

International Housing and Rental Trends:
An In-Depth Exploration with Emphasis on Türkiye

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Introduction:

The objective of this project is to conduct a comprehensive analysis of housing and renting prices in the world and putting special attention to Türkiye, utilizing multivariate data obtained from OECD Statistical Database. The dataset comprises various measures such as real house price indices, price to income ratio, rent prices, and price to rent ratio, with observations varying based on the country ranging from 1994 and 2023. It is also important to keep in mind that this data is presented on annual basis, in index form with 2015 set as the base year. The indices are seasonally adjusted, not calendar adjusted ensuring consistency and reliability in the analysis.

Objectives:

1. Exploratory Data Analysis: The primary goal is to conduct exploratory data analysis to gain insights into the trends and patterns of housing and renting prices in Türkiye over time.
2. Comparison with the United States: Additionally, we aim to compare the housing and renting prices in Türkiye with those in the United States, where applicable, to identify similarities, differences, and potential influencing factors.
3. Temporal Analysis: Another objective is to perform a temporal analysis to understand how housing and renting prices have changed over the years in Türkiye and to identify any significant trends or fluctuations.

Significance of the Dataset:

The chosen dataset holds significant relevance within the broader context of housing market dynamics and socioeconomic trends in Türkiye. With housing being a fundamental aspect of individuals' lives and a critical indicator of economic stability and development, analyzing housing and renting prices can provide valuable insights into various aspects, including affordability, market trends, and policy implications.

Understanding the dynamics of housing and renting prices in Türkiye is crucial for policymakers, researchers, and stakeholders involved in urban planning, real estate development, and social welfare initiatives. By shedding light on the patterns of housing prices, this analysis can

contribute to informed decision-making processes and facilitate the development of targeted interventions to address housing challenges and promote sustainable development.

Data Manipulation Tasks

1. Loading the Data:

- We began by loading the dataset from the directory, which was provided in CSV format. This step involved reading the file into our Python environment using Pandas library.

2. Displaying the First 10 Rows and All Columns:

- After loading the dataset, we displayed the first 10 rows and all columns to get a quick overview of the data to quickly examine the structure of the dataset to identify any potential issues or anomalies.

3. Checking for Missing Values:

- We then checked for missing values in the dataset, three columns named: “Time period”, “Observation value”, and “Base period” had no values so we dropped them.

4. Removing Unnecessary Columns:

- We removed unnecessary columns from the dataset that were not relevant to our analysis including: STRUCTURE, STRUCTURE_ID, STRUCTURE_NAME, ACTION, REF_AREA, FREQ, Frequency of observation, MEASURE, UNIT_MEASURE, Unit of measure, Time period, Observation value, OBS_STATUS, Observation status, UNIT_MULT, Unit multiplier, ADJUSTMENT, Adjustment, DECIMALS, Decimals, BASE_PER, Base period
- I also removed all the observations related to our occupied territories that was called “Israel”

5. Determining the Dataset Size:

- We determined the number of rows and columns in the cleaned dataset: 3503 rows × 5 columns.

6. Adding New Columns:

- To enhance our analysis, we added a new column called “PCT_CHANGE” to calculate the year-over-year percentage change in housing prices for each country in the dataset.

7. Filtering and Sorting Tasks:

- We performed filtering and sorting tasks on the dataset selecting Türkiye from the list of all countries and sorting by years in a descendent order.

8. Group By Analysis:

- Lastly, we conducted group by analysis, which involved grouping the data based on certain criteria (e.g., country) and then applying a function (e.g., sum, average) to each group. This helped us aggregate the data and derive insights from grouped observations.

| Measure | Price to rent ratio | Real house price indices | Rent prices |
|---------|---------------------|--------------------------|-------------|
| mean | 124.997616 | 106.993237 | 114.595549 |
| median | 101.900117 | 99.465710 | 89.920619 |
| min | 78.146231 | 83.222268 | 34.663767 |
| max | 299.827179 | 194.509416 | 405.044405 |

- Minimum Years:
 - Price to rent ratio: 2010
 - Real house price indices: 2011
 - Rent prices: 2004
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- Maximum Years:
 - Price to rent ratio: 2023
 - Real house price indices: 2023
 - Rent prices: 2023

Data Visualization and Analysis

Through a series of insightful data visualizations, this analysis aims to shed light on the intricate relationships and trends that shape the housing landscape across various countries and regions. By examining key metrics like housing prices, rents, and price-to-income ratios, we uncover insights that shed light on the state of housing affordability especially in Türkiye. The goal is to unveil meaningful patterns and relationships within all this housing data through visualizations. Clearly communicating these insights allows stakeholders to make better decisions and work towards improving housing accessibility for all. We begin by identifying the top ten countries that experienced the highest cumulative change in housing prices over the past decade using a bar plot. Then we examine the distribution of rent prices using a histogram. This visualization provides a clear picture of the frequency and spread of rent prices across all countries, helping us understand the overall rental market landscape.

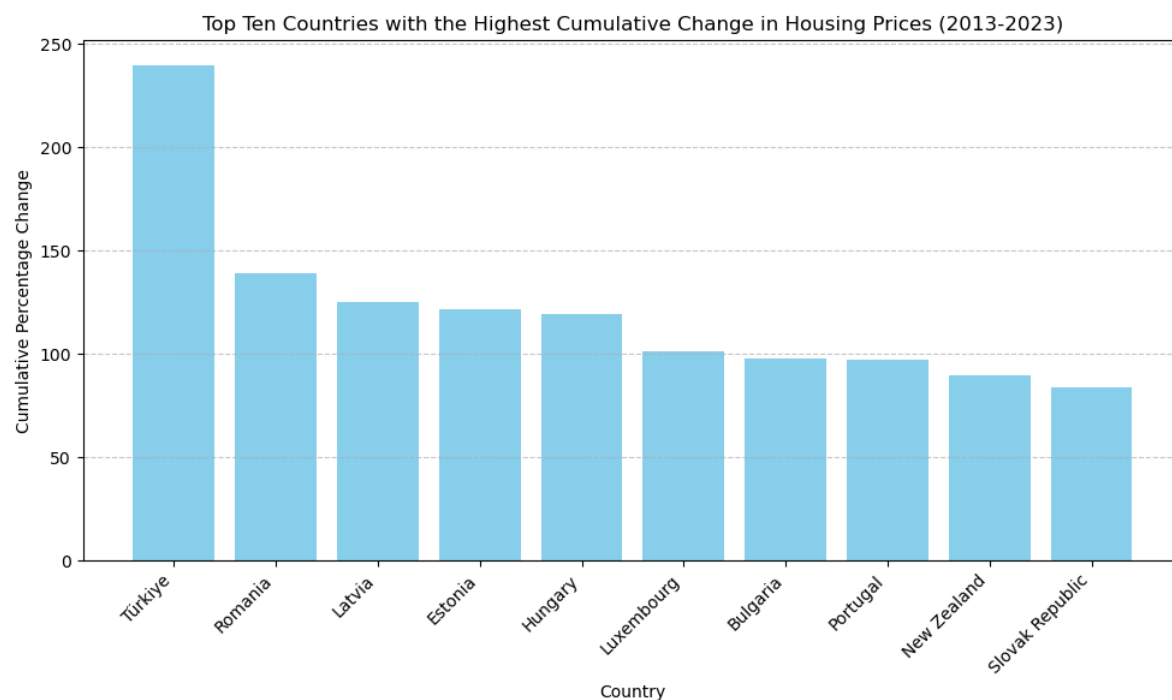


Figure 1: Top 10 Countries with Highest Cumulative Housing Price Change

Türkiye stands out with by far the largest cumulative price growth over that period at around 240%, followed by Romania and Latvia and other countries that experienced substantial housing price rises during that decade. This suggests many markets faced overheating and affordability pressures.



Figure 2: Distribution of Rent Prices

The histogram visually represents the distribution of rent price indices across all countries in a given year, with 2015 set as the base of 100. We see a curve bell shape where most rent indices cluster in the 80-150 range, indicating relatively moderate increase from 2015 levels. However, the long tail extending up to indices around 250 or even 400 highlights some markets -Türkiye which we will dive deeper into later- experienced extreme rent inflation over this period.

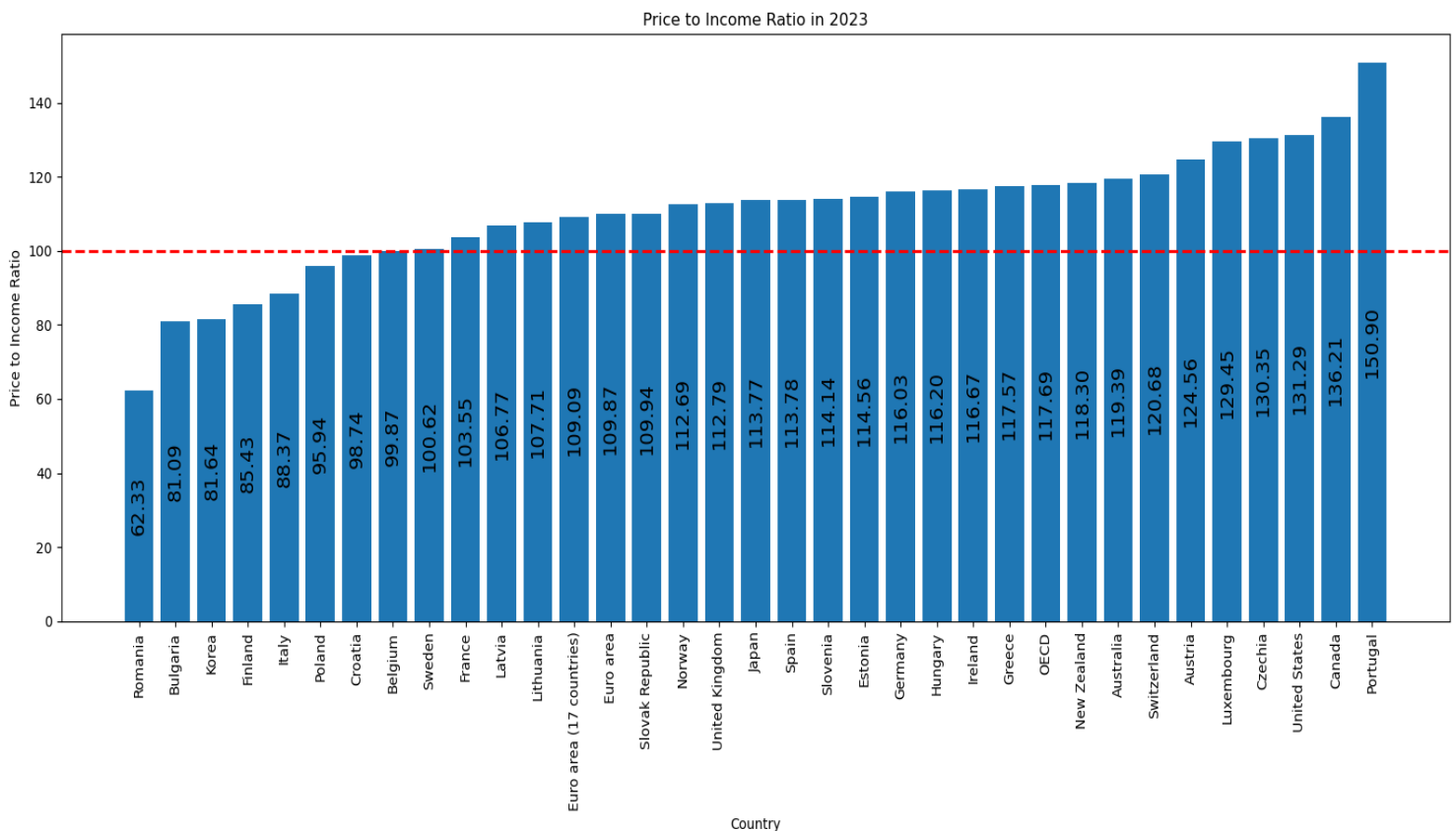


Figure 3: Price-to-Income Ratio in 2023

Looking at a global level, we examine the price-to-income ratio for housing across countries in 2023 compared to 2015. This ratio indicates if housing costs are outpacing what people earn, making it harder to afford, high ratio signals homes are very expensive relative to incomes that year. Most countries fell somewhere between 80-120, suggesting their price-to-income ratios in 2023 were within 20% above or below their 2015 benchmarks.

For Portugal, the indexed value is 150.90, meaning their 2023 price-to-income ratio was around 50% higher than the 2015 level. On the other hand, Romania had an indexed value of 62.33, indicating their 2023 price-to-income ratio was only around 62% of the 2015 base level. So while

Portugal experienced a substantial increase of around 50% in this ratio from 2015 to 2023, making homes more expensive relative to incomes, Romania actually saw an improvement in affordability, with the ratio declining by nearly 40% over that period.

Based on this information, we contrast Romania and Portugal as two extreme examples. Charting their real house price trends over time in figure 4 illustrates how their housing markets diverged to reach those opposing affordability levels.

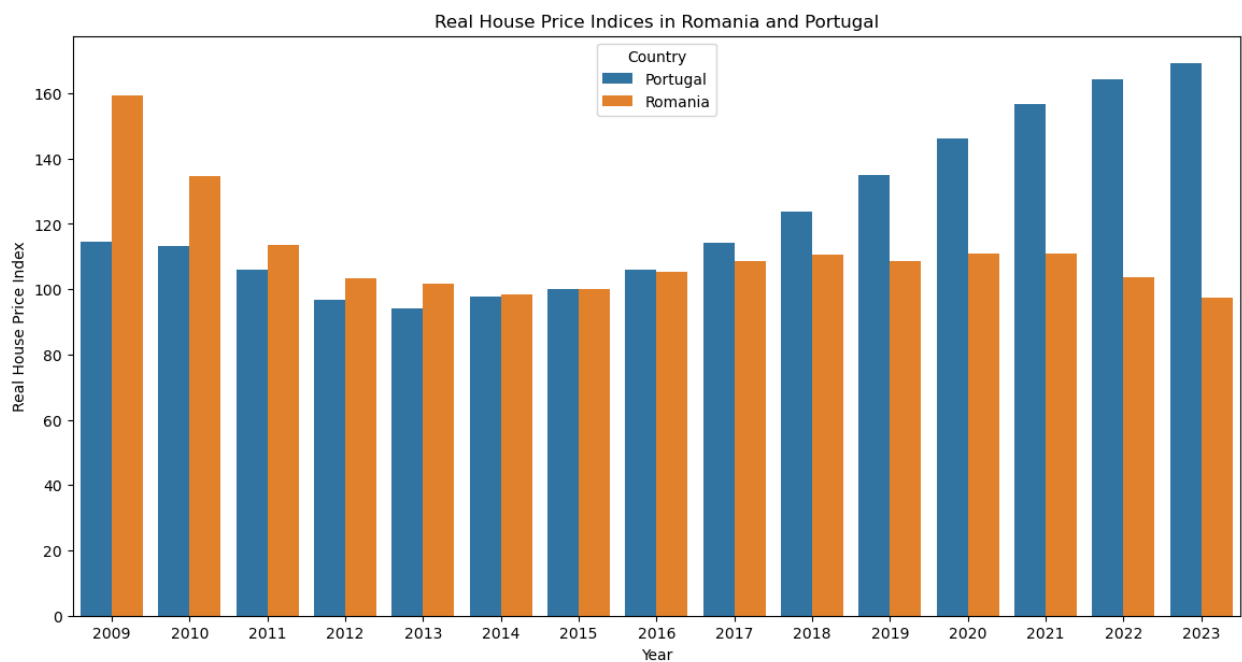


Figure 4: Real house price indices in Romania and Portugal

Next, we focus on Türkiye as we explore how different housing measures have changed over the years. To provide a holistic view, A line chart and an area plot was created to track three key housing measures over time; the price-to-rent ratio, real house price index, and rent prices. Seeing how these move together and the aggregate changes over time lets us understand the dynamics in Türkiye's housing sector more deeply by identifying long-term trends.

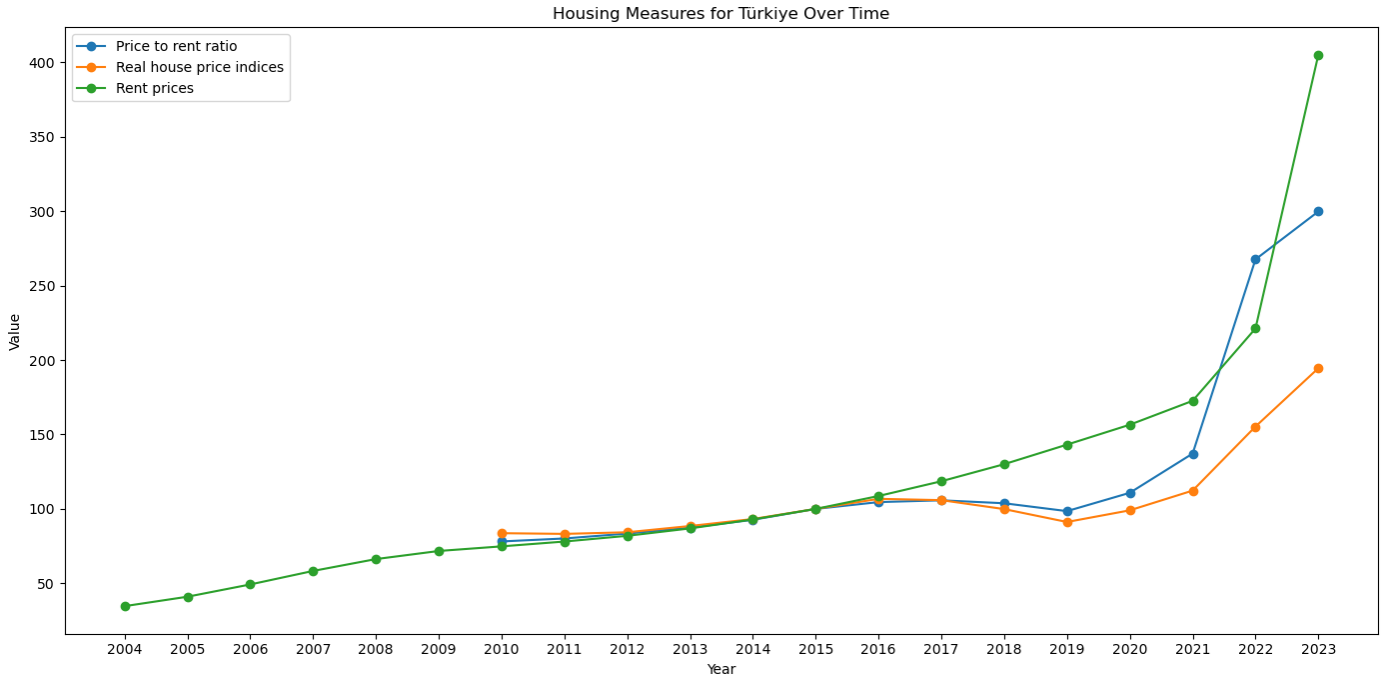


Figure 5: Housing Measures for Türkiye Over Time

Based on the chart above, all three measures – the price-to-rent ratio, real house price index, and rent prices – experienced a steady upward trend over the years. However, after 2016, the prices showed higher fluctuations. From 2021 onward, a significant spike in prices was observed, especially rent prices. The area chart in figure 6 visualizes the cumulative increases of the same three housing measures over time in Türkiye. While rent increases appear modest initially, we see they compounded significantly over the years in a higher rate compared to the other two measures.

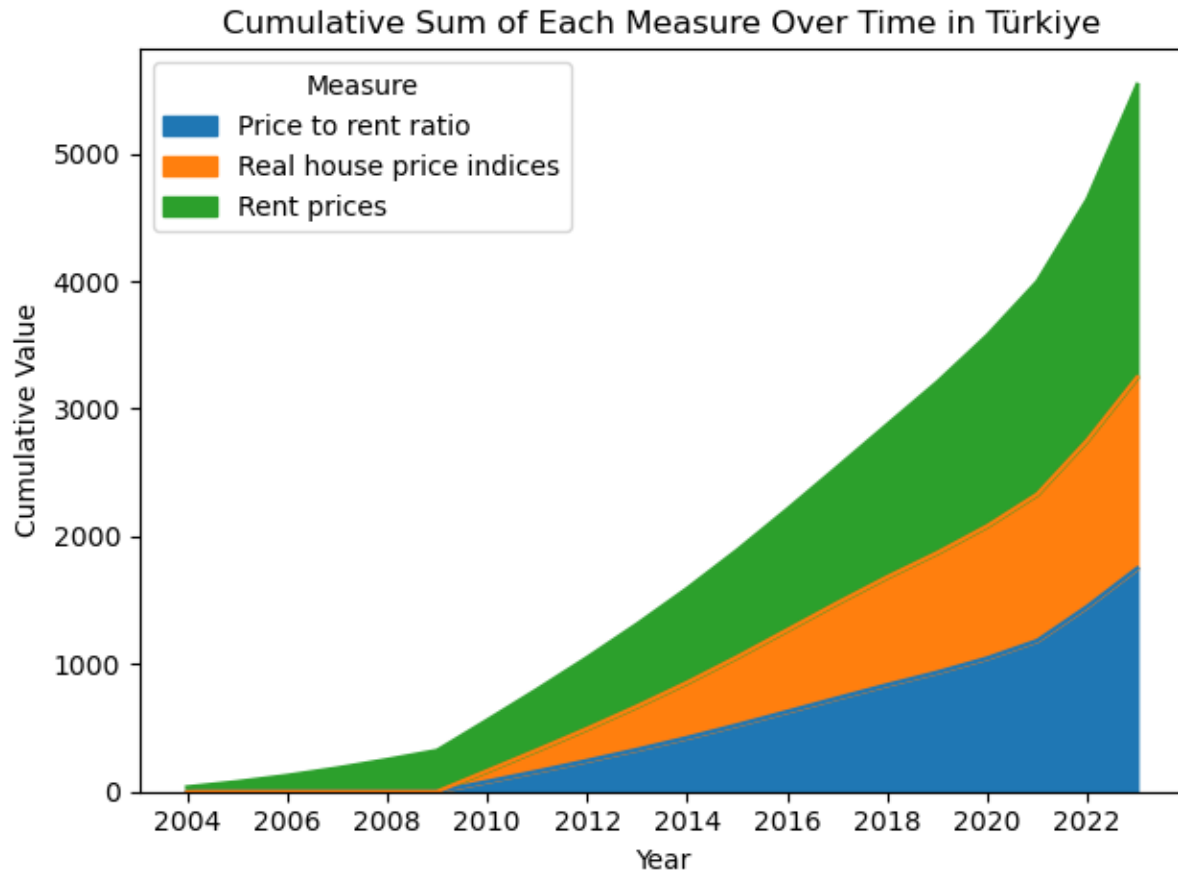


Figure 6: Cumulative Sum of Housing Measures for Türkiye

We then compare the real house price indices and rent prices of Türkiye with the Euro Area using a line plot. These help us see how Türkiye's housing market compares with a larger regional market. This side-by-side view highlights similarities and differences between the two regions' housing markets over the years. As depicted in figure 7 below, comparing real house price index trends, we see Türkiye started below the Euro area level in 2010 until 2016 when it crossed over before declining again for the next three years. However, its index accelerated upward rapidly after 2020 exceeding the Euro area index by far in 2023. The Euro area saw a more gradual, stable rise throughout the period. This suggests Türkiye's housing market experienced more overheating than the broader Euro region.

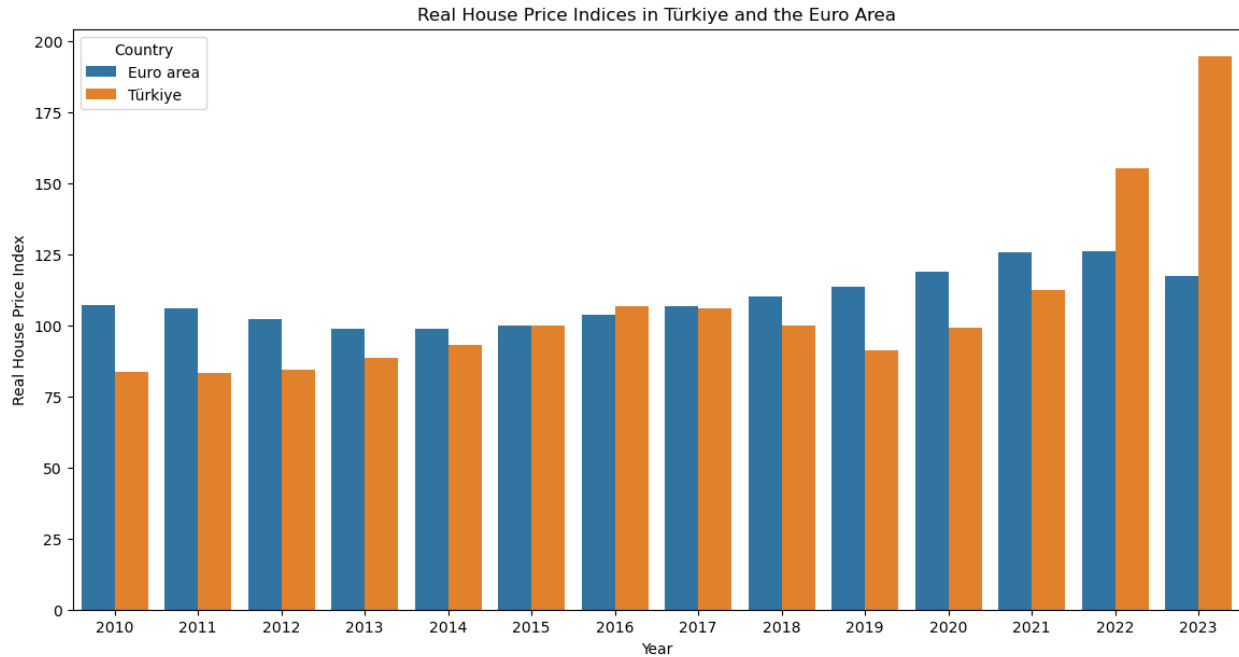


Figure 7: Real House Prices - Türkiye vs Euro Area

For rent prices, the trajectories between Türkiye and the Euro area showed even a higher contrast. While rent prices showed a slight steady increase over the years in the Euro area, it was increasing in a much higher rate in Türkiye compared to the base year 2015 especially after.

Starting from 2015, the rent prices in Türkiye began to rise sharply, surpassing the base year index value of 100 and outpacing the rent prices in the Euro Area. With the index reaching nearly 400 by 2023, rent prices in Türkiye have increased significantly, almost four times higher than the 2015 levels.

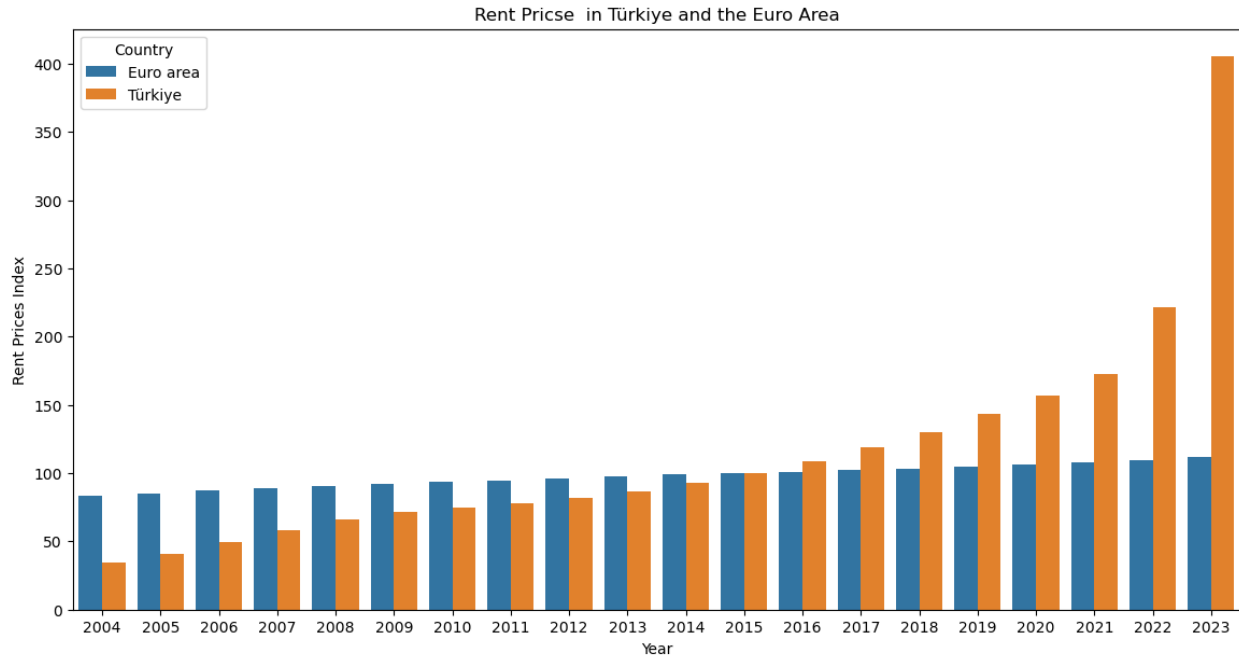


Figure 8: Rent Prices - Türkiye vs Euro Area

Lastly, we can see where the Real House Price Indices in Türkiye either increased or decreased compared to the previous year in the pie chart figure 9. The larger slice, indicates that in approximately 69% of the years, the Real House Price Indices experienced an increase compared to the previous year while only 30.8% decreased. This visual representation highlights that the Real House Price Indices in Türkiye exhibited an upward trend, with increases occurring more frequently than decreases.

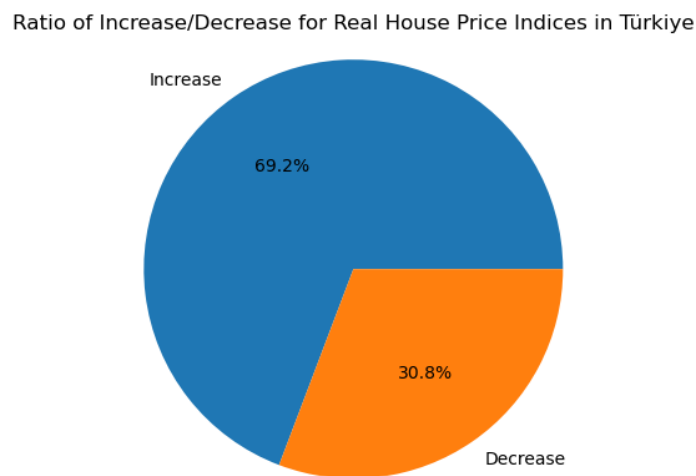


Figure 9: Ratio of Increase/Decrease for Real House Indices in Türkiye