increase (inflation), rational agents are expected not to change their behavior since the real prices matter but these money-illusioned agents do change their behavior.

Another significant psychological effect is called *anchoring*. In an economy with many other available prices for different goods, nominal mortgage prices can be taken as an anchor, while the real mortgage prices can be derived using the available information. However, since the money-illusioned investors are not willing to be exposed to nominal losses, these investors make decisions based on the nominal prices rather than the accurate information denominated in real terms. This effect is quite close to the *framing effect* except for the nominal prices serving as a reference point.

Finally, Thaler (1980) brings forth the term *mental accounting* which basically states that people perceive the world differently and therefore think about the notions of profit and loss differently as well. Based on the divergence of how they perceive the world, they make quite different decisions using the same information set. A good example would be the stock market for which the same information for investment is available to everyone but based on the individual perception of the shares, the investment decisions are likely to differ assuming no asymmetric information in the market.

2.3 Inflation as a Key Trigger to Money Illusion

The general idea behind money illusion can be described as follows: As long as the difference between real and nominal quantities is sufficiently small, it is generally

convenient to use real and nominal rates interchangeably. Therefore, it is quite possible that agents omit the rate of inflation for small values while making a decision. That is why inflation, which causes the nominal and real prices to diverge, is generally accepted to be one of the most significant drivers behind money illusion. Considering the fact that long-run neutrality of quantity theory of money rests on the absence of money illusion, it is clear how much money illusion is crucial for the aggregate economy.

While the aforementioned psychological effects are important in the decision-making process, they become much more interesting when combined with some economic facts. In a zero-inflationary environment, the real cost burden of mortgage payments stays the same over time, while in an inflationary environment the real cost tends to move to the earlier periods of the payment scheme. In such a case, the aggregate demand for the mortgage credits will decline due to the fact that real cost burden has moved towards the early periods and this has come to be known as *tilt effect*. This effect, which is considered as a form of market friction, can have a tremendous effect on the investment decisions of individuals due to an investment environment caused by inflation. The prominent examples that cover this effect are Lessard and Modigliani (1975), Tucker (1974), Kearl (1979) and Follain (1982).

In the standard empirical literature of monetary and financial economics, the initial focus for money illusion was on the stock market and investment decisions. A general conclusion of the early studies was to correlate inflation and nominal stock returns negatively.[1] While this conclusion seems to be intriguing and contradictory due to the fact that one would have expected the nominal returns to move closely with the level of inflation, further explanation is needed. A potential explanation for this result is justified by the money illusion. For instance, in their paper Modigliani and Cohn (1979) states that there does exist a money illusion in the stock markets

[1] The studies conducted by Fama and Schwert (1977), Gultekin (1983), Lintner (1975) and Amihud (1996) are the prominent studies to clearly exemplify the negative correlation between nominal asset returns and inflation.

because when calculating the financial cash flows, investors generally mistakenly interfuse real cash flow with the nominal ones. To be more precise; when investors calculate the equity earnings, they take into account the nominal returns instead of real rates and also these money illusioned investors fail to realize that their capital and liabilities depreciate in real terms. As a result, they claim that a high inflationary environment tends to pose pressure on the stock returns. In support of the Modigliani-Cohn hypothesis, the studies by Campbell and nVuolteenaho (2004) and Cohen et al. (2005) directly attribute the mispricing in the dividend to capital earning ratio with inflation using both time series and longitudinal data. It might be quite interesting why those investors would make such a huge mistake which costs them millions and perhaps billions of dollars. According to Cohen et al. (2005) the so-called Fed investment Model clearly explains this fallacy, because the model itself associates the return on stocks to the return on nominal bonds. And in practice, generally, the sum of bond return and risk premium would imply "normal" yield. This argument is further acknowledged by Sharper (2002) as well. Since investors are prone to the partial overlook of inflation, this conclusion is compatible with the New Keynesian economic approach that small frictions may generate remarkable fluctuations in the real economy. Therefore, the potential consequences of money illusion regardless of whether in stock or other markets are not only confined to the markets people invest but rather they can affect the whole economy.

A contemporary study by Basak and Yan (2010) investigates the potential influences of money illusion on financial security prices under an inflationary environment while still maintaining the fundamental assumptions of finance. Using investors with different degrees of money illusion, they clearly reveal that consumption patterns of illusioned investors follow nominal price level and is negatively correlated with prices. They further claim that although the effects of money illusion may be relatively very limited for investors themselves, its effect on the aggregate economy is found to be considerable. This finding is quite consistent with the New Keynesian thinking that short-run non-neutrality of money can

generate tremendous effects on the real economy. As have been stated before although the stock market has taken a pivotal role regarding the illusion story, the academic world has extended its range to other markets that could have mispricing stemming from money illusion.

Another market where people tend to invest for long-run purposes is the housing market (real estate market). As have been stated before since inflation is regarded to be the main reason leading people to make decisions under money illusion, Follain (1982) challenges the argument whether housing market demand is affected by the real prices as economic theory suggests or is led by money illusion. He, thus, investigates the relationship between rent and home ownership (tenure choice). In his study, he finds out that increases in inflationary expectations reduce housing demand and home ownership since high inflation decreases the amount that can be bought due to the fact that in this market fixed income securities are highly dominant as a means of payment. Although inflation can bring some return on capital, housing demand is much more sensitive to accruing costs than to the capital returns. Another study investigating the long run relationships between rents and house prices is conducted by Gallin (2008). In his paper, he investigates the long run links between rents and housing prices and how they dynamically affect each other. Using long-run error correction models he finds that house prices and rents tend to correct back to each other in the long run (3 years as long-run average). The correction mechanism works through long run co-integration models showing that both rents and house prices correct towards each other. The most important conclusion of his paper is that house prices correct back to rents. Since the price-rent ratio shows the relative house prices to that of rents, the author further claims that this ratio can be used as a measure of valuation in the housing market. In the literature of housing economics, this measure is generally used to reflect long-run real price dynamics in the real estate market. A study conducted by Brunnermeier and Julliard (2006) very thoroughly investigates the potential effects of money illusion in housing markets of the US, the UK and Australia. The idea covering their paper is as follows: When people decide to buy a house or make a constant

mortgage payment (with a prefixed nominal interest rate), are well affected by money illusion. This is because of the aforementioned fact that people generally tend to think that nominal and real variables move together. Thus, in case inflation goes down they mistakenly reflect this downturn on real interest rates as well. Therefore, they will implicitly underrate the real costs of future mortgage payments. Since they underestimate the real costs of these payments, the relative demand for housing increases in case of a decline in inflation. As a consequence, they find out that the fundamental reason behind sharp run-ups and downs in the housing market is inflation itself. One interrelated question that one might pose is to seek potential explanations for linkages between inflation and this illusion proxy. The authors propose that inflation may make the aggregate economy much riskier and by increasing the risk premium, the house prices will be suppressed. Thus, low levels of real house prices are accompanied by high inflation and future inflation expectations. The most important and a common finding of all these studies is that economic agents are subject to the money illusion which breaks the concept of non-neutrality of money, contrary to the classical economic theory. This illusion, therefore, can lead individuals/investors to make decisions based on nominal or absolute prices rather than the real prices. As a result, a small cost for an individual can generate remarkable influences on the aggregate economy.

CHAPTER 3

A GLANCE AT THE TURKISH HOUSNING MARKET

3.1 Literature on the Turkish Housing Market

In recent years, return on housing investments started to outdistance that of other liquid financial assets and these increases in housing prices brought about fundamental questions on the Turkish real estate market. Two most important and outstanding questions on the Turkish housing market has been deeply investigated to provide answers for the surge in house prices. While the first one is whether there exists a bubble in the Turkish real estate market, the second related question is to seek for the most relevant and determinant macro and micro sources of house prices in Turkey. Most of the papers (for instance Erol (2013), Karasu (2015), Sari et al. (2007), Selim (2011), Keskin (2008)) on Turkish housing market have concentrated on these questions using slightly different econometric and statistical methodologies. One of the most used statistical methodologies is first to find appropriate macroeconomic variables that are thought to drive house prices and then to get an estimate from these variables. After that, the difference between the realized and estimated value is obtained and in the case that the difference between the two shows some patterns of an anomaly then this is interpreted as a sign of a bubble. The statistical method is to check for the existence of a unit root for the difference and rejecting the Null hypothesis provides the support that there exists no housing market bubble. Another approach is to directly use the time series statistical properties of these variables by employing several different tests such as Phillips et al. (2012) being one of the most strong ones that are robust to the existence of many bubbles. The potential explosive behavior of the series implies the existence of the housing market bubble.

Against this background, Erol (2013) tries to provide an answer whether the surge in house prices is driven by a revival in the Turkish housing market or it is rather led by the market expectations. The motivation of this study follows from Case and Shiller (2003) that if the change in fundamental market indicators captures sufficiently large component of the rise in house prices, then we can expect that a housing market balloon is not formed. For the study, the data for both *Reidin* and TURKSTAT are used. According to the empirical results, fundamental economic/demographic indicators can largely capture the change in house prices and there is no clear evidence in favor of housing market balloon. For the empirical part, this study employs the data for GDP, population growth, interest rates, and corresponding housing costs (construction costs). Employing different Ordinary Least Squares (OLS) regressions, she comes up with the conclusion that house prices are sufficiently explained by macro fundamentals and the difference between actual prices and estimates does not imply a clear sign of a bubble. A relevant study, conducted by Karasu (2015), explores the existence of a bubble in Turkey using market fundamentals parallel to the Case and Shiller (2003) that bubbles can be basically defined as the deviation from fundamentals. For the study, he chooses industrial production as a proxy for income, construction costs, interest rates and housing starts as fundamental macro variables that are thought to affect house prices. Using vector error correction models (VECM), first, he gets an estimate implied by the fundamentals and then takes the difference between the estimate and actual price as a proxy for the bubble. In addition to the VECM analysis, he furthermore employs a Generalized Sup-ADF test (GSADF) developed by Phillips et al. (2012) which is the right-tailed transformed version of Augmented Dicky Fuller (ADF) test to check if the prices show an explosive behavior. The superiority of this test is that it can tackle the very complex non-linear structure of the time series in case that even there exist many bubbles, compared to the existing ones. According to this study, although there are some signs of over-pricing in recent years; the fundamental figures (such as price-income ratio, price-rent ratio) are not sufficiently large to infer that there exists a housing market bubble.

Another comprehensive paper conducted by Sari et al. (2007) deeply seeks the dynamic effects between housing market activity and main macroeconomic fundamentals. Using a reduced form of VAR approach with generalized variance error decomposition technique for many macroeconomic variables (such as interest rates, output, prices, etc.). As an empirical finding, they come up with the conclusion that the effects of monetary shocks significantly affect housing market contrary to the advanced economies. This is quite conflicting with the long run neutrality of money in New Keynesian economic doctrine. The second crucial macro variable is the output that captures the overall economic activity. On the other hand, as opposed to the advanced economies the labor market is found to be relatively less important in affecting the house prices, meaning that there is not a strong mechanism between production and labor market. Since they employed a dynamic model, there is also a feedback from the housing market to output, labor market and prices that corroborate the idea of the fact that housing sector can be seen as a leading economic indicator for the aggregate economy. Relatively new and more elaborate work by Coskun and Jadevicius (2017) further checks the existence of the bubble using both aggregate and regional housing data with a multi-strand technique. This study includes three complementary methodologies for checking the bubble. Firstly, with price-income ratio and price-rent ratio he investigates housing affordability and these measures do not yield any sign of bubble between 2010 and 2014. As a second approach, he employs income, population, employment ratios, and interest rates as explanatory variables and he comes up with a conclusion that these variables can nearly explain 70% of the house price variations and there is not a strong argument in favor of a bubble. Thirdly he uses a more advanced version of Augmented Dicky Fuller (ADF) test, a right-tailed unit root test (GSADF) developed by Phillips et al. (2012), leading him to conclude that housing market was not in the bubble during this time period.

On the other hand, there are some approaches embracing a comparative technique and based on the counterparties, they provide alternative explanations. For instance,

the studies conducted by the same author Coskun (2010) and Coskun (2013) compares the real estate market of Turkey with that of United States and concludes that Turkish real estate markets are rather burgeoning and too small which makes Turkey less vulnerable to housing market balloon. This conclusion derives from the fact that financial deepening increases the vulnerabilities of the housing market.

Despite the fact that all these aforementioned studies have focused the house prices from a macroeconomic approach, there are some studies that seek for the micro-foundations as well. To illustrate, Selim (2011) uses a hedonic regression approach to detect the fundamental determinants of house prices using household budget survey data in 2004. The hedonic pricing approach takes into consideration the quality of houses and in a sense, makes a quality-based price adjustment. In the paper, she found out that type of house, type of building, number of rooms and size significantly affect the house prices. These types of microeconomic approaches are not only limited to the aggregate house prices, but there also exist some studies that focus on regional or urban level data, too. For example, Keskin (2008) explores the determinants of house prices in Istanbul using a hedonic regression model approach. In her paper, she finds pretty much consistent results with the previous study. Main determinants are found to be living area size, being in a secured site, age of the building and average income of the household.

To summarize all these empirical studies conducted on the Turkish housing market, we see that the main focus has been detecting the fundamental determinants of house prices, both from macro and microeconomic perspectives, and to check for the existence of a house price bubble employing different statistical/econometric approaches. To the best of our knowledge, there has not been any study in the Turkish housing market that specifically focuses on money illusion, behavioral dynamics of the housing market and their effects on house prices. Within this context, this is going to be the first academic study that combines the Modigliani-Cohn Hypothesis (MCH) with the housing market. It should be noted that the aim of

this study is not to check for the existence of housing bubble by any means, neither does it try to incorporate the macroeconomic fundamentals as being the main determinants of the house prices and then to yield any proxy for the bubble. The academic contribution of this thesis is not to check whether there are balloons in the Turkish housing market by any means, but rather to provide an answer to why abnormal price movements occur. To accomplish this aim we take MCH hypothesis a reference guide and fill this gap on the literature for the Turkish housing market.

3.2 Data and Statistics

In this study, monthly data that cover the periods between January 2010 and February 2018 is used and it consists of 98 observations for each variable. In the analysis, we employ house price index, rent price index, inflation, housing market loan rates, long term (5-year) Turkish government bond rates, real interest rates, nominal exchange rates, and exchange rate volatility. While the longterm government bond rates *per se* are not directly used in the regression analyses, they are used to derive empirical counterpart of excess returns on housing investment and rent that we will correlate with some empirical risk factors (such as exchange rate volatility) in the next chapter. Since in some parts we investigate the interaction between inflation and the price-rent ratio, we use inflation without rent to remove the effect of rent on inflation, in a sense to get rid of over-fitting in the analysis. It should be noted that the base year of the series is different, therefore to make the series visually compatible with each other, their base years have been modified. For example, the base year of inflation data is 2003 and that of housing is 2010. Thus, to make the data more readable we adjust the data by taking 2010 as the base year, but the changes in price-rent ratio stay the same and it does not affect the empirical analysis at all. Finally, housing and rent price index have been seasonally-adjusted so that the seasonal variation shall not have any influence on the results.

Regarding the source of data; house price index, mortgage market interest rates, and nominal exchange rate are taken from the electronic data delivery system of Central Bank of the Republic of Turkey (CBRT), inflation and rent price index are taken from Turkish Statistical Institute (TURKSTAT). Long term government bond rates and exchange rate volatility using the daily data are obtained from Bloomberg. One of the most important variables we use is the real rate of interest rate which is calculated as;

$$\text{Real Rate} = \frac{1 + i_t}{1 + \pi_t} - 1 \simeq i_t - \pi_t$$

where i_t is the nominal interest rate and π_t is the inflation. According to Brunnermeier and Julliard (2006), this is what actually rational agents must consider when deciding to buy a house or rent. The major determinant of money illusion will be the divergence between nominal and real interest rates due to inflation. This divergence between those two variables is a potential trigger for money illusion that individuals will be exposed to.

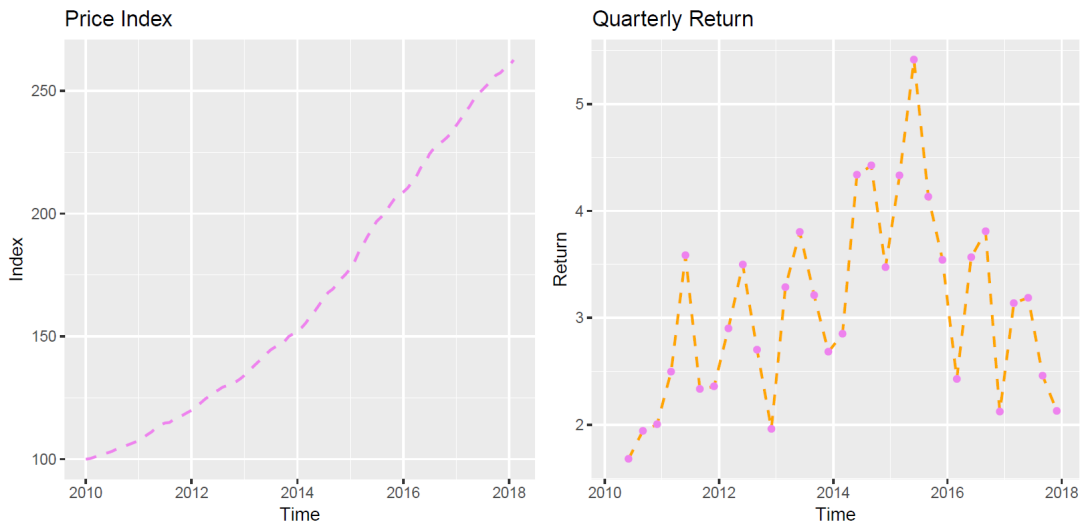


Figure 3.1 House Price Index and Return on Housing Investment

To make a better understanding and an inference from the data at hand, we will make a short tour on the return on housing investment. From the Figure 3.1 and Table 3.1, it can be seen that there has been a considerable rise in housing prices

compared to inflation. For instance, while the average monthly rate of inflation is nearly 0.69% that of return on housing is 1%. Especially, the jump of return between 2013 and 2015 is unusual in the sense that it is much higher than the average rate of inflation. What is more, the average quarterly housing return is around 3.5% and this information again leads us to investigate the sources of this extraordinary return on the housing market and to give an answer whether these movements in prices have real backgrounds or they are pulled by the behavior of agents in the economy. Another important point that we need to touch upon is that the nominal and real interest rates. As it has been used extensively in the literature (for instance; Modigliani and Cohn (1979), Cohen et al. (2005), Brunnermeier and Julliard (2006), Basak and Yan (2010)), money illusion makes people consider the nominal interest rates instead of real rates while making a decision. Therefore; while a real interest rate as high as 1%, on average, is also significant that agents may be expected to take into account, its empirical validity will be checked in line with the Modigliani-Cohn Hypothesis (MCH). This hypothesis asserts that rather than taking the real interest rate into account no matter how high it is, agents are going to make a decision based on the nominal interest rates. The charts provided in Figure 3.2 demonstrate a crucial aspect of the macroeconomic fundamentals in Turkey, in the aftermath of the global financial crisis. Except for one observation point, the real interest rates show a relatively constant pattern. However, the course of nominal interest rates and return on housing investment have a quite fluctuating picture which implicitly implies that house prices may be affected by the nominal interest rates rather than the real rates. Another significant point is that the strong correlation between exchange rate volatility and the mortgage market interest rate (nominal rate). The left panel of Figure 3.3 clearly demonstrates that higher exchange rate volatility leads to a higher level of the nominal interest rate. The reason for including exchange rate volatility is that it can be a good proxy for empirical risk factors when we include the subjective behavior of money-illusioned individuals into the analysis. For instance, Berüment and Günay (2003) shows that exchange rate volatility measured as the conditional variance of the exchange rate can have

crucial impacts on the nominal interest rates. Thus, when making a decision whether to buy or rent a house, the risk taken by individuals may be well proxied by exchange rate volatility. On the other hand, the right panel of Figure 3.3 indicates that there exists a negative relationship between nominal interest rates and return on house prices. This quick snapshot provides us with a sign that agents may consider the nominal rates when reaching a decision. Combining these two results together, we come up with the conclusion that exchange rate volatility may have a significant impact on the behavior of money-illusioned individuals and house prices. This is because of the hypothesis asserted by Modiagliani and Cohn (1979) that it is the nominal interest rate considered by the money-illusioned individuals while making a decision on investment rather than the real rate.

Table 3.1

Basic Statistics of Variables Used in Analyses

Variables	Mean	Std. Dev.	Min	Max
Inflation	0.687	0.787	-1.430	3.273
Return on Housing	1.000	0.378	0.180	2.067
Mortgage Market Loan Rate	1.228	0.014	1.193	1.251
Real Interest Rate	1.003	0.005	0.978	1.014
Change in Exchange Rate	1.016	2.703	-4.777	7.727
Exchange Rate Volatility	2.419	0.266	1.578	2.943

Furthermore, the distribution of return on housing investment in Figure 3.4 also reveals a piece of potentially significant information about the price abnormalities in the Turkish housing market. The mean value of housing investment return is approximately 1% and monthly returns are unevenly dispersed. While monthly returns are mostly dispersed between 0.5% and 1.5%, there exist some outlier observations as well. In that context, although the returns up to 1.6% show a pattern of Normal distribution, the right tail of the histogram points to different dynamics

that may stem from money illusion causing people to rush for buying houses. All in all, this information from the data visualization gives some hints about the price abnormalities in the Turkish housing market and these price anomalies make us investigate the sources at the background.

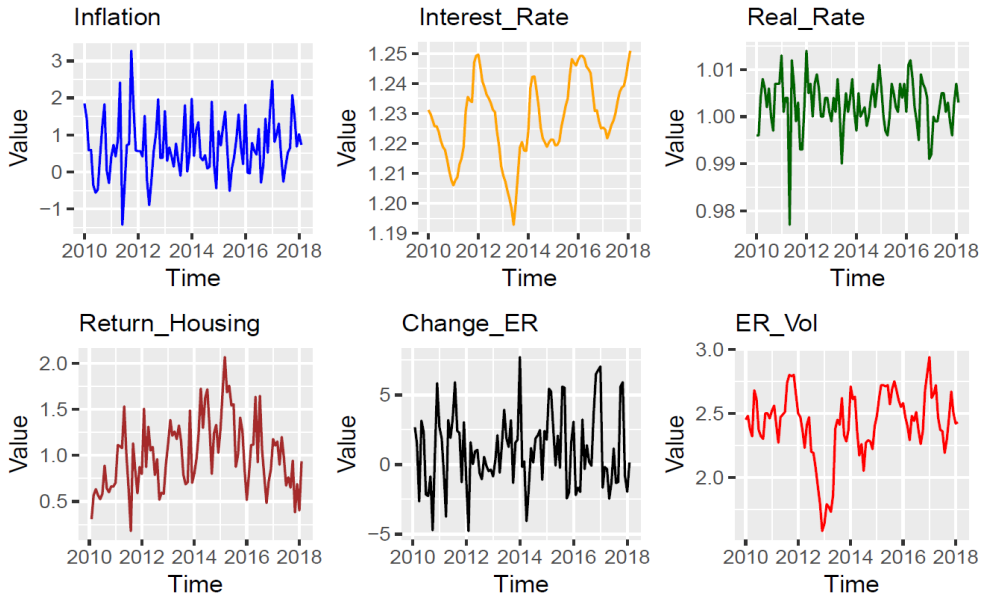


Figure 3.2 Time Series used in the Analyses

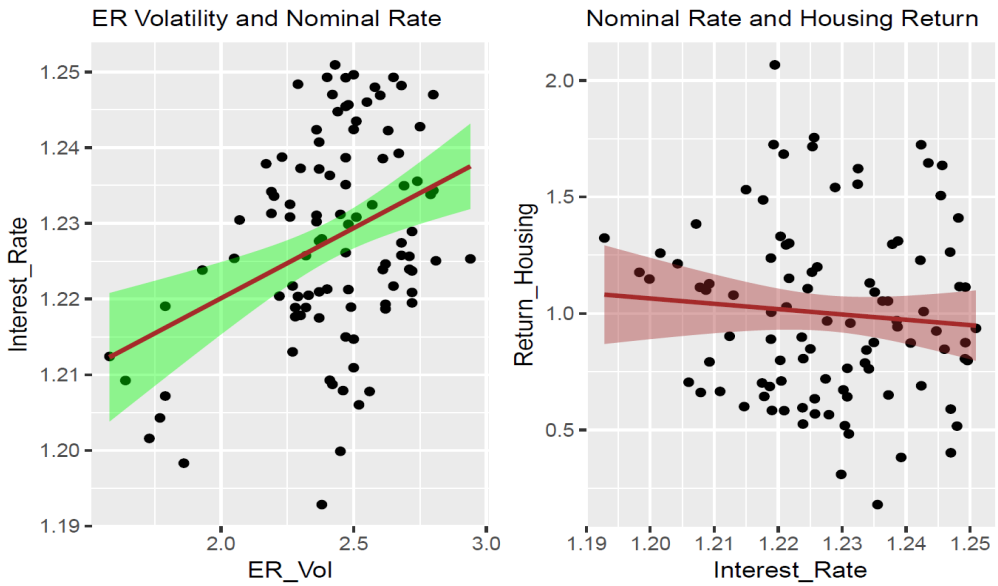


Figure 3.3 Scatter Plot of Exchange Rate Volatility, Nominal Interest Rates and Return on Housing

3.3 Unit Root Tests

In this sub section, we investigate time series statistical properties of the variables that we use in the regressions. A well-known fact in time series that variables including unit root lead to spurious regression necessitates checking all the variables against the potential unit roots. However, each unit root test may imply a different result depending on its nature. In our empirical testing, we use three widely used unit root tests namely Augmented Dicky-Fuller (ADF) test, Phillips-Perron (KPSS) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test to get convincing results. It should be noted that while the Null hypothesis of the first two is the existence of Unit root, that of the latter is in favor of stationarity. Table 3.2 documents the results.

Figure 3.4 Distribution of Return on Housing Investment

According to the results presented in the table, all three tests do not point to the existence of unit roots for inflation, real interest rate, return on housing and change in the exchange rate. It should be noted that the first two tests reject the Null for the existence of unit roots. The test values of the KPSS test are less than the critical

values which again lead to the fact that we are not able to reject the Null for the existence of stationarity. On the other hand, the results for the mortgage market interest rate (nominal rates) and exchange rate volatility are somewhat different. For mortgage market interest rate, ADF and KPSS still point to the stationarity but that of Phillips-Perron is the opposite. For the volatility of the exchange rate, they still mostly point to the stationarity. Consequently, all three tests mostly point to the stationarity for the variables we use in the analysis and they reaffirm that our results will not be led by spurious regressions.

Table 3.2

Unit Root Test Results for Variables

Tests	Inflation	Interest Rate	Real Rate	Return on Housing	Change in ER	ER Volatility
ADF-INT	0.00	0.077	0.00	0.000	0.053	0.000
ADF-(TR AND INT)	0.00	0.090	0.00	0.000	0.167	0.000
PP-INT	0.00	0.230	0.00	0.000	0.037	0.000
PP-(TR AND INT)	0.00	0.314	0.00	0.000	0.124	0.000
	Test-Values					
KPSS-INT	0.099	0.287	0.09	0.363	0.180	0.091
KPSS-(TR&INT)	0.027	0.060	0.06	0.250	0.115	0.035
	Critical-Values (Table Values)					
KPSS- (CV) INT	0.347	0.347	0.37	0.347	0.347	0.347
KPSS- (CV) TR&INT	0.119	0.119	0.19	0.119	0.119	0.119

CHAPTER 4

THEORETICAL DERIVATIONS AND ESTIMATIONS

In the existing literature, there is a significant emphasis on whether there is a balloon in the housing market or not, as have been stated before. What typically done is that the house prices are regressed on the macroeconomic fundamentals and the residuals are obtained. If the residuals show an explosive pattern, it is claimed that there is either a balloon or at least an overpricing in the market. An alternative approach is to use time series statistical properties of the house prices index using different versions of Augmented Dicky-Fuller test. In this chapter, our aim is to shed light on the behavioral side of the functioning of the housing market rather than just seeking the existence of a housing market bubble. Specifically, we will touch upon the behavioral dynamics of agents that pave a way for mispricing in the housing market. To be more concise and clear, we will consider both the objective and subjective expectations of individuals and investigate the divergence between them. This divergence between different types of expectations will constitute an important step towards building the empirical mispricing proxy. Having got the empirical proxy, we will be able to correlate it with different macroeconomic fundamentals.

The main idea of the paper is as follows: A general and simple rule of calculating the nominal interest rate is to sum the real interest rate and inflation. A potential decline in inflation will bring the nominal interest rate down, the real interest rate does not show a similar pattern though. From this perspective, those who plan to rent or buy a house when comparing monthly rent and the monthly payment of a fixed nominal interest rate mortgage are very likely to be subject to the money illusion. Since these agents have money illusion, they implicitly assume or think that

the real and nominal interest rates move together, therefore a potential decline in inflation should likely to be transmitted to the decline in real rates and thus they underestimate the costs of future mortgage payments that they will face. Because these agents underestimate the true cost of future mortgage payments, there will be excess demand in the housing market and house prices will be having an upward trend. In this thesis, we decompose the price-rent ratio into different subcomponents and using these components we will derive a mispricing proxy for the effects of money illusion stemming from different types of expectations as explained above. After getting the mispricing measure, we will explore the linkages between this proxy and a few macroeconomic fundamentals.

4.1 Theoretical Derivations

4.1.1 A Primer on Present Value Calculation

In setting up the theoretical model we will closely follow the methodology of Brunnermeier and Julliard (2006). In the optimal case, the present value of house prices is going to be equal to the discounted cash flow of rent payments and the salvage value of house price at the period of T. Therefore;

$$\mathrm{P_t} = E_t\left[\sum_{\tau=1}^{T-1} m_{t,t+\tau}L_{t+\tau} + m_{t,T}P_t\right]$$

where P_t is the house price, E_t is the expectation operator, m_t is the discount factor, L_t is the rent price. Readjusting the above term will yield the price-rent ratio as;

$$\frac{\mathrm{P_t}}{\mathrm{L_t}} = \mathrm{E_t}\left[\sum_{\tau=1}^{\infty} \frac{1}{\left(1 + r_{t,t+\tau}\right)^{\tau}}\right] \approx \frac{1}{r_t}$$

where r_t is the real interest rate and we assume that at the terminal the value of house prices at the period of T theoretically will approach to zero. Therefore, we will just omit this ignorable salvage value of house price for simplicity. Depending on whether agents have money illusion or not, the above statement may not be valid.

For those who are subject to the money illusion, the above statement turns out to take a value corresponding to the reciprocal of the nominal rates, that is, it takes a value which is approximately equal to the long run value of interest rate reciprocal;

$$\frac{\mathrm{P_t}}{\mathrm{L_t}} = E_t\left[\sum_{\tau=1}^{\infty}\frac{1}{(1+i_{t,t+\tau})^{\tau}}\right] \approx \frac{1}{i_t}$$

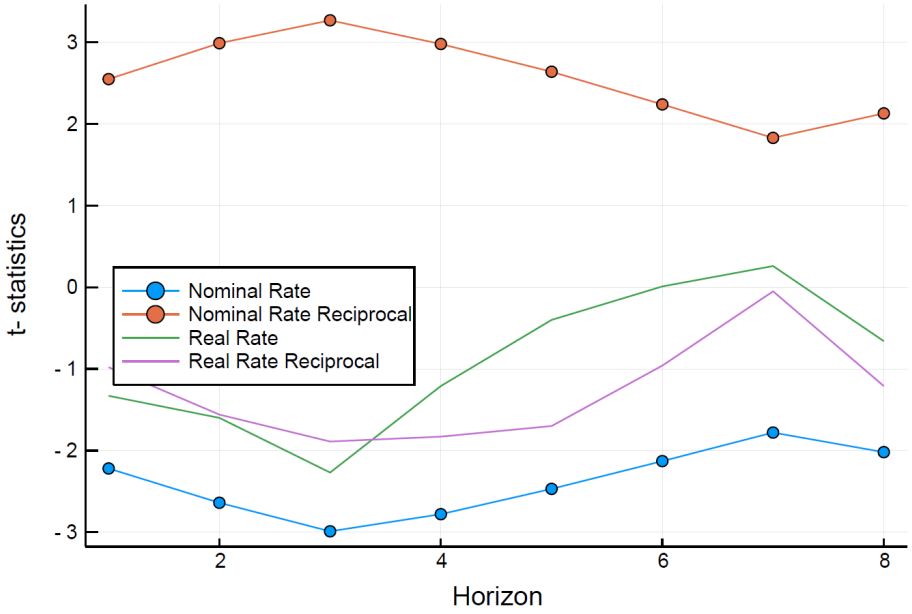
where i_t is the nominal interest rate. Observe that the price-rent ratio is equal to the interest rate reciprocal. While for the rational agents we use the real interest rate reciprocal, for those who suffer from money illusion we use the corresponding nominal rate. The reason why we use $\frac{1}{i_t}$ instead of $\frac{1}{r_t}$ is that the agents treat nominal interest rate as the real one. Therefore, as we understand well from the above statements the terms $\frac{1}{i_t}$ and $\frac{1}{r_t}$ can be used to test whether there exists a money illusion or not in the housing market. Since the primary purpose is to check money illusion, we will employ these proxies to test the existence of money. A noteworthy point is that since house prices are mostly predictable (see Follain (1982), Case and Shiller (1988)), we are more interested in the unpredictable component rather than the predictable one. Specifically, we will explore what might have paved the way for potential anomalies in housing prices. Therefore, to manage that, we will empirically compare their forecasting abilities for $\frac{P_t}{L_t}$. In this sense, in case that while nominal variables have statistically explanatory power and real ones do not, we will have a proof of money illusion as suggested by the theory. One more advantage of using these methods is to remove the potential *locally* persistent movements in the series. To manage that, we follow the authors by setting up a proxy for forecasting error as given below.

$$\varphi_{t+1,t+1-\tau} = \frac{\mathrm{P}_{t+1}}{L_{t+1}} - \widehat{E_{t-\tau}}\left[\frac{\mathrm{P}_{t+1}}{L_{t+1}}\right]$$

where τ stands for the horizon of forecast, $\widehat{E_{t-\tau}}\left[\frac{\mathrm{P}_{t+1}}{L_{t+1}}\right]$ shows the estimated proxy of $\frac{\mathrm{P}_t}{L_t}$ in regression analysis. Observe that for $\tau = 0$ forecast error will be equal to the realized value itself. In this step, we will estimate the value $\widehat{E_{t-\tau}}\left[\frac{\mathrm{P}_{t+1}}{L_{t+1}}\right]$ by using a

Vector Auto Regression for price-rent ratio. In the VAR regression, we will use the log value of return on housing investment (r_t), the growth rate of rent Δl_t), changes in the bilateral exchange rate and finally log value of housing market loan rates. The reason for using a VAR regression is quite common in the literature. For instance, Case and Shiller (1988) documents that house prices are mostly predictable due to the market inefficiencies, contrary to the efficient market hypothesis. And the aforementioned variables are the most relevant ones that capture the house price dynamics. This part essentially captures the one that would be implied by rational behavior. In other words, having known the ex-ante information at hand, a rational individual would choose the price-rent ratio that is exactly equal to the estimated value of $\frac{P_t}{L_t}$. Therefore, the difference between this estimated and realized value, we construct the empirical forecast error. Using the optimal lag lengths determined by the information criteria (AIC and BIC), we regress the forecast error on selected macro fundamentals ($i_t, r_t, \frac{1}{i_t}, \frac{1}{r_t}$) parallel to the hypothesis that we claimed when deriving the forecast errors. In the charts Figure 4.1 and Figure 4.2 given below, we see that our nominal macro variables can extract much of the information in forecast errors, parallel to the findings of the previous studies.

The univariate regression of forecast error, $\delta_{t+1,t+1-\tau}$, on the macro fundamentals document that while nominal interest rates and interest rates reciprocals do have statistically significant forecasting power for price-rent ratio, real interest rates and it is reciprocal do not. These results are consistent with the existing academic literature. These results can be verified by t-statistics and the regression fits. Furthermore, the coefficient of the nominal interest rate is negative meaning that an increase in interest rate will bring the relative housing demand down. Since the interest rate reciprocal is defined to be $\log(\frac{1}{i})$, its coefficient is found to be positive. In a sense, it is quite natural to expect their signs to be opposite.



On the other hand, the real interest rates do not have statistically significant explanations in the regressions. These findings are essentially controversial to the rational expectations of agents. This is because of the fact that rational agents are expected to act according to the real prices or price ratios, not the nominal variables.

Figure 4.1 t-Values of Forecast Error on Fundamentals

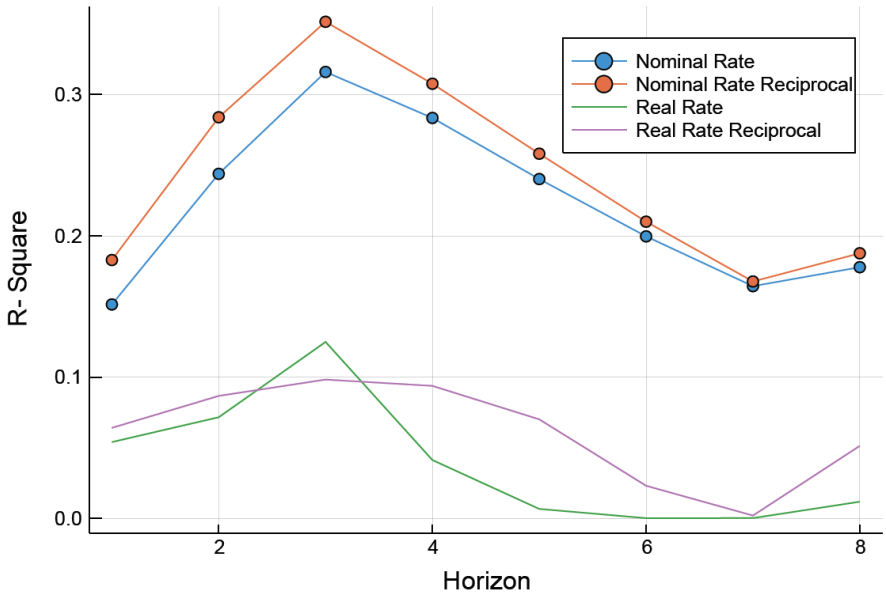


Figure 4.2 R-Squares of Forecast Error on Fundamentals

4.2 How to Locate the Effect of Inflation on Empirical Mispricing?

Having proven the existence of money illusion and the fact that the price anomalies are mostly explained by nominal variables, we have covered a noticeable distance. This proof of money illusion is consistent with the existing theory and academic literature. The next step is to find the effect of inflation on this empirical mispricing measure. Since inflation can affect the mispricing and thus price-rent ratio significantly, we decompose the effect of inflation on money illusion as a proxy. By applying this procedure, we will be able to answer the question that how much of the mispricing can be explained by the inflation itself. To do that we follow Campbell and Shiller (1988) and Brunnermeier and Julliard (2006). Firstly, the gross return on housing investment can be best represented as an approximate functional value of the rent and housing return;

$$R_{h,t+1} = \frac{P_{t+1} + L_{t+1}}{P_{t+1}}$$

where P and L denote the housing prices and rent respectively. After that getting the log values and linearizing around the long run equilibrium point the statement will turn out to be;

$$R_{h,t+1} = (1-\rho) * k + \rho * (p_{t+1} - l_{t+1}) - (p_t - l_t) + \Delta l_{t+1}$$

where $r_{h,t}$, p_t and l_t respectively stand for log value of gross return , R_t, house prices and rents. Furthermore, Δl_t is logdifferenced value of rents, $\rho = \frac{1}{\exp(\overline{l-p})}$ where $\overline{l-p}$ shows the long term simple average of $\frac{P_t}{L_t}$. Following this, we will restate the term $\frac{P_t}{L_t}$ as a function of future rent growth, expected a future return on housing and a final (terminal) value. Here we omit the constant terms while restating $\frac{P_t}{L_t}$ as a function of other variables. This is because of the fact that removing the constant will not only bring simplicity to our analysis but also the constant terms will be captured by the regression constant in a sense that the elasticities will not change anyway.

$$\mathrm{p_t} - \mathrm{l_t} = \lim_{\mathrm{T}\to\infty}\left[\sum_{\tau=1}^{\infty}\rho^{\tau-1}\left(\Delta l_{t+\tau} - r_{h,t+\tau} + \rho^{T}(p_{t+T} - l_{t+T})\right)\right]$$

Now we define the the excess rates of return for rents and housing investment (risk premia) as $\Delta l_{t+\tau} = \Delta l_t - r_t$ and $\mathrm{r^e_{h,t}} = \Delta l_t - r_t$ where the variable r_t shows the real interest rate, $r_{h,t}$ is log value of gross return $R_{h,t}$. To prevent any notational confusion, observe that the return on housing investment is further denoted by sub h as $r_{h,t}$ while real interest rate is r_t. Elaborating the above statement a little bit we get and taking out the transversality condition (TVC) we get:

$$\mathrm{p_t} - \mathrm{l_t} = \sum_{\tau=1}^{\infty}\rho^{\tau-1}\left(\Delta l^{e}_{t+\tau} - r^{e}_{h,t+\tau}\right) + \lim_{\mathrm{T}\to\infty}\left[\rho^{T}(p_{t+T} - l_{t+T})\right]$$

Following the above statements, we need to derive two different mispricing proxies, depending on whether transversality condition holds or not.[2]

4.2.1 Empirical Mispricing Proxy, $\boldsymbol{\psi_t}$

For the first case, assuming that the transversality condition holds, agents suffer from the inflation illusion for which the observed/realized value will diverge from the true value. Therefore, if we take the objective expectations we are left with;

$$\mathrm{p_t} - \mathrm{l_t} = \sum_{\tau=1}^{\infty}\rho^{\tau-1}E_t(\Delta l^{e}_{t+\tau}) - \sum_{\tau=1}^{\infty}\rho^{\tau-1}E_t\left(r^{e}_{h,t+\tau}\right)$$

On the other hand, since agents have subjective expectations, we can write this statement as given below as well because this expression is to hold for any expectation operator.

$$\mathrm{p_t} - \mathrm{l_t} = \sum_{\tau=1}^{\infty}\rho^{\tau-1}\widetilde{E}_t(\Delta l^{e}_{t+\tau}) - \sum_{\tau=1}^{\infty}\rho^{\tau-1}\widetilde{E}_t\left(r^{e}_{h,t+\tau}\right)$$

where E is the objective and $\widetilde{E}$ is subjective expectations operator.

[2] We should note that although there are two different measures, the second one exists in case of a housing market balloon. Therefore, we will be contended with this one, considering the fact that there is no housing market bubble in Turkey according to the consensus in the academic literature, (see Erol (2013), Coskun and Judevicius (2017)

Now we elaborate the statement further. We add and subtract $\sum_{\tau=1}^{T} \rho^{\tau-1} E_t[\Delta l_{t+\tau}^e]$ to the last equation and we get;

$$p_t - l_t = \sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t(\Delta l_{t+\tau}^e) - \sum_{\tau=1}^{\infty} \rho^{\tau-1} \widetilde{E}_t\left(r_{h,t+\tau}^e\right) + \underbrace{\sum_{\tau=1}^{\infty} \rho^{\tau-1} (\widetilde{E}_t - E_t)(\Delta l_{t+\tau}^e)}_{\psi_t}$$

where the statement represented via under brace is our mispricing measure, ψ. At this point we should note that our mispricing measure shows the deviancy due to the expected future growth rate of the rent. Thinking retrospectively, if our subjective and the objective expectations were similar then there would not be a mispricing, in other words ψ would get value of 0. Additionally, note that if we applied the same procedure as above for the second term we would get the mispricing measure being equal to $-\sum_{\tau=1}^{\infty} \rho^{\tau-1} (\widetilde{E}_t - E_t)(r_{t+\tau}^e)$. The reason why it has a negative sign is that the term itself has a negative sign in the above expression. Therefore, the mispricing measure will be;

$$\psi_t = -(\sum_{\tau=1}^{\infty} \rho^{\tau-1} (\widetilde{E_t} - E_t)(r_{t+\tau}^e)) = \sum_{\tau=1}^{\infty} \rho^{\tau-1} (\widetilde{E_t} - E_t)(\Delta l_{t+\tau}^e)$$

The above mispricing measure that we have derived is something very specific to the case of money illusion but rather it can capture every form of price deviancy stemming from the subjective beliefs. In order to see the case of money illusion we need to employ *money illusioned individuals* as stated by Modigliani and Cohn (1979) that agents fail to distinguish between the real and nominal yields. Since Modigliani-Cohn individuals (MCI, henceforth) mix those two variables they reflect a potential inflation shock, let say a decrease in inflation, on real interest rates. In this way, these agents implicitly overlook the fact that future rent growth rates, $\Delta l_t + \pi_t$, will go down as well. Therefore, their subjective belief about the future rent growth will be under-calculated thus we get,

$$\widetilde{E_t}[\Delta l_{t+\tau}] = E_t[\Delta l_{t+\tau} - \pi_{t+\tau}]$$

Or we can state them more compactly as;

$$E_t[\Delta l_{t+\tau}] - \widetilde{E_t}[\Delta l_{t+\tau}] = \pi_{t+\tau}$$

This equality means that the ex-ante log rent growth rate differential will be equal to the inflation itself.

In order to get the empirical values for ψ_t we first set up a Vector Auto Regression (VAR) and calculate the objective expectation for the future rent growth rate. This is to say that if Modigliani-Cohn individuals had different ex-ante information, they would have chosen the VAR estimate of price-rent ratio, $\frac{\widehat{P_t}}{L_t}$. The reason for using VAR regression is that the literature has a consensus that the house prices are largely predictable and this fact is contrary to the efficient market hypothesis, (see Case and Shiller (1988), Follain (1982)). These studies further point out that the predictability of the house prices stems from the market inefficiencies or the lack of information/information asymmetry. In our analysis, we also follow their approach and employ the fundamentals that are meant to capture the house price changes. In the VAR analysis, we include excess returns on housing investment, log price-rent differential, excess rent growth rate, change in the bilateral exchange rate and (smoothed) inflation. To smooth inflation, we take 3-month simple average, one could also have used different alternatives though. The idea behind using smoothed inflation is to check whether the conclusions are robust enough to monthly idiosyncratic shocks. The optimal lag values for the VAR system are used considering the AIC, BIC, HQ test statistics. Remember that;

$$\psi_t = -(\sum_{\tau=1}^{\infty} \rho^{\tau-1} (\widetilde{E_t} - E_t)(r^e_{t+\tau})) = \sum_{\tau=1}^{\infty} \rho^{\tau-1} (\widetilde{E_t} - E_t)(\Delta l^e_{t+\tau})$$

Restating the first part of the term we have,

$$\sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t(r^e_{t+\tau}) = \sum_{\tau=1}^{\infty} \rho^{\tau-1} \widetilde{E_t} (r^e_{t+\tau}) + \psi_t$$

As have been stated above, the term at the left-hand side is obtained using the fitted value of the VAR regression. This is to say that the objective expectation can be constructed as if the objective value would be the one that is formed according to

the market fundamentals. On the other hand, the way to construct ψ_t would be to regress the first term on the second one and store the residuals as being equal to ψ_t. However, the problem is that we are not able to directly observe the value of subjective expectations $\sum_{\tau=1}^{\infty} \rho^{\tau-1} \widetilde{E_t}\,(r_{t+\tau}^{e})$ .Therefore we follow the standard literature and use the fact that this value is determined by some market risk factors such that it can be written as a function of them. Therefore, we will write down the sum of the discounted value of subjective expectations;

$$\sum_{\tau=1}^{\infty} \rho^{\tau-1} \widetilde{E_t}\,(r_{t+\tau}^{e}) = \beta_0 + \beta_1 \omega_t + \epsilon_t$$

In order to find the value of the statement ψ_t we set up an ordinary least squares regression that;

$$\sum_{\tau=1}^{\infty} \rho^{\tau-1}\, E_t(r_{t+\tau}^{e}) = \beta_0 + \beta_1 \omega_t + \epsilon_t + \psi_t$$

where

$$\beta_0 + \beta_1 \omega_t + \epsilon_t = \sum_{\tau=1}^{\infty} \rho^{\tau-1} \widetilde{E}_t\,(r_{t+\tau}^{e})$$

and ω_t is the empirical risk measure. At this stage, we need to find and use some empirical proxies for the aforementioned risk factors. And then we get the empirical counterpart of illusion proxy, ψ, as the residual series in the regression. We should point out that finding an appropriate risk factor is tedious. Depending on the structure and functioning of the economy, the choice of the risk factor differs. At this point, we consider an important fact about the Turkish economy, which are the developments in exchange rates. The exchange rate developments play a significant role in the functioning of the economy. Especially its dependence on imports makes the exchange rate much more important in the sense that any exchange rate shock will be directly translated into the rate of inflation. And any change in inflation is also going to be reflected on the market interest rates. Therefore, the exchange rate not only determines the level of inflation and interest rates, but its volatility is also a crucial factor. Therefore, we follow Berüment and Günay (2003) in the sense that

exchange rate volatility can significantly affect the market interest rates and it can be taken as a potential empirical risk factor.

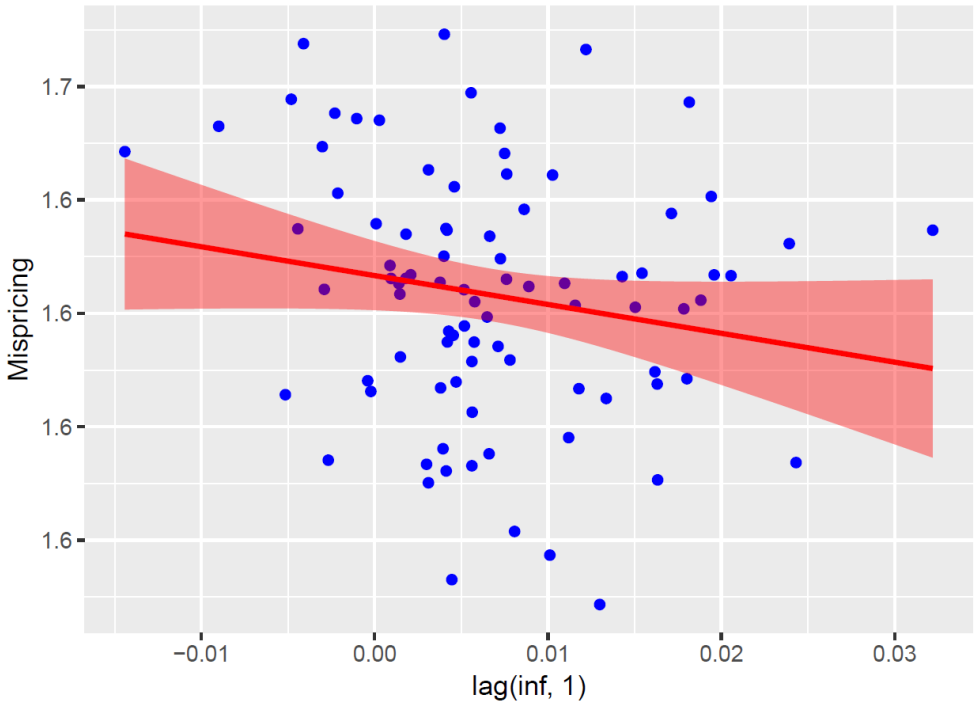


Figure 4.3 Mispricing Measure and Lagged Inflation

The left panel of Figure 3.3 in Chapter 3 clearly demonstrates this relationship that the higher exchange rate volatility, the higher is the nominal interest rate. Since higher interest rates are associated with the lower sales as demonstrated in Figure 1.2, volatility in the exchange rate makes people stay away from housing investment and lead them to find alternative investment opportunities.[3] As we see from the above graph there is a non-ignorable correlation between inflation and the mispricing measure. This result is quite consistent with theory since from the very beginning we have built our hypothesis on the fact that nominal interest

[3] We should note that empirical studies use different risk factors. For instance, Brunnermeier and Julliard (2006) employ investment security that has a long position on housing investment and a short one on long term government bonds as a potential empirical risk factor. For that, they apply a GARCH regression and get the conditional volatility of the empirical risk factors. After that they apply the standard procedure and get the residuals as being equal to the mispricing proxy.

rates/inflation have explanatory power in determining money illusion. Finally, we set up an ordinary least squares (OLS) regression as;

$$\psi_t = \sum_{k=1}^{12} X_{t-k}\alpha_{t-k} + \mu_t$$

where t denotes time, k is the lag value of each variable and α is the corresponding coefficient. The reason for using lag values is that it takes time for individuals to respond to the changes in macroeconomic fundamentals. Put differently, we expect the agents to have some backward-looking behavior and make their decisions. The choice of 12 lags is further determined by the information criteria. To this end, we regress mispricing measure on inflation and smoothed inflation separately. For each regression, the regression is estimated with HAC robust standard errors. From the estimation results provided in Table 4.1 we see that both inflation and smoothed inflation have significant explanatory power on the mispricing of the housing market. The second important point is that the negative signs of inflation and smoothed inflation are theory consistent. As we pointed out at the very beginning that as inflation declines people will expect a decline in real interest rates as well, in a way agents think that nominal and real rates move together. Thus, an expectation for a decline in real rates puts upward pressure on housing, causing the prices to go up compared to the rent payments. In the regression results, what we see is the above-stated theory consistent result. Additionally, inflation itself can explain a considerable amount of variation of mispricing alone. The reason for including 12 lags in the regression is that agents can have a backward-looking behavior and it can take 9 to 18 months for agents to respond to the effects of changes in macroeconomic fundamentals. Furthermore, we should note that one also needs to investigate the case where the transversality condition does not hold. In this case, he would implicitly allow for the explosive cases, when there exists a housing market balloon. Since there is a clear consensus that the Turkish housing market does not show any pattern of the bubble, we simply skip this part.

Table 4.1

Regression Results for Mispricing, Inflation and Smoothed Inflation

	Dependent Variable: Mispricing			
	Inflation		Smoothed Inflation	
	Coefficient	**SE**	**Coefficient**	**SE**
Lag1	−0.53***	-0.100	−3.87***	-0.620
Lag2	−0.58***	-0.110	1.89**	-0.890
Lag3	−0.50***	-0.100	−1.12	-0.840
Lag4	−0.63***	-0.100	0.290	-0.850
Lag5	−0.58***	-0.110	−0.71	-0.850
Lag6	−0.63***	-0.110	2.17***	-0.790
Lag7	−0.06	-0.110	−2.20***	-0.800
Lag8	−0.06	-0.110	0.860	-0.860
Lag9	−0.08	-0.100	−0.34	-0.860
Lag10	0.020	-0.100	0.040	-0.860
Lag11	0.040	-0.100	−0.64	-0.840
Lag12	−0.10	-0.100	−0.75	-0.580
Constant	1.66***	-0.010	1.65***	-0.010
R^2	0.73		0.75	
ADJ R^2	0.68		0.70	

*p<0.1; **p<0.05; ***p<0.01

4.3 Liquidity Constraints

Up to now we have not considered the effect of market frictions at all. In this section, we will focus on a very specific case of liquidity constraint that might have paved the way for a relationship between the inflation and mis-pricing proxy, ψ_t from the Figure 4.4, in an environment when there is no inflation, the burden of mortgage payments will stay still across time. However, in an inflationary environment, real mortgage payments will decline across time since the discounted value of future cash payments goes down. Therefore, to compensate for this decline the mortgage payments at the beginning must be higher than the fixed mortgage payments. This situation causes the real payments cost curve to be tilted to the left. Put it differently, in inflationary environment nominal payments are higher than by a factor that is roughly proportional to the interest rate reciprocal. In such a case, the

costs of housing finance may shift towards the early periods of the mortgage contract causing a potential decline in housing demand and prices. However, we should note that there are opportunities that the mortgage payments can be made in flexible amounts such that the tilt effect goes away or it will be decaying over time compared to the case of fixed mortgage payments.

In this sense, we would set up our hypothesis such that the absolute value of the coefficient of inflation in a regression of ψ_t over inflation to get smaller values. To do that we use the first 35 observations[4] for estimation and then we will apply the recursive regression procedure by adding one more observation each time to the estimation.

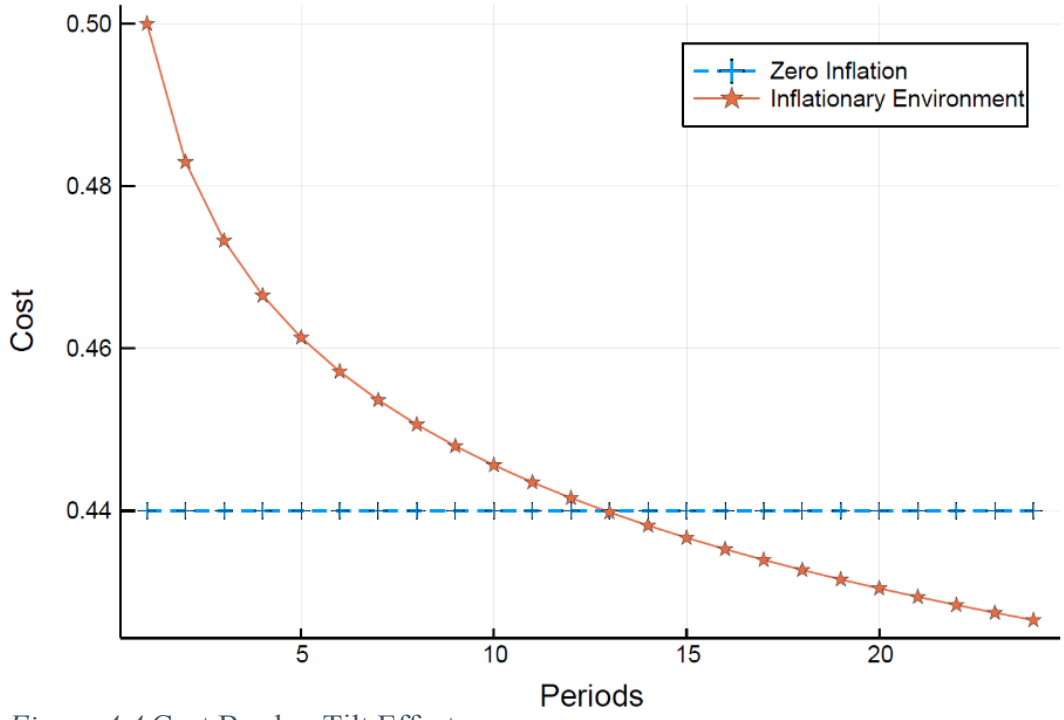


Figure 4.4 Cost Burden-Tilt Effect

[4] The idea behind choosing roughly 35 observations is the Central Limit Theorem (CLT). To get more reliable t-statistics and confidence intervals, considering the degrees of freedom, we set the minimum number of observations to 35 and for each estimation, we increment it by 1 more observation. In that way, we will capture the time-varying property of elasticity of mispricing with respect to inflation.

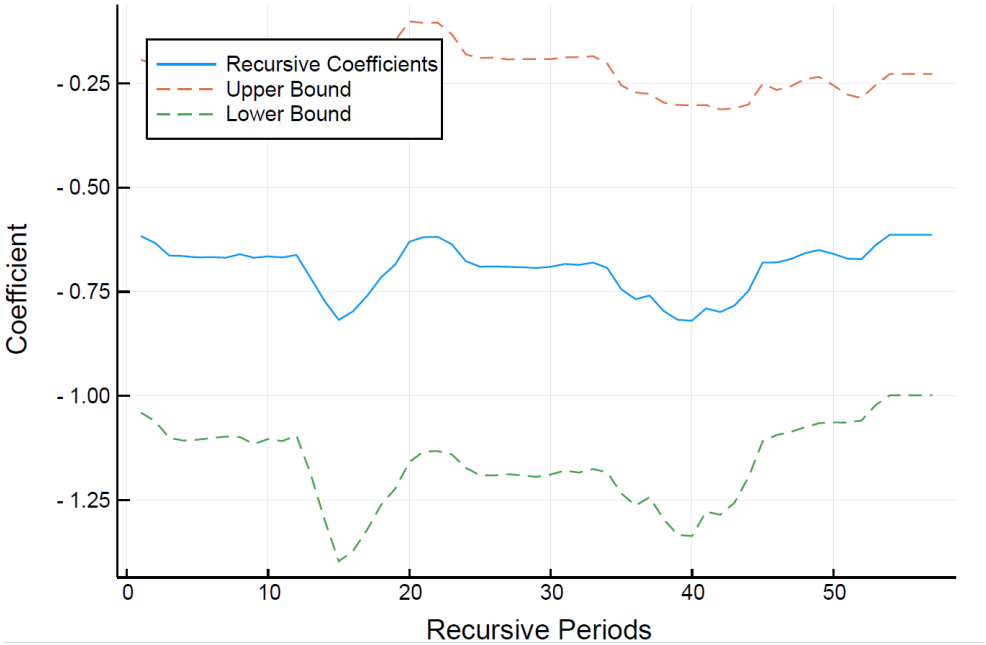


Figure 4.5 Recursive Coefficients

In the initial regressions, the elasticity of one lagged inflation for mispricing proxy is around -0.53. When we run a recursive procedure, the estimated coefficient will remain flat across time horizon. In case of a tilt effect, we would have expected the elasticity to go down in absolute value. However, we have a relatively flat coefficient that falsifies the existence of tilt effect. In other words, this inflation illusion is not caused by the tilt effect. What is more, the coefficient always remains negative meaning that an increase in inflation always causes relative house prices to go down. All in all, we can say that the mispricing proxy, ψ_t, is not caused by tilt effect but it is rather captured by the behavior of individuals that once again proves the existence of money illusion.

4.4 Robustness Checks - A Bayesian Approach

In this section, we will investigate whether the estimation results are robust enough since the expected return on housing and growth of rent are not observable but they are rather estimated. Our aim is to factor out the posterior distribution of VAR

regression. For this estimation, the choice of the prior is important. Since we do not have a piece of strong prior information, we employ a flat/diffuse prior which is also sometimes called non-informative prior. For such a prior, the probability of a draw is the same or flat such that for each draw result being obtained is equally likely. The functional form is $f(\theta) = \frac{1}{b-a}$ where a and b are the lower and upper bounds. Under such a prior, the posterior distribution can be factored out as the product of inverse Wishart distribution and multivariate Normal distribution. Therefore, under this set up we have the posterior of VAR be as follows;

$$\beta \sim N\left(\hat{\beta}, \Sigma \otimes (\mathrm{X}'\mathrm{X})^{-1}\right)$$

$$\Sigma^{-1} \sim Wishart\left(\left(n\hat{\Sigma}\right)^{-1}, n-k\right)$$

where $\beta, X\ and\ \Sigma$ respectively show the coefficients, independent regressors and variance-covariance matrix of the error terms. Furthermore, n shows the sample size and k stands for the number of estimated coefficients (parameters).

4.5 The Wishart and Inverse Wishart Distributions

The Wishart distribution can be considered as a special case of the gamma distribution. Since Chi-square distribution χ^2 is the sum of standard normal distributions, the Wishart distribution in a sense generalizes this to a multivariate case. Therefore, this distribution simply stands for the "sum of squares and cross products of m draws from multivariate normal distribution." To make it more clear, lets consider a bivariate positive definite matrix such that $C \sim (A, B)^{\top}$ and suppose that $C \sim N(0, \Sigma)$ where

$$\Sigma = \begin{bmatrix} \sigma_A^2 & \rho\sigma_A^2\sigma_B^2 \\ \rho\sigma_A^2\sigma_B^2 & \sigma_B^2 \end{bmatrix}$$

and

$$\mathrm{W} = \begin{bmatrix} \sum A_i^2 & \sum A_i B_i \\ \sum A_i B_i & \sum B_i^2 \end{bmatrix}$$

Then the data that we have $C_1, C_2, \dots, C_m$ will constitute the W. Having got the Wishart Distribution, we can state Inverse Wishart Distribution (IWD) such that in general ϕ follows Wishart Distribution (WD) if $\Theta = \Sigma^{-1}$ has IWD.

The Bayesian procedure goes as follows: Firstly from the inverse Wishart distribution we draw Σ with parameters n-k and $n\hat{\Sigma}^{-1}$ then conditioning on these draws we will draw the coefficients for the VAR regression such that $\dot{\beta} \sim N(\hat{\beta}, \Sigma \otimes (X'X)^{-1})$ where the dotted variables show the posterior values. Having obtained the coefficients and variance-covariance matrix for the error terms now we will construct the corresponding values for excess return on housing investment and excess rent growth rate. Using these two we will set up the mispricing measure, ψ_t. Finally, we will set up a Bayesian linear regression for this mispricing measure on the macro fundamentals such as inflation and smoothed inflation to see if they prove the existence of money illusion. For the estimations, we have the same number of observations as OLS regressions but for the Bayesian approach, we repeat this procedure 10000 times. In other words, we take 10000 draws from Inverse Wishart Distribution and burn first 10% of draws to remove the potential effects of initial draws. The Table 4.2 and Table 4.3 given below summarize the estimation results. In summary, since the expected rent and housing investment growth were not observable but rather estimated, the main argument behind using Bayesian regression was to check if the results are robust enough to the estimations. In this sense, these results once again prove the existence of money illusion in the housing market. All in all, both the results of the classical estimation and that of Bayesian one together provide us with the further evidence in favor of money illusion in the Turkish housing market that house price dynamics are significantly affected by the behavior of those who are subject to the money illusion, parallel to the Modigliani-Cohn hypothesis. The effect of the money illusion on the economy as a whole is also important since the entire housing market is affected by those Modigliani-Cohn individuals. The Bayesian estimation results are consistent with that of classical estimation. Again the coefficients of inflation and smoothed inflation are mostly

negative meaning that an increase in inflation makes people decide whether to buy a house or not.

Table 4.2

Estimated Coefficients and Different Standard Errors

	Mean	St. Dev	Naive SE	Time-series SE
Intercept	1.660***	0.004	0.000	0.000
Lag1	-0.533***	0.124	0.001	0.001
Lag2	-0.566***	0.130	0.001	0.001
Lag3	-0.504***	0.128	0.001	0.001
Lag4	-0.628***	0.129	0.001	0.001
Lag5	-0.581***	0.135	0.001	0.001
Lag6	-0.629***	0.135	0.001	0.001
Lag7	-0.064	0.130	0.001	0.001
Lag8	-0.061	0.134	0.001	0.001
Lag9	-0.084	0.126	0.001	0.001
Lag10	0.021	0.126	0.001	0.001
Lag11	0.041	0.125	0.001	0.001
Lag12	-0.098	0.127	0.001	0.001

Table 4.3

Different Quantiles for Bayesian Regression

	1^{st} Quantile	2^{nd} Quantile	3^{rd} Quantile	4^{th} Quantile	5^{th} Quantile
Intercept	1.650	1.650	1.660	1.660	1.663
Lag1	-0.772	-0.617	-0.533	-0.450	-0.285
Lag2	-0.834	-0.665	-0.577	-0.490	-0.320
Lag3	-0.753	-0.590	-0.505	-0.417	-0.254
Lag4	-0.883	-0.711	-0.628	-0.542	-0.373
Lag5	-0.847	-0.672	-0.579	-0.491	-0.315
Lag6	-0.894	-0.718	-0.627	-0.539	-0.362
Lag7	-0.321	-0.150	-0.062	0.023	0.187
Lag8	-0.317	-0.150	-0.061	0.028	0.206
Lag9	-0.332	-0.167	-0.083	0.000	0.162
Lag10	-0.225	-0.063	0.020	0.105	0.271
Lag11	-0.203	-0.043	0.040	0.124	0.289
Lag12	-0.349	-0.183	-0.097	-0.012	0.144

What is more, the estimated coefficients for different quantiles further prove that the effect of inflation on house prices is negative in a robust way since in each quantile the estimated coefficients do not change their signs. Density plots of estimated coefficients, provided in Appendix A, further prove that inflation causes a downward pressure on house prices.

CHAPTER 5

CONCLUDING REMARKS AND DISCUSSION

This study investigates the effects of widely known phenomena, money illusion, that has been introduced to the literature by J.M. Keynes in early 20^{th} century. In the standard theory of economics, individuals are assumed to be fully rational meaning that they always choose the best alternative that brings the most utility among all others. Since those so-called rational individuals are self utility maximizing, they only care about the choices that bring a utility increase in real terms. However, there are some alternative approaches advocating that agents may not be necessarily as such. This field of economics (Behavioral Economics) generally touches upon the behavioral side of human interactions and their economic implications. Accordingly, in this thesis we challenge this phenomenon of rational agents mostly resting our thesis on the Modigliani-Cohn hypothesis. We mainly investigate the impact of behavioral dynamics of individuals on the Turkish housing market. This effect is expected to imply tremendous effects considering the fact that Keynesian theory assumes that short-run non-neutrality of money can bring significant effects on the aggregate economy. Main arguments of this thesis rest upon the Modigliani-Cohn hypothesis which states that individuals are subject to money illusion and they may not behave as the mainstream economic theory suggests. When individuals decide to buy a house or to rent, they compare monthly mortgage payments with rents. At this point, the monthly interest rate of mortgage payments becomes important since it will determine the decision of agents towards one of these alternatives. Since agents are generally accepted to be rational they should only consider the real interest rate. However, as MCH suggests these individuals are not always as such, but they are subject to the money illusion. This, in turn, implies that instead of the real interest rate, they directly consider the

nominal ones. Therefore, a potential jump in inflation will be fed into nominal rates but the real rates do not move accordingly. However, since these economic agents are subject to the money illusion and they have some beliefs they think of real rates moving with the nominal rates. And they make a decision based on their beliefs rather than real rates. As a result, the effect of this jump will make agents decline the housing demand since the corresponding nominal rates will go up as well.

To empirically calculate the existence of money illusion and whether this illusion can be explained with inflation, we derive a mispricing proxy and correlate it with inflation and nominal interest rates data. To do that, we will decompose price-rent ratio using Campbell and Shiller (1988) methodology and by elaborating further on that, we get the empirical mispricing proxy as the difference between objective and subjective expectations of rent growths or return on housing. Although for the objective expectations we use VAR regressions, we cannot employ an econometric approach on the subjective part since these expectations are not observable. Therefore, we correlate the subjective part with some empirical risk factors. Lastly, the difference between those two parts will be our empirical mispricing proxy and regressing this proxy on inflation, smoothed inflation and nominal interest rates will yield statistically significant results. The results are consistent with the theory and our expectations that an increase in inflation will decrease the housing demand. The results of nominal interest rates further confirm these results meaning that agents do decide on nominal interest rates rather than real ones. Furthermore, regression results indicate that nearly 75% variation in mispricing is explained by the inflation itself. This finding leads to the fact that as opposed to the classical economic theory that suggests the rational behaviors of individuals, people may be subject to money illusion. This, in turn, can affect the whole economy, as proposed by Keynesian economic doctrine.

What is more, since the expected returns on housing investments and rents are not directly observed but rather estimated one might challenge these findings.

Therefore, we need to check whether these empirical results are robust enough to our estimations. To do that we employ a Bayesian methodology and we set the mispricing measure using the posterior distributions of our variables. Having got the mispricing measure, we regress it on inflation and smoothed inflation and the Bayesian estimation results further validate the existence of money illusion. Another case that one must consider is whether market frictions could bring such an effect that we have mistakenly attributed to the money illusion. In case when there is no inflation, the cost burden of mortgage payments will be the same across time. However, in an inflationary environment, real mortgage payments will decline across time since the discounted value of future cash payments goes down. Therefore, to compensate for this decline the real mortgage payments at the beginning must be higher than the fixed mortgage payments. This situation causes the payments cost curve to be tilted to the left. To empirically check the existence of such an effect we employ a recursive estimation methodology. When we run a recursive procedure, the estimated coefficient will remain flat across time horizon. In case of a tilt effect, we would have expected the elasticity to go down in absolute value. However, we have a relatively flat coefficient that falsifies the existence of tilt effect. In other words, this inflation illusion is not caused by the tilt effect but rather by money illusion. What is more, the coefficient always remains negative meaning that an increase in inflation always causes relative house prices to go down. All in all, we can say that the mispricing proxy is not caused by tilt effect but it rather captured by the behavior of individuals that proves the existence of money illusion.

To sum up, contrary to the common beliefs, individuals are subject to the money illusion that brings a crucial effect on the aggregate economy, considering the short-run non-neutrality of money. From this perspective, this study, to the best of the author, is the first one that concentrates on the money illusion and housing market in Turkey. Empirical findings are quite compatible with the theory and existing academic literature.

REFERENCES

Akerlof, G. A., Dickens, W. T., Perry, G. L., Bewley, T. F., & Blinder, A. S. (2000). Near-rational wage and price setting and the long-run Phillips curve. *Brookings Papers on Economic Activity*, *2000*(1), 1-60.

Amihud, Y. (1996). Unexpected inflation and stock returns revisited--evidence from Israel. *Journal of Money, Credit and Banking*, *28*(1), 22-33.

Basak, S., & Yan, H. (2010). Equilibrium asset prices and investor behaviour in the presence of money illusion. *The Review of Economic Studies*, *77*(3), 914

Berument, H., & Günay, A. (2003). Exchange rate risk and interest rate: a case study for Turkey. *Open economies review*, *14*(1), 19-27.

Campbell, J. Y., & Shiller, R. J. (1988). The dividend-price ratio and expectations of future dividends and discount factors. *The Review of Financial Studies*, *1*(3), 195-228.

Campbell, J. Y., & Vuolteenaho, T. (2004). Inflation illusion and stock prices. *American Economic Review*, *94*(2), 19-23.

Case, K. E., & Shiller, R. J. (1988). The efficiency of the market for single-family homes.

Case, K. E., & Shiller, R. J. (2003). Is there a bubble in the housing market? B*rookings Papers on Economic Activity*, *2003*(2), 299-362.

Cohen, R. B., Polk, C., & Vuolteenaho, T. (2005). Money illusion in the stock market: The Modigliani-Cohn hypothesis. *The Quarterly Journal of Economics*, *120*(2), 639-668.

Coskun, Y. (2010). An analysis of the strengths and weaknesses of the Turkish real estate market. *Available at SSRN 1641211*.

Coşkun, Y. (2013). Taşınmaz piyasası döngüleri ve ülkemiz taşınmaz piyasaları için bir değerlendirme. *İktisat ve Toplum Dergisi*, *28*, 71-82.

Coskun, Y., & Jadevicius, A. (2017). Is there a housing bubble in Turkey? *Real Estate Management and Valuation*, *25*(1), 48-73.

Erol, I. (2015). Türkiye'de Konut Balonu Var mı? Konut Sektörü Kapitalizasyon Oranları Analizi. *E. Ozcelik & E. Taymaz, Türkiye Ekonomisinin Dünü, Bugünü Yarını. Yakup Kepenek'e ve Oktar Türel'e Armağan [Turkish Economy's Past, Present Tomorrow. Gift to Yakup Kepenek and Oktar Türel]*, 323-345.

Fama, E. F., & Schwert, G. W. (1977). Asset returns and inflation. *Journal of Financial Economics*, *5*(2), 115-146.

Fisher, I. (1928). The money illusion (Adelphi Company, New York, NY).

Follain, J. R. (1982). Does inflation affect real behavior: The case of housing. *Southern Economic Journal*, 570-582.

Gallin, J. (2008). The long- run relationship between house prices and rents. *Real Estate Economics*, *36*(4), 635-658.

Gultekin, N. B. (1983). Stock market returns and inflation: evidence from other countries. *The Journal of Finance*, *38*(1), 49-65.

Julliard, C., & Brunnermeier, M. K. (2006). Money illusion and housing frenzies. *NBER Working Paper*, (w12810).

Karasu, M. N. (2015). *Understanding real estate bubbles: An analysis of the recent trends in the Turkish housing market* (Doctoral dissertation, Dissertation, Master of Science, METU.

Kearl, J. R. (1979). Inflation, mortgage, and housing. *Journal of Political Economy*, *87*(5, Part 1), 1115-1138.

Keskin, B. (2008). Hedonic analysis of price in the Istanbul housing market. *International Journal of Strategic Property Management*, *12*(2), 125-138.

Lessard, D. R., & Modigliani, F. (1975). Inflation and the housing market: Problems and potential solutions.

Modigliani, F., & Cohn, R. A. (1979). Inflation, rational valuation and the market. *Financial Analysts Journal*, *35*(2), 24-44.

Patinkin, D. (1956). *Money, Interest and Prices: An Integration of Monetary and Value Theory* (No. 332.401 P3.).

Phillips, P. C., Shi, S. P., & Yu, J. (2013). Testing for Multiple Bubbles 2: Limit theory of real time detectors.

Sari, R., Ewing, B. T., & Aydin, B. (2007). Macroeconomic variables and the housing market in Turkey. *Emerging markets finance and trade*, *43*(5), 5-19.

Shafir, E., Diamond, P., & Tversky, A. (1997). Money illusion. *The Quarterly Journal of Economics*, *112*(2), 341-374.

Sharpe, S. A. (2002). Reexamining stock valuation and inflation: The implications of analysts' earnings forecasts. *Review of Economics and Statistics*, *84*(4), 632-648.

Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior & Organization*, *1*(1), 39-60.

Tobin, J. (1995). Inflation and unemployment. In *Essential Readings in Economics* (pp. 232-254). Palgrave, London.

Tucker, D. P. (1974). *The variable-rate graduated-payment mortgage* (No. 2). Board of Governors of the Federal Reserve System (US).

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, *211*(4481), 453-458.

APPENDICES

A. SOME REGRESSION DIAGNOSTICS

A.1. Classical Regression Estimation Diagnostics

A.1.1 Inflation as a Regressor in the Classical Estimation

Correlogram of Residuals Squared

Date: 06/19/19 Time: 10:05
Sample: 2010M01 2018M02
Included observations: 82

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.029	0.029	0.0712	0.790
		2	-0.083	-0.084	0.6670	0.716
		3	-0.042	-0.037	0.8213	0.844
		4	-0.027	-0.032	0.8869	0.926
		5	0.092	0.087	1.6361	0.897
		6	-0.053	-0.066	1.8893	0.930
		7	-0.046	-0.030	2.0835	0.955
		8	-0.024	-0.027	2.1387	0.976
		9	-0.012	-0.015	2.1525	0.989
		10	0.028	0.010	2.2270	0.994
		11	0.170	0.177	5.0383	0.929
		12	-0.034	-0.044	5.1542	0.953

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

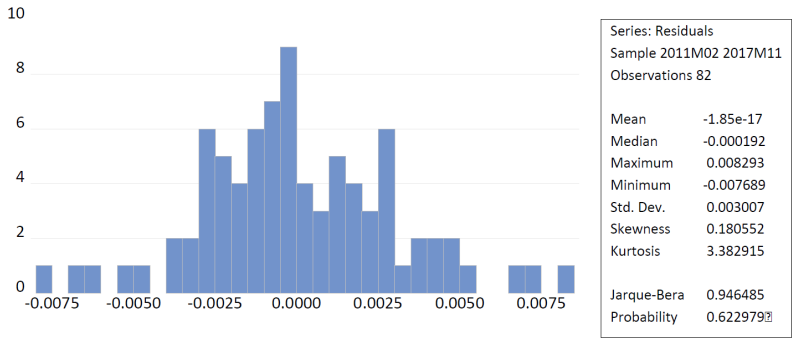
F-statistic	1.043248	Prob. F(12,70)	0.4207
Obs*R-squared	12.59195	Prob. Chi-Square(12)	0.3994
Scaled explained SS	9.148881	Prob. Chi-Square(12)	0.6902

Correlogram of Residuals

Date: 06/19/19 Time: 10:33
Sample: 2010M01 2018M02
Included observations: 77

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.084	0.084	0.5651	0.452
		2	-0.113	-0.121	1.6018	0.449
		3	0.000	0.022	1.6018	0.659
		4	-0.046	-0.063	1.7774	0.777
		5	-0.040	-0.027	1.9106	0.861
		6	0.005	-0.002	1.9129	0.928
		7	-0.014	-0.023	1.9309	0.964
		8	0.035	0.038	2.0372	0.980
		9	0.128	0.116	3.4998	0.941
		10	0.023	0.009	3.5467	0.965
		11	0.063	0.092	3.9148	0.972
		12	0.057	0.049	4.2195	0.979

*Probabilities may not be valid for this equation specification.



Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 12 lags

F-statistic	0.223622	Prob. F(12,58)	0.9965
Obs*R-squared	3.670315	Prob. Chi-Square(12)	0.9887

	Value	df	Probability
t-statistic	0.628242	69	0.5319
F-statistic	0.394688	(1, 69)	0.5319
Likelihood ratio	0.473417	1	0.4914

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	4.48E-06	1	4.48E-06
Restricted SSR	0.000788	70	1.13E-05
Unrestricted SSR	0.000784	69	1.14E-05

LR test summary:

	Value
Restricted LogL	362.1654
Unrestricted LogL	362.4021

A.1.2 Smoothed Inflation as a Regressor in the Classical Estimation

Correlogram of Residuals Squared

Date: 06/19/19 Time: 10:32
Sample: 2010M01 2018M02
Included observations: 77

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.014	-0.014	0.0163	0.898
		2	-0.050	-0.050	0.2190	0.896
		3	-0.175	-0.177	2.7370	0.434
		4	0.009	0.000	2.7444	0.601
		5	0.004	-0.014	2.7458	0.739
		6	0.024	-0.007	2.7942	0.834
		7	-0.066	-0.067	3.1721	0.869
		8	-0.077	-0.084	3.6931	0.884
		9	-0.066	-0.078	4.0858	0.906
		10	-0.036	-0.076	4.2028	0.938
		11	0.362	0.341	16.299	0.130
		12	-0.070	-0.100	16.752	0.159

Correlogram of Residuals

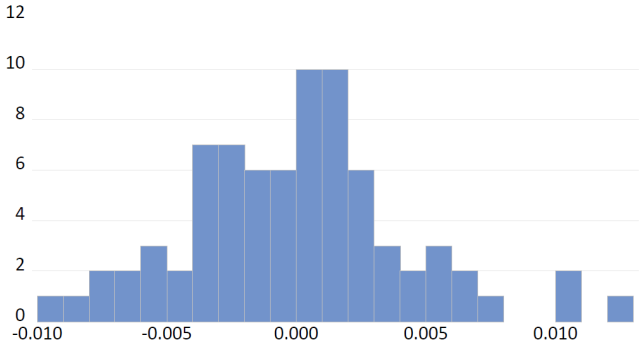
Date: 06/19/19 Time: 09:28
Sample: 2010M01 2018M02
Included observations: 82

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.034	-0.034	0.0984	0.754
		2	-0.100	-0.101	0.9604	0.619
		3	0.013	0.006	0.9761	0.807
		4	0.066	0.058	1.3653	0.850
		5	0.131	0.140	2.9038	0.715
		6	-0.138	-0.119	4.6293	0.592
		7	0.022	0.039	4.6752	0.700
		8	0.014	-0.017	4.6946	0.790
		9	-0.049	-0.057	4.9244	0.841
		10	-0.072	-0.084	5.4270	0.861
		11	-0.038	-0.022	5.5658	0.901
		12	0.005	-0.035	5.5685	0.936

*Probabilities may not be valid for this equation specification.

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.224005	Prob. F(12,64)	0.2868
Obs*R-squared	14.37297	Prob. Chi-Square(12)	0.2775
Scaled explained SS	12.81762	Prob. Chi-Square(12)	0.3824



Series: Residuals
Sample 2011M07 2017M11
Observations 77

Mean	4.20e-16
Median	0.000267
Maximum	0.012801
Minimum	-0.009174
Std. Dev.	0.004247
Skewness	0.388873
Kurtosis	3.581739
Jarque-Bera	3.026453
Probability	0.220198

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 12 lags

F-statistic	0.467277	Prob. F(12,52)	0.9248
Obs*R-squared	7.494953	Prob. Chi-Square(12)	0.8232

	Value	df	Probability
t-statistic	0.847289	63	0.4000
F-statistic	0.717899	(1, 63)	0.4000
Likelihood ratio	0.872471	1	0.3503

F-test summary:

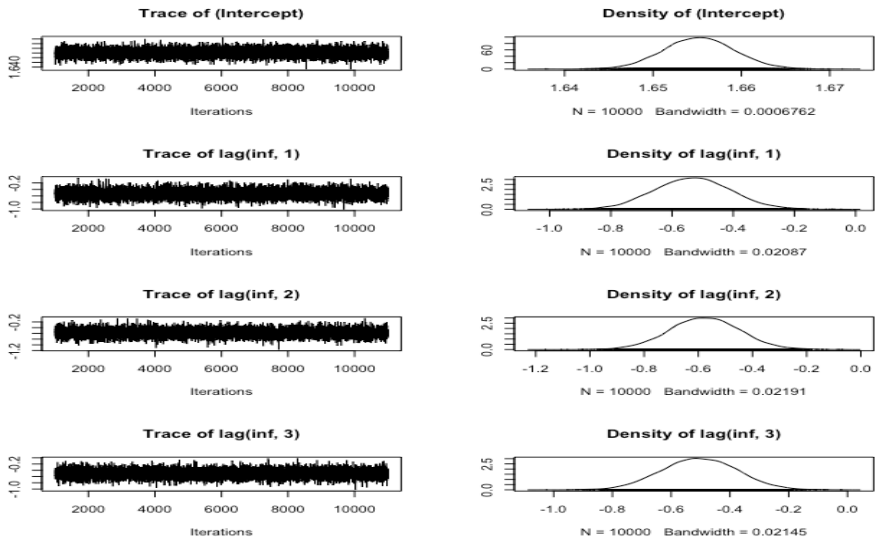
	Sum of Sq.	df	Mean Squares
Test SSR	1.54E-05	1	1.54E-05
Restricted SSR	0.001371	64	2.14E-05
Unrestricted SSR	0.001356	63	2.15E-05

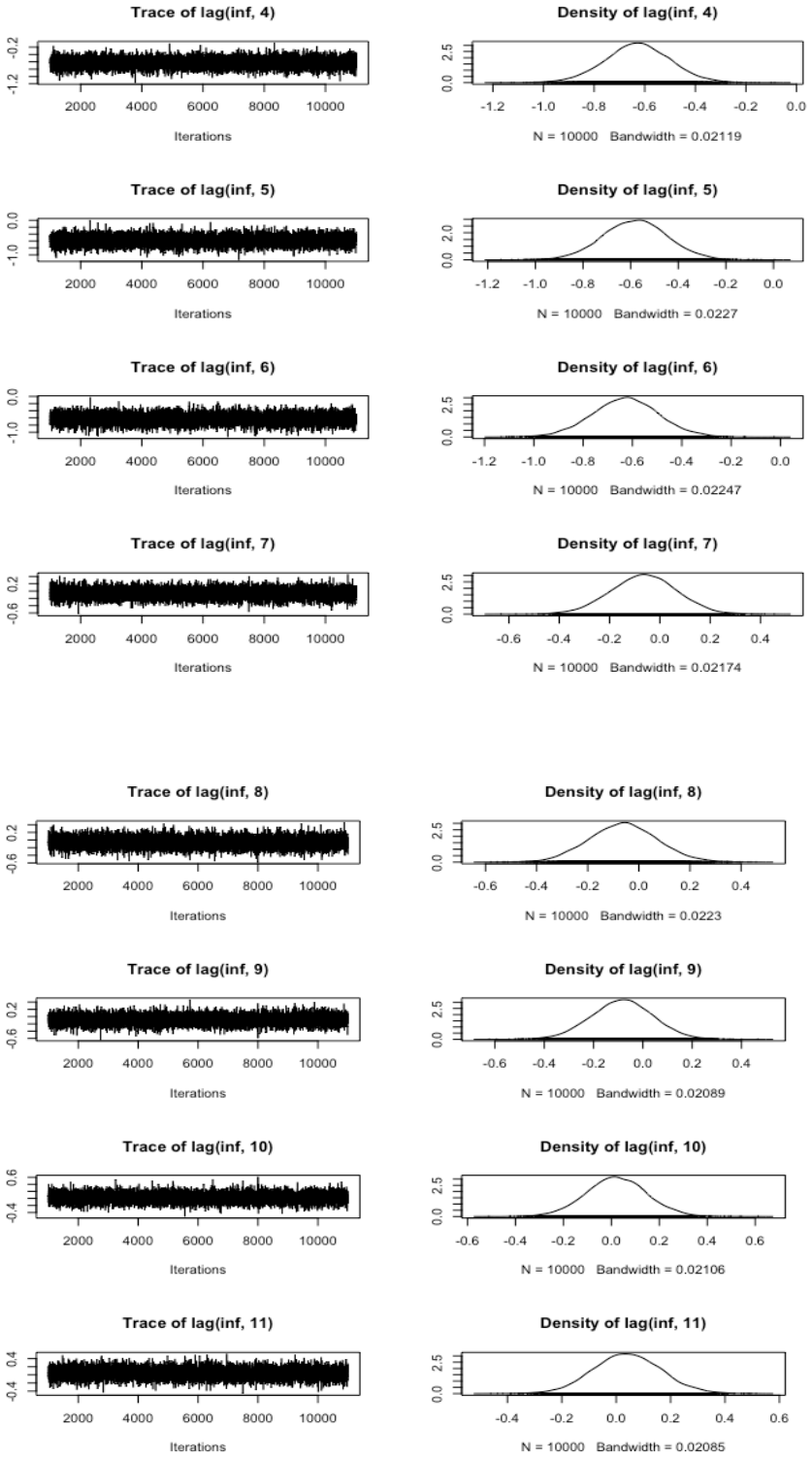
LR test summary:

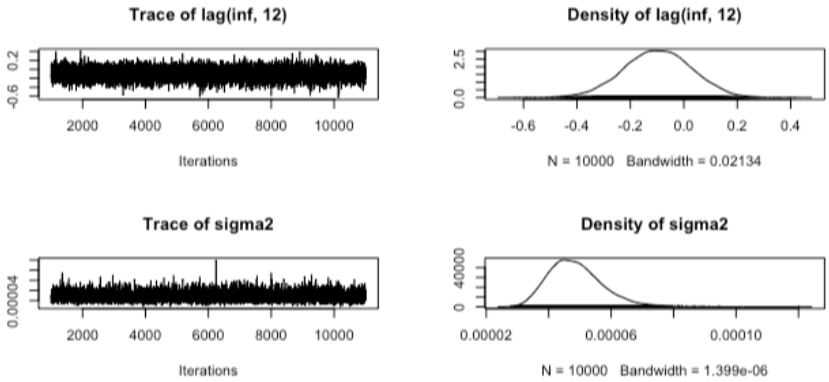
	Value
Restricted LogL	311.7781
Unrestricted LogL	312.2143

A.2 Bayesian Estimation Density Plots of Estimated Coefficients

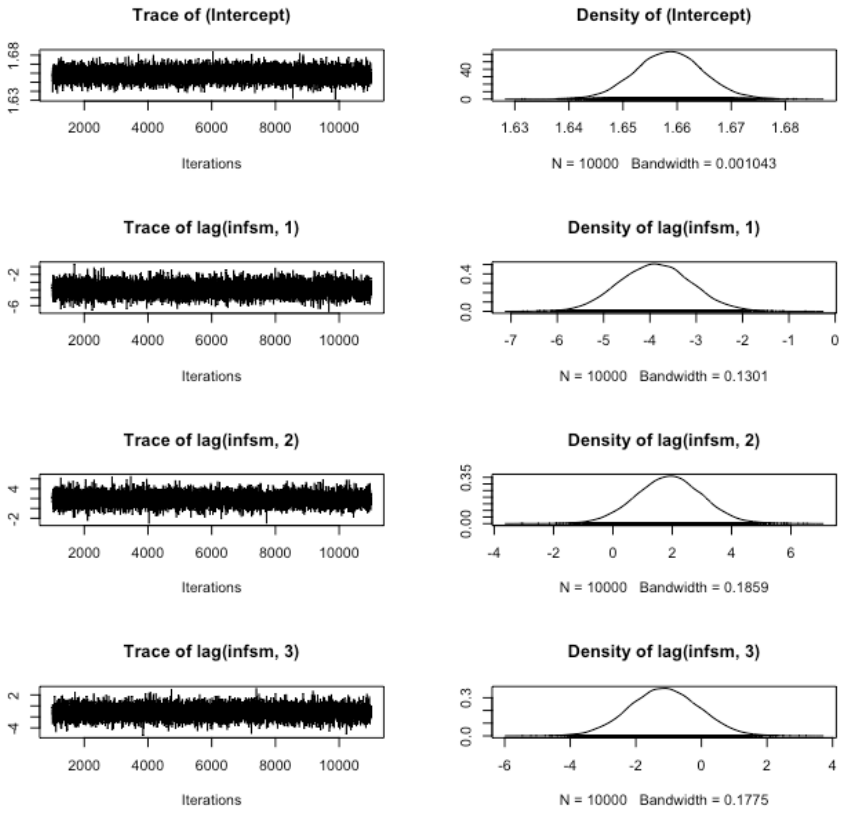
A.2.1 Inflation as a Regressor in Bayesian Estimation

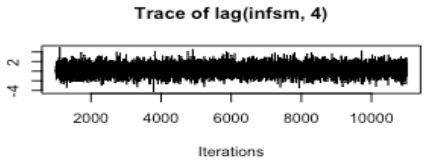


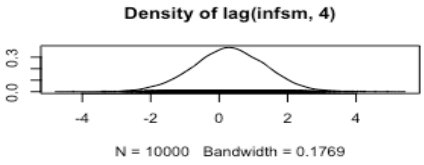

Trace of lag(inf, 4)
Density of lag(inf, 4)
Iterations
N = 10000 Bandwidth = 0.02119
Trace of lag(inf, 5)
Density of lag(inf, 5)
Iterations
N = 10000 Bandwidth = 0.0227
Trace of lag(inf, 6)
Density of lag(inf, 6)
Iterations
N = 10000 Bandwidth = 0.02247
Trace of lag(inf, 7)
Density of lag(inf, 7)
Iterations
N = 10000 Bandwidth = 0.02174
Trace of lag(inf, 8)
Density of lag(inf, 8)
Iterations
N = 10000 Bandwidth = 0.0223
Trace of lag(inf, 9)
Density of lag(inf, 9)
Iterations
N = 10000 Bandwidth = 0.02089
Trace of lag(inf, 10)
Density of lag(inf, 10)
Iterations
N = 10000 Bandwidth = 0.02106
Trace of lag(inf, 11)
Density of lag(inf, 11)
Iterations
N = 10000 Bandwidth = 0.02085

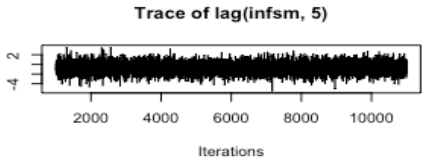


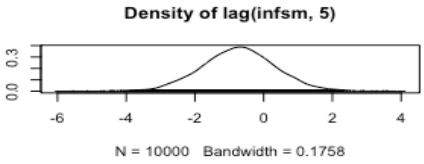
A.2.2 Smoothed Inflation as a Regressor in Bayesian Estimation

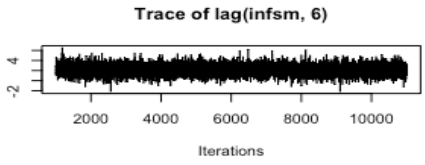


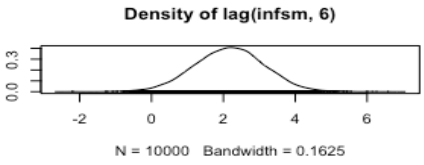

Trace of lag(infsm, 4)
Iterations

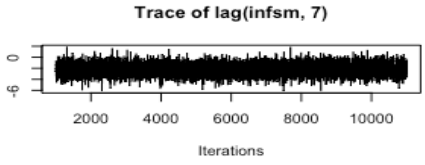

Density of lag(infsm, 4)
N = 10000 Bandwidth = 0.1769

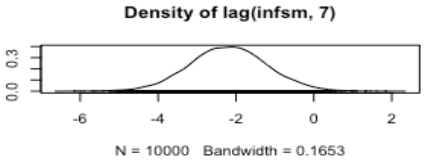

Trace of lag(infsm, 5)
Iterations

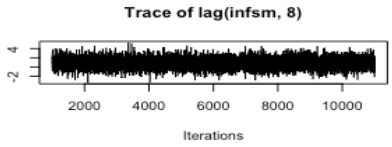

Density of lag(infsm, 5)
N = 10000 Bandwidth = 0.1758

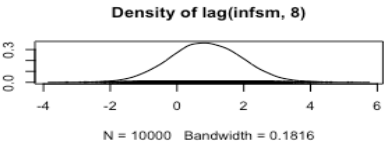

Trace of lag(infsm, 6)
Iterations

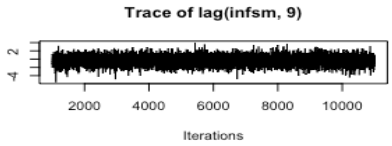

Density of lag(infsm, 6)
N = 10000 Bandwidth = 0.1625

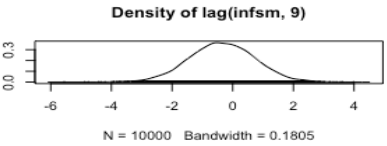

Trace of lag(infsm, 7)
Iterations

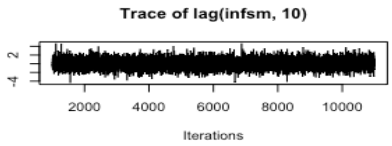

Density of lag(infsm, 7)
N = 10000 Bandwidth = 0.1653

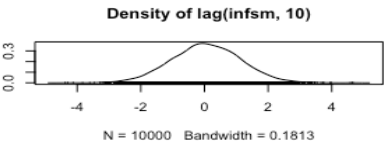

Trace of lag(infsm, 8)
Iterations

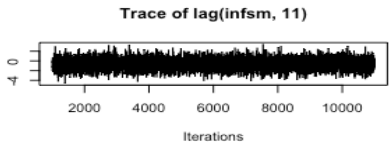

Density of lag(infsm, 8)
N = 10000 Bandwidth = 0.1816

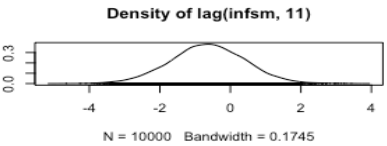

Trace of lag(infsm, 9)
Iterations

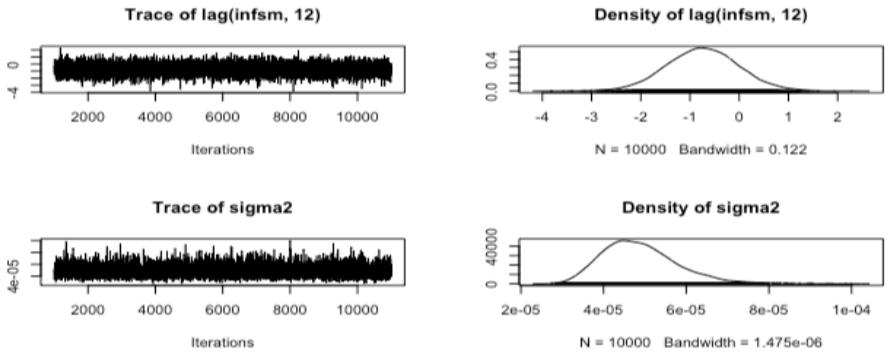

Density of lag(infsm, 9)
N = 10000 Bandwidth = 0.1805


Trace of lag(infsm, 10)
Iterations


Density of lag(infsm, 10)
N = 10000 Bandwidth = 0.1813


Trace of lag(infsm, 11)
Iterations


Density of lag(infsm, 11)
N = 10000 Bandwidth = 0.1745


Trace of lag(infsm, 12)
Density of lag(infsm, 12)
Iterations
N = 10000 Bandwidth = 0.122
Trace of sigma2
Density of sigma2
Iterations
N = 10000 Bandwidth = 1.475e-06

B. TURKISH SUMMARY/TÜRKÇE ÖZET

2008'deki küresel finansal krizin ardından, konut piyasasına yönelik genel bakış çarpıcı bir şekilde değişmeye başladı. Bunun nedeni, bu krizin temelde konut piyasasından kaynaklanması ve varlık balonunun çöküşünün büyük ölçekli makroekonomik sonuçlar doğurmasıdır. Küresel finans krizinden sonra, ekonomi politikalarından sorumlu ana kurum ve kuruluşlar, reel ekonomideki yaygın sonuçlarından dolayı finansal istikrarın en az makroekonomik istikrar kadar önemli olabileceğini vurgulamaya başladı. Örneğin, ABD'de konut piyasasındaki varlık balonunun patlamasından sonra işsizlik oranları bir yılda yüzde 6'dan yüzde 10'a yükselmiş, milli gelirde 2008'in son çeyreğinde yüzde 2'den fazla daralma gerçekleşmişti. Küresel finans krizinin ardından birçok akademisyen ve iktisatçı, konut piyasalarının altında yatan temelleri, konut fiyatlarındaki büyük artışların arkasındaki dinamikleri, finansal piyasalar ile arasındaki bağlantıyı ve reel ekonomi üzerindeki sonuçları daha derin bir şekilde sorgulamaya başladı.

ABD ekonomisindeki daralmanın ardından ABD Federal Merkez Bankası (FED) ekonomiyi canlandırmak için piyasalara yüksek oranda para enjeksiyonu yapmaya başladı ve böylece aşırı likidite, piyasa faiz oranlarının aşağı inmesine neden oldu. Düşük faiz oranları risk iştahını artırmış ve sıcak paranın sürekli cari açık veren ve ekonomisi yabancı sermayeye bağımlı olan ülkelere akmasına sebep olmuştur. Gelişmekte olan piyasalar gibi ülkelere gelen yüksek orandaki sermaye akımları, yerel para birimlerinin değer kazanmasına neden olmuş, ulusal ekonomilerin daha hızlı bir büyüme performansı göstermesini sağlamış ve bu ekonomiler büyük oranda ithalata bağımlı olduğu için enflasyon oranlarını da düşürmüştür. Diğer gelişmekte olan piyasa ekonomileri gibi Türkiye de, büyük miktarlardaki sermaye akımlarından yararlandı ve Türk Lirası, ABD Doları karşısında değer kazanmaya başladı. Ardından, enflasyon oranı düşüş kaydetmiş ve piyasa faizleri de aynı şekilde kredi piyasalarındaki büyümenin önünü açmıştır.

Konut piyasası, uzun vadeli bir yatırım yapmak için çok önemli bir alan olarak görüldüğü için, bunlar arasında, belki de en önemlisi olarak göze çarpmaktadır. Dolayısıyla, düşük faizli kredi ortamında konut talebinin artması ve konut fiyatlarının da tüketici fiyatlarına kıyasla bir sıçrama kaydetmesi bu sonucu açıkça belgeleyen önemli bir gerçeği ortaya koymaktadır. Konut fiyat endeksi ve tüketici fiyat endeksi (TÜFE) 2012 yılının başlarına kadar beraber hareket ederken, bu endeksler 2012 yılından itibaren ciddi bir şekilde ayrışmaya başladı. Örneğin, sadece yeni inşa edilen ev fiyatları değil, aynı zamanda eski evlerin fiyatları da yeni ev fiyatlarını çok yakından takip ederek oldukça hızlı bir artış kaydetmiştir. Özellikle, 2018 yılı itibariyle konut fiyatlarındaki genel artış %162 iken tüketici fiyatlarındaki artış %93 olarak gerçekleşmiştir. Bu dönemde, yüksek orandaki sermaye girişlerine bağlı olarak düşük seyreden enflasyon, nominal faiz oranlarının da düşük kalmasını sağlamış ve toplam talebin de canlı görünümünü korumasını sağlamış ve dolayısıyla konut fiyatlarındaki hızlı artışlara neden olmuştur. Şekil 1.2, konut fiyatlarının nominal faiz oranlarından büyük ölçüde etkilendiğini doğrulayarak, faiz oranları ve ipotek satış endeksi arasındaki güçlü negatif ilişkiyi göstermektedir.

Bu çerçevede, konut fiyatlarındaki önemli hareketlerin arkasındaki nedenleri farklı teoriler ve ampirik metodolojilerle anlamak için birçok çalışma yapılmıştır. Türkiye konut piyasası için yapılan çalışmalar genel olarak, makroekonomik değişkenleri konut fiyatlarının açıklanan bileşeni ile ilişkilendirerek konut piyasasında potansiyel bir varlık balonunun var olup olmadığını anlamaya çalışmıştır. Ampirik Çalışmaların ortak sonucu olarak konut fiyat dinamiklerinde açıklanamayan kısmın, konut piyasasında potansiyel bir varlık balonu lehine yeterli kanıt sağlamadığı olmuştur. Örneğin, Erol (2013), Karasu (2015), Coskun ve Judevicius (2017) Türkiye'deki konut fiyatlarının makroekonomik temeller tarafından büyük ölçüde açıklandığını söylemektedir. Bununla birlikte, söz konusu çalışmalar, konut piyasasında yanlış fiyatlamaya (açıklanamayan bileşen) neden olan gerçek

dinamikleri ve dolayısıyla reel ekonomi üzerindeki etkilerini araştırmak yerine, bir fiyatlandırma mekanizmasının sonuçlarına odaklanmıştır. Bu çerçevede, bu akademik çalışma bu boşluğu doldurmayı amaçlamaktadır.

Bu tezin ana motivasyonu ve katkısı, davranışsal bir yaklaşım perspektifi ile konut fiyat dinamiklerini ve bunun arkasındaki faktörleri anlamak ve yeterli bir kanıt sunmaktır. Özellikle, enflasyonun konut ve kredi piyasaları arasındaki etkileşim üzerindeki rolüne ve bunun konut fiyatlarına olan etkileri üzerinde yoğunlaşmıştır. Case ve Shiller (1988) ev fiyatlarındaki değişimin, etkin piyasa hipotezinin aksine, konut piyasasındaki verimsizliğe bağlı olarak tahmin edilebilir olabileceği öne sürmüştür. Bu bağlamda, Modigliani Cohn hipotezini referans alarak konut piyasasında bu verimsizliğin kaynağını araştırılmıştır. Bu hipotezin ana argümanları, bireylerin genellikle bir yatırım kararı verirken nominal ve gerçek değişkenler arasında bir ayrım yapmadıkları için parasal yanılsamaya maruz kaldıklarını söylemektedir. Örneğin, bireyler ev satın almak veya kiralamak için karar verdiğinde, genellikle aylık ödemeler ile kira bedellerini karşılaştırırlar. Bu noktada, konut ödemelerinin aylık faiz oranı, aracıların bu alternatiflerden hangisine yönelik kararını belirleyeceği için daha da önem kazanmaktadır. İktisadi ajanların genel olarak gerçek değişkenlere bakarak karar vermeleri gerektiğinden, yalnızca reel faiz oranını göz önünde bulundurmaları gerekir. Ancak, bu hipotezin öngördüğü gibi, bireyler her zaman böyle davranmayabilir ve parasal yanılsamaya maruz kalabilirler.

Bu öncül, bireylerin reel faiz oranı yerine, doğrudan nominal oranlarını dikkate aldıklarını söylemektedir. Fisher denklemi göz önüne alındığında, enflasyondaki potansiyel bir sıçrama (genel fiyat düzeyindeki artış) nominal faiz oranlarına da yansıyacak, ancak reel faizler genellikle risk priminde önemli bir değişiklik olmadığı varsayımıyla daha az hareket etme eğilimindedir. Bununla birlikte, bu ajanlar parasal yanılsamaya maruz kaldığından ve bazı kişisel beklentilere sahip olduklarından, nominal oranlara bakarak hareket etme eğilimine sahip olurlar ve

böylece beklentilerine paralel bir karar verirler. Sonuç olarak, bu hareketin etkisi, aracıların konut taleplerini azaltmasına neden olacak çünkü nominal faiz oranları görünürde artış kaydetmiştir. Beklenti temelli karar verme mekanizması, konut piyasasına bir bütün olarak yansıyarak, ipotekli konut kredisi talebini azaltacak ve dolayısıyla konut fiyatlarını aşağı çekecektir.

Para yanılsamasının varlığını ve MCH hipotezine paralel olarak bunun enflasyonla açıklanıp açıklanamayacağını deneysel olarak kontrol etmek için, yanlış fiyatlamaya tekabül eden bir ölçü türetilip ve bu ölçü birimi enflasyon ile nominal faiz oranları verileriyle ilişkilendirilmiştir. Bunu yapmak için fiyat-kira oranı Case ve Shiller (1988) metodolojisi kullanılarak farklı kısımlara ayrıştırılmış ve bunun üzerinde daha fazla çalışılarak, nesnel ve öznel kira büyümeleri veya konut getirisi arasındaki fark olarak ampirik yanlış fiyatlama ölçü birimi elde edilmiştir. Objektif beklentiler için, vektör oto regresyonlarından türetilen tarihsel esneklikler kullanılırken, sübjektif beklentiler gözlemlenemediğinden öznel bir ekonometrik metodolojiyi doğrudan kullanılmamıştır. Dolayısıyla sübjektif kısmı, beklentiye dayalı kararları alması gereken bazı deneysel risk faktörleriyle ilişkilendirilmiştir. Son olarak, bu iki kısım arasındaki fark olan deneysel yanlış fiyatlama ölçüsü ile enflasyon ve düzeltilmiş enflasyon arasında istatistiksel olarak anlamlı sonuçlar elde edilmiştir. Ampirik sonuçlar davranışsal finans/ekonomi teorisi ve beklentilerimiz ile uyumludur. Tahminlerde, enflasyondaki artış göreli konut fiyatlarını önemli çlçüde düşürmektedir. Aylık özgül şoklardan kaçınmak için, üç aylık ortalama düzleştirilmiş enflasyon da kullanılmış ve yine çok yakın bir ilişki bulunmuştur. Dahası, regresyon sonuçları, yanlış değerlendirmenin önemli bir bölümünün yalnızca enflasyonun kendisi tarafından açıklandığını göstermektedir.

Bu deneysel bulgulara karşı bazı eleştiriler olabilir, çünkü konut yatırımları ve kiralardan beklenen getiri doğrudan gözlenebilir değildir, sadece tahmin edilmektedir. Bu sorunların üstesinden gelmek ve daha net mesajlar vermek için, bu deneysel sonuçların deneysel tahminlerimiz için yeterince sağlam olup olmadığı

kontrol edilmiştir. Sağlamlık kontrolleri için, Bayesçi tahmin yöntemi kullanılmış ve daha sonra değişkenlerimizin ardıl dağılımları kullanılarak yanlış ölçü birimi elde edilmiştir. Bunu değişken elde edildikten sonra; enflasyona ve düzelmiş enflasyona, ayrı ayrı regresyona tabi tutulmuş, Bayesçi tahmin sonuçlarına göre para yanılsamasının varlığı bir kez daha da doğrulanmıştır.

Dikkate alınması gereken bir başka özel durum, piyasa friksiyonlarının yanlışlıkla para yanılsama atfedilebileceğimiz benzer bir etkiye yol açıp açamayacağıdır. Bunu kontrol etmek için, Tilt Effect adı verilen özel bir likidite kısıdı durumunu ele alınmıştır. Buna göre, enflasyonun olmadığı bir ortamda (sıfır enflasyon oranı), ipotekli konut ödemelerinin maliyeti zaman içinde değişmez. Öte yandan, enflasyonlu bir ortamda, gelecekteki nakit ödemelerin reel değeri düşmektedir. Bu nedenle, bu düşüşü telafi etmek için başlangıçta gerçek ipotek ödemelerinin sabit ipotek ödemelerinden daha yüksek olması gerekir. Bu durum, maliyet eğrisinin sola doğru eğilmesine neden olur. Ampirik araştırma için özyinelemeli bir tahmin izleği uygulanmıştır. Regresyon sonuçlarına göre bu durum altında, tahmini katsayı zaman içinde nispeten sabit kalmaktadır. Ancak, piyasa friksiyonunun olduğu bir ortamda, esnekliğin zaman içinde büyük oranda düşmesi beklenmektedir. Nispeten düz katsayılı bu bulgu, tilt etkisinin varlığını açıkça reddetmektedir. Başka bir deyişle, bu enflasyon yanılsaması, tilt etkisiyle açıklanamaz, bunun nedeni parasal yanılsamadır. Ayrıca, katsayının her zaman negatif kalması, enflasyondaki artışın konut fiyatlarının görece düşmesine neden olduğu anlamına gelmektedir. Sonuç olarak, yanlış fiyatlandırma ölçüsünün tilt etkisinden kaynaklanmadığını, para yanılsamasının varlığını ispatlayan bireylerin davranışlarından kaynaklandığını söyleyebiliriz.

Özetlemek gerekirse, tüm ampirik sonuçlar, insanların parasal yanılsamaya maruz kalabileceğini ortaya koymaktadır. Bu da, Keynesyen ekonomik doktrin tarafından önerildiği gibi bütün ekonomiyi etkileyebilir. Bu çalışmanın ana katkısı, deneysel tekniklerin yanı sıra felsefi yaklaşımıdır. Türkiye'de konut piyasası üzerine yapılan

ampirik çalışmaların genel olarak konut fiyatlarının makro ve mikroekonomik belirleyicileri üzerine yoğunlaştığı ve farklı ekonometrik metodolojileri kullanarak konut piyasası balonunun varlığını aradığı göz önüne alındığında, bu çalışma açıkça kendine özgü katkısını göstermektedir. Ayrıca, bunun parasal yanılsamanın Türkiye'de konut fiyatlarına etkilerini davranışsal bir yaklaşım kullanarak özel olarak inceleyen ilk çalışma olduğu değerlendirilmektedir

Kurumsal Çerçeve ve Tarihçe

Para yanılsama kavramı, 20. yüzyılın başlarından itibaren alandaki önde gelen bilim adamlarının çalışmalarının katkısı ile önem kazanmaya başlamıştır. Bu alandaki kişiler genel manada birbirleriyle aynı çizgide olmasına rağmen, bu terim için farklı tanımlar kullanmaya başladılar. Bu terimi (Parasal İllüzyon) ilk defa, J.M. Keynes tarafından akademik yazına kazandırıldı bunu müteakiben Fisher (1928), "The Money Illusion" adlı kitabı yazdı. Fisher (1928), bu kitapta, bu terimi "doların veya herhangi bir para biriminin değerinde azalma veya artma durumunun algılanamaması" şeklinde tanımlar. Başka bir deyişle, paranın nominal değerinin zaman içinde değişebileceği ve para yanılsamasının, bireylerin paranın bugünkü değeri ve bugüne indirgenmiş gelecekteki paranın değeri arasında ayrım yapmalarını engellediği vurgulanmaktadır. Öte yandan, Patinkin (1956) alternatifinin bir tanım getirerek "Bir ürünün talep fonksiyonlarının yalnızca göreceli fiyatlara ve servete bağlı olmaması durumunda, bu bireyin böyle bir yanılsamadan muzdarip olduğu söylenir" demiştir. Genel manada bu tartışmalardan iyi anladığımız gibi, parasal yanılsamaya maruz kalmayan bir birey mutlak fiyatlara dayalı kararlar vermez. Diğer bir deyişle, verilecek kararların göreceli/gerçek değerlere bağlı olması gerekir. Tek başına bu beyan, gerçek ya da göreli fiyatların karar alma sürecinde, mutlak fiyatlardan ziyade nispi ya da gerçek fiyatların önemini ortaya koyar.

Öte yandan, 1970'lerde para yanılsaması kavramı, fayda-maksimize edici rasyonel ajanların önemini vurgulayan neo-klasik ekonominin başlangıcı olduğu için şiddetli bir şekilde eleştirilmişti. Bu bağlamda, Tobin (1972) tarafından öne sürülen çok daha iddialı bir tanım, "Bir ekonomik teorisyenin, parasal yanılsama dayalı bir karar verme sürecini kabul etmekten daha büyük bir suç işlemeyeceğini" işaret ediyor ve bu ünlü öncül, bir ekonomistin karar verme sürecinde izleyeceği yolu açıkça belirliyor. Parasal yanılsamanın varlığını desteklemek için Akerlof ve ark. (2000), "Aslında, parasal yanılsamasının bir yaşam gerçeği" olduğunu, şimdiye kadar ele aldığımız olası tanımları kısaca özetler ve para yanılsamasını bir varsayım veya hipotez yerine hayatın bir gerçeği olduğunu ortaya koymaktadır. Bu çerçevede, parasal yanılsamanın varlığı akademilerde yaygın olarak kabul görmüş ve yazındaki yerini de almıştır. Literatürdeki ilk çalışmaların ardından, parasal yanılsaya, bunun arkasındaki faktörlere ve toplam ekonomi üzerindeki etkilerine ışık tutacak teori üzerine muazzam bir çalışma olmuştur.

Ekonomik Karar Verme Sürecinin Arkasındaki Psikolojik Faktörler

Ekonomik karar alma sürecinin, bireylerin karşılaştığı psikolojik etkilerle ilgisi vardır. Bireylerin aynı bilgi setine tabi olmasına rağmen, kararlarına dayanarak farklı kararlar alabilirler. Tversky ve Kahneman (1981) 'in çalışmaları ile iyi bir şekilde belgelenen bu gerçek, Tilt etkisi olarak bilinir ve aracıların kararlarının büyük ölçüde seçimin büyük ölçüde değişkenlerin gerçek veya nominal olarak ifade edilip edilmemesine bağlı olduğunu belirtir. Ve bu etki, bireylerin terimlerin adlarına dayalı alternatif seçimler yapmaları için potansiyel bir tetikleyicidir. Örneğin, gelir ve toplam fiyatlar üçe katlandığında, rasyonel bir aracının kararında herhangi bir değişiklik olması beklenmezdi. Tam tersine, Tversky ve Kahneman (1981), ajanların problemin ciddiyetine eğilimli olduğunu ve genellikle gerçek anlamda çok daha az riskli olmaktan ziyade nominal olarak ifade edilen daha az riskli bir kararı tercih ettiklerini ileri sürmektedir. Yukarıda belirtilen etkiye oldukça paralel olan bir anket çalışması Shafir ve ark. (1997) parasal yanılsamayı besleyen

psikolojik etkilerin geçmişini derinlemesine araştıran bir çalışmadır. Bu çalışmaya göre, insanların nominal ve gerçek değişkenleri iyi bilmelerine rağmen, hesaplamaları nominal olarak düşünmeye meyillidirler. Bunun nedeni, temel iktisat teorisinin, denge fiyatlarının mutlak değerlere değil, nispi fiyatlara bağlı olduğunu varsaydığıdır. Bu nedenle, bir fiyat artışı (enflasyon) durumunda, rasyonel ajanların davranışlarını değiştirmemeleri beklenirken, ancak bu yanılsamaya tabi olan ajanlar davranışlarını değiştirir.

Bir diğer önemli psikolojik etki ise anchoring olarak adlandırılır. Farklı mallar için pek çok uygun fiyatı olan bir ekonomide, nominal ipotek fiyatları, çapa olarak alınabilirken, gerçek ipotek fiyatları, mevcut bilgiler kullanılarak elde edilebilir. Bununla birlikte, para ile beslenen yatırımcılar nominal zararlara maruz kalmaya istekli olmadıkları için, bu yatırımcılar, reel olarak belirtilen doğru bilgilerden ziyade, nominal fiyatlara dayalı kararlar alırlar. Bu etki, referans noktası olarak sunulan nominal fiyatlar dışında, Tilt efektine oldukça yakındır. Son olarak, Thaler (1980), temel olarak insanların dünyayı farklı algıladıklarını ve bu nedenle de kar ve zarar kavramlarını farklı şekilde düşündüklerini ifade eden mental muhasebe terimini ortaya koymaktadır. Dünyayı nasıl algıladıklarının farklılığına dayanarak, insanlar aynı bilgi kümesini kullanmasına rağmen oldukça farklı kararlar verirler. İyi bir örnek, yatırım için aynı bilginin herkese açık olduğu ancak hisse senetlerinin bireysel algıya bağlı olduğu bir ortamda, yatırım kararlarının piyasada asimetrik bilgi olmadığı varsayımıyla farklılık göstermesi muhtemeldir.

Para Yanılsamasının Tetikleyicisi Olarak Enflasyon

Para yanılsamasının ardındaki genel fikir şu şekilde tanımlanabilir: Gerçek ve nominal miktarlar arasındaki fark yeterince küçük olduğu sürece, gerçek ve nominal oranları birbiriyle değiştirerek kullanmak genellikle uygundur. Bu nedenle, aracıların karar alırken küçük değerler için enflasyon oranını ihmal etmeleri oldukça muhtemeldir. Bu nedenle, nominal ve reel fiyatların birbirinden ayrılmasına neden olan enflasyonun genellikle para yanılsamasının arkasındaki en önemli itici

güçlerden biri olduğu kabul edilmektedir. Para miktar teorisinin uzun vadeli tarafsızlığının para yanılsamasının yokluğuna dayandığı gerçeği göz önüne alındığında, toplam ekonomi için ne kadar para yanılmasının çok önemli olduğu açıktır.

Yukarıda belirtilen psikolojik etkiler, karar alma sürecinde önemli olmakla birlikte, bazı ekonomik gerçeklerle birleştirildiğinde çok daha ilginç hale gelir. Sıfır enflasyonlu bir ortamda, ipotek ödemelerinin gerçek maliyet yükü zaman içinde aynı kalırken, enflasyonist bir ortamda gerçek maliyet ödeme planının önceki dönemlerine geçme eğilimindedir. Böyle bir durumda, ipotek kredileri için toplam talep, reel maliyet yükünün erken dönemlere doğru hareket etmesi nedeni ile (Tilt effect) nedeniyle düşecektir. Bir piyasa sürtünmesi biçimi olarak kabul edilen bu etkinin enflasyonun neden olduğu bir yatırım ortamı nedeniyle bireylerin yatırım kararları üzerinde büyük bir etkisi olabilir. Bu etkiyi gösteren önemli örnekler Lessard ve Modigliani (1975), Tucker (1974), Kearl (1979) ve Follain (1982) tarafından açık bir şekilde akademik yazında dile getirilmiştir.

Parasal ve finansal ekonominin standart yazınında parasal yanılsama için ilk odak noktası borsa ve yatırım kararları olmuştur. Yapılan ilk çalışmaların genel bir sonucu olarak, enflasyonun nominal hisse senedi getirilerini olumsuz yönde etkilediği sonucuna varılmıştır. Ortak bir sonuç olarak, nominal getiriler ve enflasyon arasındaki negatif korelasyon inşa edilmiştir. Bu sonuç, nominal getirinin enflasyon düzeyiyle yakın bir şekilde hareket etmesini bekleyeceği için ilginç ve çelişkili görünmekle birlikte, daha fazla açıklama yapılmasını gerekmektedir. Bu sonuç için olası bir açıklama para yanılsama ile ortaya konmuştur. Örneğin, Modigliani ve Cohn (1979) makalelerinde, borsalarda parasal yanılsam durumunun mevcut olduğunu belirtmektedir. Çünkü finansal nakit akışları hesaplanırken, yatırımcılar genellikle gerçek nakit akışını nominal olanlarla karıştırırlar. Daha specifik olmak gerekirse; yatırımcılar öz kaynak kazançlarını hesaplarken, reel oranlar yerine nominal getiri değerlerini dikkate alırlar ve aynı zamanda bu

yanılsamaya uğrayan yatırımcılar sermaye ve borçlarının reel olarak değer kaybettiğinin farkına varamazlar. Sonuç olarak, yüksek enflasyonlu bir ortamın borsa getirileri üzerinde baskı oluşturma eğiliminde olduğunu sonucu ortaya çıkmaktadır. Modigliani Cohn hipotezini desteklemek için Campbell ve Vuolteenaho (2004) ve Cohen ve ark. (2005), hem zaman serilerini hem de boylamsal verileri kullanarak, temettü oranındaki yanlış kazanç oranını enflasyonla doğrudan ilişkilendirmiştir.

Bu yatırımcıların neden milyonlarca, belki de milyarlarca dolara mal olan bu kadar büyük bir hata yapmaları ilginç olabilir. Cohen ve ark. (2005) Fed yatırım Modelinin bu yanlışlığı açıkça ortaya koyduğunu belirtmekte, çünkü modelin kendisi hisse senedi getirisini nominal tahvil getirisi ile ilişkilendirmektedir. Ve pratikte, genellikle, tahvil getirisi ve risk primi toplamı "normal" getiri anlamına gelir. Bu argüman ayrıca Sharper (2002) tarafından da kabul edilmektedir. Yatırımcılar, enflasyonun kısmi bakış açısına yatkın olduklarından, bu sonuç, küçük sürtünmelerin reel ekonomide kayda değer dalgalanmalar yaratabileceği görüşünü savunan Yeni Keynesyen ekonomik yaklaşımla uyumludur. Bu nedenle, hisse senetlerinde veya diğer piyasalarda sadece yatırım yapan pazarlarla sınırlı değil, tüm ekonomiyi etkileyebilecektir. Basak ve Yan (2010) tarafından yapılan çağdaş bir araştırma, parasal yanılsamanın olduğu bir ortamda enflasyonun finansal menkul kıymet fiyatları üzerindeki potansiyel etkilerini araştırırken, temel finans varsayımlarını sürdürür. Farklı derecelerde para illüzyonuna sahip yatırımcıları kullanarak, illüzyonlu yatırımcıların tüketim modellerinin nominal fiyat seviyesini takip ettiğini ve fiyatlar ile negatif korelasyon içinde olduğunu açıkça ortaya koymaktadırlar. Ayrıca, parasal yanılsamanın etkilerinin yatırımcılar için nispeten çok sınırlı olmasına rağmen, toplam ekonomi üzerindeki etkisinin önemli olduğunu iddia etmektedirler. Bu bulgu, Yeni Keynesyen iktisat yaklaşımının Paranın kısa vadeli tarafsız olmama durumunun reel ekonomi üzerinde muazzam etkiler yaratabileceği düşüncesiyle oldukça tutarlıdır. Daha önce de belirtildiği gibi, borsa, parasal illüzyon hikayesinde önemli bir rol üstlense de akademik dünya yelpazesini

parasal illüzyondan kaynaklanan yanlış fiyatlamaların olduğu başka yerlere doğru genişletmiştir.

İnsanların uzun vadede yatırım yapma eğiliminde olduğu bir diğer pazar ise konut piyasasıdır (emlak piyasası). Daha önce de belirtildiği gibi, enflasyonun, insanların parasal yanılsama altında karar vermelerine yönlendiren asıl sebep olarak kabul edilmesinden dolayı, Follain (1982), konut piyasası talebinin, ekonomik teorinin öne sürdüğü ya da para yanılsaması tarafından yönlendirilen gerçek fiyatlardan etkilenip etkilenmediği sorusunu irdelemekte, rant ve ev sahipliği arasındaki ilişkiyi araştırmaktadır. Çalışmasında, enflasyonist beklentilerdeki artışın konut talebini azalttığını, yüksek enflasyonun ise bu piyasada sabit getirili menkul kıymetlerin ödeme aracı olarak oldukça baskın olmasından dolayı satın alınabilecek tutarı azalttığını tespit etmiştir. Enflasyonun sermaye üzerinde bir miktar getiri sağlayabilmesine rağmen, konut talebi, sermaye tahakkuklarından ziyade maliyet tahakkukunda çok daha hassastır.

Kiralar ve konut fiyatları arasındaki uzun vadeli ilişkileri araştıran bir başka çalışma Gallin (2008) tarafından yapılmıştır. Makalesinde, kiralar ve konut fiyatları arasındaki uzun vadeli bağlantıları ve birbirlerini dinamik olarak nasıl etkilediklerini araştırmaktadır. Uzun dönem hata düzeltme modellerini kullanarak, ev fiyatlarının ve kiralarının uzun vadede (uzun vadede ortalama olarak 3 yıl) birbirlerine düzelme eğiliminde olduğunu ortaya koymaktadır. Düzeltme mekanizması hem kiraların hem de konut fiyatlarının birbirine göre doğru olduğunu gösteren uzun dönemli ortak entegrasyon modelleri kanalı ile çalışmaktadır. Makalesinin en önemli sonucu, ev fiyatlarının kiralara yakınsadığıdır. Yazar bu oranın konut piyasasında bir değerleme ölçüsü olarak kullanılabileceğini iddia eder. Konut ekonomisi yazınında bu ölçü genellikle uzun vadeli reel fiyat dinamiklerini yansıtmak için kullanılır.
Brunnermeier ve Julliard (2006) tarafından yapılan bir araştırma, parasal yanılsamanın ABD, İngiltere ve Avustralya'nın konut pazarlarındaki potansiyel etkilerini çok iyi ortaya koymaktadır. Makalelerini kapsayan fikir şöyle

özetlenebilir: İnsanlar bir ev satın almaya veya sabit bir ipotek ödemesi yapmaya karar verdiğinde (önceden belirlenmiş bir nominal faiz oranıyla), parasal yanılsamaya maruz kalabilirler. Bunun nedeni, insanların genel olarak nominal ve gerçek değişkenlerin birlikte hareket ettiğini düşünme eğiliminde olmalarıdır. Dolayısıyla, enflasyonun düşmesi durumunda, bu düşüşü yanlışlıkla reel faiz oranlarındaki düşüşe de atfetmektedirler. Bu nedenle, gelecekteki ipotek ödemelerinin gerçek maliyetlerini dolaylı olarak düşük tahmin edeceklerdir. Bu ödemelerin gerçek maliyetlerini hafife aldıklarından, enflasyondaki düşüş durumunda konut piyasasındaki talep görece artmaktadır.

Sonuç olarak, konut piyasasındaki keskin artışların ve düşüşlerin ardındaki temel nedenin enflasyonun kendisi olduğunu ortaya koymaktadırlar. Bununla ilişkili bir soru, enflasyon ile bu yanılsama ölçüsü arasındaki bağlantılar için potansiyel açıklamalar aramaktır. Yazarlar enflasyonun toplam ekonomiyi daha riskli hale getirebileceğini ve risk primini artırarak konut fiyatlarının bastırılacağını öne sürüyorlar. Böylece, düşük reel konut fiyatlarına yüksek enflasyon ve gelecekteki enflasyon beklentileri eşlik etmektedir. Tüm bu çalışmaların en önemli ve ortak bulgusu, ekonomik ajanların klasik ekonomik teorinin aksine paranın tarafsızlığı kavramını kıran para yanılsamasına maruz kalmasıdır. Bu nedenle bu yanılsama, bireylerin ve yatırımcıların gerçek fiyatlardan ziyade nominal veya mutlak fiyatlara dayalı kararlar vermelerine yol açabilir. Sonuç olarak, bireysel ölçekte gözlenen ufak maliyetler, toplam ekonomi üzerinde kayda değer etkiler yaratabilir.

C. TEZ İZİN FORMU/THESIS PERMISSON FORM

ENSTİTÜ / INSTITUTE

Fen Bilimleri Enstitüsü / Graduate School of Natural and Applied Sciences [ ]

Sosyal Bilimler Enstitüsü / Graduate School of Social Sciences [X]

Uygulamalı Matematik Enstitüsü / Graduate School of Applied Mathematics [ ]

Enformatik Enstitüsü / Graduate School of Informatics [ ]

Deniz Bilimleri Enstitüsü / Graduate School of Marine Sciences [ ]

YAZARIN / AUTHOR

Soyadı / Surname : ÇİFTÇİ
Adı / Name : MUHSİN
Bölümü / Department : İKTİSAT

TEZİN ADI / TITLE OF THE THESIS (**İngilizce** / English) :
Behavioral Dynamics in Turkish Housing Market: The Role of Inflation

TEZİN TÜRÜ/DEGREE: **Yüksek Lisans** / Master [X] **Doktora** / PhD [ ]

1. **Tezin tamamı dünya çapında erişime açılacaktır. /** Release the entire work immediately for access worldwide. [X]
2. **Tez iki yıl süreyle erişime kapalı olacaktır.** / Secure the entire work for patent and/or proprietary purposes for a period of **two years. *** [ ]
3. **Tez altı ay süreyle erişime kapalı olacaktır.** / Secure the entire work for period of **six months**. ***** [ ]

***** *Enstitü Yönetim Kurulu kararının basılı kopyası tezle birlikte kütüphaneye teslim edilecektir.*
A copy of the decision of the Institute Administrative Committee will be delivered to the library together with the printed thesis.

Yazarın imzası/Signature ..... **Tarih**/Date: 08/08/2019