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The Impact of Liberalization and Restriction of the Financial and Capital
Markets on House Price Dynamics

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Abstract

The aim of this study is to investigate how the liberation of financial markets, as of the 90s, especially the gearing of the credit use, and consequently the great global crisis in 2008 affected house price dynamics. The study was developed in Stata and uses a panel fixed-effects model, following Driscoll and Kraay (1998).

Key words:

Residential Prices; Economic and Financial cycle;
Macroeconomy & Monetary Policy Shocks

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1. Introduction

Since the 1990s many investors have been changing their investment portfolios, mainly due to globalization and technological effects and to the liberalization of financial and capital markets. Nonetheless, over the last 30 years both the capital and the investment structure have undergone major changes, especially in the years following the financial crisis, in 2008, particularly due to changes in the costs of loans, fundamentals and speculative bankruptcies and consequently to a greater control of the rating agencies. Real estate assets have traditionally been regarded as safe investments, due to inflation hedging advantages and also because it facilitates portfolio diversification, as described in the literature. As a matter of fact, houses are the largest assets of most households, which justifies the fact that if there are any changes in house prices, it can truly affect the homeowner's welfare.

Real estate is an asset with different properties, such as residential, commercial and industrial, presenting unique characteristics that can turn it in an asset for many investors, since it has quite unusual returns and risks, mainly associated with the economic and business cycle. In this world, the residential market is actually a sector of greater responsibility, namely due to the fact that it presents interesting characteristics for investments. Residential assets are also considered to be an essential good for everyone, and it is therefore quite interesting to analyze its behavior, as well as to realize how changes in certain variables may affect real houses prices during booms and busts.

As expected, an expansion of real GDP, an appreciation of the stock market value and a lower unemployment level, in a particular country, will have a positive impact on residential prices. However, on the other hand, an increase in interest rates is expected to reduce dwelling demand and consequently their prices, through the increase of borrowing rates that affect positively the costs of buying a house. In recent years, a lot of studies have analyzed the dynamics of house prices mainly after the financial crisis, mainly triggered by the collapse of

the US house price bubble. Furthermore, the recent worldwide crisis still is influencing the housing market and has also been revealing that the understanding of their price dynamics requires further research.

Therefore, the purpose of this paper is to analyze the impact of the liberalization of financial and capital markets, during the 90's and their restrictions after the crisis year (2008), on the housing market, and also observe how the recent global financial crisis in 2008 affected residential prices across the globe. Actually, during the crisis period, financial indicators were affected by the failure of many mortgages payments that resulted in a leverage and unbalanced financial and economic system. Notwithstanding, given the complexity of this particular sector, this asset will always face new challenges not only due to a shift in the economic, financial and banking structure, but also because of changing preferences and beliefs of investors and families.

This study uses 3 distinct samples where each one of them contains a different set of countries. To construct these samples, it was necessary to collect data from several sources. Banco de Portugal provided the real house prices, real GDP, interest rates, real gfcf and the unemployment rates; Bloomberg the stock market indices and lastly the Federal Reserve Bank of St. Louis the inflation rates.

The remainder of the paper is organized as follows: Section 2 describes the literature review that is important for the empirical analysis. Section 3 describes the data and explains the contribution of each country individually. Section 4 presents the empirical model and all the steps considered in the construction of the variables used in the model. Then in section 5 the results are discussed and sections 6 and 7 provide the conclusions and present the bibliography, respectively. Finally, an appendix includes the results that support the analysis.

2. Literature Review

2.1 Economics and Expectations Analysis

Recently, many authors have studied and developed models which are intended to explain house price dynamics and the challenges of the real estate assets in the new millennium. The global financial crisis, which started in 2008, truly highlighted the importance of the housing wealth effect on the economy, therefore demonstrating its influence on the individual's well-being (Kishor, Kundan, Marfatia & Hardik, 2017; Ling, Ooi & Thao, 2013; Paloma & White, 2016; Quigley & Shiller, 2012).

Quigley and Shiller (2012) proposed to measure and to relate the effect of housing and stock market on consumption. The authors concluded that the increase of house price has been associated with boom-cycles, optimistic expectation, a more valuable stock market and higher levels of consumption, while uncertainty periods were mainly marked by a negative expectation, registering a decline in residential properties' prices, as well as in the stock market values. Nonetheless, the stock market does not always follow the housing price dynamic.

Quigley and Shiller (2012) provide empirical evidence of the influence of dwelling price dynamics on aggregate consumption and on household savings, demonstrating that the housing market is an important portion of the total wealth of the household and of investors which influences people's consumption. Moreover, the authors also compared house price dynamics with financial markets, suggesting that the effects of prices on stock markets sometimes does not explain the level of consumption during unusual periods as was the case during the Dot Com recession in 2001, since markets headed in quite opposite directions (Matos, 2013). On the other hand, Quigley and Shiller (2012) also argue that variations in residential market prices, and even before the recent high volatility caused by the global crisis, had an important impact on aggregate consumption, as well as on real GDP.

In a different study, Case, Quigley and Robert (2006) highlighted the investors' divergent behavior, specifically when they invested in stocks and in real-estate. As a matter of fact, the emotional impact seems to be quite different for both assets, since investors are less aware of

the short-term changes in the housing market, considering that they do not receive regular updates on its value as they do in the stock market, which is daily tracked on the internet or by banks. Hence, the real estate's influence on consumption and on real GDP is not immediate, which justifies the fact that the presence of lagged variables in the model can help better understand the real-estate's dynamics.

Inspired by the coherent market theory proposed by Vaga (1990), Ling, Ooi and Thao (2013) emphasized the importance of the investors' beliefs on the housing market - good expectations would attract more and new investors, who would be willing to pay more for the same property. Hence, the sharp increase of residential demand, associated with the boom cycles, will positively affect house price dynamics, especially when the supply is constant. According to Vaga (1990), the combination of the investors' predominant linear emotion with clear signs would mark the trend in the economy. Such dynamic and non-fundamental relationship (expectation) would, in turn, affect investors/household decision making, therefore contributing to speculation during boom and bust cycles. Even though expectations would be extremely difficult to sanction by statistical models, since expectations and trends cannot be quantified, their consideration is crucial for the markets' analysis, as well as for the analysis of the individual's emotions during boom and bust periods.

2.2 Macroeconomics and Monetary Policy Shocks

The European Commission has been recognizing the importance of the real estate prices' impact on the macroeconomic equilibrium. As a matter of fact, some studies in the EU suggest a positive correlation between the increase of prices' volatility in the residential markets and the number of crisis. La Paz and White (2016), show that the increase of house market value, specifically by expansionist lending practices granted by the banking system (expansive monetary policy), had an important impact on the global financial crisis in 2008.

Lamont and Stein (1999), as well as Spiegel (2001), showed that higher levels of leverage are associated with a higher impact of fundamental shocks on house prices, possibly leading to macroeconomic disturbances and to inferior transparency level. More recently, Guerrieri and Iacoviello (2017), Ghysels, Plazzi and Torous (2012) and Hornstein (2009), indicate that some residential aspects, such as high collateral values on dwellings, and consequently the easiest to borrow against this sector of activity, would lead to banking and economic leverage. In fact, houses characteristics and financial system innovations make it easier for owners to go against the collateral value of their houses, changing the investors and families' preferences for riskier decisions. As a result, house prices would represent pronounced boom-to-bust cycles, which may seem to be incompatible with an efficient capital market dynamics, justifying the importance of clarifying how monetary policy changes and how macroeconomic determinants could affect house price evolution.

During the financial market liberalization, which started in the 80s, (for the majority of countries presented in this study) monetary policy indirectly influenced the housing market and the overall economy through interest rate reductions (Mishkin, 2007). A decrease of collateral requirements, lower transaction costs and an increase on capital flows via the monetary policy system allows households/investors to borrow more aggressively against unexpected shocks to their wealth, resulting in higher levels of indebtedness. The new financial instruments, such as collateral mortgage obligations (CMO) and collateral debt obligations (CDO), also encouraged an increase in the security measures of the sub-prime areas, therefore resulting in an increase of credit supply and in the relaxation of lending practices (lower price of debt), which leads, in turn, to a boost of risky contracts, particularly in the residential market.

Indeed, families thought that their wealth was increasing, particularly due to the higher values of their house assets. However, such situation was merely speculative, considering that the moment of collapse was coming, since the disposable income of households was insufficient

to pay the rises of house prices, increasing the probability of indebtedness, measured by mortgages loans in terms of disposable income. Hence, innumerable cases of default began to emerge with the collapse of the banking system (Quigley & Shiller, 2011). Still, and according to Ghysels, Plazzi and Torous (2012), between 2000 and 2010 credit supply of the banking sector was, by far, the most powerful explanatory variable of real estate prices at an international level.

2.3 Investors Preferences

According to Supple and Briddell (2011), asset allocations added real estate to policy portfolios, and despite the issues related to residential investment, such as “asset pricing, volatility, leverage, securities, and securitized real-estate debt”, since over the last few years investments in this sector had significantly increased. More recently, some studies tried to better understand the real-estate sector and its functioning (Chiang, Jiang & Lee, 2009; Hudson-Wilson, Gordon, Fabozzi, Anson & Giliberto, 2005; Kapoor, 2011; Liang, Chatrath & McIntosh, 1996; Schnure, 2017; Stevenson, 2001; Supple & Briddell, 2011).

As a matter of fact, the inclusion of real-estate in investment portfolios could help investors achieve higher returns per risk. Therefore, asset portfolios diversification by investing in properties is quite beneficial to investors. The positive results in this area demonstrate that investment in real-estate has certain particularities, namely: 1) “reduce the overall risk of the portfolio by combining asset classes that respond differently to expected and unexpected events”; 2) “achieve an absolute return competitive with other asset classes”; 3) “to partial hedge against unexpected inflation” – although different property types and different levels of equity/debt in this market deliver different degrees of inflation hedging; 4) “to constitute a part of a portfolio that is reasonable reflection of the overall investment universe”; 5) “to deliver strong cash-flow to the portfolio”, when compared to stocks and bonds (Chiang, Jiang & Lee, 2009; Hudson-Wilson et al., 2005; Stevenson, 2001; Supple & Briddell, 2011). Despite the

benefits of the real estate, this market is also a puzzle for many managers, since it is really far from achieving market efficiency, mainly due to the high transaction cost, lack of liquidity, carrying costs, large search costs stemming from real estate's heterogeneity, tax considerations and the limited price revelation, which makes the possibility of exploiting property values difficult.

3. Data

Our data set comprises quarterly time series from 1990: Q1 to 2017: Q2 for the United States, the United Kingdom, Germany, France, Spain and Portugal. Data on real house prices (rhp), real GDP (rGDP), interest rate (m), real gfcf housing (rGFCF) and unemployment level (unemployment) were collected from Banco de Portugal. The inflation rate (inflation) from the Federal Reserve Bank of St. Louis and finally, the stock market index (stockmarket) from Bloomberg.

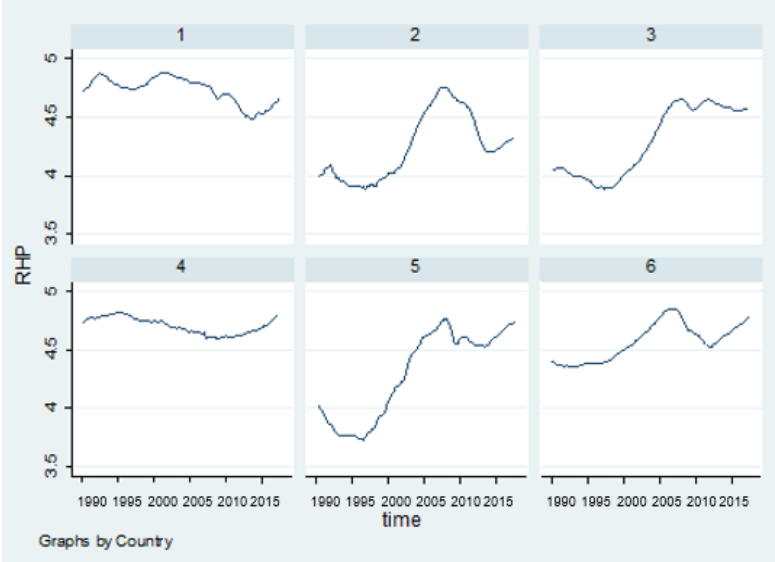
Real house prices information in this work and according to other studies e.g. Ghysels, Plazzi and Torous (2012) and Rossi (2012), face some challenges regarding their price calculation. Firstly, the house price is derived from hedonic approaches to price measurement, characterized by valuing the houses in terms of their attributes: "average square meter price", "size of the dwellings involved in transactions and their location". Additionally, the collection of the house price data during this investigation, exhibits other relevant obstacles: 1) "the demographic changes, construction cost and regulatory restriction, that have a large impact on house prices"; 2) "the leverage properties are more sensitive to economic shocks and this determinant have an important influence on house price dynamics"; 3) "the lack of longer and higher-frequency of real estate's data renders estimation and hypothesis could testing difficult".

In the panel data regression, we use 3 different samples, where the first one includes all countries in the sample, the second one considers only the United States and the United Kingdom and the last one includes Germany and France. These samples are important to

analyze and compare the house price behavior between the different periods for the 3 sets of countries. Each country in the sample experienced different stages of the financial and economic cycle and demographic flows over time.

The most detailed information in each country, besides helping in the data analysis and explanation of the final results, especially the most ambiguous ones, helps to understand each countries' choices for the last two samples in the model, where the variables' impact is visible in Table 2 (in Results, section 5).

Figure I: This figure shows the real house prices (rhp) for the countries under analysis.



Countries: 1 – Portugal; 2 – Spain; 3 – France; 4 – Germany; 5 – UK; 6 – US.

1) For the United States and the United Kingdom Nneji, Brooks and Ward (2013) observed that the property nominal prices in the US grew by an average of 3% yearly since the 90s until early 2000 and grew by over 6% between late 2000 and 2005 but fell sharply during 2007. For the UK, Iacoviello and Minetti (2003) and Himmelberg (2005) concluded that house prices are more sensitive to interest rate movements when interest rates are low. As can be observed from Figure I, there is a huge price volatility in the UK's house market (Panel 5) that was strongly affected by the global crisis. In fact, we can add with the help of the other figures in the appendix that the liberation and restriction of the capital and financial markets had a huge influence on the UK's house price dynamics. In conclusion, in both countries, real-estate

represents an important part of investment. Additionally, they represent a competitive economy in the global world, where the stock markets (Dow Jones and FTSE 100) have great visibility and impact worldwide.

2) Germany and France: Not all countries in the sample have experienced high price volatility in the residential market. The instability in Germany's house prices stands out even more when compared with France and other countries present in the sample. According to Voigtländer (2012) it was observed that this country is unique in retaining its price levels stagnated and both the decrease in interest rates and the financial crisis have had no impact on the housing market. The author adds that one of the reasons to maintain the stability process in Germany is the high demand for deposits, the alignment of lending to the mortgage lending value (instead of the market value) and the low risk of default of the banking system. Moreover, Germany has a great commitment and influence in Europe and the globalization process has fostered economic growth, boosting the DAX for large amounts of international investment. Therefore, the strict standards followed by the economy and financial system in this country may have helped keeping the smooth effects and the standard of macroeconomic shocks in the residential market. In France, house price dynamics distinguishes itself from the real house prices of Germany and other countries present in the model. The prices of houses in France registered a strong increase before the crisis, however there was a slight decrease after the financial turmoil in 2008, as we can see in Figure I. According to the result of the assets' quality review and stress tests, the banking institutions complied with the minimum requirements demanded by the EU. Regarding the CAC 40, which was positively affected by the liberalization of capital markets in the 90s, it represents one of the most developed and dynamic universal stock markets.

3) Portugal and Spain: In Spain, house price heterogeneity was significantly higher when compared to other countries in the model. According to Lourenço and Rodrigues (2012),

Spanish house prices grew more than 6% per year on average, until the beginning of the financial turmoil in 2008 and then decreased by about 6% from 2007 until 2012. Despite the similar economic situation in both countries, in Portugal the residential price scenario was completely different because the house price dynamics increased about 1% and fell about 1%, respectively. The beginning of the fundamental difference between the house price dynamics in the two countries started in the late 90s, with an interest rate reduction and with the big impact of an immigration flow to Spain, which contributed to the increase of housing demand. In Portugal, according to Pinto (2017), there was the conclusion that residential prices grew an average 4% in 2014, for the first time since 2007. According to Poisson (2017), the reason for the residential growth, besides the increase of international investors in Portugal, can also be explained by the increased preference of national investors, which can be justified by the lack of profitability in other sectors in Portugal.

According to the literature (Vaga, 1990 and Matos, 2013), the theoretical work of Hoechle (2007) indicates that the psychological behavior and social norms patterns enter panel regressions and unobservable common factors. In fact, this condition could make the study's analysis difficult because the cross-sectional correlation which is limited by the fact that the spatial correlation cannot be quantitatively measured, especially in the higher and lower moments of financial and economic euphoria.

In Portugal, the late development of the stock exchange and consequently the lack of transparency in the financial markets, led to a lack of information from the 1990: Q1 until 1992: Q3 for the stock market index variable. In Spain, the inflation rate information starts in 2001: Q4 and in France in 1992: Q1. However, the number of missing data present in the model does not change the conclusions.

4. Empirical Model

In order to find a model that achieves the purpose of this study, it is crucial to construct a valid statistical regression model. Therefore, the explanatory variables were constructed as followed:

Firstly, we analyze the variables individually regarding stationarity, we come across non-stationary and stationary series, in some of the cases only the difference was applied, or the 1st difference of the logarithm so that it becomes stationary (it should be noted that for the variables that correspond to rates, such as unemployment, inflation and interest rates, only the first difference should be applied to obtain stationarity). That being said:

- Global model: for real house prices, real gdp, the stock market index and real gfcf, it was necessary to compute the 1st difference of the log, whereas for the unemployment rate it was only necessary to compute the difference, inflation and interest rates were stationary.
- Model before the Crisis: for real house prices, real gdp and real gfcf the 1st difference of the log was compute. For the interest rate and the unemployment rate the difference was applied, the inflation rate and the stock market index were stationary.
- Model after the crisis: for the real house prices, real gdp, stock market and real gfcf the 1st difference of the log was compute. For the unemployment rate the difference was applied, inflation and interest rates were stationary.

After that, a fixed-effect model vs a random-effects model was tested using the Hausman test. The assumption of autocorrelation of the residuals over time and “between countries” was rejected. Thus, we decided to use the model described in Hoechl (2007), which was suggested by Driscoll and Kraay (1998), “which produces heteroscedasticity consistent standard errors that are robust to very general forms of spatial and temporal dependence.” This model was estimated in Stata.

Besides the variables presented in equations (1) and (2) represented below, the model initially included the real money market rate, long-term bonds and the gold index. However, the presence of these variables (the real money market rate, long-term bonds and the gold index) in the model was skewing the final result, for its significant correlation with some other variables, such as: the real money market rate which was strongly correlated with the stock market index in a positive and negative way with the long-term bonds and interest rate. Next, the long-term bond series were negatively correlated with the stock market index and the gold index and in a positive way with the interest rate. Lastly, the gold index was excluded from the equation model because it was skewing the results of the stock market index and interest rate.

Eliminating these variables from the model improved considerably the results: firstly, the real GDP, after the crisis, was not statistically significant and the stock market index had a negative impact in every economic period, considered which contradicted the literature and the expected results. These variables' exclusion still caused a change in the unemployment level: in a first model, the unemployment rate had registered a positive elasticity and was statistically significant in the global period (1990-2017) and before and after crisis periods its influence was negative and significant only in the period between 1990: Q1 to 2006: Q4, in the static and lagged equations.

Therefore, there are eighteen combinations of different equations to be interpreted, where the $\alpha_i, i = 1, \dots, n$ represent the unknown intercepts for each set of countries in each equation. Real GDP, the stock market index, the interest rate, inflation rate, real gfcf and the unemployment rate are the explanatory variables of the model. The $\beta_k, k = 0, \dots, 6$ and $t = 1990q1, \dots, 2017q2$, are the coefficients of each regressor and the interpretation of the estimated results (beta) changes in accordance with whether the regressors and dependent variables are logarithmized or not.

Next, the error term (ε_{it}) and finally, the output (real house price: y_{it}), that is the variable that I will look to explain given the information available.

The first panel data regression is represented by:

$$rhp_{it} = \beta_0 + \beta_1 rGDP_{it} + \beta_2 stockmarket_{it} + \beta_3 m_{it} + \beta_4 inflation_{it} + \beta_5 rGFCF_{it} + \beta_6 unemployment_{it} + \alpha_i + \varepsilon_{it} ,$$

$$i = 1, \dots, n \text{ and } t = 1990q1, \dots, 2017q2$$

(1)

Additionally, to incorporate the time effects to control for the impact of variables on house price dynamics, I considered the variables lagged (2nd equation). According to the literature review, the impact of the variables on the residential market, could be delayed.

The model with lagged regressors is:

$$rhp_{it} = \beta_0 + \beta_1 rGDP_{it-1} + \beta_2 stockmarket_{it-1} + \beta_3 m_{it-1} + \beta_4 inflation_{it-1} + \beta_5 rGFCF_{it-1} + \beta_6 unemployment_{it-1} + \alpha_i + \varepsilon_{it} ,$$

$$i = 1, \dots, n \text{ and } t = 1990q1, \dots, 2017q2$$

(2)

5. Results

In this section, the empirical results are presented and discussed in light of the evidence from the relevant empirical literature. Table 1 shows the panel regression results for all countries in the sample (US + UK + Germany + France + Portugal + Spain) and Table 2 presents the results separately for US + UK and Germany + France. Moreover, both tables represent the results for the global period (1990: Q1 to 2017: Q2), the period before the crisis (1990: Q1 – 2006: Q4), and after crisis (2007: Q1 – 2017: Q2).

As can be, observe from Tables 1 and 2, the house price behavior is different for the 3 samples and simultaneously, most indicators behaved distinctly during the liberalization of the

financial and capital markets (before crisis) and after the global financial crisis, that is, the restriction of the financial and capital markets. These changes in parameter estimation allow for breaks and the housing market could produce results during unpredictable times which may not reflect a true relationship between macro factors and growth in house prices.

Table 1: Panel data result for all countries

Global Period 1990: Q1 – 2017: Q2	Static	Lag Equation
dln_realgdp	1,428381 *** (0,2190699)	0,9493246 *** (0,2678118)
stockmarket	4,23E-08 (1,36E-07)	1,82E-09 (1,50E-07)
m	0,0001586 (0,0000967)	0,0000524 (0,0000779)
Inflation	- 0,0004505 *** (0,0001425)	- 0,0005127 *** (0,0001488)
dln_realgfcf	0,2263752 *** (0,0697259)	0,2437567 *** (0,0688175)
d_unemployment	- 0,0147607 ** (0,0058537)	- 0,0128576 * (0,0060587)
_cons	0,0009837 (0,0009016)	0,0014687 (0,0009323)
N	586	580
Adjusted R Sqr	0,2866	0,2294

Before Crisis 1990: Q1 – 2006: Q4	Static	Lag Equation
dln_realgdp	0,5810694 (0,2887358)	- 0,3692632 (0,283017)
stockmarket	5,04E-07 *** (9,58E-08)	5,74E-07 *** (1,01E-07)
d_m	0,000178 (0,0000941)	2,36E-06 (0,0000623)
Inflation	- 0,0007718 *** (0,0002453)	- 0,000947 *** (0,0002475)
dln_realgfcf	0,0805162 (0,0656987)	0,1387533 (0,0734763)
d_unemployment	0,0064189 (0,0052825)	0,0161795 *** (0,0048457)
_cons	0,0009832 (0,0010298)	0,0015823 (0,0009388)
N	268	262
Adjusted R Sqr	0,3034	0,3043

After Crisis 2007: Q1 – 2017: Q2	Static	Lag Equation
dln_realgdp	1,420877 *** (0,2720897)	1,211031 *** (0,2648691)
stockmarket	1,11E-07 (1,63E-07)	- 2,95E-08 (1,64E-07)
m	- 0,0001534 (0,0006281)	0,0002721 (0,0006066)
Inflation	- 0,0004775 * (0,0002352)	- 0,0005084 ** (0,0002277)
dln_realgfcf	0,2800486 *** (0,0665795)	0,2311136 *** (0,0802828)
d_unemployment	- 0,0209587 *** (0,0079978)	- 0,0246193 *** (0,0078155)
_cons	0,0002329 (0,0010545)	0,0011508 (0,0011)
N	318	318
Adjusted R Sqr	0,3645	0,3145

Source: Data from Bloomberg, Banco de Portugal, European Central Bank and Federal Reserve Bank of St. Louis
Note: *, ** and *** indicates statistical significance at 1 %, 5% and 10%, respectively. Robust SE
For variables that start: d_ the difference was applied and for dln_ the difference of log.

Considering the whole period under analysis for all countries in Table 1 and its estimation results, we can observe that the main drivers of real house prices are real GDP, inflation rate, the real gfcf and the unemployment rate. These variables present the expected signs except for inflation. As expected, a percentage increase in real GDP and real gfcf has a positive percentage impact on real house prices, while a percentage increase in the unemployment rate leads to a percentage decrease in real house prices.

When it comes to inflation, the increase of one unit will lead to a decrease in house prices by $100 \cdot \beta_6$. This was not the expected result, considering that inflation should lower the real cost of acquiring a property, that is, despite the increase of the house price through the inflation of price to finance it, the eventual capital net gains should offset the price increase, boosting and increasing its purchase/investment and its prices, respectively, *ceteris paribus*. According to Lessard and Modigliani (1975), this result, may be due to the additional cost of acquiring and maintaining this kind of asset. Actually, for houses purchased with credit, the real benefit of the rise of inflation could be lower because the increase of the interest of the lender to curb the inflation effect can be higher than the increase of the net benefits caused by inflation: in fact, when the need for compensating the lender is bigger than the capital net gains expected via inflation, there may be incentives for a reduction in house searching, and therefore the price will decrease, in case the offer stays unchanged.

An explanation for the expected positive sign in residential gfcf is that in a broad way, a potential increase in rents or a reduction in the cost of acquiring and maintaining a house, assuming *ceteris paribus* for both examples, makes the investment in the real estate sector a lot more attractive. Therefore, when the value of rents increases, in the face of the increase of the cost in the purchase and maintenance of a house, leads to more people wanting to invest in this

sector, due to the higher rates of return. As expected and as shown in the results, an increase in investment in the residential market, in this case a percentage increase of the real gfcf will cause a percentage increase in house prices. It is worth adding that it is usual during periods of economic expansion that real GDP increases and the expectations of people improves in the face of the future, in which the investment and consumption increases, which can influence in a positive way, investment and registered purchases in this market. By doing so, real GDP and real gfcf are correlated in a positive way because investment in the residential market is bigger during economic booms, when there is a rise in the production of goods and services and also when the expectations of population and the investors are better.

The stock market index and the interest rate have a positive elasticity upon the dynamics of house prices but are not statistically significant. The stock market index had the expected result because it is the reflection of the economic activity of a country and also for the value of those listed in the stock market index being influenced by the expectations of investors in the face of the market. The positive signs of the interest rate, coefficient is difficult to explain and it also goes against the explanation collected from literature. However, this variable has a negative effect in the static model after the crisis, despite still not being significant.

In Table 1, we observe that some of the variables take different values, both in the explanation of the dynamics of house prices and in the statistical significance for the periods before and after 2007. The variables that stand out the most in both cycles, both for its difference in behavior and statistical significance are real GDP, the stock market index and the unemployment rate.

When it comes to the real GDP before crisis (during the liberalization of the financial and capital markets), besides not being statistically significant, its elasticity is negative in the lagged equation. Still, the stock market index is going to be statistically significant and will have a positive impact in both models (static and lagged). However, the behavior of both these

variables will change after the financial crisis, in which the sign of real GDP becomes positive and statistically significant for both equations and the behavior of the stock market index does not only become significant, but it also becomes negative in the lagged equation. This change registered between the different periods, may have been caused by the fact that before the financial global turmoil, the housing market was considered a very safe asset, where people placed lots of trust. However, the credit supply increase and excessive trust in the residential market levered excessively its purchase, where the cheap loans given by banks, originating a time of a lot of speculation and vulnerability in the face of economic booms and busts. After the crisis, there was a calm period regarding speculation and credit supply by the rating agencies that started to improve the flow of information, the banks that reduce the credit offer over the residential market and people making less risky decisions in the purchase of houses.

When it comes to the unemployment rate, its percentage impact goes from positive and just significant for the lagged equation (before crisis) to negative and significant for both models. As I will show with the help of Table 2, a plausible explanation for these contradictory results in the first period is that it may have been caused by the influence of significant immigration registered in the 90s to Germany and Spain.

Table 2: Panel data results for US + UK and Germany + France

Countries included	US + UK		Germany + France	
Global Period 1990 Q1 2017 Q2	Static	Lag Equation	Static	Lag Equation
dln_realgdp	2,003954 (0,55257)	1,26372 (0,597836)	0,2361473 (0,3070928)	- 0,4023643 (0,347941)
stockmarket	4,79E-07 (3,68E-07)	3,60E-07 (3,82E-07)	4,48E-07 (1,35E-07)	4,66E-07 (1,45E-07)
m	0,000254 (0,0001362)	4,00E-05 (0,000102)	- 0,0000141 (0,0001312)	- 0,0000616 (0,000107)
Inflation	- 0,0008026 (0,000234)	- 0,0009514 (0,0002232)	0,0003819 (0,000248)	0,0001223 (0,000294)
dln_realgdp	0,2108447 (0,0749757)	0,2558258 (0,0894778)	0,4454998 (0,0923466)	0,3175114 (0,118183)
d_unemployment	- 0,0167292 (0,013013)	- 0,000906 (0,012817)	0,0128792 (0,019719)	0,0199848 (0,220326)
_cons	0,0007335 (0,0007335)	0,0017933 (0,004175)	- 0,0022524 (0,0008594)	- 0,0016843 (0,0009364)
N	218	216	208	206
Adjusted R Sqr	0,4704	0,3702	0,179	0,0999

Countries included	US + UK		Germain + France	
Before Crisis 1990: Q1 – 2006: Q4	Static	Lag Equation	Static	Lag Equation
dln_realgdp	0,6350757 (0,56818)	-0,94892 (0,51766)	0,340373 (0,3152975)	-0,9489239 (0,51766)
stockmarket	1,72E-06 (4,27E-07)	1,03E-06 (2,1E-07)	1,02E-06 (1,81E-06)	1,03E-06 (2,16E-07)
d_m	0,0002568 (0,000123)	-0,0000773 (0,0000763)	0,0000145 (0,000013)	-0,000077 (0,0000763)
Inflation	-0,0007832 (0,0002544)	0,0003869 (0,0003307)	0,0006013 (0,000282)	0,0003869 (0,0003307)
dln_realgfcf	0,119252 (0,086757)	0,408498 (0,134707)	0,3745144 (0,1164942)	0,408498 (0,134707)
d_unemployment	-0,0073329 (0,0133321)	0,044218 (0,044218)	0,0463938 (0,025632)	0,044218 (0,0234294)
_cons	-0,0008988 (0,0018837)	-0,0035131 (0,0012949)	-0,0042744 (0,001052)	-0,0035131 (0,0012949)
N	134	124	126	124
Adjusted R Sqr	0,5516	0,2044	0,2245	0,2044

Countries included	US + UK		Germain + France	
After Crisis 2007: Q1 – 2017: Q2	Static	Lag Equation	Static	Lag Equation
dln_realgdp	2,15765 (0,678676)	-0,2630944 (0,435688)	-0,469001 (0,5652)	-0,2630944 (0,4357)
stockmarket	1,19E-06 (5,54E-07)	2,22E-07 (1,95E-07)	3,09E-07 (2,40E-07)	2,22E-07 (1,95E-07)
m	0,0006585 (0,0004497)	0,0003723 (0,000369)	-0,0000685 (0,0003635)	0,0003723 (0,000369)
Inflation	-0,0009216 (0,0001545)	-0,0007332 (0,0003434)	-0,000283 (0,00028)	-0,0007332 (0,000343)
dln_realgfcf	0,1859165 (0,0751854)	0,092556 (0,1401842)	0,519444 (0,1293085)	0,0925562 (-0,14018)
d_unemployment	-0,0147292 (0,0170831)	-0,0196501 (0,024217)	-0,008481 (0,0233238)	-0,0196501 (-0,0242)
_cons	-0,0031517 (0,0022486)	-0,0002639 (0,001328)	-0,0013921 (0,0015018)	-0,0002639 (-0,00132)
N	84	82	82	82
Adjusted R Sqr	0,6387	0,1133	0,2068	0,1133

Source: Data from Bloomberg, Banco de Portugal, European Central Bank and Federal Reserve Bank of St. Louis
Note: *, ** and *** indicates statistical significance at 1 %, 5% and 10%, respectively. Robust SE
For variables that start: d_ the difference was applied and for dln_ the difference of log.

Table 2 is important to see how economic structures and heterogenous immigration flow between countries may affect and have affected the dynamics of house prices. Moreover, this table also helps explain some contradictory results registered in Table 1.

In Table 2, we observe that the results for inflation and interest rates are very distinct for the two samples. While in the US + UK, interest and inflation rates have a contradictory impact to what is expected, that is respectively positive and negative. In the case of Germany + France, the impact of these variables acts according to expectations. In the case of the interest rates, which have a contradictory impact, it is difficult to explain such a result. Relatively to the inflation rate, we observe that according to Table 1, countries like the US and the UK, for which the volume of houses purchased through a loan was high (when compared to Germany and

France), and because of that, as we explained in the discussion of the results of Table 1, the gains from inflation advantages could be less through the effect of the lender's interest, according to Lessard and Modigliani (1975). In Germany and France, those variables' volatility, despite having suffered some oscillations, was not as significant and it was the lowest exposition of loans registered in those countries, that may have helped reach the expected results.

Relatively to the periods before and after 2007 in Table 2, the results are important to demonstrate the existing differences in the unemployment rate, which helps confirm the explanation of the antagonistic results before the crisis (Table 1). As we can see from Table 2, the unemployment rate has a positive impact for Germany + France, in the global model and in the model before the crisis. According to Beyer (2016) and Ghysels, Plazzi and Torous (2012), the positive influence of the unemployment rate over house price dynamics can be explained by the strong flow of immigration registered during the 90s. Referring to the samples in Table 2, despite every country having suffered an increase in the level of immigration, Germany was the country with the highest flow, in the beginning of the 90s. As mentioned above and in accordance with Lourenço and Rodrigues (2012), the high flow of immigration was also registered in Spain, in the 90s. Truly, the populational increase registered in both countries may have been the main cause of the contradictory results, observed in the two tables. After that period of strong immigration, its impact will be negative.

Concluding, the analysis of the house price dynamics, in the last 30 years, we highlight still the results of Table 1 and observe that in Table 2, the stock market index and real gfcf will have a positive impact over the residential market as expected.

6. Conclusion

In this paper, I employ a panel data fixed-effects regression model to examine the relation between residential price dynamics and key macroeconomic variables in the US, the UK,

Germany, France, Portugal and Spain. This paper investigates the difference of the house price dynamics before and after the crisis, comparing the set of countries that were more shaken by the global financial turmoil and those that presented a bigger economic and financial sturdiness.

The results of the study concluded that the effects of some variables over the house price dynamics in times of economic booms and busts tend to be different, in accordance to the level of vulnerability of the countries in the face of its economic structure. For the more levered countries, in the periods of bigger instability, dynamic prices in the residential market could be disconnected from some macroeconomic fundamentals.

In this study, I found that there are some variables more robust than others regardless of the leverage state of the countries and their economic cycle, such as real gfcf and unemployment rate. Real GDP and the stock market index are very important variables for the study of this type of assets. However, there is statistical evidence that suggests that crash regimes slightly changed the behavior of these variables in the residential market. Sometimes even, when the elasticities are those expected, these variables may stop having statistical significance. When it comes to inflation and interest rates, despite the complexity of these results being larger, its analysis is also relevant for the study of this market. A more vulnerable and levered economic regime may lead to a contradictory effect, once the countries that registered more solid and stable economies, like Germany and France, obtained the desired results. Regarding the most vulnerable and leverage economies, when it comes to the negative and statistically significant effect of the inflation rate over house prices it can be explained by the increase of the interest from the lender, that could be higher than the respective capital net gains caused by inflation. Finally, we can determine that significative migratory flows will have an impact on the residential market, through the contradictory effect of the unemployment level.

Although this study provides a detailed examination of the impact of macroeconomic variables on the residential market during the liberalization and the restriction of the financial

and capital markets, it would be interesting to conduct further research in this area. In specific, it would be useful to analyze more closely the impact of the inflation rate, to understand more detailed in which circumstances the inflation would affect positively and negatively the house price dynamics. It would also be interesting to investigate the behavior of the interest rate over the market, since the results expected in this study were contradictory to the global and the US + UK models.

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Appendix: Provides additional information and guidance on the analysis content

All the figures presented in the appendix contain the relevant variables used for the analysis from 1990Q1 to 2017Q2.

For each figure: 1 – Portugal; 2 – Spain; 3 – France; 4 – Germany; 5 – UK; 6 – US.

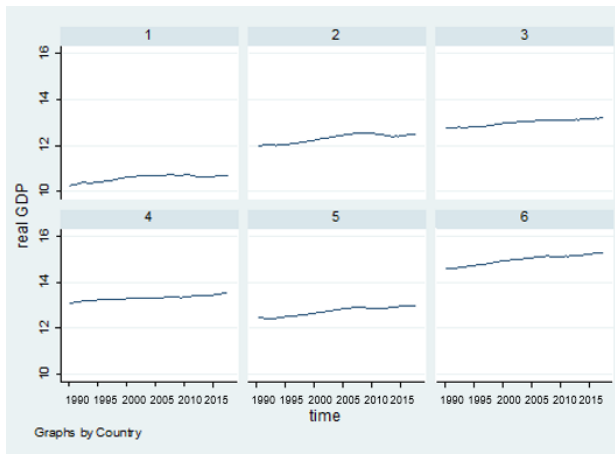


Figure I: represent the real GDP.

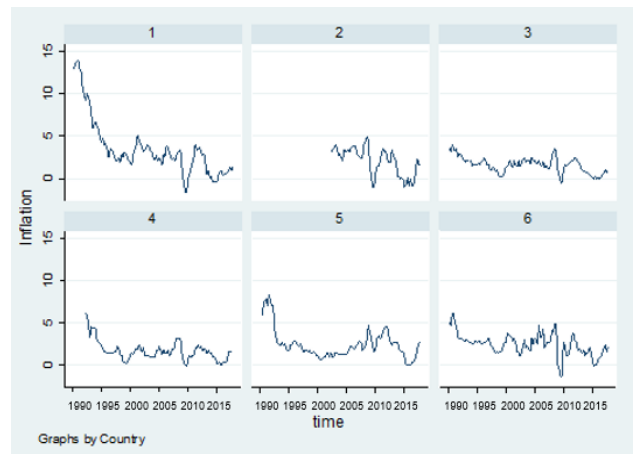


Figure II: Inflation rate.

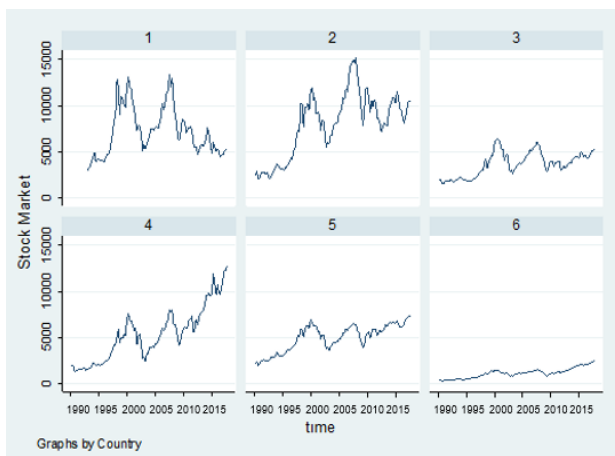


Figure III: Stock Market.

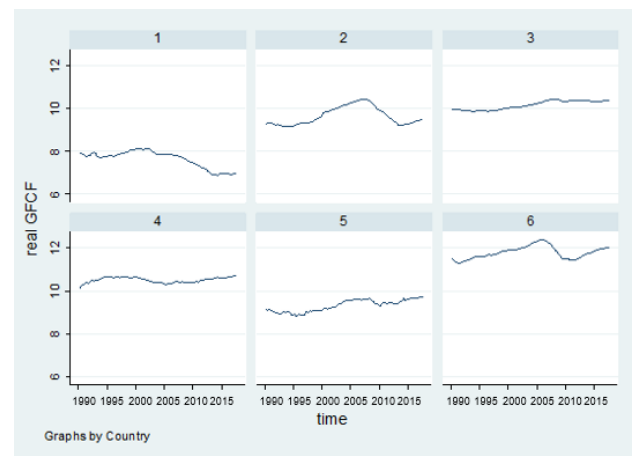


Figure IV: real GFCF.

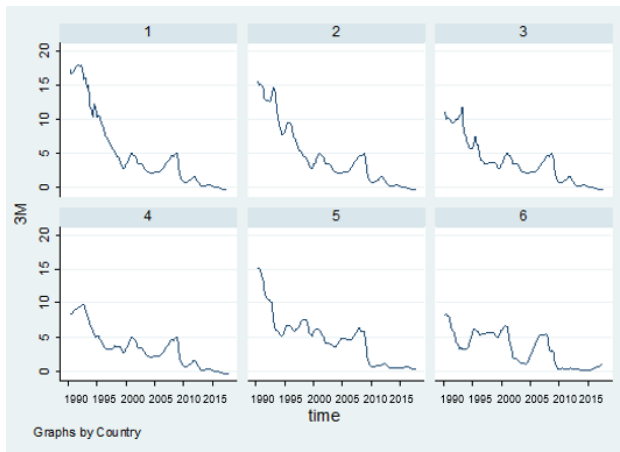


Figure V: interest rate.

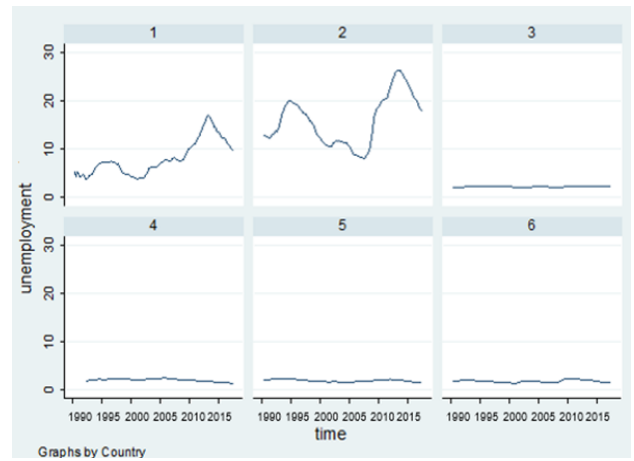


Figure VI: unemployment rate.