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The Impact of Real Estate Market in Financial Stability: Commercial Banks Exposure

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Resumo

Este estudo pretende analisar pontos chave bem como interações importantes entre o sistema bancário e o setor imobiliário, para quatro países distintos na Europa. Hoje em dia, os bancos estão mais expostos a atividades imobiliárias, via empréstimos habitacionais ou investimento direto, pelo que alterações neste específico setor tende a influenciar o retorno dos bancos. Usando dados mensais desde o ano 2000 até 2014, para os casos de França, Portugal, Suécia e Reino Unido, concluí que o mercado de habitação é um elemento chave quando se pretende medir as receitas e custos associados ao sistema bancário. Também é visível que o investimento direto, ou uma grande exposição a empréstimos para habitação, são variáveis mais importantes a considerar do que a taxa de juro, para estes países. Nesta linha de pensamento, defendo que a relação entre estes dois mercados tem de ter um papel central na definição da politica monetária, dentro da Europa.

Keywords: Setor imobiliário; Retorno bancário; Taxa de juro; Investimento direto; Empréstimos para habitação

Abstract

This paper studies key factors and spillovers concerning the real estate market connection to the banking system, in four very different European countries. Nowadays, banks are strongly engaged in housing related activities, therefore changes in real estate value most probably have a non-trivial impact on bank´s profitability, either through direct investment or due to housing related loans. Using monthly data since 2000 until 2014 for four countries (France, Portugal, Sweden and United Kingdom) I found evidence that indeed the real estate is an important factor when one measures the costs and profits related to the banking system, it is also noticed that direct banking investment in this sector or massive engagement in mortgages related loans, are variables more important to control than the interest rate, for these European cases. My findings also suggest that the monetary policy in Europe should take into account this relationship between banking and the real estate market.

Keywords: Real Estate; Bank Returns; Interest Rate; Direct Investment; Mortgages Loans

Contents

List of tables

List of figures

I) Introduction

The widespread impact of the 2008 financial crises caught the majority of practitioners, academics and regulators in absolute surprise, and governments and central banks showed their inability to face a "sudden stop" scenario. Beginning with the bankruptcy of the Lehman Brothers investment bank, the whole financial system was suddenly compromised. The North American real estate market crisis and the rapid contagion process due to the huge amount of financial products created on mortgages disseminated a wave of financial losses, maximizing the negative externalities to the overall real economy. This wave quickly spread across the Atlantic into Europe, evolving to a severe public debt crisis. The situation escalated, leading to a credit squeeze that affected the borrowing conditions for firms and households. A global economic slowdown was in place worldwide with the decreasing in consumption and the destruction of investment.

In our current economy, financial institutions can sell a lot of the risk attached to assets and loans, despite that a commercial bank will invariably have to hold back a great component of that risk, normally called "first losses". For instance, a fall in real estate prices usually represents a fall in the bank´s portfolio, simply because the real value of assets (collaterals) owned by the bank is now reduced. The present literature applies a two type risk model for the banking system: the interest rate risk and the client default risk. This happens over a scenario where interest rates rise, reducing the present value of future payments or, on the other hand, when a wide range of macroeconomic, market factors or bad quality loans forces a client to default, not paying his entire debt. I will address commercial banking vulnerability from a different perspective, trying to understand the banks capacity to generate profits in a scenario of real estate price volatility. Some research has been conducted on this basis, although recent works tend to overlook this question, therefore I believe it is important to provide updated research for the European case.

Financial institutions have a big role in liquidity creation, working with maturity transformations over a large period of time, which makes them obliged to operate on a high leveraged balance sheet. A commercial bank differs from other institutions, like hedge funds for instance, due to banks close connection with the real economy. That key difference

requires an extra responsibility by the bank managers to coordinate and take on good investment options, always being cautious on leverage ratio levels. In times of economic stress, the banking system needs to be able to provide liquidity into the financial system, in order to allocate losses and minimize the consequences for the real economy. These key factors set the commercial banks in another level of financial agent.

In this paper I will work on the relationship between the financial system and the real estate market, examining the interaction between these markets in four European countries, in the last fifteen years. The aim of this paper is to understand if the real estate market has an important role on financial stability. I mainly want to measure the impact of real estate price drifts over the returns generated by the banking system. Since a commercial bank balance sheet holds a great percentage of long-term debt mainly associated with mortgages, it is important to analyse the issues associated with real estate price fluctuations over the bank's portfolio value. What is the impact of real estate price fluctuations in the bank balance sheet? This question will be the main focus of my work and I will address it with real cases, trying to understand the link between the relevant variables.

As a starting point I will review the related literature. The evolution of financial markets and the banking system itself, will be analysed in Section II.1, in an effort to characterize and get a good framework about financial changes over the years. Then, in Section II.2, some liquidity problems that banks may face will be summed up as this topic is important in order to explain some fundamental keys about liquidity before taking on a profit-return framework. In Section II.3, I want to study the relationship between the housing market and the banking system, based on the existing literature. This analyses will expose the banks vulnerability to the housing sector. After that, in Section II.4, a closer look will be taken on the impact of real estate market in the specific balance sheet of the banks, some key papers will be referred as this topic is central to understand the econometric study and variables in place. In section III the econometric model will be tested, with the stock return of major banks, for the European cases of France, United Kingdom, Sweden and Portugal, acting as dependent variable. Finally, in Section IV I will confront the results with the literature and summarize the main conclusions.

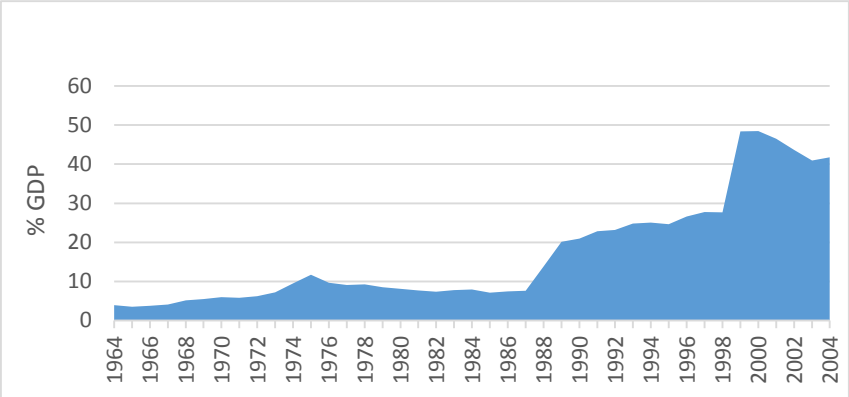
II) Literature Review

II.1) Evolution of the financial markets – the role of the bank

In the mid 1970´s the United States was operating on a very strict and regulated basis, the financial industry was strongly regulated and commercial banks were mainly small local businesses. Commercial banks were also independent from the investment banks, with the last ones handling the trading of financial products, at the time almost bonds and stocks exclusively. These banks were small and most of them private partnerships, with a small number of members. The old financial era was known as very conservative, depositors were safe because the scenario of a bank run was an extreme penalty, capable of endangering the institution. Managers were paid a fixed salary, with no incentives attached, so the bank was never tempted to engage in risky investment activities. In these conditions bank managers were very competent and careful with depositor´s money. Although this safe strategy was very inefficient, competition level was low with depositors and lenders having a very limited power of choice.

During the 80s the financial industry burst, hundreds of new financial institutions were created around the world, capable of providing credit and compete directly with the banking system. By the early 90s a new competitive environment was settled, forcing commercial banks to expand into riskier activities.

Figure 1: Nonbank financial institution assets as a percentage of GDP



Data: Euro Area

Source: Global Financial Development database

Three factors were crucial to explain the turning point in the late 80´s, from the old financial system to the new financial era:

- Technological changes have brought down the costs of communication and information, leading consequently to a low cost of acquiring and maintaining positions, expanding the markets and the overall approach to financial products;
- Institutional changes created new private corporations within the financial sector, banks were now forced to deal with higher competition. The advances in technology together with institutional changes led to an explosion of new and more complex financial products;
- Deregulation has removed artificial barriers preventing entry and anti-competition laws, markets and jurisdictions were now shared by all.

This structural changes implied that markets became deeper, risks were now widely spread through investors and institutions. Economic agents that want to invest their extra funds can now operate directly in the market, choosing the financial products they most desire, without bank intermediation (Rajan, 2005).

In a bank perspective, transaction procedures suffer massive changes, too. For example, in the old system when a homeowner paid their monthly mortgage, the money went straight to the lender, the commercial bank. Since these loans took a long time to be repaid, banks were careful with the borrowing process, restraining the credit to good clients only. Lenders and borrowers operated in a single dimension market, without the intervention of other institutions or financial products associated. In the new system lenders can sell the mortgages risks to other financial operators, like hedge funds or insurance companies. These institutions will combine thousands of mortgages and other big loans, such as car loans, in order to create financial products, like Collateralized Debt Obligations. The institutions then sell these products to investors worldwide, reducing their risk and the commercial bank risk as well. With a lot of new institutions emerging, banks can now reduce the risk attached to loans and mortgages, simply by selling it to investors as a financial asset. Despite this fact, banks have always retained a portion of the risk, normally known as the “first losses”, and this position

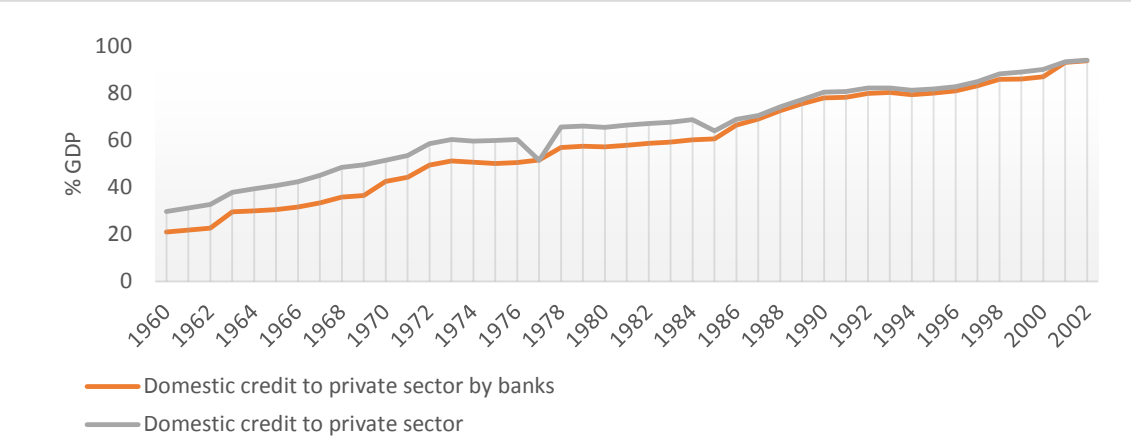
tend to increase as the quality of the loan decreases. We can find evidence of that, as well as the risk sharing process, in Franke and Krahnen (2005).

Since competition is stronger and risks can be more widely spread, bankers are less conservative nowadays. Manager's incentive structure has also changed over time, from a fix pay check to an incentive structured compensation, so the investment returns are directly correlated to the manager reward. A securitization process is established and it allows institutions to transfer risk, meaning that those who originate the first transaction may not be the ones that ultimately hold the risk. This system led institutions to cut a big share of the risk attached to their operations, making them more efficient.

Despite this fact, a "securitization shield" together with an incentive premium system may tempt managers to take on more risky investment activities, or to accept loans with lower quality. The process of constant search for high-return products in order to stay competitive, may push banks to the limit, forcing them to continuous flirt with liquidity boundaries. It is stated and proven that risks in actual markets are more widely spread, although the amount of risk generated per transaction is now bigger and banks liquidity tend to be smaller (Rajan, 2005).

Financial markets are now more efficient, firms and people can now borrow at cheaper rates than in the past. Competition force institutions to innovate and to be efficient, for investors the free choice of financial instruments without the bank intermediation makes financial opportunities more profitable than ever before. All these benefits come with associated costs, primarily for the banking system. Commercial banks are now competing directly with other financial agents like hedge funds or pension funds, therefore leveraged balance sheets are common. It is known that banks can now take on more illiquid positions, the credibility they have on the market gives the bank manager a small window to operate on a highly leveraged level.

Figure 2: Domestic credit provided to private sector, by banks



Data: European Union

Source: World Bank

The graph above shows us that banks are still the major players in the financial system, even in times that allow them to take on more and more risk. For that reason it is important to protect and carefully manage the banking system itself, the increasing competition together with the search for high return investment opportunities may deviate banks profit and expose them to the, not so common, tail risks. The general concern is whether, in times of economic downturn, banks will be able to provide the capital needed to allocate possible losses within the financial system, in order to minimize the spillovers to the real economy.

II.2) Liquidity management in commercial banking

When one studies the capacity of a bank to generate profit, it is central to close monitoring the liquidity issue, due to the growing tendency to engage in highly leveraged operations in order to chase big investment opportunities. Ioan and Dragos (2009) focus on the role of liquidity levels in commercial bank activities, more specifically it focus on the liquidity management in commercial banks, the important role of the manager itself and the minimum positions and procedures that banks should maintain to be safely protected in times of economic stress. In a commercial banking activity perspective, liquidity risk represents the

probability of a bank to lose his financing capacity in transactions, which means, the probability of a certain bank to fail his commitments with his clients. Some of the obligations to clients are, for example, the obligation to withdrawal deposits, or the ability to cover additional funding requirements in loans and investment portfolios.
A possible scenario of liquidity crisis within a single bank can cause negative effects over the entire banking system, due to the risk of contagion through interbank activity. Therefore, it is extremely important to maintain a balanced liquidity ratio, mainly for two key reasons:

- Firstly, an inadequate liquidity level may lead to chasing additional sources of market funding, normally with higher costs, reducing the profitability of the commercial bank which can lead ultimately to his insolvency;
- Secondly, an excessive liquidity leads to a decrease of the income associated with the return on assets[1], with the consequence of a poor financial performance. That is inefficient for the bank and for the economic agents seeking liquidity and financial investment options.

It is central to define a way in order to have the ideal amount of liquidity. It is important and decisive to have backup processes to provide liquidity when it is most needed, usually very important when alternative scenarios, like a sudden downturn in the economic cycle, are materialized.

Another challenge that managers have to face is the contingent liabilities. The management strategy should take in consideration the influences of contingent liabilities, which are the off-balance sheet elements, such as bank guarantees or credit letters. During unpredictable downturn periods, these instruments can generate significant outflows of funds that do not depend on the bank performance and are not fully controlled by the manager.

Nowadays European banks have to legally maintain minimum liquidity ratios to protect themselves against capital outflows. A liquidity coverage ratio is now mandatory, as well as a minimum level of liquid reserves, after the Basel III agreement, requiring banks all over Europe to maintain good quality assets and be capable to cover their operations for at least 30 days. Although the banking system is legally obliged to keep adequate levels of liquidity

the regulator paper is central, simply because sudden losses of liquidity within banks are now more frequent than ever, as regulators tend to "ring the bell" too late. Just in Portugal three banks have gone bankrupt since 2008, due to bad management options and lack of regulation.

From a different liquidity perspective, it is important to know if the bank's assets are liquid enough to face economic changes. Under normal conditions, assets owned by banks can be quickly transformed into available funds; however, the latest economic turnovers have shown that assets may not always provide a certain source of funding. Banks ought to previously take into consideration the type of assets that they own. Certain assets may be very liquid under stable conditions, but substantially reduce their liquidity conversion when facing adverse economic scenarios. This major issue faced by all financial institutions has a central role in my paper, since the housing market is very sensible to economic turnovers, it may lose substantial value in stressed times.

II.3) Housing market and commercial banks

The common studies focusing the banking system and the risks attached to commercial bank activities applied a two type risk model for commercial banks: the interest rate risk and the client default risk. The vast majority of these papers does not include the real estate market as a possible destabilizer factor of the normal banking activity. Although some papers analyse this question, their main focus is on the US economy.

To better understand my work there are a few papers worth mentioning. Begenau *et al.* (2015) studies the exposure of US banks to interest rate and credit default risk only, with a complex analysis of interest rate structure in order to represent banks liquid positions in their portfolio. Their approach delivers time varying measures of vulnerability that are comparable across banks as well across the business segments of a single bank. In order to measure default risk, this paper applies some stylized facts about the latest development of bank risk taking, applied to the current US economic system. Allen *et al.* (1995) argue that for a bank value to be significantly related to the real estate market, two conditions are necessary: banks must hold a significant amount of real estate assets and those real estate holdings must be significantly influenced by general changes in the market. The study is conducted using

monthly banking stock returns - separated into big, medium and small banks – as dependent variable. The paper uses three explanatory variables: overall stock market returns represented by S&P 500 index; interest rate represented by interest rate index; and real estate market activity represented by the NAREIT Equity REIT[2] Index. The authors document a positive significant relationship between bank returns and changes in real estate value, beyond the effects of stock market and interest-rate movements, for banks that hold a significant amount of real estate on the balance sheet. The sensitivity of bank values to the real estate market has increased over time (from 1979 until 1992) and the bank sensitivity is positively linked to the bank balance sheet exposure to the housing market. They argue that regulators should consider a closer monitoring of the real estate exposure just as they monitor bank exposure to interest rate risk.

The main literature stream relating banking and housing market tend to establish a relation between banks stock returns and real estate returns. For example, He *et al.* (1996) measure the sensitivity of bank stock returns to changes in real estate market prices. In order to measure the impact of the housing market the authors add up a third component, a real estate return index, to the traditional banking two-index model (stock market return index and an interest rate proxy). This new component increases the explanatory power of the model, with a substantial rise of the model *R*-squared and *F* values.

He *et al.* (1996) also argue that the level of impact is positively correlated with the bank exposure level to the housing sector. According to these authors a shifting in the normal activities was noticed in the US, around 1980, where banks significantly engaged larger portions of their loan portfolios into real estate. This increase in real estate lending has caused concern about the continuing economic health of banks, since changes in real estate returns evidenced by changes in property value could potentially have a significant impact on a bank default risk and profitability. In this scenario of default risk and low profits, banks could potentially affect the whole economic system due to systemic risk, the interbank market could be extremely penalized by the bad behaviour of a single bank, which would lead ultimately to credit contractions and an inevitable economic slowdown.

Lausberg (2001) points out that banks are always more exposed to the house market than any other financial institution, and therefore it is crucial to understand the types of real estate

assets that banks own and the consequences induced by property prices fluctuation in the bank portfolio. The author also resumes several ways according to which banks are exposed, directly or indirectly, to the real estate market, even when the exposure is not strictly related to their prime activity.

Table 1: Banks real estate related assets

Type	**Example**
Direct investment	
Real estate for investment purposes	Acquisition of a property to rescue a loan
Other real estate owned	Bank headquarters
Real estate leasing	Construction and leasing of buildings
Loans	
Loans to the construction and real estate industry	Loans to real estate developers
Mortgage loans	Housing Loans to private customers
Indirect investments	
Fee income from real estate related activities	Real estate brokerage
Income from real estate trusts	Fees as the initiator of a REIT[1]
Capital investments in real estate companies	Dividends from REITs

Source: Lauberg (2001), page 1

Lausberg (2001) points out that the main portion of assets present in a commercial bank balance sheet. For instance, in the year 2000 the housing loans alone account for 40% of all loans owned by the German banks. Therefore the author argues that real estate risk has been overlooked by the banking managers and regulators, which can be very costly if there's an abrupt turnover in the economic cycle, simply because a downturn usually starts with a real estate market fluctuation, meaning that banks will face loans defaults and collateral prices fluctuations as well.

There are four types of real estate indirect risk faced by banks:

- **Credit risk** - the danger attached to real estate market fluctuations, that could reduce the creditworthiness of a borrower;

- **Collateral risk** - when the value of a property could be brought down with an adverse market movement, reducing the value of assets owned by the bank as a lender;
- **Profitability risk** - occurs when real estate market variations endanger the profitability of an investment, owned by the bank as an investor;
- **Price risk** - exists if the real estate market has a negative influence on other market prices and trends, such as other assets or stock prices.

Lausberg (2001) argues the effect of the real estate market on banking is almost the same as interest rates. Positions are "wide open" simply because tools for hedging the real estate market risk are not common or even in use by some managers. The author concludes by indicating that banks do not have the right instruments in place to handle real estate market risk.

In a very similar paper, Yuan and Cunat (2014) aim to explain the reaction of commercial banks when losses are induced by a crisis in the housing market. They analyse the US banking sector during the 2005-2010 period using three sources of data: level data from CALL reports[3] with a quarterly frequency, information about real estate prices (quarterly data) and prices/capital elasticities (cross sectional data). The results show that banks indeed suffer from substantial capital losses as a result of their direct exposure to real estate prices. Although it is hard to quantify the magnitude of these losses with precision, the elasticity of capital to real estate prices is estimated to be around 22%, which means that a reduction of house prices of 10% would lead to a reduction of bank's capital of 2.2 %. Banks tend also to change their lending, capital structure and operational policies in accordance with this capital reduction, with more affected banks obligated to even cut lending. The reductions in lending are not strictly on real estate loans, they affect all the loans. Overall, the capital losses showed by a commercial bank have a considerable level of contagion within the internal bank operations. The authors also found evidence on the impact of problematic loans (sub-prime) and liquidity failures, related to real estate assets owned by the banks - houses and properties. They believe that in times of economic stress and low confidence, it is usually hard to liquidate the big share of real estate positions owned by commercial banks. In fact, that happened during the Japanese banking crisis in the 1990´s decade.

The majority of these studies focus on the US house market and the US financial system, and those results are not directly applied to other countries or other time periods. The former 1980s crises, which the majority of the studies includes, saw a nationwide real estate price drop of unparalleled proportions. In addition to that, a massive stock market bubble affected the Wall Street market in the late 90´s, when the arrival of the internet companies predicted a scenario of a fake constant sustainable growth over time. For all these reasons we cannot take for granted that the relationship between banks and the real estate market observed in the US is the same in other countries. My goal is to apply the theories and methodologies documented in the literature to several European markets, taking Portugal, United Kingdom, Sweden and France as study cases.

II.4) Housing impact in commercial banks balance sheet

In order to study the impact of real estate assets over commercial banks' balance sheet, it is important to analyse what happens to the bank strategy in a scenario of housing prices variation. The existing literature suggest two important ways to analyse this subject:

- In a firm perspective (this represents the demand of credit in the market), studies suggest that a real estate boom will have a positive impact, raising the collateral value of firms that own real estate properties. In this scenario, firms are now a more trustworthy borrowers, since the collateral backing up the credit is now more worthy. Firms tend to increase investment and reduce borrowing costs, while demanding for extra credit (see Chaney *et al*., 2010).
- In a bank perspective, a real estate boom tend to increase a bank exposure in mortgage related activities, during the boom this strategy strengthens the bank balance sheet. This re-enforced balance sheet could happen either through banks direct holding of real estate properties investments or through an increase of bank engagement in mortgage lending.

In a recent paper Flannery and Lin (2015) show that a housing price increase delivers a great potential to growth and changes the composition of bank balance sheet. The authors study

this relation since 1996 to 2006, concluding that when the house prices of a depository bank increases by 1%, the bank balance sheet increases by more than 0.5%. This positive correlation is not exclusive to real estate loans as it also includes commercial and industrial loans, so when prices of real estate market raises, supply and demand for general credit meet together in a level above the normal equilibrium.

Despite these facts it is known that banks assets and liabilities will not grow in a proportional way and pace. On the assets side, housing loans show the fastest growth rate, follow up by commercial and industrial loans. Although banks, that are strongly active in the housing market, increase their investment capacity in real estate related assets, mortgage lending becomes more attractive under these conditions, so banks will cut their commercial and industrial lending, making them more exposed to the housing sector. A more profitable housing market may ultimately lead to a crowding-out effect on other sectors, which may induce banks to provide sub-prime loans (MacKinlay *et al.*, 2013).

Herring and Wachter (1999) adopt a simple portfolio framework to measure the impact of a real estate market boom in the bank's investment strategy, analysing the evolution of real estate loans against other types of loans. They argue that a rising in the real estate market makes the bank balance sheet stronger, either because the investment in real estate are now more valuable, or simply because the collaterals provided by borrowers, to secure a loan, are now more worthy. This impact in the bank balance encourage further lending. In a rising market scenario, banks that are strongly exposed to real estate can lend more without increasing the probability of bankruptcy or lowering its profitability. In other words, as housing related loans get more attractive relative to other loans, banks transfer more resources, increasing the percentage of real estate assets in the total mix. MacKinlay *et al.* (2013) analyse this same issue considering banks' exposure to the housing market between the period of 1988 and 2006. They documented that banks more engaged in real estate market activities actually increase their mortgage related loans while cutting commercial and industrial loans. The bankruptcy risk will only be an important factor if the market stop being profitable, but when the downturn occurs banks have to be able to allocate their losses, a task that will be quite hard given their high exposure level to the sector.

III) Econometric study

This section exposes the methodology used in the econometric application. Then the data used in the regressions are presented and subjected to a preliminary analysis. For each expected variable the expected result over the bank stock returns will be summed up, grounded in the literature reviewed in previous Section II. A quick explanation about each European country economy and financial position is also performed, along with a quick analysis regarding some structural changes that occurred in Europe during the years in study, such as the impact of the 2008 sub-prime crises or the III Basel agreement.

III.1) Methodology

The econometric model used here is based on the theoretical and empirical approaches proposed by some papers, namely by Allen *et al.* (1995) and He *et al.* (1996). Mostly, the model aims to measure the impact of the housing market on the banking performance. The econometric model uses two variables as controlling factors: the interbank interest rate and the overall stock market returns. Literature points out these factors as the main ones affecting the banks' profitability. Interbank rate is also a central variable when one study the system stability, simply because that rate measures the cost of inflows and outflows between banks, related to the central bank monetary policies, measuring together the confidence and the liquidity levels in the system. The remaining explanatory variables gather information regarding the housing prices and real estate exposure of banks, due to loans and direct investment.

The model is the following:

$$R_t = ß_0 + ß_1 I_t + ß_2 I_{t-1} + ß_3 SM_t + ß_4 SM_{t-1} + ß_5 HPI_t + ß_6 HPI_{t-1} +$$
$$+ ß_7 RE_t + ß_8 RE_{t-1} + ß_9 L_t + ß_{10} L_{t-1} + ß_{11} HPI_t * RE_t + ß_{12} HPI_{t-1} * RE_{t-1} + \quad (1)$$
$$+ ß_{13} HPI_t * L_t + ß_{14} HPI_{t-1} * L_{t-1} + ß_{15} R_{t-1} + e_{it}.$$

The dependent variable is the log returns of the banking sector computed as $R_t = ln\ (P_t/P_{t-1})$, where *P* refers to the banking sector stock index. By measuring the bank's profitability I can get an approximated idea about the impact over the balance sheet and, ultimately, over the bank structure. It is well known and consensual between economists that a fall in the stock market is a huge first step into financial instability. Again, my main goal with this paper is to analyse the impact of real estate fluctuations over the system stability, taking banks as the main agents operating in the financial market. A bank return analyses will provide me answers about the general financial stability, since the institutions capacity to operate in an efficient manner, during long periods of time, has been strictly related to the returns generated by those activities, that ultimately, measure the whole system capacity to continuously perform in an efficient way.

The variables *I* and *SM* are the interbank interest rate with a maturity of three months and the log returns of the overall stock market, respectively. As mentioned above these are control variables. The variable HPI refers to the real estate price index. The variables used to measure the exposure of banks to real estate are *RE,* which measures the bank direct investment in real estate, and *L*, which measures the mortgage loans. The model also includes nonlinear effects, captured by the interaction between the real estate price index and each of the exposure variables, direct investment and loans; and lagged effects not only of the explanatory variables but also of the dependent variable.

It was impossible to isolate real estate direct investment of banks from that conducted by other financial institutions, therefore his effect is measured with an error-in-variable. However, it is arguable that most of this investment is done by banks. One of the most important components of investment is information, for this type of institutions it is easy to assume that the major banks are the most informed agents in the market, not only because of the resources they have but mainly as a result of their engagement with this type of assets, during the normal bank activity. Since they concede a big share of mortgages loans, banks are always well informed about property prices and possible investment opportunities, as well as other important information usually hard to get by the remain financial agents. With this privileged knowledge, banks will act as the first movers in housing investment market, followed by the major financial companies and lastly by a few private investors.

Table 2 below summarizes the definition of the variables, the indicator used and the expected sign in the regression given by Equation (1). For more detailed information see Table 3 in the Annexes.

Table 2: Definition of variables

Variable	Definition	Indicator used	Expected sign
R	Banking system stock returns	Bank stock returns index	Dependent variable
I	Interest rate, 3 months	Euribor, Libor, Stibor	Negative
SM	Stock market returns	PSI20, CAC40, FTSE100, OMX30	Positive
HPI	Current housing prices (linear effect)	House price index	Positive
RE	Real Estate Investment (linear effect)	All financial institutions investments related to real estate	Positive
L	Mortgage loans (linear effect)	Housing loans	Positive
HIP*L	Mortgage loans exposure (nonlinear effect)	Housing loans; house price index	Positive
HIP*RE	Real Estate investment exposure (nonlinear effect)	All financial inst. investments related to real estate; house price index	Positive

III.2) Data and preliminary analysis

The majority of the data collected for this study comes from the Datastream, World Bank and European Central Bank databases (revisit Table 3 in the Annexes). Although this paper initially aimed to measure the impact of the housing sector over commercial banks alone, I found it very hard to specify the statistical data for this type of banks. This may seem a serious problem at first, but, since commercial banks are the major lenders for mortgages related loans and investment in the sector, I believe that the real estate market has consequences over

this type of banks, almost exclusively. The bank related data is a compilation of the entire banking system, for each country, using the median method to aggregate all the data.

The time series cover the period between 2000 and 2014. For this short period of time it is better to work on a monthly basis, instead of an annual or quarterly one, that way I can get a good spectrum of observations and a wide range sample. The "House price index" is the only variable that is not recorded at a monthly frequency, instead it is recorded quarterly. I used linear interpolation to fulfil the missing observations at a monthly frequency.

The four countries studied in this paper, Portugal, Sweden, France and United Kingdom, present structural economic differences. Portugal is located in southern Europe, where financial development is slower than in the north. The intervention of the IMF in Portugal for three times, the latest in 2011, indicates that a close monitoring about external spillovers is an important issue in this southern European country. Besides, Portugal banking system has shown some problems over the years, with the bankruptcy of three banks in the last seven years. Sweden has one of the biggest annual growth rate in Europe, conditioned by one of the most expensive housing market in the world and a solid banking system. France is one of the most important countries in the Euro system, not only known for the steady development rate, this country is also very famous for his cultural diversity, giving shelter to a lot of foreigners, France is one of the most liberal regions within Europe. The consequences are crystal clear, French real estate market is one of the most unpredictable, due to the different living conditions. Changes from region to region, or even from neighbourhood to neighbourhood, are very common, making the French case suitable and interesting to study. The United Kingdom economy is quite relevant too, the strong monetary value of the Sterling Pound together with the fact that London stands as one of the most important financial centre of the world, makes the country economic structure a relevant study case.

These four European economies present different policies, banking strategies and development levels, so analysing the impacts in each case will reduce the error associated with specific conditions, due to the different economic structures.

In order to start estimating the model, some information about stationarity is mandatory. It is recognized that traditional regression methods are badly suited when variables are

nonstationary, producing spurious relationships between variables. All variables are tested for stationarity using the "Augmented Dickey - Fuller test", in which the null hypothesis is of existence of at least one unit root. If variables are integrated of order 1, they are differentiated and the test is run again until stationarity is achieved. Table 4 shows the p-values of the ADF teste with 5 lags and a constant. The null hypothesis is not rejected, at any usual significance level, for all variables in levels, after differentiating all variables are stationary at a significance level of at least 5%. In fact, before differentiating I have applied the natural logarithmic to all variables, meaning that in fact I am going to use in the model the instantaneous growth rate of those variables.

Several descriptive statistics are shown in tables 5, 6, 7 e 8 in the Annexes. Starting with the bank returns, the average value is -0.01% for France, -1.5% for Portugal and -0.3% for the United Kingdom, only Sweden has a positive overall return index with 0.5%. The interest rates have shown a decreasing trend during this period. Euribor is the rate for Portugal and France, the Libor is used for UK and the Stibor for Sweden. In the housing and stock markets, structural differences makes it hard to specify the data for each economy.

Although between the year 2000 and 2014 the main impact over these variables were felt in the years of 2007, 2008 and 2009, due to the housing market and stock market crises originated in the United States, that quickly spread across Europe, affecting all the countries in study. As consequence, a lack of investment by banks in this type of assets led to a sudden decrease of property prices, lowering the housing market exposure, with banks cutting mortgage lending and investment as property prices sank further down. Figure 3, in Annexes, shows the evolution of bank exposure to the real estate sector in each country.

A crucial issue when studying the banking sector during this period is the III Basel Agreement, presented after the sub-prime crises turning point. This Swiss settle required minimum capital positions for banks to hold, guidelines that banks should follow in order to increase their liquidity and decrease the leverage ratios. Europe and the US took separate implementation methods. European governments gave the possibility to the banking system slowly change the structural basis, until 2019 for capital related guidelines and until 2018 for leverage related guidelines. Liquidity rules were implemented, too. A liquidity coverage ratio

now requires banks to hold good quality assets in order to cover their net outflows, at least for a 30 days period. Basel III was implemented when a big portion of financial institutions did not provide enough liquidity during the turnover scenario presented in 2008, the big competition led institutions to continuously flirt with the liquidity boundaries over the years, without accounting the not so common, but yet important, tail risks.[4]

In this paper it is important to count the Basel III effects, mainly over the housing market exposure indicators and the bank stock returns, from 2011 to 2014. A gradual capitalization of financial institutions is expected, after the 2011 and 2012 years, with a steady increase over the time until the achievement of the minimum ratios. This new Basel Agreement will be critical for the upcoming years, after the adaptation period, when the banking system will be more regulated and legally obligated to follow regulation strictly. In my econometric approach this could be a relevant factor, although it is important to remind that the years from 2011 to 2014 will fall in the adaptation period defined by the European governments.

III.3) Results

Model given by Equation (1) is applied to France, Portugal, Sweden and United Kingdom, for the period since 2000 until 2014. I use a procedure from general-to-specific, withdrawing from Equation (1) the variable with the highest p-value. This is done sequentially until the final regression only has significant variables with a p-value of at least 10%. This procedure is applied using the Gretl software.

Table 9 shows the final regression results, for each country.

Table 9: Econometric results

	France	Portugal	Sweden	United Kingdom
I_t	-	-	-	-
I_{t-1}	-	-	-	-
SM_t	1,2272 *** (20,2444)	1,1853 *** (15,5752)	0,8564 *** (13,7777)	1,0050 *** (12,8704)
SM_{t-1}	-	0,2485 *** (3,3191)	-	-0,1623 ** (-2,2031)
HPI_t	-	-	1,9150 *** (3,2829)	-
HPI_{t-1}	-	7,1098 *** (5,5723)	-	1,1053 *** (2,7878)
RE_t	-	-	0,1510 ** (2,5762)	0,3080 *** (5,6664)
RE_{t-1}	-	-	-	-
L_t	-	-	-	-
L_{t-1}	-	-0,2680 *** (-2,8412)	-	-
HPI_t*RE_t	-	7,8321 * (1,8755)	-	-
$HPI_{t-1}*RE_{t-1}$	-28,3470 *** (-4,1780)	-	-13,7718 ** (- 2,1896)	-
HPI_t*L_t	-	-	-	11,7066 ** (2,4220)
$HPI_{t-1}*L_{t-1}$	-	75,6962 *** (2,8812)	-	-
R_{t-1}	0,205817 *** (5,1482)	-	-	-
Adjusted R^2	0,72	0,62	0,65	0,69

Table 9 shows the results after estimating the equation (1) for all the four countries, with the methodology presented in previous section III.1. The values under brackets represents the coefficient t-stat; the asterisk stands for the significance level, where one, two and three asterisks represent significance levels of ten, five and one percent, respectively.

The adjusted R^2 are quite high spanning from 0.62 for Portugal to 0.72 for France. The principal variable explaining the banking sector returns is the overall stock market, this

variable is highly significant for all countries, and in the case of Portugal and United Kingdom it still has important one period lagged effects. The contemporaneous coefficients are positive as expected. France is the only country where there is important first order autocorrelation in the banking sector returns. It seems that the short run interest rate is not particular important in explaining the banks stock returns. In any case this variable, contemporaneous or lagged, is not significant at a 10% level.

The results point out that the real estate market has some kind of impact in the performance of banks in all countries. However, the particular channels by which the information passes from the real estate market to the banking sector seems to be specific of each country.

For France the only effect is the nonlinear and lagged effect from the house price index via the exposure to real estate resulting from direct investment. However the sign is negative implying perhaps some kind of readjustment dynamics.

Portugal is the country where the real estate market shows more effects: a linear lagged effect from the house price index, a linear lagged effect from the mortgage loans, a nonlinear contemporaneous effect from the house price index and direct investment and finally a nonlinear effect lagged from the house price index and the mortgage loans. All these effects are positive, except the second one; this may imply that the increase in the amount of loans may undermined the banks performance via the increase of bad quality loans.

In the case of Sweden the more important effect is the contemporaneous linear effect from the house price index, as well as the general stock market.

The United Kingdom shows a significant linear relationship between the banking returns and the lagged house price index, the contemporaneous direct investment, being this one the most important. The mortgage loans also appear to be significant, although its effect is nonlinear in conjunction with the house price index.

IV) Summary

In this econometric study I found a significant impact of the real estate market on the banks stock returns, for all the countries, due to direct investment in the market or to the prime banking activity, the loans provided for housing purchase. It is clear that these two markets are integrated, which can lead to financial instability if assets prices suddenly flow away from fundamentals. Therefore, the natural subsequent question is how can the central bank control this instability?

It is well know that nowadays monetary policies are based on the Taylor Rule, which the interest rate is represented under the form: $i = r + \pi + h\,(\pi - \pi^*) + b\,(y - y^*)$, $h > 0$, $b > 0$.

This guide for monetary policy incorporates the inflation rate, π, the real interest rate, r, as well as coefficients that measure the central bank preferences over the stability of the inflation, h, or the preference for product stability, b. The variables $(\pi - \pi^*)$ and $(y - y^*)$ are the inflation gap and output gap, respectively. The letters with asterisk stand for the long term natural value of the correspondent variable.

It is worth mentioning that these coefficients, h and b, are arbitrarily chosen, due to the central bank strategies and the current economic cycle.

My main prescription is that central banks should consider the effects of the real estate market when defining monetary policies. There are three main reasons explaining why this should be done:

- Real estate is a quite predictable sector in terms of the near future economic development. Its predictability may help future values of the output gap, and therefore may be used to increase de accuracy of b.

- This specific sector has an important impact over the banks profit and, as I mentioned in the Section II.1, the bank is still the major financial institution within European economy. Besides, monetary policies main goal is about controlling the interbank market, by controlling the short run interbank interest rate, measuring the cost of borrowing and lending within different banks. This will lead to spillovers into the real

economy, as the interbank rate is the prime indicator defining the costs of current lending for companies and families.

- One result of my econometric study it that mortgage loans and banks real estate investments in the past influence the banks' returns generated in the present. This confirms the widely range of papers defending that the housing market is the first sign of an economic turnover, acting as an important key factor over the general stock market index and the banking stock returns. Therefore, incorporating this sector in the design of monetary policies today, may anticipate spillover effects that will have impacts in the real economy, in a nearby future.

In order to be efficient and well-adjusted in the future, the short term interest rate defined by the central bankers should incorporate a nearby future predictable factor, as well as a variable that measures efficiently changes in the bank´s capital structure. It is known that after the 2008 crisis, the monetary policy has not been accurate in Europe, which is one of the reasons that makes the interest rate variable non-significant for all the countries in this study. I believe that, by adding the real estate market as a central indicator in the *b* coefficient, better adjusted monetary policies can be designed in the future.

Besides, when one incorporates this market as a controlling and predictable factor, also the bank exposure level to the sector will be controlled. When the banks are strongly engaged in real estate activities, the *b* coefficient will be bigger and as a consequence the interest rate will also rise, meaning that a more efficient credit rationing will occur. In this scenario, it is more expensive for the banks to set interbank settlements, between themselves or even with the central bank, leading to a decrease of the direct investment as well as a more controlled quality and quantity in lending. This will slowly decrease the banking exposure to the market, avoiding unnecessary risks like sub-prime loans or bad quality investments.

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