

# An Empirical Investigation of the Portuguese Housing Prices (2004-18)

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**Abstract:** This article presents an integrated macro view of the Portuguese housing market with macroeconomic indicators. Firstly, it compares the housing market and several macroeconomic indicators from 2004 to 2018. Then, the dynamic analysis of the housing prices by different regions in Portugal and its typology included. Also, the article is complemented with the regression analysis to identify the relationship between the house prices and macroeconomic indicators.

Results show that the current negative interest rates are increasing the demand for houses and the housing prices. The housing stock in Portugal is mostly fixed but may experience limited growth as the rebuild program and new constructions. GDP and the housing prices have a positive correlation. Houses in Algarve and Lisbon are markedly more expensive than in the interior. From the regression analysis, the unemployment rate is the closest correlated variable.

**Keywords:** Housing Prices, Housing market, Real estate, Portugal.

## INTRODUCTION

The Portuguese housing market is booming, and the real estate market recovered and kept making new records on the housing prices. By noticing that, the phenomenon in the current Portuguese housing market drives us to the theme of this research.

Since the residential property is the most critical component of households' wealth, real estate market prices trends affected households' consumption and investment decisions via wealth effects (Lourenço & Rodrigues, 2015). The importance of asset price is because it affects economic activity (Helbling & Terrones, 2003). Moreover, there are vast studies on the financial crisis happened in 2008 to proof how large fraction of real estate to the overall capital in the economy (Covitz, *et al.*, 2013; Mishkin, 2011; Baily & Elliott, 2009; Agnello, Castro, & Sousa, 2018). Giving the importance of the housing market, the scholars made significant efforts on estimating the housing market and even gave out the predictions to the future market. The housing market plays a crucial component in a country's economy. Oikarinen (2014) stated that the price difference between regions in the housing market could create diversification benefits not only for a housing investor but the whole nation as well. This statement reflects the housing prices inequality between the Algarve and the interior of mainland Portugal regions like the Alentejo and the Center.

With the recent increase on housing prices in Portugal, it is of relevance to investigate the current housing market of Portugal within countries' economic context. Therefore, we aim to respond the following research questions: What is the current performance of the housing market in Portugal? How the macroeconomic indicators and the housing market affect each other? What is the relationship between the indicators and the housing prices?

To answer the questions above, we developed research on the related events which had impacts on the Portuguese housing market. Then by collecting the macroeconomic dataset and real housing prices from OECD and Instituto Nacional de Estatística (INE-Statistics Portugal), comparisons in graphs and tables were presented to illustrate the situation of the housing prices and the economy. Besides, data analysis methodology was adopted to analyze the relationships further.

The article divided as follows. The next section provides a review of the literature including: macroeconomics and housing market and its predictors. The methodology section explains the choices of relevant macroeconomic indicators and data sources. The section initiates with the evaluation methods in housing prices and our research strategy. The results are presented and discussed in the following sections. Finally, the conclusion and limitations and future research are presented.

## LITERATURE REVIEW

### Macroeconomics, Housing Market and its Determinations

The housing industry is an essential segment of the whole country's economy. Take the golden visa

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**JEL Classification:** R30, R31.

program as an example, its investment is focused on real estate. Another significant event is the 2008 financial crisis in the United States, which started from the housing market and spread to the other industry of the United States. Indeed, the real estate market is an indicator of its national economies. Because of the interconnection between the housing market and macroeconomics, we searched reviews and studies to identify the indicators.

Several researchers analyzed the link between macroeconomics and the housing market. An early study wrote by Fisher about the debt-deflation theory of Great depressions appeared in 1933. Fisher related the macroeconomics and housing market (Fisher, 1933). Actually, in the early years, conventional housing economics and urban economics research virtually ignored interactions between housing markets and macroeconomic variables (Leung, 2004). Early stage of papers on macroeconomic variables used as exogenous control variables: inflation, GDP, and unemployment (Henderson & Thisse, 2004; Cheshire & Mills, 1999; Mills, 1987; Nijkamp, 1986).

On the contrary, researchers in finance area had more efforts to link macroeconomics to the housing market. They considered macroeconomics can rationally explain the housing market phenomenon. In the financial book, it connected the macroeconomics and housing literature (Constantinides, *et al.*, 2003).

The investigation on the macroeconomics and real estate housing market is growing, focusing on linking the macro indicators with the housing economy (Álvarez & Cabrero, 2010; Adams & Füss, 2010; Goodhart & Hofmann, 2008; Andrews, 2010; Greiber & Setzer, 2007; Lee, 2009).

According to Leung (2004), the significant fluctuations in housing prices imply significant variations in wealth, and thus potentially significant household wealth effects. Housing prices are leading indicators to illustrate the real estate housing market.

In measuring the value of the domestic economic activity, GDP is considered the best measure of how well an economy is performing (Mankiw, 2016a). Additionally, an economic boom always comes along with the increase of national income which also drags the demand for housing. As the inflow of foreign investment in Portugal, a considerable income grows. Therefore, the GDP and household disposable income among Portuguese should be included in the analysis.

Unemployment rate should also be considered since it influences the volatility of the national income. Previous research compared the unemployment rate in Spain and Switzerland to introduce the way how to put Europe citizens back to work by reducing home ownership (Oswald, 1999).

Regarding the homeownership, it is necessary to mention the immigration and housing problems. The model of the housing market was set up by two parts. First, the demand for the existing houses determines the equilibrium housing prices. Then, the housing prices determine the flow of residential investment (Mankiw, 2016b). Due to the golden visa and tax benefits program, foreign investment flew in and new immigrants, which drives the demand for housing.

Mankiw discussed the supply and demand of the housing market. It announced that the residential investment depends on the relative price of housing, in turn, the relative of the house depends on the demand for housing (2016). The importance of interest rates is to stimulate the demand on house market, which is widely considered and agreed within many articles (Sutton, *et al.*, 2017; Tsatsaronis & Zhu, 2004; Kuttner & Shim, 2016; Andrews, 2010). The main reason for the importance of interest rates is because the mortgages which people used to buy houses.

Since the real estate market has a strong connection to the national economies, another factor is the monetary policy of the country (Greiber & Setzer, 2007). The monetary system is essential in a country scale because it contains the regulation in the trade market, tax policy, the credit availability and other political elements.

Considering the demand-supply model, the supply, housing stock in Portugal is also critical to the housing market. The number of new houses and its growth rate, the reconstruction from the city rebuild program. Along with the residential investment from the government and individuals also determined the housing supply.

### **Housing Market Studies in Portugal**

Back to the housing market research in Portugal, there are published studies of the Portuguese real estate market. In 2009, Matos (2009) provided insights by analyzing the housing dynamic from 1991 to 2001. The rise in house number and quality have been improved by the government's housing programs, but there were still significant housing deficiencies. Meanwhile, during this period, there was a change in

the housing occupancy and ownership by the growth of seasonal housing stock (Matos, 2009).

In another study (Matos, 2012), the housing market in Portugal compared with the European Union. The characteristic of owner-occupied housing and the changing attitude of the housing market drove to a rise in the importance of location, the quality of materials and spaces, environmental sustainability, and architectural and urban innovation.

Another comparison study in house price (Lourenço & Rodrigues, 2014) is between Portugal and Spain. The residential investment had been slowed down since the end of the 1990's in Portugal, and the models showed the real disposable income, labour and real interest rates are relevant in determining the dynamics of house prices.

In 2017, after the debt crisis in Portugal, Lourenço and Rodrigues (2017) analyzed the driving factors of house price movements from residential investment (GFCF), GDP, labor market, interest rates, housing loans, foreign direct investment in housing. From their study, interest rates and economic growth had highlighted for the impact on house price growth.

Tavares, *et al.* (2014) analyzed the average house prices by its locations and typologies, and they also considered the housing market with several macroeconomic indicators, which were GDP, interest rates, construction confidence index, unemployment etc. The low-interest rates after entering the Eurozone were the cause of the increasing mortgage loans at that time. They concluded the fall of new houses made by the worrying construction confidence index and consumer confidence index.

More recently, they compared two types of the apartment (two-bedroom and one-bedroom) in Lisbon and Porto (Tavares, *et al.*, 2016). With the same methodology, hedonic pricing model Ferreira and Jalali (2015), focused on the home sales determinants, and used fuzzy cognitive mapping to identify its fundamental determinants. House prices and housing attributes were considered to have impacts on the home sales.

Also, Pinto (2012) investigated the patterns of housing demand under uncertainty in Lisbon, finding that the demand for rental accommodation grows with an uncertain and insecure economic and financial situation together with the real estate crisis. She also discussed the constraints of the real estate market, and

the new changed in the cultural and social context which influenced people's buy/rent decision.

## METHODOLOGY

### Methodology in Housing Evaluation

To give a proper assessment of a real estate price is difficult because it required the information from players in the different field of the housing market (Pagourtzi *et al.*, 2003). The market players include real estate agents, property developers, brokers, appraisers, mortgage lenders, investors, and other specialists and consultants. Tavares, Moreira, and Pereira (2012a), they stated in their study that the information asymmetry might cause the distortions of housing prices.

In general, the role of an accurate property value estimate should reflect the market culture and conditions at the time of the valuation (Pagourtzi *et al.* 2003). After viewing the methods of valuing the housing prices, we found two directions of evaluating the housing prices. Pagourtzi *et al.* (2003) gave a completed overview of those methods. They concluded the traditional valuation methods were: comparative, investment/income, profit, development/residual, the contractor's/cost, multiple regression, and stepwise regression. Advanced valuation methods are: fuzzy logic, artificial neural networks, hedonic pricing, and autoregressive integrated moving average.

The recent trend in the business appraisal was using the scientific methodology which relies on the foundation of quantitative data or based on the geographical approaches (Adair & Hutchison, 2005; Olmo, 2007). In the business evaluation, the sales comparative method is commonly used. Another important technique is the income method, focused on investment and profits aspects of the house value (Trojanek, 2010).

In terms of advanced methods, we found that there is a large number of housing price estimations based on hedonic pricing (Butler, 1980; Linneman, 1980; Grether & Mieszkowski, 1980; Straszheim, 1973). According to a study by Engle, *et al.* (1984), the hedonic indices are well-studied procedures and introduced into housing economics by Ridker and Henning (1967). This method requires a value of particular environmental attributes, such as the characteristics of the property, location, and environment. The regression methods classification of Pagourtzi *et al.* (2003) considers multiple regression and stepwise regression.

## Relevant Macroeconomics Indicators and Data Sources

Housing prices are affected by various factors, from interest rates, economic growth to its location and house attributes. All the data came from the official database websites, which included OECD database and INE. Based on the Literature review, we sorted the relevant macroeconomics indicators in nine groups, which are: GDP, Unemployment, Inflation & CPI, Housing market, Interest rate, Household disposable income, Investment, Immigration, and Housing stock. The indicators sources were: Gross domestic product (GDP). We used quarterly GDP from OECD (Q1 2004-Q2 2018); Unemployment. We collected the data from OECD including the unemployment rate and the youth unemployment rate. The data reference period is also from Q1 2004-Q2 2018; Inflation and consumer price index (CPI). The CPI dataset (Q1 2004-Q2 2018) came from OECD. We also used the harmonized index of consumer prices dataset from INE. The index is divided by purpose. Based on the personal consumption purpose, we chose the total consumption index and the consumption index on housing, water, electricity, gas and other fuels. They are the monthly dataset, and the term we used is from Jan-2004 – Aug-2018; Housing market. We extracted Real house price from OECD, namely quarterly real house price and yearly real house price in Q1 2004-Q2 2018 and 2004-2017 respectively. For geographic analysis we collected data from INE, the dataset is from September-2008 to July-2018. Another dataset from INE is the yearly figures from 2004-2017 of the amount value in Purchase and sale contracts; Interest rates. We used quarterly short and long-term interest rates from OECD (Q1-2004-Q2-2018). To compare with mortgage number (Monthly), we also downloaded the monthly short-term interest rates from OECD, but for this dataset, the period is from Jan-2007 to Aug-2018. Rodrigues and Louren (2017) pointed out that “Most economic fundamentals have been affected by credit shortage and failure of many mortgage holders to meet their payments.” Considering the housing loan and mortgage, we used Interest rate on housing loan by the financial purpose of housing acquisition and Loan agreements with conventional mortgage number from INE. The period is the same as the monthly short-term interest rate, which is also from Jan-2007 to Aug-2018; Household disposable income. The dataset we used is household disposable income (AGR) from OECD, 2004-17. The indicator measures the net in annual growth rates and gross adjusted in USD per capita at current prices and

PPPs (OECD, 2018); Investment. The indicator of investment in OECD is Investment (GFCF) from 2004 to 2017. The indicator is in million USD at current prices and PPPs; Immigration. We adopted the number of permanent immigrants from INE. The data was only available from 2008-17. Housing stock. We collected the licensed buildings number in the period 1995-2017. To compare the buildings number in new constructions, we collected the yearly dataset of Completed dwellings number in new structures for family housing (1995-2017). In addition, we compare the new houses and the refurbished houses to find out more information about the housing stock situation in Portugal. Thus, we used the yearly indicators of Completed dwellings number and Proportion of total reconstructed area (%). The time of these two datasets is also from 1995-2017.

## Research Strategy

The research strategy is based on three main approaches: an exploration of theoretical rationale on the reviews in Portugal housing market and the other researcher’s experimental works in finding the relevant macroeconomic indicators with housing prices. And then, we collected the data of the relevant indicators. To further analyze the data, we extracted the information from the data by using graphs and regression methods. First, we graphed the dataset by combining different indicators and profound the info from them. Then, we conducted a statistical analysis to model the housing prices as the dependent variable and the relevant macroeconomic metrics as explanatory variables in multiple regression analysis.

Therefore, in this section, we presented our research strategy in statistical analysis, which includes Analysis of Variance (ANOVA), Correlation Analysis, Simple linear regression, Multiple Linear Regression Model, Ordinary Least Squares Method (OLS), and the Durbin-Watson test. In the regression analysis, the dataset comprises quarterly time series from Q1-2004 to Q2-2018 in Portugal. Data on real housing price index is the dependent variable, and we extracted: GDP, Unemployment rate, Short-term interest rate, Inflation (CPI), Completed dwellings number as explanatory variables.

## RESULTS

### Economic Indicators Related to the Housing Market

Before the results of the empirical analysis, it is useful to describe the evaluation in a macroeconomic



**Figure 1:** GDP and Housing price index Portugal.  
 Source: Authors' elaboration based on data from OECD (2018).

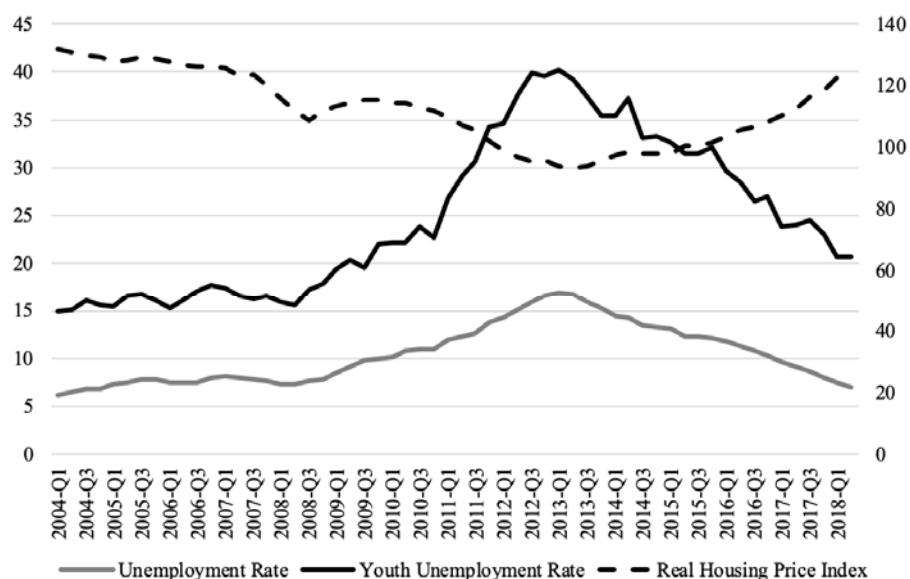
context. Here we analyzed ten charts referring to different categories of economic indicators: GDP, Housing market, Unemployment, Interest rates, Inflation & CPI, Household disposable income, Investment, Immigration, and Housing stock.

During the period from Q1-2004 to Q2-2018, Portugal's GDP percentage fluctuated from 1.15% to minus 2.30% (Figure 1). The lowest point appeared in Q1-2009 with the debt crisis spreading through Eurozone. GDP recovered to 0.13% in Q2-2009. A year later, GDP decreased again and remained negative until 2013. Considering 2015, housing prices index had some correlation with GDP trend. It had a slow decrease until the valley period (Q3-2008). Then it had a smooth plateau until 2010. From then on, the

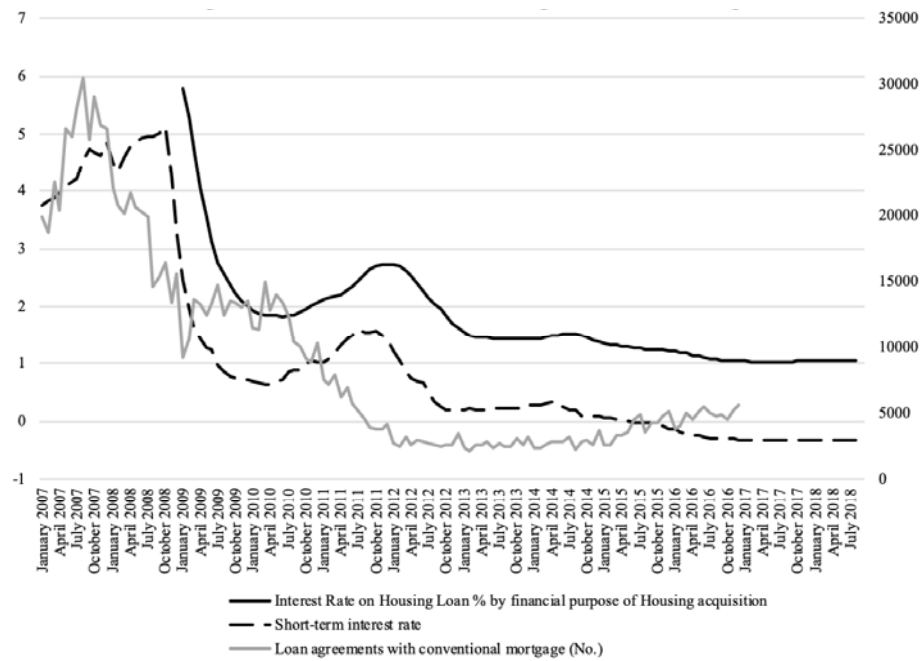
price went downward until the end of 2013, and since then, it started to increase slowly.

Figure 2 shows an inverse relationship between housing prices and unemployment (Total and Youth). The youth unemployment rate started to increase at the end of 2008 until 2013. The overall unemployment rate also started to increase at the end of 2008. It took around a decade (2008-2018) for it to return to the long-term unemployment rate (approximately 5%).

Regarding the level of interest rates (Figure 3), data wasn't available for the variable "Interest Rate on Housing Loan % by the financial purpose of Housing acquisition" between 2007 and 2008. But from the rest of the data, we ascertained that the interest rates on



**Figure 2:** Unemployment and Housing price index in Portugal.  
 Source: Authors' elaboration based on data from OECD (2018).



**Figure 3:** Interest rates and Loan agreements in Portugal.

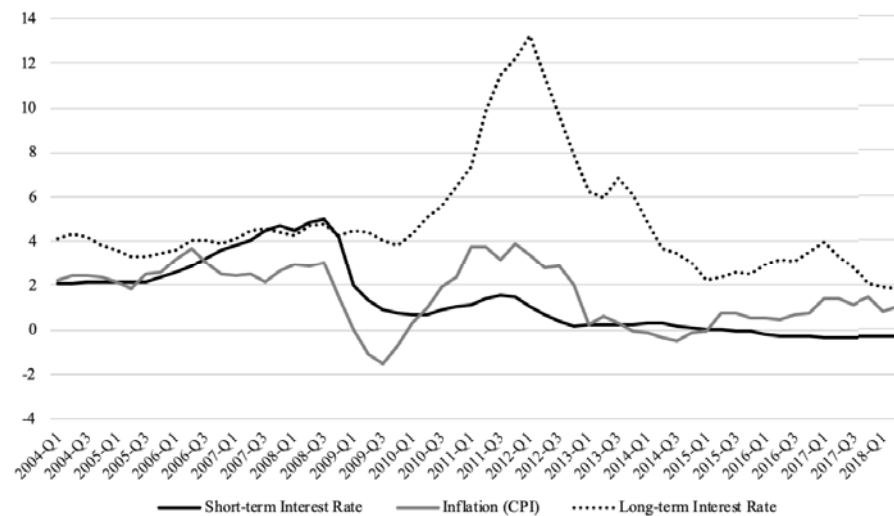
Source: Authors’ elaboration based on data from OECD and INE (2018).

housing loan and the short-term interest rate changed in tandem. But, the interest rate for housing loans has a time delay vis-a-vis the short-term interest rate. In that period, we use the short-term interest rate as a proxy on “Interest rate on housing loan %” in the later regression analysis.

Interest rates fell sharply on 2009. There was a plateau period from 2012-14. In 2015 the short-term interest rate reached a negative value the end of the analyzed period.

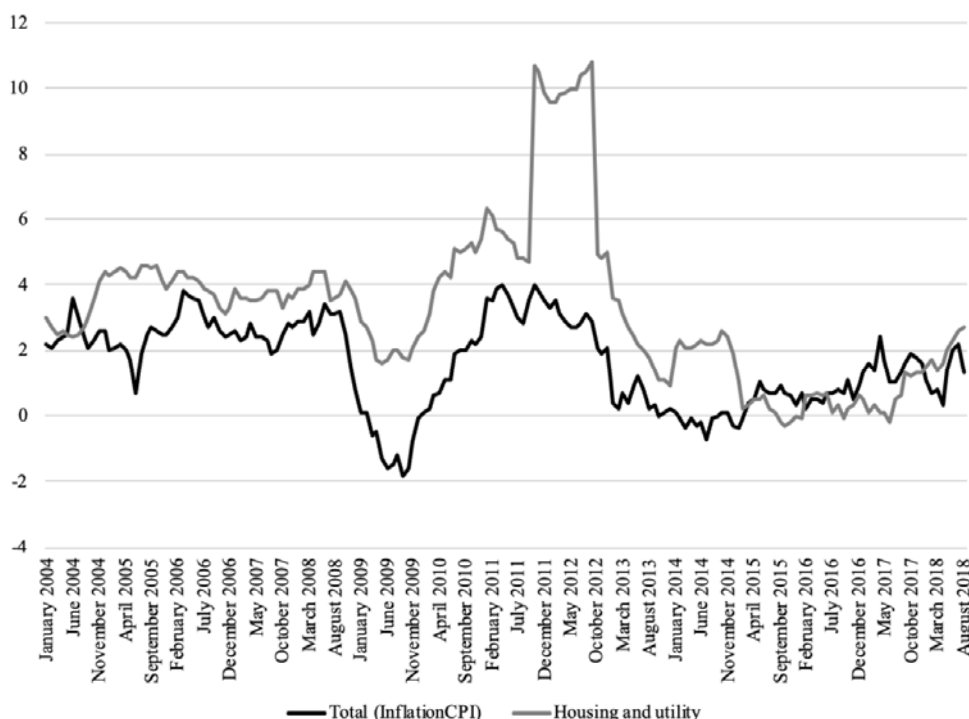
Loan agreement number (Figure 3) grew sharply at the beginning of 2007 and then fell until 2009. It stabilized around 13,000 mortgages/month on 2009 and 2010. At the end of 2011, when the interest rates reached another peak, the loan agreements were below 5,000/month.

In Figure 4, the long-term interest rate increased dramatically from Q4-2009. In 2010, the long-term interest rate rose while the short-term interest rate kept low. Also, the inflation was at the lowest point in 2010. As the increase of the long-term interest rate, the



**Figure 4:** Interest rates VS. inflation (CPI) in Portugal.

Source: Authors’ elaboration based on data from OECD (2018).



**Figure 5:** Harmonized index of consumer prices in total and housing and utility.

Source: Authors' elaboration based on data from INE (2018).

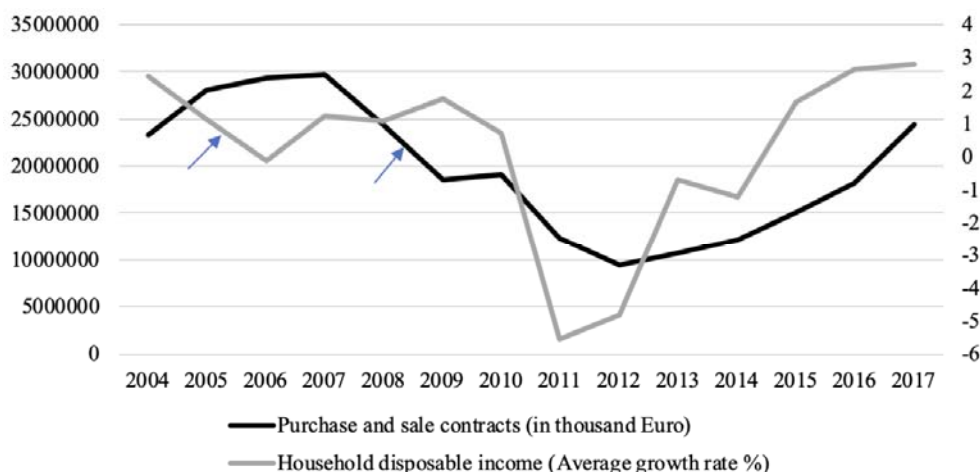
inflation (CPI) followed to an upward trend. The inflation had a peak period (2011). The long-term interest rate also reached a peak (13.22, see Appendix 1.) in 2012-Q1 and then went down in a straight line. It kept decreasing to around 2%.

Regarding Inflation, we further graphed it against housing and utility cost. By using the harmonized index of consumer prices, we selected the individual consumption expenditure on housing, water, electricity, gas, and other fuels and its total index, which is the

Inflation measure in Figure 4. From a general overview from this chart, it seems that the index of housing and utility CPI was higher than the total CPI before 2015.

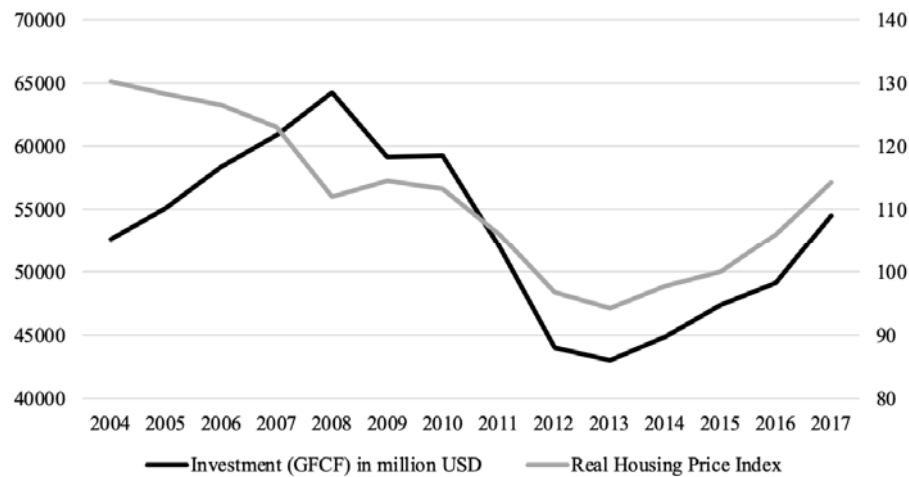
The total CPI gradually decreased in 2011 and 2012. Another point is that total CPI experienced a deflation in 2009 and in 2014.

Figure 6 compare the purchase of houses and the household disposable income, evidencing a pattern. When household disposable income decreased during



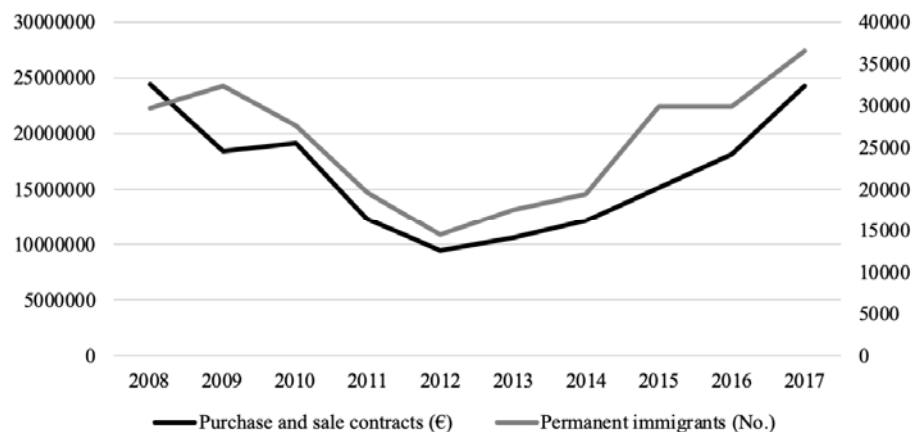
**Figure 6:** Purchase of houses and household disposable income in Portugal.

Source: Authors' elaboration based on data from OECD and INE (2018).



**Figure 7:** Investment and housing price index in Portugal.

Source: Authors' elaboration based on data from OECD (2018).



**Figure 8:** Permanent immigrants and purchase and sale contracts in Portugal.

Source: Authors' elaboration based on data from INE (2018).

the period from 2004-06, there was a corresponding parallel shift<sup>1</sup> in the purchase of house value from 2007-09. As household disposable income saw in a subtle platform (2006-2010), house acquisition stabilized in the next three years. However, both dropped in 2011. After 2011, household disposable income began to rise and house value recovered in 2013 and steadily grew.

From 2004 to 2008, the residential investment or GFCF grew steadily. In 2009, it contracted by USD 5 billion. GFCF stabilized in 2010, but it continued the contraction (15 billion USD) in 2011. During the financial crisis, GFCF suffered a severe decrease. Growth commenced again from 2013, and the GFCF slowly began on an upward trend. The GFCF in 2017

(54 billion USD) recovered to 2005 values. By comparing it with the yearly real housing price index, it was seen that they moved contrary to one another between 2004-09. When GFCF increased, the housing prices decreased. However, their general trajectories have been synchronous since 2009 (Figure 7).

The next determining variable to consider is the foreign inflow. Figure 8 depicts the permanent immigrant population and the purchase of houses. From 2009-12, the population of permanent immigrants decreased. The turning point was in 2012, which indicated the permanent immigrants figure started a steady increase. Immigrant numbers increased quickly in 2015 and maintained in 2016; then it rose again in 2017. By comparing this variable with the purchase and sale contracts, they had different correlation before 2010. But since 2010, they had followed similar paths.

<sup>1</sup>The corresponding parallel shift was pointed out by the arrows in Figure 6.





**Figure 9:** Building permits and new houses completed in Portugal.  
 Source: Authors' elaboration based on data from INE (2018).

Figure 9 shows building permits and new constructions in Portugal including the yearly datasets from 1995 to 2017. In Figure 9, the licensed buildings, includes new buildings and other construction. Completed dwellings number represents new structures. Completed houses were increasing in the 1990s and reached a peak in 2002. After that new buildings permits decreased to 30,000. The decline in licensed buildings was smaller than the decline in new buildings.

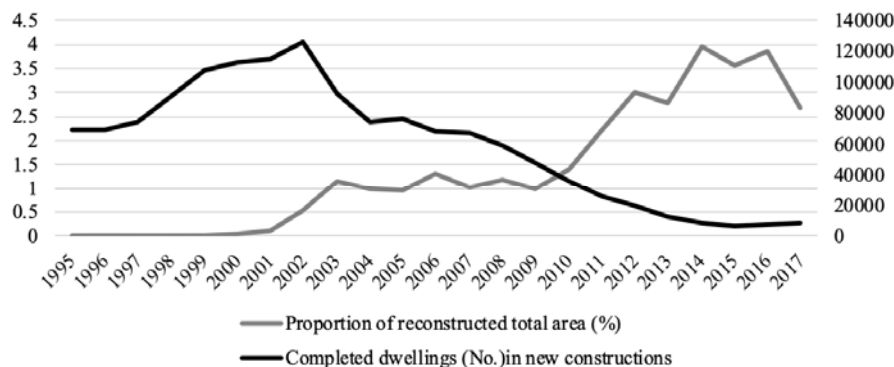
The decline of the building numbers lasted until now (Figure 9). Completed dwellings were significantly high before 2008 (over 60,000). Considering the difference of completed houses in the study period, we identified its maximum and the minimum values in Appendix 1, where the ceiling was in 2002 with 125,708 new buildings per year, and the minimum was in 2015 (6,794). From 2004 (74,000) to 2017 (8,900), the new houses decreased over eight times.

To further represent the housing stock, we gathered the data of proportion of total reconstructed area in

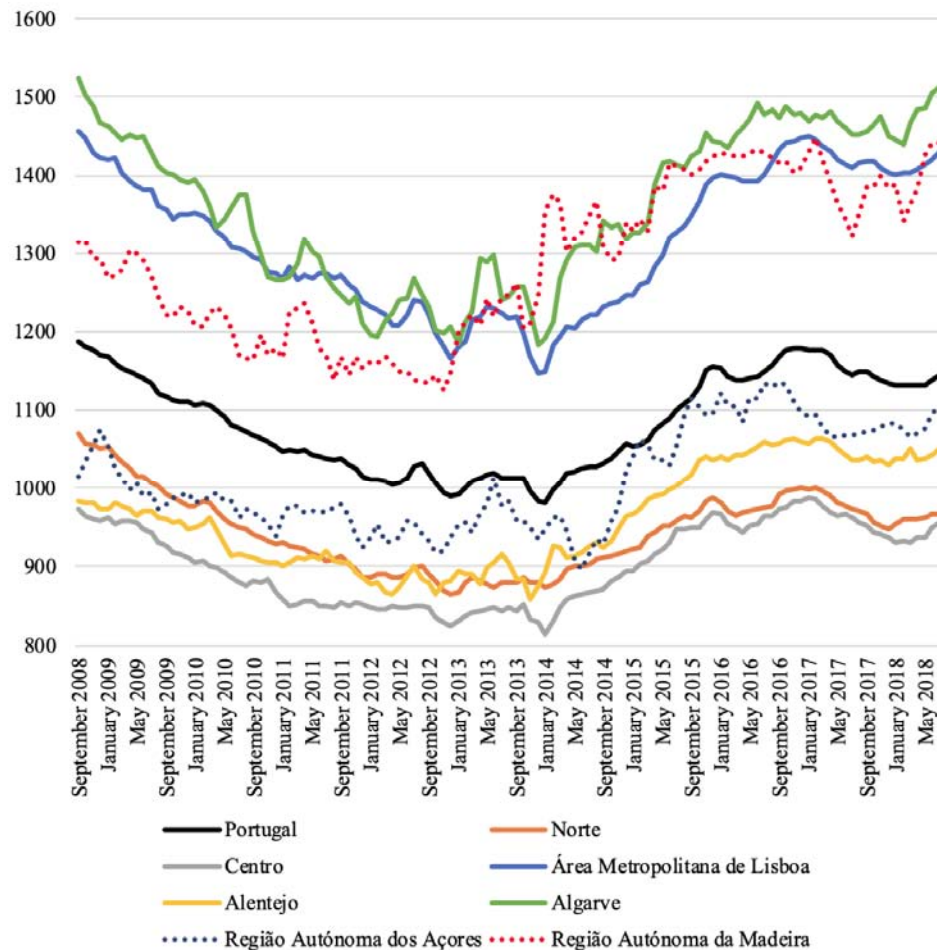
Portugal to compare with completed dwellings in Figure 9. The utterly opposite trend between reconstructions and new constructions showed the total housing stock might remain about the same amount. The proportion of reconstructions started to grow from 2001, after a plateau period (2002-2009), and then speeded up in 2010. As we describe in Figure 9, there was a fast development of new buildings in the 1990s and then diminished in 2000s. On the contrary, the proportion of reconstructions remained at 1% at the period of 2003-2009 and then multiplied. From 2014-16, the percentage kept around 4%. But it started to slow down recently, with a steep decline appearing in 2017.

**Housing Prices in Portugal**

Housing prices in Portugal have been increasing in recent years. Through the analysis of relevant macroeconomic indicators, we obtained background knowledge of macroeconomics situation in Portugal. In this section, we went back to our foundation housing prices of Portugal in order to collect detailed prices information for it. To illustrate the housing prices



**Figure 10:** The reconstruction and new completed houses in Portugal.  
 Source: Authors' elaboration based on data from INE (2018).



**Figure 11:** Average unit prices (€/m<sup>2</sup>) of houses by regions in Portugal.

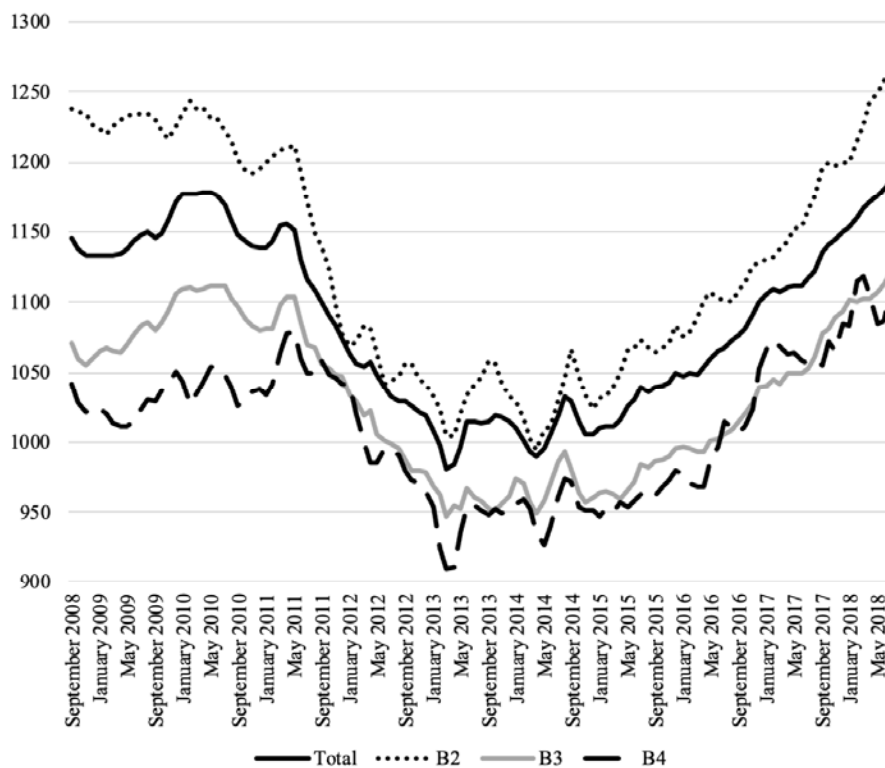
Source: Authors' elaboration based on data from INE (2018).

situation in Portugal, we studied other researchers' work (Tavares, Pereira, & Moreira, 2014) and then decided to show the housing prices in Portugal in two dimensions. The first dimension is geographic location and the second one is from its topological dimension. The dataset we used was the average monthly value of bank evaluation (€/m<sup>2</sup>) of living quarters by its geography and typology from INE, and the term was from Sep-08 to Jul-18.

In Figure 11, we presented the evolution of the housing prices per square meter in different regions. The regions selected are Norte, Centro, Lisbon, Alentejo, Algarve, Azores, Madeira, and together with its whole country level. In a general overview of the graph, all the lines followed a similar V shape, which means they had been subject to a decrease, accompanied by an increase. After 2016, the housing prices tended to be at a stable level. There were three regions which exceeded the cost of the country level, which were Algarve, Lisbon, and Madeira.

In July 2018 the point for the Algarve was 1514 €/m<sup>2</sup> while the coastal area average was 1154 €/m<sup>2</sup>, and in the cheapest housing prices region (Centro) it was in 957 €/m<sup>2</sup>. After the minimum in 2013, the recovery of the housing prices began in 2014. During the restoration, prices fluctuated but kept in a growth trend. In 2016, some regions almost reached the value before the crisis. In the most recent two years, the housing prices appeared to pause.

On the other hand, the situations from the typology dimension revealed the price-quality ratio of houses. In Figure 12, there are four types of residence, which are the Total, B2 (two-bedrooms), B3 (three-bedrooms), and B4 (four-bedrooms). In Figure 12 the overall housing price trend was the same as the one by geography (V-shape), as they experienced depression and recovery to its normal level in the later years. B2 was the highest price house among them as measured €/m<sup>2</sup>. On the other hand, B4 was the lowest one by the measure. The price of different typologies was in a



**Figure 12:** Average unit prices (€/m<sup>2</sup>) of houses by typology in Portugal.

Source: Authors' elaboration based on data from INE (2018).

stable period from late 2008 to early 2011. By comparing the differential between each type of houses, the difference narrowed after 2011. From Figure 12, the difference value between B2 and B3 was more significant than the price difference between B3 and B4. The difference between B3 and B4 of house prices per square meter has gone almost the same amount since 2011.

Table 1 summarizes the comparison between the average housing prices per square meter in geography and typology in Portugal from September 2008 to July

2018. Based on the property data, we calculated each region's and its typology's average housing prices over the study period. From the whole country level, the average housing price per square meter in this decade period was 1085.35 €/m<sup>2</sup>. And the values in Portugal of B2 was 1128.25 €/m<sup>2</sup>, B3 was 1031.35 €/m<sup>2</sup>, and B4 was 1009.89 €/m<sup>2</sup>. B2 was the most expensive housing price per square meter at the country scale. In its leading role, the housing prices of the Algarve were the highest in all types of apartment except B3 (1305.04 €/m<sup>2</sup>), which was just below the Lisbon region (1317.21 €/m<sup>2</sup>). The average prices per square meter in Alentejo,

**Table 1: Average Unit House Prices (€/m<sup>2</sup>) in Portugal**

	Total	B2	B3	B4
Portugal	1085.35	1128.25	1031.35	1009.89
Algarve	1360.01	1337.87	1305.04	1430.22
Área Metropolitana de Lisboa	1315.30	1291.45	1317.21	1347.44
Região Autónoma da Madeira	1289.74	1274.69	1301.26	1288.10
Região Autónoma dos Açores	1011.29	1181.98	1044.84	989.25
Alentejo	961.10	977.42	956.52	972.66
North	945.04	942.84	919.35	939.56
Center	903.17	971.36	873.91	869.67

Source: Authors' elaboration based on data from INE (2018).

Norte, and Centro were below 1000 €/m<sup>2</sup> during the study period, plus the B4 in the Azores. Apart from B2, the average value of Centro was all at the lowest price per square meter of the table. Additionally, both the maximum and the minimum were in the column of B4. The maximum was 1430.22 €/m<sup>2</sup> in the Algarve while the minimum was 869.67 €/m<sup>2</sup> in the Centro.

### Date Analysis Results

In the majority of regression analysis studies of real estate prices, the dependent variable usually used is the market prices of property. The prices vary from the house price indexes, the sales prices and rental prices. The real housing price index used in our study. For the independent variable group, we selected GDP, the Unemployment rate, the Short-term interest rate, Inflation (CPI), and completed dwellings absolute number in new constructions in our study. As we mentioned in the last chapter 3.3 Research strategy,

our dataset used in the data analysis comprises quarterly time series from Q1-2004 to Q2-2018 for Portugal.

To begin with, we assessed the descriptive statistics (Table 2) for each sample, in order to have a general overview of the dataset. In Table 2, we present each variable's Represent Group, Mean, SD, Minimum, Maximum, and Observations. The observations in each variable are 58. The Real housing price index is an index price dataset with its base year in 2015. It represents the housing market condition, and we used it as our dependent variable.

We also ran a correlation analysis among all the variables (Table 3 and Appendix 2). Unemployment rate (Model 2) had the strongest correlation with the real housing price index and that it is a negative correlation (-0.92). Model 5 (completed dwelling number) had a high positive correlation of 0.80.

**Table 2: Descriptive Statistics of Variables**

Name	Real Housing Price Index	GDP	Unemployment Rate	Short-term Interest Rate	Inflation (CPI)	Completed dwellings (No.)
Represent Group	Housing Market	GDP	Unemployment	Interest Rate	Inflation & CPI	Housing stock
Mean	112.11	0.13	10.47	1.38	1.57	9072.83
SD.	11.90	0.76	3.11	1.60	1.37	6686.20
Min	93.41	-2.30	6.19	-0.33	-1.51	1559.00
Max	131.77	1.15	16.88	4.98	3.91	20153.00
Obs.	58	58	58	58	58	58

Source: Authors' estimation with data from OECD and INE (2018).

**Table 3: Static Simple Linear Regression Analysis - Results**

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
GDP	4.27				
Unemployment Rate		-3.53			
Short-term Interest Rate			3.90		
Inflation (CPI)				3.15	
Completed dwellings (No.)/1,000					1.43
Constant	111.56	149.11	106.74	107.18	99.14
Correlation	0.27	-0.92	0.53	0.36	0.80
R Square	0.08	0.85	0.28	0.13	0.65
P-value	0.04	0.00	0.00	0.01	0.00
Observations	58	58	58	58	58

Source: Authors' estimation with data from OECD and INE (2018).

Table 4: Multiple Linear Regression Output

Regression Statistics	
Multiple R	0.65
R Square	0.42
Adjusted R Square	0.37
Standard Error	1.55
Observations	57

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	5	89.66	17.93	7.48	0.00
Residual	51	122.22	2.40		
Total	56	211.88			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.12	0.21	0.58	0.56	-0.30	0.55	-0.30	0.55
$\Delta$ GDP	0.03	0.27	0.11	0.91	-0.52	0.58	-0.52	0.58
$\Delta$ Unemployment rate	-2.37	0.44	-5.37	0.00	-3.25	-1.48	-3.25	-1.48
$\Delta$ Short-term Interest rate	-2.08	0.69	-3.03	0.00	-3.46	-0.70	-3.46	-0.70
$\Delta$ Inflation	-0.37	0.38	-0.98	0.33	-1.14	0.39	-1.14	0.39
$\Delta$ ComD/1,000	0.30	0.22	1.35	0.18	-0.14	0.74	-0.14	0.74

Source: Authors' elaboration based on data from OECD and INE (2018).

The next step was the simple linear regression model (Table 3). All P-values were lower than critical significance level (0.05). The effects are statistically significant.

In multiple linear regressions we conducted the Durbin-Watson test to detect the autocorrelation (residuals on Appendix 3). Durbin-Watson was 1.30, meaning no autocorrelation in this model. In Durbin-Watson table, when  $K=5$ ,  $n=55$ , the  $dL$  is 1.209 and the  $dU$  is 1.592. When  $n=60$ , the  $dL$  is 1.248, and the  $dU$  is 1.598. In our case, the  $n=57$  considered in the interval of  $n=55$  and  $n=66$ .

Table 4 presents the OLS estimates of the multiple regression model. We rejected the null hypothesis because the significance  $F$  in Table 4 is lower than 0.05. An  $R$  Square in 0.42, and an adjusted  $R$  square is 0.37. However, the P-value of coefficients among the explanatory variables range is from 0.91 to 0.00.

The  $\Delta$ Unemployment rate and  $\Delta$ Short-term interest rate are statistically significant.  $\Delta$ Unemployment rate coefficient is -2.37 and  $\Delta$ Short-term interest rate is -2.08. Regarding the other variables,  $\Delta$ GDP coefficient

is 0.03,  $\Delta$ Inflation coefficient is -0.37, and  $\Delta$ Completed dwellings is 0.30. However, the P-values of these aren't significant. With the sample size of 57 observations, we observe that the probability of  $\Delta$ Unemployment rate and  $\Delta$ Short-term interest rate had significant negative effects on the  $\Delta$ Real housing price index.

## DISCUSSION

### Housing Economy and Macroeconomics

When comparing the GDP with real housing price index, in some period of Figure 1, they seem related. Davis and Heathcote (2005) gave a study of the residential properties value in the United States, and it showed that consumption, non-residential investment, residential investment and GDP all co-move positively. In order to figure out their relationship, we developed a simple linear regression between GDP and the real housing price index. Based on the Pearson correlation analysis, there is a positive correlation between them with a correlation coefficient of 0.274. The results from the simple linear regression show the relationship between GDP and housing price index is statistically

significant, but the repeatability of the model is not convinced because of its extremely low R Square. However, there is a report done by Rodrigues and Louren (2017), proofed the positive statistical relationship between real per capita GDP and the real house price index by using multiple regression analysis with a bigger data sample size, which was from Q1-1996 to Q2-2017. Thus, here we consider the GDP and the house prices might have a positive correlation.

Figure 2 shows an upward trend of unemployment while the housing price was going down. Moreover, youth unemployment rate was worse than the whole unemployment rate. During the Portuguese recession period, the youth unemployment rate reached around 40 per cent. Tavares, *et al.* (2014) pointed out that it was one of the damaging aspects of the real estate market.

The high unemployment rate causes both economic and social problems. Job loss implies reducing living standards and increased psychological distress (Mankiw, 2016a). In Figure 4, the situation in the unemployment rate was a bit better than the youth unemployment rate, but it still had a considerable amount of growth during the recession period. In Figure 6, we observed a sharp shrink of the household income during the recession period. With lower revenue in a household, people have to consider their buy/rent decision. In the context of an uncertain economic circumstance, consumers tend to have a basic living standard to get over the recession.

In order to find out the relationship between the unemployment rate and the housing prices, we examined the linear regression between the unemployment rate and the real housing price index. The correlation results show there is a strong negative correlation ( $r=-0.92$ ;  $p=0.002$ ). In Model 2, simple linear regression results indicate that the negative relationship between the unemployment rate and the real house price index is statistically significant. Its negative coefficient shows that an increase in the unemployment rate would cause a decrease in the real housing price index.

Another important indicator of the housing prices is interest rates. After joined in the European Union, Portugal adopted the Euribor interest rate. The integration increased the competitiveness of the financial market but declined bank intermediation margins (Tavares, Pereira, & Moreira, 2014). When the European Sovereign debt erupted in Europe, there was

a sudden decline in the interest rates. The short-term interest rate from 2015 to the present has been in negative values for three years (Figure 4).

The importance of interest rates based on its effect on loans and credit. The number of loan agreements showed a lag from interest rates in Figure 3. The amount of mortgage was very high before 2007 due to the loose monetary policy at that time. In another view, the large mortgages in 2007 indicated the consumers have confidence in the housing market. But soon, as the arrival of the debt crisis, the interest rates fell and together with a diminishing loan contracts. The lower level of interest rates maintained the loan agreements number for a while. But it still cannot break the dropping of loan agreement number, with below 5,000 per month loan agreements from 2012 to 2015.

The crisis affected people's willingness to require a mortgage. According to Pinto's survey study in 2012 among Portuguese, consumers are easier to be affected by the uncertain economic climate than the individual circumstance (Pinto, 2012). It shows that the uncertainty of the country's economy might have a stronger influence on consumer confidence. During the crisis, even though the interest rates are effective methods to stimulate the demand, it still cannot overcome the losing confidence of consumers. Even at the ending point of our study, in Figure 3, when the interest rates went down to below 0%, the loans started to grow. It indicates an inefficient monetary policy on interest rates in the study period. Additionally, the long-lasting negative interest rates might be a big concern of the housing market.

Concerning the relationship between interest rates and the housing prices, we carried a Pearson correlation and a simple linear regression of them. The result showed a positive statistically association in housing prices and the short-term interest rate. We doubt the result of simple linear regression as the lower interest rates are ought to drive the demand on loans. However, as we listed the reality above that currently there might be an ineffective monetary policy of the negative interest rates. Besides, the small sample size might be another reason. Because when we eliminated the time series attributes of the dataset, the results in the multiple regression model reversed. The impact of interest rates on housing prices became negative. But the coefficient is not statistically significant. Therefore, we consider the regression results are affected by the ineffective monetary and the small sample size.

Barda and Sardanou (2010) identified changes in consumer behavior due to the very sharp rise in unemployment, loss of income, uncertainties in assessing the value of assets and the safety of savings. The case is represented by the index of housing and utility CPI in Figure 5. During the Portuguese financial crisis (2011-2013), the index of housing and utility CPI was extremely high. Also, the bailout period that began in May-2011, which required necessary adjustments in the Portuguese economy and austerity measures which strongly affected families and enterprises (Castro, 2016). They had to cut their spending on leisure products to maintain their essential living standard. The higher index on housing and utility CPI reflects people spent more on essential living expenditure like housing, water, gas, etc. during the recession period. In the year of 2014, Portugal finished the bailed out by IMF and brought in more foreign investments. In 2015 the index of housing and utility CPI was caught up by the total CPI index. The situation on expenditure preference changed again. This time, the change might be a signal of the recovery economy.

By comparing with the household income with the house purchases in Figure 6, we found there might be correlation since there was a three-year lag corresponding parallel shift between them. Nowadays, as the growth of household disposable income, people tend to be optimistic about the housing market, which indicates the continued growth of house transactions. From another point of view, the increase of the purchase of houses might cause by foreign buyers.

According to the published number from the SEF, 3.51 billion Euros investment came from those foreigners who invested in obtaining the Golden visa, and they showed over 99% of the Golden visa invested in property. The curve of permanent immigrants in Figure 8 proofed the efficient of Golden visas and tax benefits programs. As we know, the Golden visas program was launched in 2012. The decrease of immigrants (2009 - 2012) turned to increase in the next year after 2012 in Figure 8. And the number of immigrants continued growth in the following years. According to Mankiw (2016a), an economic boom raises the national income and increase the demand for housing as it brings in a large number of the population probably because immigration also raises the demand for housing. As the Golden visas policy and the tax benefit, the foreigner investment flowed into Portugal's economy and helped the economy to recover. It did not only boost the cash flow into Portugal, but it also increases the jobs opportunity and

housing demand. This growing investment comes together with a substantial increase in housing prices.

The housing boom was also encouraged by government policies that promoted homeownership (Mankiw, 2016a). In Rodrigues and Louren's work (2014) announced the residential investment had been slow down since the end of the 90s. However, in their later study in 2017, they found that the housing investment by non-residents has been increasing since the 1990s. This investment from foreigner was not affected by other exogenous factors, and it keeps rising. In Figure 7, after the debt crisis, the residential investment began to accelerate and recovered steadily. In the meanwhile, the housing prices are rising as well.

When people bid up the cost of an asset above its fundamental value, it creates a bubble (Mankiw, 2016a). Among the foreigner domain buyer market, the housing prices usually were deviated from its fundamental value. With limited background information about this country, they tend to make their decisions without a completed understanding of the local housing market. There might be some foreign buyers consider the housing prices in Portugal were similar to their country, which led to prices perception overestimation.

The housing stock also confirms the changing residential investment. In Figure 7, the investment increased steadily between 2004 and 2008, but in this period the housing price was declining. According to the accumulated housing stock from the 1990s (Figures 9 and 10), the decrease of housing prices at that time might influence by the increasing supply. In addition, the utterly opposite trend between reconstructions and new constructions in Figure 10 indicates the decrease in government residential investment, reduced by the crisis and increased by the foreign investment for the economic recovery. In the instruction of Golden visa program, the reconstruction of old houses also contributed to the housing stock.

The growing amount of rebuild program might bring problems. First is the short-term rental business, the apartments in the city center are more attractive for their business. Second, since there is no price difference in the housing type of the new house and rebuilt construction, the decrease in new buildings together with the increase in reconstructed old buildings indicates the total housing stock might stabilize.

## Housing Prices by Geography and Typology

Due to the crisis, the curves of housing prices in the different regions were all in a V shape. Algarve had the highest housing price region. Centro the lowest one. The outstanding performance of Algarve reflected the contribution of foreign investment, mainly influenced by tourism. Lisbon region is also considered an expensive region. Unexpectedly, Madeira grew quickly in 2012. When Portugal mainland was suffering from the severe economic recession, Madeira housing prices rise.

The regions near coastline were more expensive than the inland. Oikarinen (2014) concluded that the increasing difference in the housing prices between a few growing centers and the rest of the country is also likely to hinder the movement of labor force. Comparing to the Algarve and Lisbon, the interior is main industry is agriculture.

B2 had the highest housing price while B4 was the lowest one. The higher house space the smaller cost per square meter ratio. Because of multiple the floor area, the total amount to buy a bigger house is more expensive than a small one. Before the crisis, the prices differential in typology had a visible partition. In Figure 12, the price ratio was much higher in B2 before the crisis. The changing family structure was another reason for the higher need for B2. In the past, people lived in bigger families. Nowadays young couples tend to live alone.

But the price figures during the recession told us another story. The partitions among the price per square ratio diminished during the recession period. When the market recovered, the price differential reappeared. From the ending point in the study period, the demand went to B2 again, which almost recovered to before crisis level. Therefore, we conclude that in the regular economic period, the housing demand of B2 were more attractive. Another finding is that the price differential was eliminated between B3 and B4 since 2011.

Table 1 reveals a shift in demand. Algarve and Lisbon evidenced their highest housing price €/m<sup>2</sup> in B4, indicating a higher demand. B4, in Algarve, was the highest type of house and region. On Azores, Alentejo, Norte, and Centro B2 still took the leading place, and B4 was the lowest.

The economic crisis creates a distortion in the market. Our results show a decreasing demand as a

result of the crisis. However, Tavares, *et al.* (2014) based on pre-crisis data, found that the higher average prices of the apartment in Algarve region for B1 and B2 can be explained by the huge foreign investment in real estate in Algarve.

## Housing Prices Regression

As seen, we evaluated a group of specific quarterly variables: GDP, unemployment rate, short-term interest rate, inflation, and completed dwellings. Our tests included ANOVA, Pearson correlation, Simple regression, Durbin-Watson test and multiple regression analysis. We removed the models that were not statistically significant, or R squares were low. We found no autocorrelations in multiple regressions.

A simple linear regression analysis was carried out in model 1 to 5; all the P-values were lower than 5% significance level. With the method of the simple linear regression model, the R square of unemployment was 0.85 with statistically significant results (Model 2) pointing to a negative relationship between unemployment rate and housing prices.

While in Model 5, completed dwellings (NO.) has a statistically significant positive influence on the housing prices. Common sense indicates that, if we assume the demand is fixed, the increase in supply should cause a decrease in product price. However, the opposite results of Model 5 show that when increasing a new building, the housing prices would rise as well. To explain this issue, we moved back to Figures 9 or 10. Based on the chart, the number of new buildings significantly decreased in the last fourteen years.

We consider there are four reasons cause the positive relationship between housing prices and new buildings. First, the government's control and the accumulation of the housing stock from the last century. The less control by the government was evident in Figure 9. The number of completed dwellings was above the number of licensed buildings from 1995 to 2012, which revealed less governmental control. Second, living communities are closer to coastlines, which limits the residential land area. The increasing proportion of reconstructed buildings limits new buildings approval. Besides, the decrease in housing prices as a result of slump economic performance (2004-08) and from the the financial crisis led to a total ten-year decline in the housing prices in our study period (2004-18). By comparing it to a fourteen-year reduce in new buildings number, the decrease



## APPENDIX

## Appendix 1: Data Summary and Statistic Description

Data name	Group	Source	Time	Mean	Median	Std. Dev.	Min	Max	Obs.	Mode
Youth Unemployment Rate	Unemployment	OECD	Q1-2004-Q2-2018	24.81	22.80	8.20	14.91	40.24	58	
Long-term Interest Rate Quarterly	Interest rates	OECD	Q1-2004-Q2-2018	4.86	4.15	2.58	1.79	13.22	58	
Harmonized index of consumer prices (Total)	Inflation & CPI	Statistics Portugal	January 2004 - August 2018	1.59	1.90	1.35	-1.80	4.00	176	
Harmonized index of consumer prices (in Housing, Water, Electricity, Gas, and other fields)	Inflation & CPI	Statistics Portugal	January 2004 - August 2018	3.25	3.10	2.46	-0.30	10.80	176	
Interest Rate on Housing Loan % by financial purpose of Housing acquisition	Interest rates	Statistics Portugal	January 2007 - August 2018	1.75	1.46	0.84	1.03	5.77	116	
Loan agreements with conventional mortgage (No.)	Interest rates	Statistics Portugal	January 2007 - December 2016	9030.09	5073.50	7618.26	2138.00	30567.00	120	
Short-term Interest Rate Monthly	Interest rates	OECD	January 2007 - August 2018	1.07	0.31	1.66	-0.33	5.11	140	
Purchase and sale contracts (in thousands Euro) Yearly	Housing market	Statistics Portugal	2004-2017	19619436.14	18834126.50	7024347.13	9490407.00	29630074.00	14	
Household disposable income (Average growth rate %)	Household disposable income	OECD	2004-2017	0.21	1.10	2.58	-5.57	2.80	14	
Real Housing Price Index Yearly	Housing market	OECD	2004-2017	111.71	112.78	12.13	94.23	130.33	14	
Investment (GFCF) in million USD	Investment	OECD	2004-2017	53217.07	53608.30	6756.29	43046.04	64215.17	14	
Permanent immigrants (No.)	Immigration	Statistics Portugal	2008-2017	25740.30	28646.50	7321.87	14606.00	36639.00	10	
Licensed buildings (No.)	Housing stock	Statistics Portugal	1995-2017	40389.17	46577.00	18555.34	14030.00	64969.00	23	
Proportion of reconstructed total area (%)	Housing stock	Statistics Portugal	1995-2017	1.39	1.01	1.32	0.01	3.94	23	
Completed dwellings (No.) in new constructions for family housing Yearly	Housing stock	Statistics Portugal	1995-2017	59830.83	68764.00	38236.78	6794.00	125708.00	23	
Average value of bank evaluation (€/m <sup>2</sup> ) of living quarters by Geographic localization (NUTS - 2013), and Dwelling typology; Monthly	Housing market	Statistics Portugal	September 2008 - July 2018							
Portugal				1085.35	1083	61.77	981	1187	119	1014
Norte				945.04	951	49.88	866	1071	119	890
Centro				903.17	904	50.65	814	987	119	930
Área Metropolitana de Lisboa				1315.30	1308	89.19	1146	1456	119	1221
Alentejo				961.10	956	64.41	858	1065	119	1037
Algarve				1360.01	1375	100.65	1183	1524	119	1451
Região Autónoma dos Açores				1011.29	987	64.62	897	1137	119	969
Região Autónoma da Madeira				1289.74	1292	99.72	1126	1447	119	1429
B2				1128.25	1114	81.94	994	1258	119	1199
B3				1031.35	1039	54.68	947	1122.5	119	1081
B4				1009.89	1015	49.63	910	1118	119	951

**Appendix 2: Correlation Coefficient Results**

	<i>Real Housing</i>	<i>GDP</i>	<i>Unemployment Rate</i>	<i>Short-term Interest Rate</i>	<i>Inflation (CPI)</i>	<i>Completed dwellings (No.)</i>
Real Housing Price Index	1.00					
GDP	0.27	1.00				
Unemployment Rate	-0.92	-0.26	1.00			
Short-term Interest Rate	0.53	-0.11	-0.56	1.00		
Inflation (CPI)	0.36	-0.28	-0.28	0.56	1.00	
Completed dwellings (No.)	0.80	0.01	-0.71	0.83	0.47	1.00

**Appendix 3: Multiple Linear Regression Residual Output**

Observation	Predicted rp-dif	Residuals	Observation	Predicted rp-dif	Residuals
1	0.565820512	0.5971419	30	1.117929604	0.3939385
2	1.237793775	-0.554446	31	3.143028673	0.7545268
3	-0.351134641	1.2401159	32	0.264588815	2.5069429
4	1.017453437	0.455617	33	1.49005568	0.7866287
5	0.644318061	-1.129657	34	1.368399727	-0.138501
6	0.977129671	-2.227979	35	1.175712634	-1.638418
7	1.085418548	-0.315116	36	0.121581345	1.8919168
8	0.90112669	0.087639	37	0.134819987	0.4017063
9	0.41200862	0.3724065	38	-1.851617599	1.6580982
10	0.487998484	0.1248851	39	-1.609495773	-0.7495
11	1.755418484	-1.603522	40	-1.261885318	-0.069491
12	1.152167753	-0.633531	41	-0.425050397	-0.738959
13	0.572724157	1.8599597	42	-2.09827772	2.3920416
14	0.348748212	-0.844991	43	-0.321488444	0.7149013
15	0.669870273	2.6574971	44	-0.337025737	0.2816598
16	-0.423860886	4.6211276	45	-1.559541053	-0.871162
17	0.398018803	3.6642194	46	0.01837245	-0.027646
18	1.220679212	2.0384787	47	-0.582533252	-0.812304
19	-1.39087289	-1.889135	48	-0.661151321	-1.270845
20	-2.449004989	1.0666297	49	-1.552963767	-0.422661
21	-0.317075459	-0.857853	50	-0.911488921	-0.169313
22	0.418797673	-1.045114	51	-1.120516556	-0.579673
23	0.861249885	-0.995074	52	-1.259829574	-0.537453
24	1.505325551	-0.847551	53	-0.952762574	-1.462897
25	1.939216863	-1.660577	54	-1.155290789	-2.844411
26	1.021387345	0.3678878	55	-1.53726739	-0.32491
27	1.14494325	0.0818428	56	-1.302373878	-2.843721
28	3.295097964	-1.277473	57	-0.97416419	-0.442249
29	1.720669911	0.8083225			

explained the correlation problem of Model 5. Plus, the small sample size of 58 observations indicates all the simple linear regression models were weak regressions.

In processing the multiple regression models, we comprised these five indicators by using their first order

difference as independent variables. The results from the Durbin-Watson test show that there is no autocorrelation. The main drivers of  $\Delta$ real housing price index are the  $\Delta$ unemployment rate and the  $\Delta$ short-term interest rate. The coefficients and an acceptable R square indicate an increase in the  $\Delta$ unemployment rate would have a negative impact on

the  $\Delta$ real housing price index. Besides, the case in the  $\Delta$ short-term interest rate also causes an adverse effect on  $\Delta$ real housing price index. Unfortunately, the relationships between the  $\Delta$ real housing price index and  $\Delta$ GDP,  $\Delta$ Inflation,  $\Delta$ Completed dwellings cannot be explained by their constants from the study results.

## CONCLUSION

This paper investigates the Portuguese housing prices within the macroeconomic context. From the reviews and the interpretation of official statistics, we analyzed the indicators and linked discussion to related events.

The macroeconomic indicators show: GDP and the housing prices might have a positive correlation. The higher youth unemployment might influence rental costs. As the number of jobless people adding up, the decrease interferes to the income and continue its impact on consumer behavior. The current negative interest rates are increasing the demand for houses and house prices. The consumption preference changed to maintain the essential products during the recession period due to the high housing and utility CPI. And the higher total CPI after 2015 gave a signal of the recovery economy. The increasing number of immigrants and investment might be affected by the Golden visa and tax benefit program. In the meanwhile, the growing investment and housing prices might cause a housing bubble. Plus, the continuing negative interest rates, these three elements might lead to the next crisis in the real estate market. The housing stock in Portugal is mostly fixed but may experience limited growth as the rising of the rebuild program.

Algarve and Lisbon were the most expensive regions. Centro was the cheapest one. The housing prices in Madeira grew in 2012 and even continue its growth in the recession period. There is a significant difference between coastal and inland regions. The demand of B2 was higher, especially in a regular economic period. During the recession period, the housing demand for the different type of houses tended to focus on consumer's needs. Besides, the average housing price €/m<sup>2</sup> differential between B3 and B4 seems to be eliminated since 2011.

Through the data analysis results, the unemployment rate considered as the most potent determinants on housing prices among the variables in our study, which has a strong negative linear relationship with real housing price index.

## LIMITATIONS AND FUTURE RESEARCH

As with all research studies, this study has its flaws. Firstly, the study area still needs to be extended. It should fully explain the country's history, culture, citizens' preference, lifestyle, fiscal policy, and the country's other leading industries, etc.

Second, more detailed data and sensitive information from real estate agents permit to analyze market operators dimension in the models generated.

Regarding the macroeconomic indicators, the third a deeper analyses should follow this study, exploring the component element of indexes, preliminary or late indicator, etc. It is useful in discussing the situation now and prepares for future scenarios.

In future research, it would be of relevance to focus on the residential investment, especially the foreign investment. Due to tourism is an essential industry of the country, we would spend more effort on investigating and combining tourism and the housing price. Therefore, the future study would analyze the determinants related to foreign investment and tourism factors with the housing prices.

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Received on 31-10-2019

Accepted on 10-01-2020

Published on 29-01-2020

DOI: <https://doi.org/10.6000/1929-7092.2020.09.06>© 2020 Luo *et al.*; Licensee Lifescience Global.

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