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A 10-YEAR ANALYSIS OF HOUSING PRICES AND THE INFLUENCE OF ECONOMIC FACTORS IN TURKEY

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Abstract

In Turkey, the housing market is affected by various factors, and housing prices are shaped according to current conditions. In this study, the relationship between the housing price index (HPI) and economic variables (inflation and exchange rate) in Turkey was investigated. We used a 10-year time period for this study, from January-2010 to December-2019, with monthly data frequency. For our research, we employ the Wavelet Coherence Transformation (WCT) method. The results show that there is a positive relationship between inflation and housing prices in the short and long run. In addition, a continuous rise in inflation led to an increase in housing prices all over the period from 2010 to 2019. The findings of this study can aid in achieving the goal of the research by offering evidence-based perceptions of how housing prices and different economic variables are related. Housing costs in Turkey increased as a result of the substantial likelihood that the Turkish lira would weaken. The expansion of global inflation is a further anticipated factor contributing to the rise in housing costs in Turkey. This study can also be used by investors to help them decide whether to engage in the Turkish real estate industry.

JEL classification: R3, R2, R29, E3

Keywords: Consumer Price Index (CPI), House Price Index, Exchange rate, Wavelet method, Economic Indicator

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Introduction

Housing is one of the leading multi-purpose assets, thanks to the rental income it provides as a result of both meeting the need for accommodation and investment purposes and/or capital gains from the increase in the value of the housing. Housing expenditures, on which individuals spend most of their earnings, represent a large share of the country's wealth as a result of this situation. As a result of the mortgage crisis that took place in the United States in 2008, the economies of many countries were affected, and it emerged that developments in the housing market should be considered. The decision-making process in the housing market should be carried out meticulously due to the high capital demand compared to other investment or purchasing preferences.

Housing in Turkey is an important wealth component as it is a household's long-term investment tool. The construction sector, which is based on housing production, is among the most important elements of the economy. Despite the contraction experienced in the 2008–2009 period due to the crisis, the construction sector showed rapid development in Turkey after 2013. According to the data of the Turkish Statistical Institute (TUIK), the growth rate of the sector was 6.3% in 2009, 9.2% in 2013 and in 2017, 9%. It started to contract again in 2018 (2.7% in 2018; 12.7% in the second quarter of 2019).

The mortgaged housing finance system introduced in 2007 has been an important factor in expanding the housing market in Turkey. In particular, the low interest rate and low exchange rate environment provided Turkish households with long-term borrowing opportunities and increased the demand for housing. The relatively high growth and increases in per capita income seen before the 2008 Global Crisis are among the economic reasons that fed the housing demand (Karagöz & Ozkubat, 2021). The number of houses sold in Turkey between January 2013 and April 2019 was 18 million, 351 thousand. Housing sales increased by 5.1% in August 2019 compared to the same month of the previous year and reached 110,538. In addition, according to the TUIK Income and Living Conditions Survey 2018 report, the rate of home ownership in Turkey was 60.7% in 2013 and 61.1% in 2014, while it was 59% in 2018. This rate shows that 59 out of every 100 people in Turkey lived in a house of their own in 2018. The annual percentage change in the consumer price index and the housing price index is given. However, it is noteworthy that while the number of houses sold increased, the rate of housing ownership decreased. This shows that high-income households in Turkey tend to invest in housing, while lower-income households move away from owning housing.

Housing, which is an integral part of human life, is positively or negatively affected by factors affecting human life, and housing prices are shaped according to current conditions. Although macroeconomic and microeconomic indicators are among these factors, in our study, the relationship between inflation, for which we used the consumer price index (CPI), which is one of the macroeconomic indicators, and the house price index in Turkey will be examined.

The contribution of the study to the literature is made in the studies on the relationship between Turkey's housing prices and the consumer price index, the country-wide and level 2 region studies consisting of 26 regions and macroeconomic variables. This study will focus on the residences of all Turkish house prices without shifting the location focus to a more specific area. Turkey is known for having a high density of immigrants and also university students, and it has been prepared with the intention of helping individuals who are considering residing here, those who are considering buying housing for investment purposes, and researchers who are interested in the subject.

The main purpose of the study is to investigate the relationship between the economic variables and the Turkish housing price index. The economic variables are inflation and the exchange rate. The data for the variables are from January 2010 to December 2019, with a 10-year span, and have a monthly frequency. The wavelet transform coherence (WTC) model was used, and both variable exchange rate and inflation had a significant impact on the housing price index. This is very simple: when the exchange rate rises, loans are getting larger, which creates hype in inflation, and the currency depreciates, which directly affects the price of houses.

In the next section, we are going to discuss previous research that has examined the connection between HPI and economic indices in a number of nations, including China, the United Kingdom, and the United States. When it comes to researching this relationship in the context of Turkey, there is a void in the literature. By undertaking an empirical investigation of the relationship between HPI and economic indicators in Turkey, this study tries to close this gap. In doing so, this study will add to the body of knowledge and give policymakers and stakeholders important information about the housing market in Turkey.

Literature review

Studies on the relationship between macroeconomic variables and the housing price index have been done in the literature. These studies have been conducted using various data sets, sampling intervals, and methodologies, and the findings generally support the notion that both the consumer price index and macroeconomic factors have an impact on the home price index.

Housing pricing index & economic variables

The most concentrated work at the forefront of the issues are studies on what determines housing prices. Yang (2001) researched the relationship between house prices and the physical structure of the house and its surroundings, and directly proportional relationships between the variables were determined. Üçdoğruk (2001) carried out a similar study on the scale of İzmir, specifically by considering its internal physical properties and working on the same right-way connection that has been detected.

Öztürk and Fitöz (2012) investigated the determinants of housing supply and demand, which are the determinants of prices in Turkey. In their analysis of housing demand, loan interest rates, per capita income, and prices in the country are effective for housing supply. Based on the results, they concluded that HPI has a substantial effect on money supply and per capita income. Adams and Füss (2010) determined the relationship between housing prices and economic variables in 15 OECD countries. They investigated and considered the relationships between the rate of industrial production, real GDP, and loan interest rates. They concluded that all the macroeconomic variables they took into account affected housing prices positively.

Beltratti and Morana (2010), in their analysis of the G7 countries, concluded that shocks have an effect on housing prices. Çankaya (2013), in 75 countries used house price indices in his study and found relationships between housing price index and interest rates, growth rates, and disposable incomes. Fuat and Akbaş (2014), worked on the determinants of housing demand, providing detailed analysis in the short and long term. As a result of the analysis, marital status, person per capita income, and industrialization factors were positive, while employment rate, interest rates, and prices were found to have a negative effect on HPI.

Dilber and Sertkaya (2016), tested the causality relationship between Turkey's housing prices and macroeconomic variables such as exchange rates and interest rates. They found a two-way causality between inflation and one-way causality between inflation. in Turkey in determining the relationship between the inflation rate and the housing price index.

Similar to this, Chien et al. (2019) investigated the cross-border dynamic housing price link between China and Taiwan using Gregory Hansen's cointegration modeling, describing a structural break, and discovered that the rise in housing prices in Beijing and Shanghai had a negative impact on Taipei's housing prices.

The Johansen cointegration model was employed by Ozturk et al. (2018) to reach their conclusion regarding whether or not macroeconomic factors influence housing prices in Ankara. The symmetrical pricing assumption was applied despite the limited scope of the analysis since Vatansever et al. (2020) claim that the Turkish real estate markets exhibit homogeneity characteristics. The conclusions of Ozturk et al. (2018) may not be generalizable in a specific setting, even inside Turkey itself, according to the Korkmaz (2020) argument, because of internal variations like the disparity in income generation between the western and eastern areas.

Kuchler et al. (2023) researched the factors shaping and consequences stemming from housing market expectations. The authors provided an examination of the most current body of literature on this subject and engaged in a discourse regarding indications that underscore the considerable influence of recent house price fluctuations, individual or regional observations of house price movements, and anticipations regarding mortgage interest rates on housing market expectations. The study also underscored the significance of comprehending how both renters and homeowners contribute to the projection of future house prices, particularly in the midst of a housing upswing.

The research conducted by Ciocchetta et al. (2023) delved into the determinants of house price dynamics across several European nations. Employing an econometric model, the study posited that house prices are contingent on an array of factors encompassing income levels, demographic trends, prevailing interest rates, and the accessibility of credit. The findings of the study revealed that the trajectory of home prices in Europe is shaped by a confluence of influences, including economic expansion, demographic patterns, and prevailing interest rates. Additionally, the research identified instances of overvaluation in home prices within certain European countries, counterbalanced by situations of undervaluation in others.

Using the VAR approach, Bjornland and Jacobsen (2010) looked at how housing prices and macroeconomic factors interacted in Norway, Sweden, and the UK. They discovered that interest rates have a significant impact on rising home prices and home turnover, with impacts that are nearly immediate. This emphasizes the importance of monetary policy.

The main goal of a recent study by Kader et al. (2022) was to identify the crucial economic elements that significantly influenced the dynamics of housing demand and supply in Istanbul, Ankara, and Izmir, three renowned Turkish cities. All variables in the study were transformed using logarithms, with the exception of inflation, real interest rate, and nominal interest rate. The analysis used cutting-edge statistical techniques including Co-integration Analysis and the Vector Error Correction Model (VECM) to clarify the complex

linkages between various macroeconomic variables and their effects on housing demand and supply. The study's findings revealed some compelling insights. On the demand side, the volume of mortgage credit, a crucial determinant, exhibited dependencies on real per capita GDP, real house prices, projected inflation, and nominal interest rates. Conversely, the supply side featured building site availability as the dependent variable, which was found to be influenced by real housing prices, real interest rates, and the real cost of construction.

Housing pricing index & inflation

Kırca and Canbay (2022) conducted a study to investigate the determinants of housing inflation in Turkey using a conditional frequency domain causality analysis. The study aimed to examine the short- and long-term effects of inflation, exchange rate, housing interest, and supply on housing inflation. The study found that inflation, exchange rate, and housing interest rates have a significant short-term impact on housing inflation, while housing supply has a significant long-term impact. The study also found that changes in housing supply have a permanent effect on housing inflation, indicating a unidirectional causality running from housing supply to housing inflation. The study concluded that policymakers should focus on increasing the supply of housing to stabilize housing prices in Turkey.

The research from Malmendier and Wellsjo (2023) explored an intricate relationship among previous inflation experiences and the tendency for homeownership, both at the individual and international levels. The authors discovered an unexpected insight by using cutting-edge survey data collection techniques: past experiences with inflation have a major impact on people's decisions to become homeowners. According to this study, a person's lifetime exposure to inflation significantly influences their decision to buy a home.

Erol and Tirtiroglu (2008) used OLS to examine the ability of real estate investments in Turkey to safeguard against inflation from 1999 to 2004. It has been established that real estate investments are more resistant to inflation than the Borsa Istanbul (BIST) stock indices. Additionally, during periods of high inflation, real estate investments are more effective at protecting against inflation.

In their analysis, Piazzesi and Schneider (2009) found a positive correlation between property prices and inflation rates. They noticed that higher anticipated inflation tended to raise the price-dividend ratio in real estate. But according to a study by Tan (2011), inflation rates show a somewhat negative correlation with home prices, meaning that they are not a significant factor in setting home prices.

Returns on residential housing in the United States are marginally higher than inflation during periods of the housing boom, according to research (Wu & Pandey, 2012). They came to the conclusion that residential real estate provided a modest hedge against anticipated inflation.

Paksoy et al. (2014) examined the inflationary pressure on the regions impacted by the House Price Index between 2010 and 2014, with a focus on Turkey and TRC1, TRC2, and TRC3 as the level regions. Hacker and Hatemi-J (2006) employed the bootstrap causality test for this purpose. The CPI was used in the study as an inflation indicator, and it was found that inflationary pressure was only present in the TRC1 and TRC2 regions. They discovered a positive correlation between prices and used Turkey's inflationary scenario to explain it.

According to Walentin's (2014) research, a decline in home values results in fewer alternatives for people to borrow money, which makes consumption and inflation more sensitive to monetary policy. According to Christiano and Fitzgerald (2003), a positive shock to employment and inflation will raise real house prices while lowering housing demand. The price of homes likewise rises as a result of the inflationary increase in the money supply. The existence of per capita income, the unemployment rate, and the inflation rate were noted (Tan, 2011) as economic factors influencing Malaysian home prices.

Using data from 35 major Chinese cities from 1996 to 2010, Kuang and Liu (2015) discovered that housing prices were positively connected with inflation in the short term, but not in the long run. Christou et al. (2018) used monthly data for the USA from 1953 to 2016 to conduct a quantile cointegration analysis on the long-term link between home prices and non-residential CPI. The findings showed that the CPI and HPI series have a low level of cointegration but no long-term link at medium or high levels.

In their analysis, Karaağaç and Altınırmak (2018) used the Granger Causality Test to analyze the causative relationship between the Turkey House Price Index, the Level Based House Price Indices, the CPI, and other variables. The data used spans the years 2010 to 2017, and there is one-way causality from the CPI to the THPI (Turkey House Price Index); the CPI in the TR21 (Edirne, Kirklareli, Tekirdag) region, employment, and unemployment; and the CPI in the TR31 (Izmir) region. They also discovered causality relationships in various directions between the CPI variables and level-based housing price indices in the TRC1.

The effects of the inflation rate on house prices were examined in the study by (İslamoğlu & Nazlioğlu, 2019) utilizing data from the provinces of Istanbul, Ankara, and Izmir from 2010 Q1 to 2017 Q4. It has been

established that inflation has a favorable impact on housing prices as a result. The study's empirical findings demonstrated that home prices rise and fall in lockstep with inflation. Housing prices in Turkey's three largest provinces rise by 1.55% for every 1% increase in population growth, with population growth having the greatest overall positive impact on housing costs. Furthermore, it is evident that there is a large demand for housing investment in densely populated locations due to the high population elasticity of housing costs.

Housing pricing index & exchange rate

In a study conducted by Akkay (2021) researchers analysed the connection, between property prices and various macroeconomic factors in the Turkish economy from 2010 to 2020. The findings revealed that mortgage interest rates the USD/TL exchange rate and employment levels significantly influence the dynamics of home prices in Turkey. To examine the long-term correlation among these variables the study utilized the ARDL model. The results indicated that factors such as money supply, real stock prices and real construction expenses have effects on house prices. Real money supply, real interest rates and real exchange rates have effects on housing costs. Furthermore, it was discovered that both the real effective exchange rate and the real interest rate have a term negative impact on house prices.

Changes in expected inflation in the study of Blose (2010) investigated how it will affect the prices and that the fluctuations in the market have no effect on gold spot prices was shown by (Ibrahim et al., 2014) they examined the factors affecting gold prices in Malaysia. In the study, covering 10 years of data between 2003 and 2012, dependent variables were used to determine a significant relationship between independent variables. A linear regression model was used as a method, and gold prices, crude oil prices, and inflation were three independent variables affecting the rates and exchange rates. There is a significant negative relationship between inflation rates and exchange rates, and the price of crude oil is positively significant as found out by (Shafiee & Topal, 2010).

Other important influencing variables include oil prices and global inflation. They conducted research on the relationship between oil prices, the US exchange rate, the US inflation rate, and US real interest in the model. They made a model to predict future prices. Toraman et al. (2011) performed a study, which included the USA with the highest correlation between gold prices. They found a negative relationship between the exchange rate and, moreover, between gold prices, and found a positive relationship between oil prices.

Küçükaksoy and Yalçın (2017) looked at the investment alternatives preferred by individual and institutional investors. Among these, gold and foreign exchange constitute two important alternatives. This investment is the choice between alternatives whose individual, demographic, and financial characteristics vary according to the criterion. Investing in gold is traditional for speculative purposes as well as for speculative purposes which can also happen.

Many other financial instruments are used for portfolio diversification. Conversely, gold does not carry a counterparty risk. Usually, a store of value is universally used and characterized by high liquidity. It is an accepted entity. In the study by Michis (2014), gold is only evaluated over medium- and long-term investments. It has been shown to provide the lowest contribution to portfolio risk.

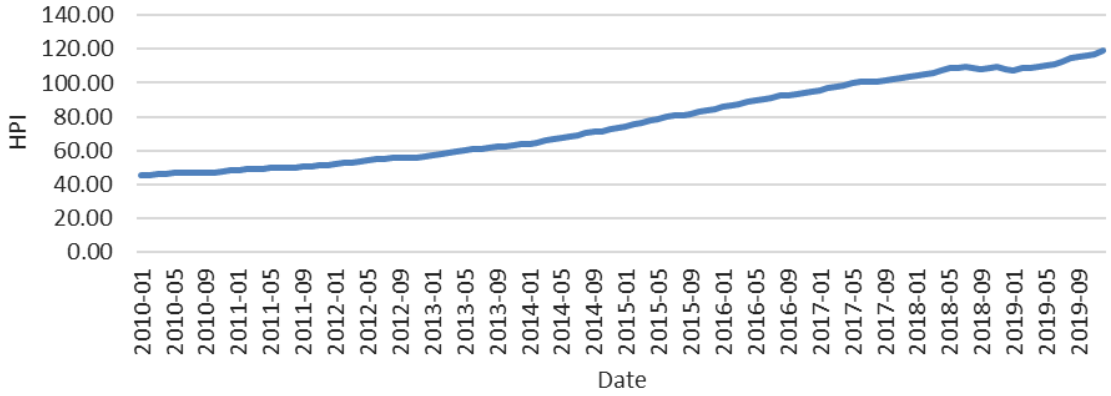
In a recent study by Akça (2023), macroeconomic indicators' short- and long-term implications on Turkey's housing market dynamics were examined. The study discovered that while housing supply has a large long-term impact on home price dynamics, inflation, exchange rates, and housing interest rates have a considerable short-term impact as well. Additionally, the real effective exchange rate and the real interest rate were found to have a considerable negative short-term impact on the dynamics of property prices. These results are in line with other studies by Akkay (2021) as well as Krca and Canbay (2022), who also discovered that macroeconomic variables are quite important in predicting home prices in Turkey.

There are many studies in the literature on the relationship between exchange rates and macrovariables. The general conclusion that can be drawn from the research is that the exchange rate is important, especially in developing economies. It is an important variable that needs to be monitored and directed. Housing prices and the construction industry, on the other hand, have been the subject of a limited number of studies in literature. If we conclude all of the literature review, we can say authors like (İslamoğlu & Şabanoğlu, 2019; Walentin, 2014; Paksoy et al., 2014; Akkay, 2021; Kırca & Canbay, 2022; Akça, 2023; Malmendier & Wellsjo, 2023) found that inflation has a positive relationship with the house price index. Some of the authors also conclude that inflation affects the short run more than the long run. (Toraman et al., 2011; Shafiee & Topal, 2010) also found a positive impact of the exchange rate on HPI. There are also some studies (Ciocchetta et al., 2023; Kader et al., 2022) which show that interest rate is one of the effective factors in terms of valuation of housing prices in Turkey and Europe. Until now, the research had been done on some specific part of Turkey with different methods and also with various different economic variables. The unique aspect in our research is that we are taking the entire Turkish housing price index and using the wavelet transform coherence (WTC) method.

Methodology & data

The first aim of the study is to investigate the relationship between the consumer price index and the Turkish housing price index, and the second is to check the effects of the exchange rate on the Turkish housing price index. The data for the inflation is between 2010 and 2019, and the data have a monthly frequency, obtained from the CBRT (Central Bank of the Republic of Turkey) and TUIK (Turkish Statistical Institute), while the Turkish housing index data is obtained from the CBRT, which is one of the most preferred websites in Turkey for home purchase. The reason for the data start in January 2010 and finish in December 2019, a 10 -year time span, is so that we can find long-term effects. Extending the dataset beyond 2019 was avoided to mitigate the potential influence of external factors such as the COVID-19 pandemic and the Russo-Ukraine war.

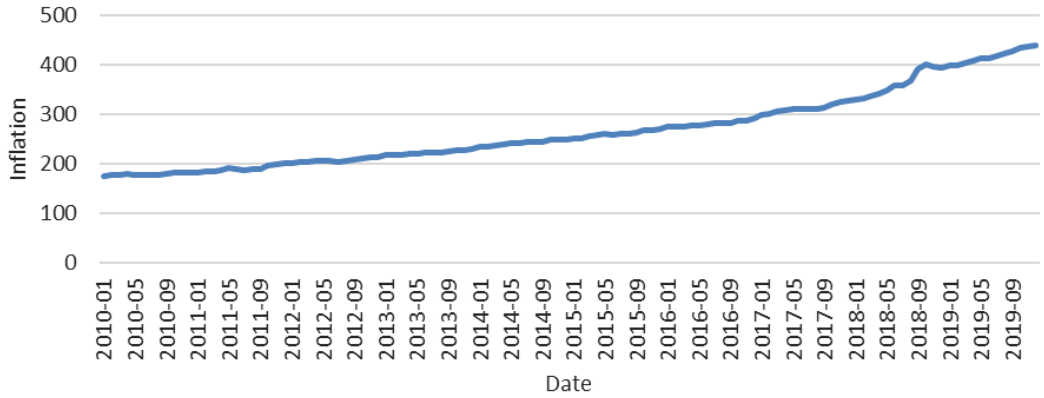
Figure 1: Turkish Housing Price Index between 2010 – 2019



Source: Own elaboration based on Central Bank of Republic Turkey (CBRT).

Again, the Consumer Price Index (CPI) data between the same periods is published in the Turkish Statistical Institute (TUIK) (tuik.gov.tr). The data has a monthly frequency structure. Both time series data have been brought to a level that can be analyzed in the study.

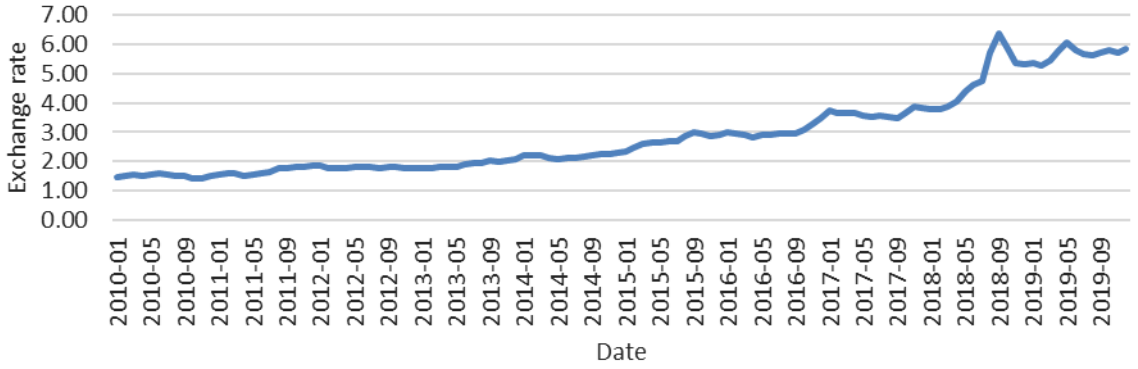
Figure 2: Consumer Price Index Chart for 2010 – 2019



Source: Own elaboration based on Central Bank of Republic Turkey (CBRT).

Furthermore, the exchange rate we take is the US dollar against Turkish lira, and data between the same periods is published in the Central Bank of Republic Turkey (CBRT) (cbrt.gov.tr). The data has a monthly frequency structure. Both time series data have been brought to a level that can be analyzed in the study.

Figure 3: Exchange rate (US dollar/Lira) between 2010 – 2019



Source: Own elaboration based on Central Bank of Republic Turkey (CBRT).

In the study, the main purpose is to find the relationship between CPI and HPI in Turkey, and after that, we are going to check the effect of the exchange rate on the housing price index and also on inflation. Whether there is a unit root in the data series is decided by looking at the stationarity of the series. That is, the fact that the data series does not change over time indicates the stationarity of the series and shows that it is a unit root (Koyuncu, 2018). When we tried to use the raw data, there was a stationary problem. For that reason, we use the log of all three variables. Determining the relationship with the wavelet transform coherence (WTC) model was used by Ma et al. (2021), and we are going to do analysis with the same model by using the R-language program. The main hypotheses of the study are as follows:

H_0: changes in CPI have no impact on Turkish house prices,

H_1: changes in CPI have an impact on Turkish house prices.

The other aim is to find out whether the exchange rate has any effect on the Housing Price Index (HPI) and CPI:

H_0: changes in Exchange rate have no impact on HPI and CPI,

H_1: changes in Exchange rate have impact on HPI and CPI.

A reliable and adaptable strategy to investigate the interactions between house prices and macroeconomic variables is to employ the Wavelet Coherence Transformation (WCT) method. The usefulness of this approach comes from its capability for multiscale analysis, which makes it possible to examine correlations at different temporal frequencies. WCT succeeds by addressing these complications because economic and housing data are dynamic and non-stationary. Additionally, it makes it easier to find lead-lag interactions, revealing probable causal connections between variables. WCT's visual representations help make findings easier to communicate and more understandable for both professionals and non-experts.

A wavelet is a wave that starts at a certain moment in time and ends at a certain moment which means functions that show movement (Percival & Walden, 2000). This wave is in the sense of a small wave, since functions do not move continuously. Mathematically, the expression ψ(w) is the Fourier transform of ψ(t). Including the admissibility condition which is:

$$C_\psi = \int_{-\infty}^{\infty} \frac{|\psi(w)|^2}{|w|} d\omega < \infty \quad (1)$$

The square-integrable ψ(t) function that provides the inequality is called a wavelet (Chui, 1992; Meyer, 1993; Bernard et al., 1998). A wavelet function has zero mean and is located in both frequency and time domains (Grinsted et al., 2004). Debnoth and Shah (2015) proved that the resident property of the wavelet is acceptable.

(I) Wavelets are bandpass filters, so ω→∞ frequency response is fast enough, weakens and is zero when ω→∞,

(II) is the impact response of the filter, which weakens rapidly as t increases and becomes an oscillating one around zero.

When these two elements of wavelet transform are considered, wavelet scale succession of bandpass filters linearly related to the characteristic period of the filter which can be thought of as applying it to the time series (Grinsted et al., 2004) x(t) studied time series, the scale parameter which shows how much the s wavelet is expanded or contracted, and Continuous wavelet transformed, where u is the location parameter that determines the location of the wavelet (CWT) mathematically.

$$w_x(u,s) = \int_{-\infty}^{\infty} x(t) \frac{1}{\sqrt{|s|}} \psi^*\left(\frac{t-u}{S}\right) dt \quad (2)$$

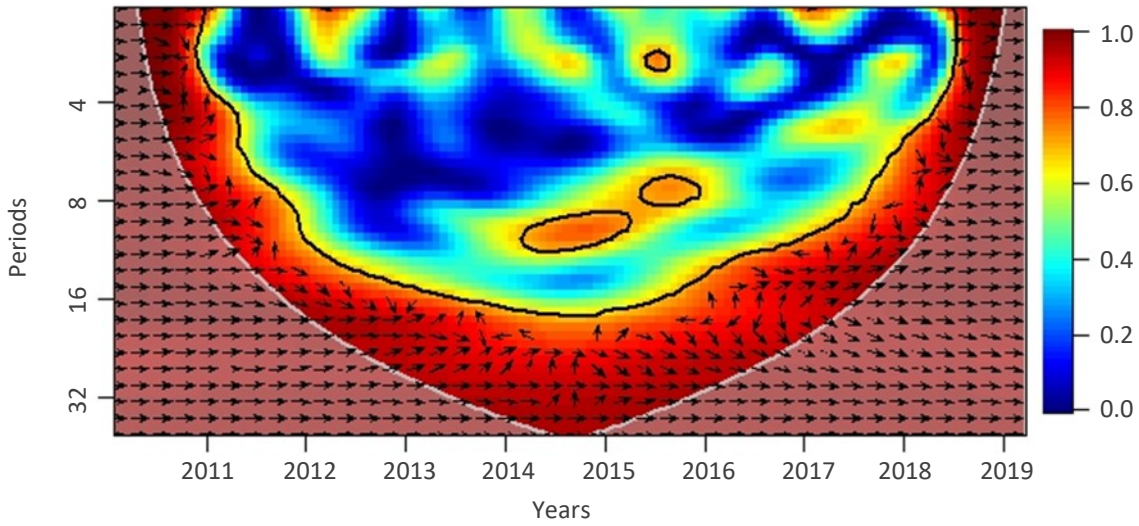
It can be represented as ψ* and in wavelet transform, the expression of the wavelet is complex which denotes a conjugate. In other words, the wavelet trans-

form of time series Wx and y(t) wavelet transforms of time series complex conjugate Wy* inclusive.

Result and discussion

The current study used the wavelet coherence transformation method to determine the behavior of the inflation and housing price index in Turkey and to detect vulnerable times. Figures 4, 5, and 6 show the results of the wavelet coherence transformation analysis. The cone that dominates an edge under which the wavelet coherence exerts response due to discontinuity is shown by the white cone-shaped curve. The thick black contour, on the other hand, reflects a Monte Carlo simulation-derived significance threshold of 0.05%

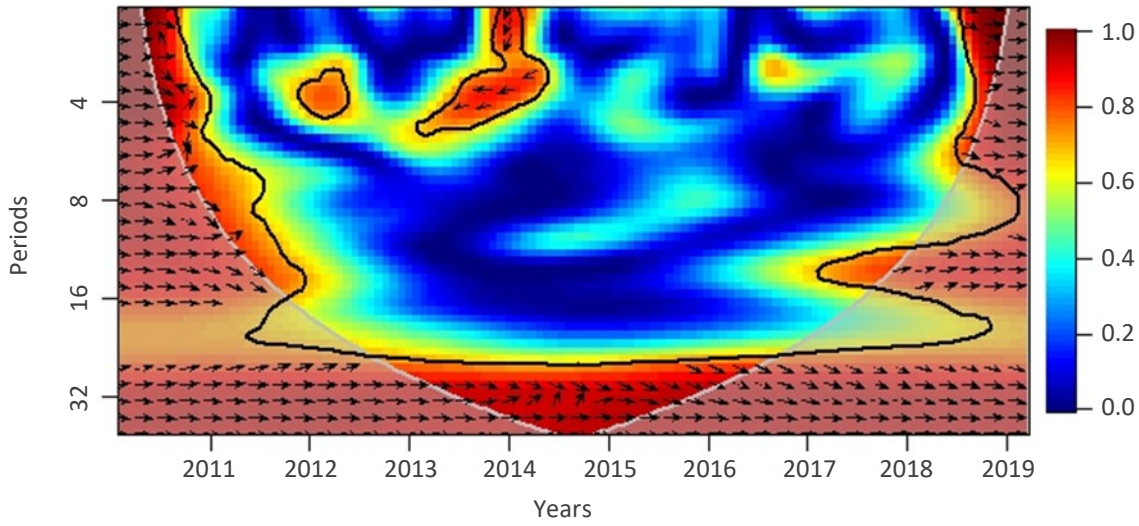
Figure 4: WCT between Inflation and Turkish HPI from 2010 – 2019 (Exchange Rate vs. Inflation)



Source: Author's own work.

In accordance with the primary objective of our work, we also used wavelet coherence to investigate the time-frequency relationship between inflation and the housing price index. Figure 4 displays the wavelet coherence between Turkey's housing price index and inflation. The wavelet coherence merely examines the co-movement of the housing price index and inflation within the total time-frequency sphere. Figure 4 makes it abundantly evident that there is a significant long- and short-term relationship between the housing price index and inflation between 2010 and 2019. Since the majority of the arrows are heading to the right, we can infer that Turkey's housing price index and inflation are in sync, indicating a strong and positive correlation between the two. This outcome may serve as additional evidence of the direct impact of Turkey's housing price index (Paksoy et al., 2014).

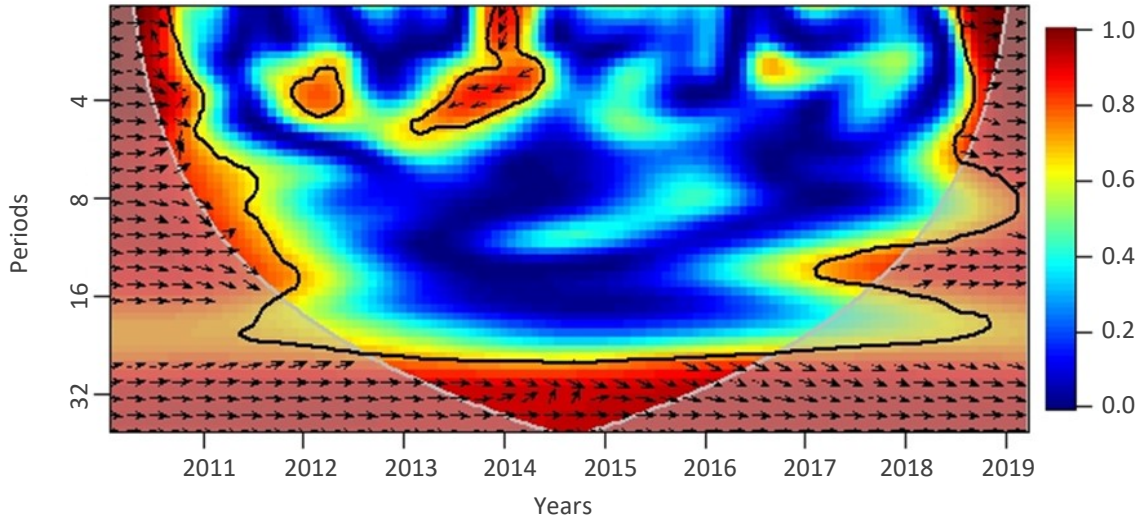
Figure 5: WCT between Exchange rate and Turkish HPI from 2010 – 2019 (House Prize Index vs. Exchange Rate)



Source: Author's own work.

Figure 5 displays the wavelet coherence between Turkey's housing price index and exchange rate. The wavelet coherence merely examines the co-movement of the housing price index and exchange rate within the total time-frequency sphere. Figure 5 makes it abundantly evident that there is a short-term relationship between the housing price index and the exchange rate between 2010 and 2019. As you can see, from 2013 to 2017, there was high coherence, which is because the Turkish central bank abruptly increased interest rates in an effort to support the lira. Lastly, from 2018 to 2019, you can see the color is blood red, which shows a 100% perfect relationship that increases in exchange rate effect on house prices in Turkey. Since the majority of the arrows are heading to the right, we can infer that Turkey's housing price index and exchange rate are in sync, indicating a strong and positive correlation between the two. This outcome may serve as additional evidence of the direct impact of Turkey's housing price index, which is also evident (Toraman et al., 2011).

Figure 6. WCT between Exchange rate and CPI from 2010 – 2019 (Exchange rate vs. Inflation)



Source: Author's own work.

Figure 6 displays the wavelet coherence between Turkey's inflation and exchange rate. The wavelet coherence merely examines the co-movement of inflation and exchange rate within the total time-frequency sphere. Figure 6 makes it abundantly evident that there is a short-term and long-term relationship between inflation and the exchange rate between 2010 and 2019. As you can see in the 2012 2nd quarter to the 2017 3rd quarter, there is a high coherence, which shows the exchange rate adversely affected inflation in Turkey because most of the products and services depend on imports. Lastly, from 2018 to 2019, you can see the color red, which shows a strong relationship that increases as exchange rate affected inflation in Turkey. It is true that from 2018 the Turkish lira started depreciating and inflation has increased until now, and it is expected to further increase. Since the majority of the arrows are heading to the right, we can infer that Turkey's inflation and exchange rate are in sync, indicating a strong and positive correlation between the two. This outcome may serve as additional evidence of the direct impact of Turkey's housing price index, which is also evident (Shafiee & Topal, 2010).

As a result, the demand for imported inputs required for housing production will decrease, and as a result, foreign exchange demand will decrease. There is a causal relationship between imports of capital goods and consumption goods (Eryüzlü & Ekici, 2020).

Due to their effects on the general economy and the purchasing power of customers, inflation and exchange rates can have an impact on housing prices in Turkey. Housing costs may rise as a result of increasing inflationary costs for labour and building supplies. Inflation can also weaken consumer purchasing power, which can dampen demand for property and bring down house prices. Exchange rate changes may also have an impact on the price of imported building supplies and machinery, which may have an impact on the cost of building homes and eventually have an impact on home prices. Furthermore, changes in exchange rates may have an impact on customers' purchasing power, which may have an impact on housing demand and pricing.

Conclusion

In this study, the short- and long-term responses of housing price movements to the increases and decreases in economic growth in Turkey are investigated. In this sense, the study provides evidence for the asym-

metrical effect of economic activities on the housing market.

Housing prices are affected by macro and microeconomic indicators and also affect these indicators. Within the scope of the study, an attempt has been made to explain the relationship between housing prices in Turkey and the economic variables (inflation and exchange rate). The period intervals of the data used in the study were 2010–2019. Housing price data for Turkey was obtained from CBRT.

The empirical findings obtained from the Wavelet method, which is also used by Ma et al. (2021), show that there is a positive relationship between inflation and housing prices in the short and long run, in line with the economic literature (İslamoğlu & Şabanoğlu, 2019; Walentin, 2014; Paksoy et al., 2014; Akkay 2021; Malmendier & Wellsjo, 2023). According to the literature, it's critical to comprehend the causes, consequences, and dynamics of housing inflation as well as previous inflation experiences in order to predict how buyers and sellers will act in the housing market. Policymakers and market participants can reduce risks related to the housing market by assessing variables such as mortgage interest rates, currency rates, employment level, housing supply, economic growth, demography, and interest rates.

According to the results, the housing price index and new home prices are components of the real effective exchange rate. The type or number of factors affecting the index is higher. The first result determined in this context is that when the exchange rate and house prices in Turkey are evaluated, it is seen that the exchange rate is independent, and house price is dependent. It would be correct to treat it as a variable. Another point to note here is that the real effective exchange rate is reversed according to the normal exchange rate logic when making interpretations.

In other words, an increase in the real effective exchange rate causes the foreign currency to lose value, not appreciate. Within the scope of this information, it primarily affects exchange rates from the housing price index, as both the new and general housing price index decrease, that is, as the housing prices decrease. It causes a decreasing effect on exchange rates (by having a positive effect on the real effective exchange rate). There may be some reasons for the situation. For example, a decrease in prices has an effect on a decrease in supply.

In this study, the increasing inflation in Turkey also brought about an increase in housing prices after a certain period of time. According to the findings of this study, a continuous rise in inflation led to an increase in housing prices all over the period from 2010 to 2019, sometimes in the short term and sometimes in the long run. Increases in inflation relatively make for high real interest rates, which don't let buyers invest in housing prices; that's how it shows a negative relationship. Secondly, from 2013 to 2017 there was a high-density relation between exchange rate and the housing price index, also between inflation and exchange rate, which is because the Turkish central bank abruptly increased interest rates in an effort to support the lira in 2014. Lastly, from 2018 to 2019 you can see a perfect relationship between both variable exchange rate and inflation, as well as the housing price index, which is very simple: when the exchange rate rises, loans increase, which creates hype in inflation, and your currency depreciates, which directly affects the price of houses. As a result, there will be less need for imported materials needed to produce dwellings, which will reduce the need for foreign currency. Imports of capital goods and consumer products are causally related (Eryüzlü & Ekici, 2020).

The economic landscape of Turkey has some noteworthy linkages, according to the data analysis from 2010 to 2019. Notably, both in the short and long terms, there is a distinct and favorable association between the house price index and inflation. The arrow alignment makes this clear, showing that changes in inflation and home values are correlated. The relationship between the exchange rate and home prices is also significant, with a clear impact shown from 2013 to 2017 when the central bank intervened. Furthermore, because Turkey depends heavily on imports for a wide range of products and services, the currency rate has a substantial impact on inflation. These results highlight the interdependence of housing prices, inflation, and exchange rates in the dynamics of Turkey's economy over the given time period (Shafiee & Topal, 2010).

Considering that Turkey is preferred by investors from all over the world, especially Gulf countries and Southwest Asian countries, there are also many immigrants residing in Turkey from Syria and Afghanistan. It is thought that this will contribute to current studies, and prospective investors and individuals who are considering buying an investment property in the region should think about the rising inflation and also about lira depreciation.

This study can offer insights into the relationship between housing prices and different economic aspects by performing empirical research on the link between HPI and economic indicators in Turkey. These insights can help policymakers and stakeholders make wise decisions. For example, governments can utilize the data to create regulations that support affordable housing and long-term economic expansion. The findings can also be used by investors to help them decide whether to engage in the Turkish real estate industry. Overall, empirical studies can aid in achieving the goal of the research, which is to examine the relationship between HPI and economic indicators in Turkey, by

offering evidence-based perceptions of how housing prices and different economic variables are related.

This study's limitations are comparable to those of other research studies. The analysis may be constrained, for example, by the quantity and caliber of data on economic factors like interest rates, geopolitical risk, and GDP. Additionally, the COVID-19 pandemic prevented the study from using data up through 2020, which may restrict the generalizability of the results. Future research on the relationship between HPI and economic indicators in Turkey should therefore carefully address these constraints and offer adequate justification for the reliability and validity of the results.

Future study projects should include a larger dataset that includes more significant elements like interest rates, building costs, and other relevant macroeconomic variables. Important events like the COVID-19 pandemic and the Russo-Ukrainian war, which could introduce new dynamics into Turkey's House Price Index (HPI) and its association with economic indicators, must also be taken into account. Researchers can develop a more thorough and accurate understanding of the complex relationships that underlie Turkey's HPI and its economic environment by taking these factors into account.

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