Real Estate Market Risk in Bank Stock Returns: Evidence for the EU-15 Countries

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Abstract

      In countries with highly-developed financial systems bank portfolios have high exposure, directly or indirectly, to the real estate sector. Changes in the value of real estate can have a potentially significant impact on the default risk of banks and on their profitability as a result of this high exposure to the real estate sector. This scenario is especially critical during real estate crises, when bank losses tend to increase dramatically, placing the entire financial system at risk of collapse, as it was the case in the recent international subprime crisis. This article studies the sensitivity of bank stock returns to real estate returns. The results indicate that EU-15 bank stocks are sensitive to real estate returns; there is a positive relation between bank stock returns and real estate returns after controlling for general market conditions and interest rates. In particular, small banks with greater asset exposure to the real estate sector showed to be more sensitive to changes in the real estate returns.

Key Words: Real Estate, Mortgage Lending, Bank Stocks, Asset Pricing.

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1. Introduction

In countries with highly-developed financial systems bank portfolios have high exposure, directly or indirectly, to the real estate sector. He *et al.* (1996), Lausberg (2004) and Lu e So (2005), indicate the existence of a high concentration of activity and assets in the real estate sector by banks in the USA, Germany and in some Asian countries.

This way, in spite of all bank loans being vulnerable to general market conditions, the default risk on real estate loans is influenced by a specific factor: bank real estate loans are affected by movements in the real estate market which are only indirectly related to the general economic conditions. Taking into account that the market value of banks is systematically influenced by the real estate market, the valuation models of bank stock returns should include factors which reflect the specific conditions in the real estate market. Given that, the financing of the real estate industry constitutes a significant part of the banks loan portfolios, it is likely that real estate market conditions affect the share price of bank.

The inclusion of real estate market conditions as a risk factor has not been thoroughly considered in the literature. Studies looking the behaviour of bank share prices have tended to focus only on market risk and interest rates (see for example, Viale *et al*. 2009). However, the Asian financial crisis and more recently the subprime crisis highlighted the importance of the real estate risk. Herring and Wachter (1999) and Lu and So (2005) state that, before these crises, there was a tendency for over-investment in the real estate sector due to the high returns associated with this type of investment, potentially driving the occurrence of speculative bubbles in real estate prices in the vast majority of these markets. Furthermore, the increase in real estate prices tends also to bring about an increase in the value of collaterals, resulting in a perceived lower risk by the lender. For these reasons, the increase in real estate prices

tends to produce increasing bank credit granting, which in turn, leads to new further rises in real estate prices.

A drop in real estate prices brings about a reduction in bank equity, as a consequence of the reduction in the value of the real estate asset portfolios held by banks, and by the corresponding reduction of collaterals. Also, the drop in real estate prices tends to result in greater awareness by banks of the perceived risks of real estate loans. For these reasons, it is very likely that a significant decrease in bank credit granting will occur. Added to this, supervisors and regulators react to this scenario of reduced bank equity with additional requirements of solvability and more stringent rules for the risk evaluation and provisioning for bad loans of real estate assets. These measures result in a further reduction in the bank credit magnifying the downfall movement in real estate prices. This seems to be the mechanism of transmission between real estate market conditions and bank stock risk and returns.

In this article, we study the sensitivity of EU-15 bank returns with regards to real estate sector returns. In particular, we look at the relationship between the banking industry returns and the returns of real estate companies, for each of the EU-15 countries, in order to assess the reasonableness of the hypothesis of a priced risk factor in real estate returns of European banks. Later, we analyse the individual sensitivity determinants of the EU-15 listed banks, in particular, size and relative asset exposure to the real estate market. In our analysis we use a three-factor risk model and an extended Fama-French model (1992 and 1993).

The results of our research indicate that the stocks of EU-15 banks are sensitive to the changes in real estate returns. We find a positive relation between bank stock returns and real estate returns, even after controlling for general market conditions and interest rates changes. In particular, small banks with greater asset exposure to the real estate market showed to be more sensitive to changes in real estate returns.

The remainder of the article is organized as follows. In section 2 we present a review of the previous literature and main empirical findings. The methodology and sample are discussed in section 3. The empirical results are presented and discussed in section 4. The conclusions appear in section 5.

2. Literature Review

Studies looking at the importance of real estate market conditions on bank returns are fairly recent and almost exclusively look at the US market.

The vast majority of studies that look into common risk factors in bank stock returns uses a two-factor risk model, which indicates that bank stock returns are influenced by general market conditions and by movements in interest rates (see, for example, Flannery and James, 1984 and Viale *et al*. 2009). These authors find a significant negative relation between, the change in interest rates and bank returns, conditional on the balance-sheet exposure to interest rate risk.

Allen *et al.* (1995) argue that the value of banks react significantly to real estate market conditions when: (1) banks have a significant exposure to the real estate sector; and (2) the exposure is significantly influenced by changes in the conditions of the real estate sector. The first condition can be easily verified through analysis of the annual reports of banks. The second condition, concerning the systematic influence of the real estate conditions on bank valuations, as function of its exposure, is analysed in section 2.1.

2.1. Real Estate Market and Bank Values

Although mortgage loans are exposed to interest rate risk, they are also exposed to default risk. As previously stated, the default risk is at least in part a function of changes in the value of real estate. When there is a decrease in the value of loan collaterals, there is an increased probability of default due to the decreased value of loans with collateral. Thus, given that the value of collateral has an impact on the value of loans and mortgages, the potential loss to a bank as a result of default risk is inversely related to the value of the collateral.

While the real estate market and overall stock market indices are positively correlated[1], these two markets do not always behave identically. Thus the impact of

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[1] Mei and Lee (1994) and Mei and Saunders (1995), for the US e Lu e So (2005), for seven Asian countries find that real estate market returns are highly correlated with overall stock market returns.

changes in real estate market conditions, measured by the banks' exposure to this factor, is thus not completely captured by the market benchmark.

Based on the arguments above, the value of bank is positively related to changes in real estate market value. The importance of the relationship between the market value of a particular bank and real estate market value should be a function of the bank's exposure to real estate assets.

In addition, there is a relationship between the size effect and bank sensitivities to real estate market conditions, due to the relevant issue of moral hazard or of "too big to fail." Mei and Lee (1994) and Mei and Saunders (1995) found that in the US, a greater sensitivity to the real estate sector is prevalent in small banks. In part, this may be due to the fact that investors attribute a lower probability of default to large banks, due to systemic risk. Large banks are perceived as safer because, ultimately, they would be bailed out by governments (see O'Hara and Shaw, 1990). On the other hand, this may be due to the fact that small banks have less sophisticated risk-analysis tools[2] and less ability to diversify risk. Thus, *ceteris paribus*, for different levels of real estate holdings, larger banks should have a lower sensitivity to the conditions in the real estate market.

2.2.   Previous Empirical Findings

Table 1 shows a summary of the main studies looking at the relationship between market capitalization of banks and real estate market risk. The majority of these studies was done for the US market and all of them use multi-factor models. The variables used and the time periods considered vary substantially. This gives greater robustness to the evidence found, which underlines the importance of a real estate risk factor in bank stock returns.

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INSERT TABLE 1

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[2] Herring and Wachter (1999) mention that one of the reasons that could lead banks to underestimate default risk originating from real estate loans is the unavailability or low quality of the time-series of prices.

The studies included in Table 1 are for the Asian market and the US market during periods of real estate market crises, and where these had a significant effect on the profitability of the banking industry and consequently on the assessment of the values of banks by investors.

In addition, Lu and So (2005) present a set of additional studies which show the existence of a significant relationship between the real estate market and the market capitalization of banks. Peek and Rosengren (1994) state that the large bank equity losses are the result of exposure to high-risk mortgage loans. Peek and Rosengren (1996) further show that banks with reduced equity ratios tend to reduce real estate credit grants in a substantial manner after regulatory measures are introduced. Ghosh *et al.* (1997) show also the prices of financial institutions react negatively to announcement of adverse news concerning the real estate industry.

Hancock and Wilcox (1993, 1994 and 1997) carried out a set of studies on the interaction between loan grants and real estate market activity. They show that the flow of bank loans in the US in 1990 declined primarily due to problems related to the real estate industry and suggest that the reduction of bank equity had a significant effect on the residential and commercial real estate market.

3. Methodology and Sample

3.1. Methodology

The literature reviewed above shows the existence of a close relationship between banking activity and the real estate industry, in the U.S. and in Asia. However, no direct analysis was conducted in order to test the sensitivity of bank returns with respect to the real estate conditions in European countries.

To carry out the analysis of the relation between EU-15 bank stock returns and the real estate market conditions we use two models: a three-factor risk model (market risk, interest rate risk and real estate market risk) and an extended Fama-French model with a real estate market risk factor.

The three-factor model used for each of the EU-15 markets is the following:

$$R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + e_{jt} \tag{1}$$

where, $R_{jt,}$ is the banking industry returns index in country j in period t; R_{mjt} is the general market return index in country j in period t; I_{jt} is the interest rate in country j in period t and R_{Rjt} is the real estate companies returns index in country j for period t. β_{mj}, β_{Ij} and β_{Rj} are the coefficients to estimate. These coefficients measure bank stock returns sensitivities relative to the market, interest rate movements and the real estate market. β_{0j} is the independent term and e_{jt} is the error term. This three-factor model is the natural extension of the two-factor asset pricing model used in earlier studies (for example, Flannery and James, 1984 and Viale *et al.*, 2009), to analyse the effects of interest rates and the market returns on bank returns.

To test the hypothesis of the importance of real estate market risk factor on bank returns, we also use an extended Fama - French.

$$R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + \beta_{vj}HML_{jt} + \beta_{sj}SMB_{jt} + e_{jt} \tag{2}$$

where, HML_{jt} and SMB_{jt} are added to equation (1) and measure, respectively, the excess historical returns of value stocks vis a vis growth stocks, and the excess returns of stocks with small capitalization stocks vis a vis the stocks of companies with large capitalization. The obtained *HML* and *SMB* returns for the EU-15 countries were constructed using MSCI[3] indices, in the following manner:

SMB = ("Small Cap Value" + "Small Cap Growth")/2 – ("Large Cap Value" + "Large Cap Growth")/2;

HML = ("Large Cap Value" + "Small Cap Value")/2 – ("Large Cap Growth" + "Small Cap Growth")/2.

The estimation procedure is the Generalized Method of Moments (GMM)[4], so that the *t* statistics for the estimated regressions are corrected heterokedasticity and autocorrelation.

Given the internationalization of business activities and the integration of the banking industry at a regional and international level, we also compute sensitivities of bank returns using real estate regional indices.

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[3] Source: Thomson Reuters DATASTREAM.
[4] Mei and Lee (1994) and Mei and Saunders (1995) also use GMM to estimate the sensitivities of U.S. banks.

Finally, in order to test a change in the sensitivities of bank stock returns to market risk, interest rates and the movements in real estate market, due to the emergence of the subprime crisis, a variable dummy D_t is incorporated into equation (1), with a value of 1, for the period of 18 June 2007 (daily data) or June 2007 (monthly data) to the end of 2008^5, as follows:

$$R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + \beta_{1j}\,D_t + \beta_{2j}\,D_t{}^*Rm_{jt} + \beta_{3j}\,D_t{}^*I_{jt} +$$

$$+ \beta_{4j}D_t{}^*R_{Rjt} + e_{jt} \tag{3}$$

The sensitivity of bank returns to economic factors tends to be dependent on the specific characteristics of banks. For example, Jahankhani and Lynge (1980) argue that bank betas are related to dividend payout ratios, variability of deposits and to the ratio between loans and deposits. Flannery and James (1984) show that the sensitivity to interest rates appears to be related to the mismatch of asset durations against liabilities.

Given that the empirical evidence points to the existence of the sensitivity of bank returns to the movements in the real estate market, we study the relationship between the specific characteristics of banks and the real estate market risk coefficients obtained in the three-factor model and in the extended Fama-French model. To this end, the hypothesis that the sensitivity of real estate market risk is related to bank size and bank asset exposure to the real estate market is tested.

To evaluate this, we looked at: (1) the sensitivities to real estate for the different quantiles of bank size and bank asset exposure to the real estate market; and (2) we use cross-section regressions of sensitivities of bank stock returns to real estate and the proxy variables associated to size and asset exposure of banks to the real estate market. The simple and multiple cross-section regression specifications are as follows:

$$\widehat{\beta_{Ri}} = \alpha_0 + \alpha_1 VR_i + \varepsilon_i \tag{4}$$

$$\widehat{\beta_{Ri}} = \alpha_0 + \alpha_1 VRD_i + \alpha_2 VRE_i + \varepsilon_i \tag{5}$$

where, $\widehat{\beta_{Ri}}$ are the estimated betas obtained from estimating (1) and (2) above for bank i and VR_i is a variable associated to size (VRD_i) or the relative asset (balance sheet) exposure to real estate market (VRE_i), for bank i. α_1 and α_2 are the coefficients to estimate. α_0 is the independent term and ε_i is the error term.

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[5] June, 18 2007 corresponds to the bankruptcy announcement of Bear Stearns. This date is widely accepted as the "official" start of the subprime crisis. See, for example, Crouhy *et al.* (2008).

3.2. Sample

3.2.1. Three-Factor Model and the Fama-French Extended Model

We use daily and monthly returns for the different time periods. Three time frames are used in the estimates of the two models: (1) Total Period – this time frame differs from country to country, by virtue of the depth of the series used in the model estimates. The estimates are conducted for a period with an indicated start date for Tables 4, 5, 6, 7, 8, 10, 11 and 12 in the column "Start" and end in 2008:12; (2) for a sub-period between 2002 and 2006 (five-year time frame); and (3) for a sub-period between 1997 and 2006 (ten-year time frame).

In choosing the proxies to use in the estimates of the three-factor model and the Fama-French extended model we use the variables proposed in previous research (mentioned in Table 1) depending on its availability for the European markets.

With respect to the dependent variable, banking industry stock return indices are used for each country[6].

With respect to the real estate market risk proxy, we use real estate companies' indices[7]. This option follow Lu and So (2005). The absence of REITs indices for the majority of European countries contributed much to our choice of proxy. Only Germany, Belgium, France, Holland and the United Kingdom have available long series of REITs returns. Notwithstanding the lack of consensus that REITs returns constitute the perfect measure of real estate market fundamentals[8], these indices have been used in the studies carried out for the US market (see Table 1). In this regard, Allen *et al.* (1995) mention that the use of REITs indices are justified because they are based on market transactions in opposition to real estate market return measures based on valuations made by surveyors. According to the authors, the latter do not constitute a perfect measure of real estate market activity due to the price smoothing problems (see also in this respect, Geltner, 1991 and Geltner and Ling, 2006). Given that the industry return index for real estate companies, like the REITs indices, are based on market

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[6] Source: Thomson Reuters DATASTREAM – "*Total Return Index – Banks.*"
[7] Source: Thomson Reuters DATASTREAM – "*Total Return Index – Real Estate.*" For Ireland and Luxembourg the real estate market *proxy* refers to the UK and BENELUX.
[8] For a throughout discussion, see Allen *et al.* (1995).

transactions, it is to be expected they constitute an unbiased measure of real estate market fundamentals[9].

To assess the robustness of the obtained results, the analysis is repeated using REITs returns as proxy for the real estate market returns, for the countries for which there are long series of REITs returns[10].

We use unexpected yield changes on 10-year government bonds Given the conclusions obtained by He *et al.* (1996), as the proxy for the interest rate risk factor[11]. To compute unexpected changes in government bond yields we follow Flannery and James (1984). The changes yields are calculated using the following procedure:

$$\Delta\% \, yield_t = (yield_t - yield_{t-1})/yield_{t-1} \qquad (6)$$

To estimate the unexpected government bond interest rates, the following *AR(p)* model is used [12].

$$\Delta\% \, yield_t = \varphi_0 + \sum_{k=1} \varphi_k \, \Delta\% \, yield_{t-k} + w_t \qquad (7)$$

The error term of equation (7), w_t, represents the unexpected change of bond interest rate yields.

The stock market indices for each EU-15 country are used as the benchmark for stock market returns[13].

3.2.2. Banks Characteristics and Real Estate Market Sensitivities

We use a sample of 202 EU-15 listed banks[14]. The breakdown by country is described in panel A of Table 3. The real estate market risk coefficient for each bank is estimated based on individual bank returns[15] over the period between 2002 and 2008. The choice of the period is due to two factors: (1) some of the data with respect to the

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[9] Lu e So (2005) refer two potential problems of using real estate companies market returns as a proxy for the real estate market conditions. Not only there is little consensus across countries regarding the definition of a Real Estate company but also it could be the case that these companies are not representative of the underlying real estate markets.

[10] Source: Thomson Reuters DATASTREAM – *"Total Return Index – REITs."*

[11] Source: Thomson Reuters DATASTREAM – *"Bond Yield Governement 10 Years."*

[12] The number of lags is given by a likelihood ratio test.

[13] Source: Thomson Reuters DATASTREAM – *"Total Return Index – Market"*.

[14] Our sample includes more banks than those used in Datastream industry indices. We include all listed banks with available information in the period between 2002 and 2008. Data source for accounting data is BANKSCOPE.

[15] Source: Thomson Reuters DATASTREAM -*"Total Return Index"*.

specific characteristics of banks (namely assets and loans) were not available prior to 2002; and (2) the number of listed banks prior to 2002 was very low.

We use three proxies for size: two accounting variables, assets and total loans, and one market variable, market capitalization. These three proxies were obtained from BANKSCOPE (specifically, *"Total Assets"; "Total Loans – Net"*; and *"Current Market Capitalization"*).

To measure bank asset exposure to the real estate market, we use the following proxies: Real Estate Holdings/Equity; Real Estate Holdings/Assets; Real Estate Loans/Equity and Real Estate Loans/Assets, based on Allen *et al.* (1995). Bank's real estate holdings are obtained in the annual reports of each bank, due to the explicit absence of this information in BANKSCOPE for most European banks. The procedure adopted for the data collection of relative bank asset exposure to the real estate market was the following: (1) we obtained the list of EU-15 listed banks in BANKSCOPE; (2) the annual reports 2002-2008 of the banks were consulted at their internet site. European listed banks disclose financial information through segments (IAS 14 – "Segment Reporting" and later IFRS 8 – "Operational Segment")[16]. Based on the procedure followed by Allen *et al*. (1995), the value of total asset exposure to real estate for each bank is the sum of mortgage loans[17] *("Real Estate Loans")* and the direct investments[18] in real estate assets. The variables Equity and Assets correspond to the accounting value of Equity and Total Net Assets respectively[19].

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[16] Operational Segment includes the breakdown by business segments ("*Primary Segment Reporting: By Business Segment*") and geographical segments ("*Secondary Segment Reporting: By Geographical Segment")*.

[17] This is the sum of Credit Granted to Construction and Real Estate and mortgage loans. Source: BANKSCOPE and individual financial reports ("*Loans and Advance to Customers*" - Construction", "*Property Companies*" e "*Personal: Residential Mortgage Loans*").

[18] This is the sum of Real Estate Assets for trade and the investment and own properties of banks. Source: BANKSCOPE and individual financial reports ("*Financial Assets Designated at Fair Value*" including "*Mortgage Backed Securities*". *Investment Property*" e "*Tangible Fixed Assets - Property e Equipment*").

[19] Source: BANKSCOPE: *"Total Assets"* and *"Total Equity".*

4. Results

4.1. Descriptive statistics

Table 2 presents the summary of the descriptive statistics for the index returns of banks and real estate companies for each the 15 European countries analysed.

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INSERT TABLE 2

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Panel A of Table 2 presents the average, the median and the variance industry index stock returns for banks and real estate companies. Sweden, the United Kingdom, Greece, Ireland, Spain, Finland and Denmark are the countries with higher average returns index for the banking industry.

Panel B of Table 2 shows that the return index for the banking industry is positively and significantly correlated to the return index for real estate companies. This evidence is consistent with the argument that banks are exposed to real estate market risk. There is also a strong and significant correlation between market returns and either banking industry returns or real estate companies returns. Panel C of Table 2 presents the values of market capitalization and the number of companies which constitute DATASTREAM's banking industry indices and real estate indices. However, the United Kingdom, Belgium, France and Spain show a higher average market capitalization, which is not surprising when you consider that some of the main European and international banks are included in these indices.

Cross-section analysis is conducted for a larger number of banks than those found on Thompson DATASTREAM´s banking industry index. The sample of 202 banks analysed is described in Panel A of Table 3. Denmark, France and Italy are the countries with the most number of listed banks analysed. These three countries represent over 50% of the sample of listed banks.

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INSERT TABLE 3

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With respect to the average size of listed banks per country, United Kingdom and Belgium have the highest average bank assets, loans and market capitalization[20]. ECB (2008) shows a coefficient concentration of 84% for the five main Belgium banks, most of which are listed. On the contrary, Denmark, Finland and Luxemburg show a lower average listed bank size.

With respect to the average asset bank exposure of European banks to the real estate market, we note a higher exposure of Irish, Spanish, British and Swedish banks.

Panel B of Table 3 shows the correlation matrix between measures associated with size and the relative exposure to the real estate sector. Size and relative asset exposure to the real estate sector are highly correlated.

Finally, in Panel C of Table 3, a comparative analysis is done between the 202 listed banks and the universe of banks in the EU-15 countries, in terms of number, average size and relative exposure to the real estate market. Whilst there is no substantial difference between listed banks and the universe of banks with respect to relative exposure to the real estate market, the average listed bank is substantially larger than the overall average bank.

4.2. Sensitivities of Bank Returns to Real Estate

Tables 4 and 5 show the estimates of the three-factor model as defined by equation (1). The estimated regressions for the different time periods aim to test the robustness of the results over different periods of time. We exclude 2007 and 2008. These are the years of the outbreak and the large impact of the subprime crisis.

INSERT TABLES 4 and 5

Tables 4 and 5 show that: 1) bank returns are positively and significantly related to the returns of real estate companies in most EU-15 countries; 2) the three-factor model seems to capture in a reasonable manner the relationship between bank returns

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[20] Average assets, loans and market capitalization for the period 2002-2008. Data source is BANKSCOPE.

and the risk factors considered, and that the "average contribution of omitted variables" of the model seems small and economically insignificant; 3) the more significant effects come from the market itself, as indicated by the significantly high coefficients associated to this factor; 4) the effects of interest rates do not appear to be significant in determining bank stock returns for the majority of EU-15 countries. Lu and So (2005) found similar results in their study of the Asian market. According to these authors, equation (1) may suffer from multicolinearity problems, where the effects of interest rates may be being captured by the returns of real estate companies[21].

These conclusions are supported by the extended Fama-French model. Again, with the exception of Austria, Belgium and Spain, the significance, signs and magnitude of the real estate returns coefficient indicate that EU-15 listed banks are exposed to the movements in the real estate market.

INSERT TABLE 6

To test the robustness of the results, the analysis is repeated using the REITs returns as proxy for the real estate market returns. These results appear in Table 7 and do not reveal any significant changes to the sensitivity of bank stock returns to the real estate market.

INSERT TABLE 7

Table 8 show the influence of the subprime crisis on possible changes in the sensitivities of bank stock returns to overall market risk, market interest rates and the movements in the real estate market. The results show an increasing influence of the real estate market movements on the returns of Irish, Spanish and British banks after the subprime crisis. This shows that banks in these countries have become more sensitive to

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[21] Given that interest rate changes and real estate assets are positively highly correlated, we run the regression including either interest rate changes or real estate companies returns. The two variables are significant and estimates are similar. To overcome multicolinerarity we also run regressions using orthogonalized real estate returns. Results are similar and are available upon request.

the movements in the real estate industry after the subprime crisis suggesting that investors were more concerned about mortgage lending after the subprime crisis. For the remaining European countries, it is not clear that there is an increase in the sensitivity of bank returns to real estate market conditions after the subprime crisis.

INSERT TABLE 8

Acknowledging the internationalization process of business activities by banks and the integration of the banking industry at a regional level, we also assess the impact of domestic, regional and international real estate activities on bank stock returns. Table 9 compares bank's exposure to the movements in real estate markets regionally and internationally.

INSERT TABLE 9

Given the weight that the banking industry has on the overall market capitalization and the fact that the risks associated with their portfolio of real estate assets is located at a regional level, we repeated the estimates of equations (1) and (2) for 11 countries of the EU-15, now considering a regional index as the proxy associated to the real estate market. The estimates for the two models are presented in Tables 10, 11 and 12.

INSERT TABLES 10, 11 and 12

Tables 10, 11 and 12, show that the coefficient associated to real estate risk is positive and statistically significant for all the 11 European countries and for all the time frames considered. The results suggest that the use of regional indices may be a more accurate proxy for measuring exposure to real estate market in countries with an internationalized banking sector. In these countries where listed banks have a very significant in the banking industry, the high exposure to international real estate assets

precludes the use of domestic real estate companies returns to ascertain the sensitivity of real estate market returns. The high international banking activity in Spain and Belgium may help understand the negative signs and statistically significant real estate market risk coefficients found in Tables 4, 5, 6 and 8. Given the reduced importance of the domestic market in the asset portfolio of the main banks in these countries, one may not see a significant positive relationship between bank returns and the returns of real estate companies based in these countries.

4.3.   Size Sensitivities of Banks to Real Estate Asset Exposure

Table 13 tests the relationship between bank size - as measured by the value of total assets, loans and market capitalization – and market returns. For the 202 EU-15 listed banks, the three-factor model estimates (equation 1) and the Fama-French extended model estimates (equation 2) are calculated using as dependent variable the daily and monthly returns of individual banks for the period 2002 to 2008. We obtained the coefficients associated to the real estate market risk factor for each bank. Next, five bank portfolios were formed based on bank size proxied by the average value of total assets, loans and market capitalization.

The conclusions for the sample of the EU-15 countries listed banks are identical to those of Mei and Lee (1994) and Mei and Saunders (1995) for the US. Small banks show greater sensitivity to real estate market risk.

INSERT TABLE 13

The results in Table 13 show that the sensitivity to real estate market risk is higher for the portfolios of small banks. The test statistic *t* for the differences between the averages confirms the existence of statistically significant differences between large and small banks sensitivity to real estate market risk. Further, the simple and multiple cross-section regressions (Tables 15 and 16) show that the larger the bank size the lower tends to be its sensitivity to real estate market risk, with the exception of the regression for loans and monthly returns based on the extended Fama-French model.

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The explanation for this fact may be due to the issue of moral hazard or of "too big to fail"; with investors attributing a lower probability of default to large banks due to the systemic risk for the banking system and where they ultimately tend to be bailed out by governments. Another explanation for this fact may be due to the fact that small banks possess less sophisticated risk-analysis tools which lead to an excessive concentration of risk in a given segment or market.

Table 14 reveals that the sensitivity to real estate market risk is higher for bank portfolios with a greater relative asset exposure to the real estate sector. The test statistic t for the differences between the averages confirms the existence of statistically significant differences between the sensitivity to real estate market risk by portfolios of banks with higher and lower asset exposure to real estate, with the exception of the Real Estate/Equity and Real Estate/Assets proxies in the Fama-French extended model with daily returns. The generality of the results shows that the portfolios of banks with higher relative asset exposure to the real estate market have greater sensitivity to real estate market risk. These conclusions are identical to those of Allen *et al.* (1995) for the US.

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INSERT TABLE 14

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The simple cross-section regressions (Table 15) show that the measure of relative bank asset exposure to the real estate market are positively and significantly related to the sensitivity of banks to real estate market risk, with the exception of three regressions for daily returns based on the extended Fama-French model.

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INSERT TABLE 15

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Table 16 shows the multiple cross-section regression estimates between the bank returns sensitivities to real estate market risk and size and relative asset exposure to real estate. The generality of the results show the existence of joint statistical significance of the coefficients associated with the specific characteristics of banks in explaining the bank return sensitivities to the real estate market risk obtained through the three-factor

model. These results are weaker when we use bank return sensitivities to the real estate market risk obtained through the extended Fama-French model.

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INSERT TABLE 16

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Given that these estimators suffer from the EIV – Error In Variable – problem, to test the robustness of these results we compute weighted least squares estimators. Results are similar to those presented in tables 15 and 16 and are available upon request.

In summary, the results presented suggest that small European listed banks with high relative asset exposure to the real estate market have a greater sensitivity to real estate market risk for the period of 2002 to 2008.

5. Conclusion

Given the weight of real estate assets on the balance sheets of banks, the objective of this study is to assess if bank stock returns are systematically affected by the real estate market returns. The results show the existence of a positive and statistically significant relationship between bank stock returns and the real estate market returns proxies suggesting that real estate risk is a priced factor This relationship between bank stock returns and the proxies for real estate is more significant when regional market indices are used as benchmark for real estate market conditions, which is justified given that most of major European banks are global banks. The results further show an increasing influence of real estate market movements in the bank stock returns, after the subprime crisis, in Ireland, Spain and the United Kingdom.

This study also tests the hypothesis of bank sensitivities to real estate returns being a function of the size and the degree of asset exposure to the real estate market of banks. The results indicate that small banks with greater relative asset balance sheet exposure to the real estate sector tend to be more sensitive to real estate market returns.

These results have two important implications. First, regulators, managers and investors should monitor the exposition of banks to the real estate market, just as they monitor the exposure of bank to interest rates. Second, with respect to event analyses for the banking sector, the results suggest that the models used to evaluate assets should incorporate an additional risk factor – real estate market risk. Similarly, real estate market risk should be included alongside market risk and interest rates in the cost of capital and asset pricing models, when assessing the NPV of bank investments or evaluating bank performance.

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Table 1: Empirical Evidence on the Relationship between Market Capitalization and Real Estate

		Sample and Variables	Results
		I. US Market	
Mei and Lee (1994)	i.	**Indices**: Return on a stock index (R_i), dividend yield on a market portfolio (R_M), t-bill rates (R_I), income yield on the Wilshire real estate index (R_R), spread between AAA bonds and t-bills (default risk factor).	There is a real estate risk premium for all stocks in addition to the stock market and the interest rate risk premium.
	ii.	**Others**: return of the stock market (R_M), government bonds (R_I), REITs, small caps, and on the Russell-NCREIF portfolio (R_R).	
	iii.	**Period**: 1978-1989.	
	iv.	**Quarterly Returns**	
Mei and Saunders (1995)	v.	**Indices**: Returns on different portfolios of 180 US-banks (R_i), dividend yield on a market portfolio (R_M), t-bill rate (R_I), cap-rate constructed as a ratio of net stabilized earnings to the market-value (market price) of a well diversified property portfolio (*ACLI cap-rate*) (R_R), spread between AAA bonds and t-bills (default risk factor), January variable (dummy).	A premium for real estate risk is increasingly apparent in bank stocks, presumably reflecting these banks' growing exposures in this area; it could be as high as the premium for interest rate risk.
	i.	**Others**: Return on portfolios of the stock market (R_M), government bonds (R_I) and REITs (R_R).	
	ii.	**Period**: 1971-1989.	
	iii.	**Monthly Returns**	

Notes: R_i, R_M, R_I, R_R respectively means the bank returns; market performance; interest rates; and real estate returns.

Table 1: Empirical Evidence on the relationship between Market Capitalization and Real Estate Market Risk (cont.)

	Sample and Variables	Results
Allen, Madura and Wiant (1995)	i. **Indices**: Returns on 125 US-banks, separately and divided into portfolios (R_i), S&P 500 index (R_M), actual T-bond rates and unexpected T-bond yield changes (R_I), NAREIT Equity REIT Index (R_R). ii. **Others**: Balance sheet data. iii. **Period**: 1979-1992. iv. **Monthly Returns**	There is a positive relationship between monthly bank returns and the real estate index; the sensitivity of bank values to the real estate market has increased over time; the bank-specific sensitivity is positively related to the bank´s balance sheet exposure to real estate.
He, Myer and Webb (1996)	i. **Indices**: Returns on various portfolios of 166-US-bank holding companies (R_i), four different stock market proxies (R_M), three proxies of interest rate (R_I) and six real estate returns proxies (R_R). ii. **Others**: Balance sheet data. iii. **Period**: 1986-1991. iv. **Weekly and Monthly Returns**	Bank stocks are very sensitive to changes in real estate returns; banks with a larger portion of their total loans invested in real estate are more sensitive.
II. **Asian Markets**		
Lu and So (2005)	i. **Indices**: Return of listed banks portfolio (R_i), return of stock market index (R_M), expected and unexpected three-month inter-bank interest rate (R_I) and return of real estate companies portfolio (R_R). ii. **Others**: interest rate spread, defined as the difference between the three-month inter-bank rates and the deposit rates (R_I). iii. **Period**: 1995-1999. iv. **Daily Returns**	They found that listed banks were exposed to real estate risk both before and after the crisis, but that the exposure increased in the post-crisis period. The large effect on the real estate sector on bank stock returns implies that, after the crisis, the hidden risk of real estate collateral on the bank lending process was explicit and recognized.

Notes: R_i, R_M, R_I, R_R stand for bank stock returns; market returns; interest rates; and real estate market returns.

Table 2: EU-15 Descriptive Statistics – Banking Industry Indices

This table reports a summary of the descriptive statistics of the banking industry returns index and real estate return index, based on daily observations for each of the EU-15 countries. The analysis period starts in the period indicated in the table and ends in 2008. For Ireland and Luxembourg real estate returns are proxied by the real estate returns index of the UK and of Benelux, respectively, due to the lack of data for real estate companies in the domestic market. Panel A show average, median and average returns of the banking industry returns index and real estate returns index. Panel B shows the correlations between banking industry return index (*Banks*) and real estate companies return index (*Real Estate*) and the overall market stock return index (*Market*). Panel C reports the values of market capitalization (€ M) and number of companies that comprise the banking industry return index and real estate companies return index of DATASTREAM.

Panel A.

Country	Start	Banking Industry Returns Index			Real Estate Returns Index		
		Average ($\times 10^{-3}$)	Median ($\times 10^{-3}$)	Variance ($\times 10^{-3}$)	Average ($\times 10^{-3}$)	Median ($\times 10^{-3}$)	Variance ($\times 10^{-3}$)
Germany	1993/10/01	0.008	0.110	0.276	0.494	0.015	0.306
Austria	1991/10/11	0.252	0.023	0.227	-0.012	-0.004	0.115
Belgium	1989/06/06	0.078	0.149	0.268	0.215	0.122	0.085
Denmark	1991/10/08	0.405	0.342	0.199	0.247	0.000	0.125
Spain	1991/04/05	0.430	0.304	0.231	0.277	0.118	0.163
Finland	1998/06/02	0.425	0.035	0.363	0.222	0.186	0.354
France	1987/07/09	0.333	0.073	0.317	0.323	0.256	0.071
Greece	1990/01/02	0.469	0.042	0.398	0.823	0.063	0.714
Holland	1986/05/16	0.344	0.374	0.438	0.198	0.321	0.073
Ireland	1986/05/28	0.457	0.142	0.390	0.319	0.242	0.122
Italy	1987/04/01	0.285	0.264	0.198	0.264	0.093	0.212
Luxembourg	1998/12/31	0.079	0.050	0.130	0.263	0.495	0.075
Portugal	1993/07/19	0.213	0.148	0.125	0.913	0.086	1.101
United Kingdom	1986/05/16	0.528	0.234	0.277	0.319	0.242	0.122
Sweden	1988/11/29	0.540	0.078	0.474	0.447	0.127	0.243

Table 2: EU-15 Descriptive Statistics - Industry Indices

Panel B.

Country	Banks vs. Real Estate		Banks vs. Market		Real Estate vs Market	
	Daily	**Monthly**	**Daily**	**Monthly**	**Daily**	**Monthly**
Germany	0.319[a]	0.445[a]	0.679[a]	0.787[a]	0.282[a]	0.376[a]
Austria	0.265[a]	0.423[a]	0.765[a]	0.762[a]	0.397[a]	0.525[a]
Belgium	0.197[a]	0.509[a]	0.831[a]	0.887[a]	0.335[a]	0.641[a]
Denmark	0.173[a]	0.299[a]	0.727[a]	0.669[a]	0.208[a]	0.312[a]
Spain	0.430[a]	0.534[a]	0.924[a]	0.915[a]	0.535[a]	0.684[a]
Finland	0.205[a]	0.317[a]	0.313[a]	0.350[a]	0.211[a]	0.148[c]
France	0.365[a]	0.422[a]	0.746[a]	0.760[a]	0.433[a]	0.471[a]
Greece	0.234[a]	0.141[b]	0.925[a]	0.962[a]	0.287[a]	0.153[b]
Holland	0.232[a]	0.479[a]	0.669[a]	0.788[a]	0.417[a]	0.514[a]
Ireland	0.280[a]	0.370[a]	0.727[a]	0.716[a]	0.017	0.344[a]
Italy	0.389[a]	0.589[a]	0.849[a]	0.869[a]	0.437[a]	0.578[a]
Luxembourg	0.166[a]	0.368[a]	0.293[a]	0.409[a]	0.202[a]	0.323[a]
Portugal	0.425[a]	0.557[a]	0.779[a]	0.827[a]	0.514[a]	0.595[a]
United Kindom	0.492[a]	0.572[a]	0.783[a]	0.777[a]	0.607[a]	0.625[a]
Sweden	0.373[a]	0.509[a]	0.659[a]	0.658[a]	0.496[a]	0.627[a]

[a], [b] and [c] denote statistical significance at 1%, 5% and 10% levels for bilateral tests.

Panel C.

Country	Real Estate Industry Index (DATASTREAM)		Banking Industry Index (DATASTREAM)	
	Number of Companies	**Average Market Capitalization**	**Number of Companies**	**Average Market Capitalization**
Germany	13	683	6	9,446
Austria	7	1,243	6	3,095
Belgium	19	182	4	12,812
Denmark	1	432	8	1,930
Spain	12	434	9	11,033
Finland	2	927	1	1,677
France	27	1,850	10	12,486
Greece	2	569	10	2,152
Holland	10	1,046	1	1,277
Ireland	0		2	7,548
Italy	5	976	19	8,267
Luxembourg	0		2	1,084
Portugal	1	53	4	2,805
United Kingdom	29	1,022	5	36,976
Sweden	7	927	5	7,112

Table 3: Bank Characteristics: Descriptive Statistics

The table shows the descriptive statistics for the banks of the EU-15 countries between 2002 and 2008. Panel A shows the number of listed banks, the average size (total assets; total loans and market capitalization) and the average relative asset exposure to real estate industry (Real Estate/Equity, Real Estate/Assets, Real Estate Loans/Equity and Real Estate Loans/Assets). To proxy size we use total assets and total loans and market capitalization (in € M). To proxy bank asset exposure to the real estate we use Real Estate/Equity, Real Estate/Assets, Real Estate Loans/Equity and Real Estate Loans/Assets. *Real Estate* refers to real estate holdings obtained by adding Real Estate Loans and Direct Real Estate Investments. Equity and Assets are the book value of equity and total assets. The list of banks listed and the variables were obtained from BANKSCOPE and individual bank reports. Median and standard deviation are presented in brackets. # refers to the number of banks per country. Panel B shows the correlations between average size and average relative asset exposure of banks to the real estate market. Panel C compares the sample of the 202 listed banks with the universe of the EU-15 banks in terms of number of banks, average size (in terms of total assets and loans) and on average asset exposure of banks to real estate market. Data were obtained from the database BANKSCOPE and ECB (2008).

Panel A.

Country	#	Size			Asset Exposure to Real Estate			
		Total Assets	Total Loans	Market Capitalization	Real Estate /Assets	Real Estate Loans/Assets	Real Estate /Equity	Real Estate Loans/Equity
Germany	24	115,977 (7,656) [302,831]	34,656 (1,961) [65,810]	2,772 (521) [6,988]	0.193 (0.138) [0.169]	0.177 (0.098) [0.176]	2.574 (2.948) [6.615]	2.400 (2.501) [6.661]
Austria	8	39,405 (10,351) [59,573]	22,090 (6,487) [32,265]	2,242 (639) [3,194]	0.222 (0.253) [0.093]	0.213 (0.245) [0.097]	3.267 (3.632) [2.162]	3.126 (3.464) [2.177]
Belgium	4	373,630 (438,299) [276,614]	152,253 (184,514) [109,370]	12,811 (15,135) [8,047]	0.168 (0.072) [0.059]	0.064 (0.067) [0.056]	2.010 (2.290) [1.470]	1.904 (2.143) [1.146]
Denmark	38	12,074 (626) [61,299]	7,109 (428) [35,611]	465 (67) [1,901]	0.194 (0.182) [0.092]	0.175 (0.164) [0.084]	1.960 (1.624) [1.312]	1.764 (1.496) [1.220]
Spain	10	164,603 (54,921) [273,534]	102,827 (41,064) [159,372]	10,029 (2,934) [17,304]	0.406 (0.421) [0.075]	0.395 (0.407) [0.076]	6.758 (6.216) [2.413]	6.579 (6.025) [2.411]
Finland	3	20,561 (24,265) [16,677]	6,480 (8,545) [3,949]	2,291 (1,677) [2,531]	0.231 (0.109) [0.302]	0.223 (0.108) [0.299]	4.230 (1.780) [5.786]	4.129 (1.763) [5.693]
France	34	136,615 (7,203) [366,617]	37,124 (5,758) [89,309]	4,850 (1,022) [11,120]	0.274 (0.205) [0.206]	0.222 (0.184) [0.159]	2.155 (1.894) [1.383]	1.938 (1.694) [1.391]
Greece	13	23,189 (12,574) [24,325]	14,866 (6,675) [15,590]	1,720 (839) [1,889]	0.188 (0.200) [0.092]	0.170 (0.179) [0.097]	3.145 (2.437) [2.621]	2.916 (2.306) [2.493]
Holland	7	187,821 (1,069) [439,206]	75,096 (2,877) [167,680]	5,935 (1,277) [12,919]	0.175 (0.148) [0.171]	0.171 (0.145) [0.175]	3.771 (1.241) [5.325]	3.667 (1.239) [5.302]
Ireland	3	126,597 (150,913) [50,682]	81,857 (103,026) [43,269]	5,783 (5,723) [3,560]	0.421 (0.407) [0.042]	0.404 (0.404) [0.021]	10.627 (11.423) [4.051]	9.941 (11.347) [3.522]
Italy	30	72,488 (8,685) [193,699]	37,341 (4,549) [98,791]	5,271 (703) [12,187]	0.154 (0.187) [0.123]	0.142 (0.172) [0.120]	1.960 (2.388) [1.669]	1.800 (2.213) [1.601]
Luxembourg	3	21,265 (419) [36,300]	12,831 (117) [22,036]	1,487 (1,084) [1,675]	0.080 (0.067) [0.066]	0.067 (0.059) [0.072]	1.239 (0.582) [1.638]	1.143 (0.511) [1.559]
Portugal	5	37,671 (35,010) [33,384]	25,933 (24,220) [23,657]	2,275 (1,649) [2,112]	0.224 (0.247) [0.065]	0.211 (0.235) [0.071]	3.934 (4.117) [1.556]	3.720 (3.912) [1.621]
United Kingdom	14	405,218 (10,583) [288,356]	166,106 (4,914) [178,837]	17,163 (1,165) [30,072]	0.278 (0.114) [0.238]	0.162 (0.075) [0.243]	4.889 (1.690) [6.830]	3.740 (1.520) [6.819]
Sweden	6	153,709 (168,314) [138,659]	85,527 (87,748) [81,548]	6,099 (6,952) [5,627]	0.197 (0.220) [0.137]	0.194 (0.214) [0.136]	4.718 (6.025) [3.566]	4.644 (5.855) [3.546]
EU-15	202	111,004	34,656	5,043	0.220	0.201	2.981	2.698

Table 3: Bank Descriptive Statistics - Specific Characteristics

Panel B.

Variable	Total Assets	Total Loans	Market Capitalization	Real Estate /Equity	Real Estate /Assets	Real Estate Loans /Equity	Real Estate Loans /Assets
Total Assets	1						
Total Loans	0.930	1					
Market Capitalization	0.921	0.958	1				
Real Estate /Equity	-0.092	-0.020	-0.046	1			
Real Estate /Assets	0.085	0.143	0.068	0.664	1		
Real Estate Loans /Equity	-0.066	0.012	-0.015	0.916	0.726	1	
Real Estate Loans /Assets	0.085	0.143	0.071	0.636	0.992	0.736	1

Panel C.

Country	Listed Banks				All Banks			
	#	Total Assets	Loans	Real Estate Loans / Assets	#	Total Assets	Loans	Real Estate Loans / Assets
Germany	24	115,977	34,656	0.177	2,108	3,273	1,447	0.139
Austria	8	39,405	22,090	0.213	808	897	403	0.074
Belgium	4	373,630	152,253	0.064	105	9,901	3,339	0.090
Denmark	38	12,074	7,190	0.175	196	3,813	2,007	0.179
Spain	10	164,603	102,827	0.395	350	6,185	3,777	0.342
Finland	3	20,561	6,480	0.223	363	648	328	0.207
France	34	136,615	37,124	0.222	865	14,287	4,803	0.098
Greece	13	23,189	14,866	0.170	62	4,620	2,442	0.153
Holland	7	187,821	75,096	0.171	406	4,394	2,305	0.199
Ireland	3	126,597	81,857	0.404	79	11,978	4,253	0.296
Italy	30	72,488	37,341	0.142	802	3,252	1,683	0.074
Luxembourg	3	21,265	12,831	0.067	160	4,885	921	0.044
Portugal	5	37,671	25,933	0.211	187	2,021	1,152	0.216
United Kingdom	14	405,218	166,106	0.162	406	20,622	11,202	0.124
Sweden	6	153,709	85,527	0.194	208	1,671	877	0.162

Table 4: Three-Factor Model Estimates - Monthly Stock Returns

The table reports the estimation results of the model defined in equation (1): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + e_{jt}$, for the EU-15 countries. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for the country j in period t and R_{Rjt} is the real estate companies return index for country j in period t. β_{mj}, β_{Ij} and β_{Rj} are the coefficients to estimate. The model is estimated for three different periods based on monthly stock returns: Total Period: the estimation is performed for a specified period beginning in the column "Start" and end in 2008, 2002 to 2006 and 1997 to 2006. For Ireland and Luxembourg real estate market refers to the real estate companies' return index for the UK and the Benelux, respectively, due to the lack of data. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Country	Start	Total Period					Period: 2002-2006 (5 years)					Period: 1997-2006 (10 years)				
		β_0	β_m	β_I	β_R	Adj. R²	β_0	β_m	β_I	β_R	Adj. R²	β_0	β_m	β_I	β_R	Adj. R²
Germany	1993-10	-0.008[b]	0.986[a]	0.009	0.156[a]	65.7%	-0.006	0.943[a]	0.008	0.136	68.9%	-0.003	0,938[a]	0,132	0,133[b]	63,3%
		(0.014)	(0.000)	(0.912)	(0.000)		(0.195)	(0.000)	(0.950)	(0.430)		(0.547)	(0,000)	(0,194)	(0,022)	
Austria	1991-11	0.001	0.975[a]	0.150[b]	0.037	58.7%	0.005	1.088[a]	0.057	-0.190[a]	54.2%	0.005	1,076[a]	0,111	-0,185[a]	54,1%
		(0.707)	(0.000)	(0.036)	(0.711)		(0.325)	(0.000)	(0.550)	(0.001)		(0.272)	(0,000)	(0,165)	(0,001)	
Belgium	1989-07	-0.004[b]	1.432[a]	0.081	-0.167[b]	79.6%	-0.006[b]	1.393[a]	0.016	-0.088	90.3%	-0.005[b]	1,335[a]	0,049	0,066	83,6%
		(0.071)	(0.000)	(0.181)	(0.031)		(0.038)	(0.000)	(0.771)	(0.497)		(0.034)	(0,000)	(0,346)	(0,545)	
Denmark	1991-11	0.003	0.785[a]	-0.077	0.127[b]	44.6%	-0.007	0.861[a]	0.023	0.120[c]	64.1%	0.002	0,748[a]	-0,074	0,143[c]	43,5%
		(0.433)	(0.000)	(0.390)	(0.039)		(0.152)	(0.001)	(0.784)	(0.063)		(0.654)	(0,000)	(0,449)	(0,057)	
Spain	1991-05	-0.003[c]	1.350[a]	0.125[a]	-0.156[a]	85.9%	-0.004	1.279[a]	0.234[a]	-0.125[b]	87.3%	0.000	1,396[a]	0,143[a]	-0,186[a]	87,8%
		(0.087)	(0.000)	(0.005)	(0.000)		(0.272)	(0.000)	(0.000)	(0.011)		(0.859)	(0,000)	(0,008)	(0,000)	
France	1987-08	-0.002	1.023[a]	-0.006	0.160[c]	58.5%	-0.006	1.054[a]	0.002	0.200[c]	72.0%	0.000	1,229[a]	-0,055	0,080	63,2%
		(0.581)	(0.000)	(0.927)	(0.069)		(0.163)	(0.000)	(0.981)	(0.059)		(0.915)	(0,000)	(0,502)	(0,477)	
Finland	1998-06	0.005	0.222[a]	-0.144	0.274[a]	18.8%	0.005	0.300[b]	-0.151	0.363[a]	23.7%	0.003	0,209[a]	-0,190	0,319[a]	17,9%
		(0.367)	(0.000)	(0.258)	(0.001)		(0.525)	(0.011)	(0.383)	(0.001)		(0.568)	(0,006)	(0,135)	(0,001)	
Greece	1990-01	-0.004[b]	1.171[a]	-0.126[b]	0.061[c]	93.0%	0.000	1.329[a]	-0.002	0.188[c]	90.5%	-0.001	1,206[a]	-0,128[b]	-0,006	90,0%
		(0.044)	(0.000)	(0.019)	(0.086)		(0.929)	(0.000)	(0.927)	(0.095)		(0.673)	(0,000)	(0,023)	(0,557)	
Holland	1986-06	-0.005	1.348[a]	0.028	0.184[b]	65.7%	-0.009	1.768[a]	-0.224	0.272[c]	79.3%	-0.008	1,512[a]	-0,011	0,253[b]	74,5%
		(0.141)	(0.000)	(0.698)	(0.050)		(0.167)	(0.000)	(0.210)	(0.087)		(0.196)	(0,000)	(0,926)	(0,047)	
Ireland	1986-06	-0.005	0.933[a]	-0.161[c]	0.196[a]	53.3%	-0.022c	1.024[a]	0.152	0.469[a]	61.7%	-0.008	1,090[a]	-0,018	0,329[a]	52,9%
		(0.223)	(0.000)	(0.066)	(0.003)		(0.002)	(0.000)	(0.338)	(0.000)		(0.185)	(0,000)	(0,893)	(0,002)	
Italy	1987-04	0.001	0.880[a]	0.028	0.119[a]	76.7%	0.006	1.260[a]	0.123	0.197[b]	80.3%	0.002	0,991[a]	0,027	0,076[c]	82,4%
		(0.513)	(0.000)	(0.551)	(0.001)		(0.101)	(0.000)	(0.115)	(0.019)		(0.531)	(0,000)	(0,660)	(0,063)	
Luxembourg	1999-01	-0.002	0.261[a]	-0.036	0.360[b]	21.1%	-0.005	0.498[a]	-0.051	0.357[b]	30.3%					
		(0.633)	(0.002)	(0.716)	(0.025)		(0.315)	(0.000)	(0.632)	(0.017)						
Portugal	1993-08	-0.002	0.885[a]	0.128[b]	0.157[b]	70.5%	-0.008[b]	1.053[a]	0.195[b]	0.054	75.0%	-0.002	0,879[a]	0,144[b]	0,179[c]	70,0%
		(0.332)	(0.000)	(0.033)	(0.050)		(0.046)	(0.000)	(0.016)	(0.608)		(0.468)	(0,000)	(0,045)	(0,059)	
United Kingdom	1986-06	0.002	1.040[a]	-0.007	0.177[a]	65.2%	-0.010[b]	0.880[a]	0.125	0.303[a]	65.0%	-0.001	1,150[a]	0,008	0,237[a]	62,3%
		(0.479)	(0.000)	(0.923)	(0.004)		(0.022)	(0.000)	(0.237)	(0.000)		(0.695)	(0,000)	(0,928)	(0,001)	
Sweden	1988-12	0.002	0.778[a]	-0.184	0.259[b]	47.1%	0.000	0.833[a]	0.114	0.070	68.5%	0.002	0,655[a]	0,023	0,156[c]	49,6%
		(0.662)	(0.000)	(0.167)	(0.018)		(0.943)	(0.000)	(0.221)	(0.426)		(0.704)	(0,000)	(0,809)	(0,056)	

Table 5: Three-Factor Model Estimates - Daily Stock Returns

The table reports the estimation results of the model defined in equation (1): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + e_{jt}$, for the EU-15 countries. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for the country j in period t and R_{Rjt} is the real estate companies return index for country j in period t. β_{mj}, β_{Ij} and β_{Rj} are the coefficients to estimate. The model is estimated for three different periods based on daily stock returns: Total Period: the estimation is performed for a specified period beginning in the column "Start" and end in 2008, 2002 to 2006 and 1997 to 2006. For Ireland and Luxembourg real estate market refers to the real estate companies' return index for the UK and the Benelux, respectively, due to the lack of data. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Country	Start	Total Period					Period: 2002-2006 (5 years)					Period: 1997-2006 (10 years)				
		β_0	β_m	β_I	β_R	Adj. R^2	β_0	β_m	β_I	β_R	Adj. R^2	β_0	β_m	β_I	β_R	Adj. R^2
Germany	1993/10/01	0.000 (0.390)	0.835[a] (0.000)	0.109[a] (0.000)	0.128[a] (0.000)	48.3%	0.000 (0.201)	0.946[a] (0.000)	0.120[a] (0.000)	0.141[a] (0.000)	65.9%	0.000 (0.853)	0.875[a] (0.000)	0.106[a] (0.000)	0.083[a] (0.000)	53,7%
Austria	1991/10/11	0.000 (0.881)	1.207[a] (0.000)	0.076[a] (0.000)	-0.067 (0.000)	58.9%	0.000 (0.812)	1.397[a] (0.000)	0.011 (0.647)	-0.203[a] (0.000)	61.2%	0.000 (0.905)	1.352[a] (0.000)	0.010 (0.700)	-0.116[a] (0.001)	68,5%
Belgium	1989/06/06	0.000 (0.196)	1.424[a] (0.000)	0.000 (0.989)	-0.163[a] (0.000)	69.7%	0.005b (0.037)	1.497[a] (0.000)	0.028[b] (0.028)	-0.155[a] (0.000)	92.9%	0.010c (0.000)	1.438[a] (0.000)	0.053[a] (0.000)	-0.106[a] (0.000)	82,8%
Denmark	1991/10/08	0.000 (0.614)	0.886[a] (0.000)	-0.035[b] (0.029)	0.030b (0.048)	52.9%	0.000 (0.814)	0.729[a] (0.000)	-0.001 (0.952)	0.052[a] (0.000)	52.9%	0.000 (0.261)	0.785[a] (0.000)	-0.039[b] (0.031)	0.029[c] (0.100)	45,6%
Spain	1991/04/05	0.000 (0.119)	1.297[a] (0.000)	0.047[a] (0.000)	-0.104[a] (0.000)	85.9%	0.000 (0.254)	1.423[a] (0.000)	0.052[a] (0.000)	-0.121[a] (0.000)	91.2%	0.000 (0.760)	1.389[a] (0.000)	0.069[a] (0.000)	-0.132[a] (0.000)	89,0%
France	1987/07/09	0.000 (0.506)	1.059[a] (0.000)	0.017 (0.422)	0.108[a] (0.000)	55.9%	0.000 (0.210)	1.123[a] (0.000)	0.044[b] (0.024)	0.141[a] (0.000)	70.9%	0.000 (0.775)	1.076[a] (0.000)	0.044b (0.020)	0.152[a] (0.000)	60,6%
Finland	1998/06/02	0.000 (0.389)	0.240[a] (0.000)	0.047 (0.157)	0.145[a] (0.000)	11.8%	0.000 (0.270)	0.368[a] (0.000)	-0.005 (0.898)	0.144[a] (0.045)	15.9%	0.000 (0.389)	0.240[a] (0.000)	0.047 (0.193)	0.145[a] (0.002)	11,8%
Greece	1990/01/02	0.000 (0.155)	1.093[a] (0.000)	-0.002 (0.788)	0.145[a] (0.000)	85.8%	0.000 (0.586)	1.214[a] (0.000)	-0.007 (0.500)	0.135[a] (0.002)	84.7%	0.000 (0.881)	1.074[a] (0.000)	0.004 (0.642)	0.077[a] (0.010)	84,2%
Holland	1986/05/16	0.000 (0.727)	1.254[a] (0.000)	0.000 (0.477)	-0.140[a] (0.000)	44.9%	0.000 (0.451)	1.415[a] (0.000)	0.033 (0.413)	-0.084[a] (0.003)	82.8%	0.000 (0.713)	1.268[a] (0.000)	0.000 (0.273)	-0.037 (0.204)	71,8%
Ireland	1986/05/28	0.000 (0.192)	1.087[a] (0.000)	0.041[b] (0.045)	0.128[a] (0.008)	52.9%	0.000 (0.965)	0.863[a] (0.000)	0.172[a] (0.000)	0.146[a] (0.007)	52.8%	0.000 (0.295)	0.946[a] (0.000)	0.110[a] (0.000)	0.184[a] (0.004)	50,4%
Italy	1987/04/01	0.000 (0.480)	0.936[a] (0.000)	0.006 (0.680)	0.021[b] (0.020)	72.1%	0.000 (0.173)	1.091[a] (0.000)	0.020 (0.191)	0.065[a] (0.004)	79.2%	0.000 (0.131)	0.977[a] (0.000)	0.041[a] (0.007)	0.003 (0.808)	75,1%
Luxembourg	1998/12/31	0.000 (0.989)	0.275[a] (0.000)	-0.018 (0.324)	0.146[a] (0.001)	9.7%	0.000 (0.802)	0.247[a] (0.000)	-0.049 (0.199)	0.101 (0.105)	4.9%					
Portugal	1993/07/19	0.000 (0.449)	0.870[a] (0.000)	0.000 (0.220)	0.054[b] (0.033)	60.7%	0.000 (0.757)	0.894[a] (0.000)	0.000 (0.523)	0.058[b] (0.027)	59.8%	0.000 (0.711)	0.837[a] (0.000)	0.000 (0.550)	0.083[a] (0.001)	60,3%
United Kingdom	1986/05/16	0.000 (0.843)	1.256[a] (0.000)	0.001[a] (0.000)	0.008 (0.661)	61.3%	0.000 (0.526)	1.129[a] (0.000)	0.125[a] (0.000)	0.002 (0.906)	75.5%	0.000 (0.394)	1.273[a] (0.000)	0.078[a] (0.006)	0.026 (0.236)	65,0%
Sweden	1988/11/29	0.000 (0.800)	0.946[a] (0.000)	0.011 (0.654)	0.087[a] (0.000)	43.6%	0.000 (0.352)	1.044[a] (0.000)	0.024 (0.310)	-0.030 (0.326)	69.7%	0.000 (0.424)	0.757[a] (0.000)	-0.003 (0.914)	0.115[a] (0.000)	49,8%

Table 6: Fama and French Extend Model Estimates - Daily and Monthly Stock Returns

The table reports the estimation results of Fama and French extended model defined in equation (2): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + \beta_{vj}HML_{jt} + \beta_{sj}SMB_{jt} + e_{jt}$, for the EU-15. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for the country j in period t and R_{Rjt} is the real estate companies return index for country j in period. HML_{jt} e SMB_{jt} measure, respectively, the excess of the historical returns of value stocks vis a vis growth stocks, and the excess returns of stocks with small capitalization vis a vis large capitalization stocks. β_{mj}, β_{Ij}, β_{Rj}, β_{vj} and β_{sj} are the coefficients to estimate. The model is estimated for Total Period based on monthly and daily stock returns. The estimation for Total Period is performed for a specified period beginning in the column "Start" and end in 2008. For Ireland and Luxembourg real estate market refers to the real estate companies' return index for the UK and the Benelux, respectively, due to the lack of data. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Country		Total Period – Monthly Returns							Total Period – Daily Returns							
	Start	β_0	β_m	β_I	β_R	β_v	β_s	Adj. R^2	Start	β_0	β_m	β_I	β_R	β_v	β_s	Adj. R^2
Germany	1994-06	-0.009^b (0.012)	1.036^a (0.000)	0.062 (0.450)	0.167^a (0.000)	0.403^a (0.000)	-0.036 (0.705)	68.4%	1994/06/01	0.000 (0.348)	0.739^a (0.000)	0.146^a (0.000)	0.141^a (0.000)	0.326^a (0.000)	-0.327^a (0.000)	52,4%
Austria	1994-06	-0.001 (0.753)	0.986^a (0.000)	0.104 (0.144)	0.022 (0.812)	0.343^a (0.002)	-0.118^b (0.035)	69.0%	1994/06/01	0.000 (0.769)	1.197^a (0.000)	0.068^a (0.002)	-0.068 (0.184)	0.158^a (0.000)	-0.158^a (0.000)	67,0%
Belgium	1994-06	-0.006^a (0.003)	1.366^a (0.000)	0.069 (0.293)	0.029 (0.766)	0.393^a (0.000)	-0.135^b (0.034)	89.4%	1994/06/01	0.010^a (0.004)	1.295^a (0.000)	0.054^a (0.003)	-0.025 (0.301)	0.471^a (0.000)	-0.238^a (0.000)	85,0%
Denmark	1994-06	0.002 (0.530)	0.877^a (0.000)	-0.034 (0.540)	0.064^b (0.041)	0.638^a (0.000)	0.070 (0.491)	60.3%	1994/06/01	0.000 (0.845)	0.794^a (0.000)	-0.017 (0.285)	0.049^a (0.000)	0.274^a (0.000)	-0.239^a (0.000)	60,5%
Spain	1994-06	-0.001 (0.749)	1.253^a (0.000)	0.133^b (0.012)	-0.101^c (0.058)	-0.042 (0.641)	-0.183^a (0.009)	87.7%	1994/06/01	0.000 (0.429)	1.238^a (0.000)	0.054^a (0.000)	-0.083^a (0.000)	0.129^a (0.000)	-0.125^a (0.009)	88,4%
France	1994-06	-0.005 (0.241)	1.276^a (0.000)	-0.027 (0.696)	0.128^c (0.079)	0.777^a (0.000)	-0.090 (0.487)	66.5%	1994/06/01	0.000 (0.557)	1.287^a (0.000)	-0.045^a (0.008)	0.084^a (0.000)	0.295^a (0.000)	0.185^a (0.000)	62,4%
Finland	1998-07	0.003 (0.574)	0.665^a (0.000)	-0.299^b (0.013)	0.106^c (0.082)	0.563^a (0.000)	0.164^c (0.068)	34.3%	1998/06/03	0.000 (0.421)	0.242^a (0.000)	0.044 (0.181)	0.147^a (0.000)	0.054^a (0.003)	-0.153^a (0.006)	12,0%
Greece	1997-12	-0.001 (0.776)	1.222^a (0.000)	-0.158^a (0.001)	0.085^b (0.021)	-0.074 (0.340)	-0.033 (0.384)	90.1%	1997/12/01	0.000 (0.524)	1.116^a (0.000)	-0.002 (0.832)	0.076^a (0.003)	-0.071 (0.128)	-0.035 (0.178)	85,9%
Holland	1994-06	-0.008^b (0.039)	1.527^a (0.000)	0.031 (0.720)	0.036 (0.763)	0.652^a (0.000)	-0.001 (0.996)	76.0%	1994/06/01	0.000 (0.610)	1.382^a (0.000)	0.000 (0.220)	-0.253 (0.128)	0.354^a (0.000)	0.100 (0.441)	46,3%
Ireland	1994-06	-0.003 (0.549)	1.039^a (0.000)	-0.115 (0.319)	0.226^b (0.014)	0.128 (0.138)	-0.322^c (0.000)	57.4%	1994/06/01	0.000 (0.488)	1.191^a (0.000)	0.104^a (0.009)	0.127^c (0.078)	0.000 (0.118)	0.000 (0.145)	55,9%
Italy	1994-06	0.000 (0.979)	1.056^a (0.000)	0.010 (0.863)	0.134^b (0.040)	0.279^a (0.005)	-0.042 (0.549)	82.2%	1994/06/01	0.000 (0.942)	1.041^a (0.000)	0.001 (0.968)	0.104^c (0.083)	0.319^a (0.000)	0.014 (0.446)	78,1%
Luxembourg	1999-02	-0.003 (0.437)	0.315^a (0.001)	-0.004 (0.962)	0.274^b (0.032)	0.316 (0.129)	0.186 (0.186)	22.7%	1999/01/31	0.000 (0.975)	0.276^a (0.001)	-0.018 (0.239)	0.143^a (0.000)	0.027 (0.238)	-0.028 (0.118)	9,7%
Portugal	1996-06	-0.004 (0.154)	0.911^a (0.000)	0.135^c (0.093)	0.103^c (0.055)	-0.057 (0.371)	0.230^a (0.002)	73.6%	1996/06/01	0.000 (0.417)	0.865^a (0.000)	0.000 (0.193)	0.064^b (0.026)	0.063^a (0.004)	-0.083^a (0.005)	61,2%
United Kingdom	1994-06	0.000 (0.943)	1.157^a (0.000)	0.042 (0.589)	0.229^a (0.003)	0.191 (0.112)	-0.258^a (0.007)	63.3%	1994/06/01	0.000 (0.566)	1.300^a (0.000)	0.055^b (0.027)	0.013 (0.527)	0.841^a (0.000)	-0.145^a (0.000)	71,2%
Sweden	1994-06	0.000 (0.967)	1.131^a (0.000)	-0.213^a (0.007)	0.135^c (0.071)	0.736^a (0.000)	-0.086 (0.321)	62.6%	1994/06/01	0.000 (0.537)	1.149^a (0.000)	-0.021 (0.304)	0.036^b (0.042)	0.824^a (0.000)	-0.105^a (0.000)	70,4%

Table 7: Three-Factor Model and Fama and French Extended Model Estimates: REITs

The table reports the estimation results of Fama and French extended model defined in equation (2): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + \beta_{vj}HML_{jt} + \beta_{sj}SMB_{jt} + e_{jt}$, for the subset of EU-15 countries where REITS data is available. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for the country j in period t and R_{Rjt} is the real estate market return for country j in period proxied by REITs returns. HML_{jt} e SMB_{jt} measure, respectively, the excess of the historical returns of value stocks vis a vis growth stocks, and the excess returns of stocks with small capitalization vis a vis large capitalization stocks. β_{mj}, β_{Ij}, β_{Rj}, β_{vj} and β_{sj} are the coefficients to estimate. The model is estimated for Total Period based on monthly and daily stock returns. The estimation for Total Period is performed for a specified period beginning in the column "Start" and end in 2008. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Panel A: Three-Factor Model

Country	Total Period – Monthly Returns						Total Period – Daily Returns					
	Start	β_0	β_m	β_I	β_R	Adj. R^2	Start	β_0	β_m	β_I	β_R	Adj. R^2
Germany	1993-11	-0.008[a] (0.004)	1.056[c] (0.080)	0.023[c] (0.078)	0.029[b] (0.021)	63.3%	1993/01/10	0.000 (0.102)	0.875[a] (0.000)	0.115[a] (0.000)	0.032[a] (0.007)	46.9%
Belgium	1995-01	-0.009[a] (0.003)	1.489[c] (0.080)	0.078[c] (0.061)	0.051[c] (0.084)	86.7%	1995/01/01	0.016[a] (0.000)	1.518[a] (0.000)	0.083[a] (0.000)	-0.119[b] (0.040)	78.9%
France	1988-08	-0.002[a] (0.003)	1.088[c] (0.082)	0.005[c] (0.063)	0.075[c] (0.059)	56.7%	1988/07/11	0.000[a] (0.000)	1.156[b] (0.024)	0.000[b] (0.020)	0.012[a] (0.010)	59.0%
Holland	1986-07	-0.005[a] (0.004)	1.334 (0.118)	0.030[c] (0.099)	0.238 (0.156)	66.0%	1986/06/16	0.000 (0.751)	1.248[a] (0.000)	0.000 (0.458)	-0.134[a] (0.000)	44.9%
United Kingdom	1986-07	0.002[a] (0,003)	1.045[c] (0,084)	-0.005[c] (0,070)	0.170[a] (0,062)	65.1%	1986/06/16	0.000 (0,852)	1.231[a] (0,000)	0.001[a] (0,000)	0.037[c] (0,061)	61.4%

Panel B: Fama and French Extended Model

Country	Total Period – Monthly Returns							Total Period – Daily Returns						
	Start	β_0	β_m	β_I	β_R	β_v	β_s	Adj. R^2	Start	β_0	β_m	β_I	β_R	β_v	β_s	Adj. R^2
Germany	1993-11	-0.008[b] (0.030)	1.107[a] (0.000)	0.072 (0.397)	0.028 (0.148)	0.358[a] (0.001)	-0.044 (0.666)	65.4%	1993/01/10	0.000 (0.548)	0.783[a] (0.000)	0.153[a] (0.000)	0.040[a] (0.001)	0.321[a] (0.000)	-0.320[a] (0.000)	50.9%
Belgium	1995-01	-0.007[a] (0.004)	1.400[a] (0.000)	0.068 (0.318)	-0.023 (0.822)	0.388[a] (0.000)	-0.127[b] (0.038)	89.7%	1995/01/01	0.009[b] (0.012)	1.305[a] (0.000)	0.048[a] (0.010)	-0.038 (0.482)	0.471[a] (0.000)	-0.237[a] (0.000)	85.5%
France	1988-08	-0.005 (0.165)	1.220[a] (0.000)	-0.018 (0.790)	0.084 (0.184)	0.737[a] (0.000)	-0.144 (0.173)	66.8%	1988/07/11	0.000 (0.317)	1.398[a] (0.000)	-0.007 (0.667)	0.017 (0.126)	0.401[a] (0.000)	-0.140[a] (0.000)	62.9%
Holland	1986-07	-0.009[b] (0.029)	1.487[a] (0.000)	0.033 (0.705)	0.133 (0.235)	0.613[a] (0.000)	-0.032 (0.789)	76.2%	1986/06/16	0.000 (0.648)	1.370[a] (0.000)	0.000 (0.235)	-0.245 (0.154)	0.353[a] (0.000)	0.097 (0.464)	46.3%
UK	1986-07	0.000 (0.894)	1.185[a] (0.000)	0.041 (0.602)	0.180[b] (0.016)	0.216[c] (0.078)	-0.208[b] (0.023)	62.6%	1986/06/16	0.000 (0.576)	1.296[a] (0.000)	0.055[b] (0.026)	0.005 (0.803)	0.839[a] (0.000)	-0.147[a] (0.000)	71.2%

Table 8: Three-Factor Model Estimates - Subprime Crisis Effect Analysis

The table reports the estimation results of the model defined in equation (3): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + \beta_{1j}D_t + \beta_{2j}D_t*Rm_{jt} + \beta_{3j}D_t*I_{jt} + \beta_{4j}D_t*R_{Rjt}+e_{jt}$, for the EU-15. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for the country j in period t and R_{Rjt} is the real estate companies return index for country j in period t. β_{mj}, β_{Ij} and β_{Rj} are the coefficients to estimate. D_t is a dummy variable that takes the value 1 for the date of June 18, 2007 (daily data) or June 2007 (monthly data) and the end of 2008, and 0 for the remaining period. The model is estimated for Total Period: the estimation is performed for a specified period beginning in the column "Start" and end in 2008, 2002 to 2006 and 1997 to 2006. For Ireland and Luxembourg real estate market refers to the real estate companies' return index for the UK and the Benelux, respectively, due to the lack of data. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Country	Start	β0	βm	βI	βR	β1	β2	β3	β4	Adj. R²	Start	β0	βm	βI	βR	β1	β2	β3	β4	Adj. R²
				Total Period – Daily Returns										Total Period – Monthly Returns						
Germany	1994/06/01	0.000	0.854[a]	0.060[a]	0.079[a]	-0.001	-0.302	0.126	0.101[a]	51.7%	1994-06	-0.005	0.923[a]	0.046	0.133[b]	-0.018	0.366[c]	-0.464[b]	0.121	67.4%
		(0.390)	(0.000)	(0.001)	(0.000)	(0.594)	(0.214)	(0.376)	(0.001)			(0.146)	(0.000)	(0.593)	(0.016)	(0.219)	(0.070)	(0.018)	(0.523)	
Austria	1994/06/01	0.000	1.040[a]	0.095[a]	-0.152[a]	0.000	0.484[a]	-0.206[a]	0.026	61.1%	1994-06	0.004	0.893[a]	0.154[b]	-0.129[b]	-0.010	0.830[a]	-0.268	-0.286	60.0%
		(0.357)	(0.000)	(0.000)	(0.000)	(0.679)	(0.000)	(0.000)	(0.415)			(0.284)	(0.000)	(0.040)	(0.069)	(0.452)	(0.002)	(0.225)	(0.185)	
Belgium	1994/06/01	0.000	1.264[a]	0.000	-0.130[a]	0.003	0.609[a]	0.019	-0.309	72.0%	1994-06	0.000	1.228[a]	0.028	-0.136[b]	-0.011	0.352[b]	0.314	0.654[c]	83.5%
		(0.790)	(0.000)	(0.613)	(0.000)	(0.880)	(0.000)	(0.849)	(0.141)			(0.748)	(0.000)	(0.589)	(0.049)	(0.306)	(0.044)	(0.118)	(0.081)	
Denmark	1994/06/01	0.000	0.831[a]	-0.049[a]	0.012	-0.002[a]	0.188[a]	0.053	0.023[c]	53.6%	1994-06	0.008[b]	0.688[a]	-0.117[c]	0.042	-0.040[b]	0.499[b]	0.021	-0.133	47.9%
		(0.355)	(0.000)	(0.001)	(0.449)	(0.008)	(0.001)	(0.374)	(0.094)			(0.030)	(0.000)	(0.098)	(0.534)	(0.015)	(0.025)	(0.936)	(0.451)	
Spain	1994/06/01	0.000	1.313[a]	0.057[a]	-0.114[a]	0.000	-0.047	-0.049	0.142[b]	86.0%	1994-06	-0.004[b]	1.377[a]	0.112[a]	-0.163[a]	-0.003	-0.210[c]	0.214	0.170[c]	86.0%
		(0.664)	(0.000)	(0.000)	(0.000)	(0.475)	(0.239)	(0.221)	(0.020)			(0.036)	(0.000)	(0.010)	(0.000)	(0.621)	(0.081)	(0.248)	(0.059)	
France	1994/06/01	0.000	1.038[a]	-0.030[c]	0.040	-0.001	0.045	0.182[c]	0.180	56.4%	1994-06	0.000	1.018[a]	-0.019	0.105	-0.017	-0.122	-0.031	0.298	58.5%
		(0.846)	(0.000)	(0.063)	(0.116)	(0.359)	(0.753)	(0.055)	(0.127)			(0.954)	(0.000)	(0.780)	(0.269)	(0.290)	(0.698)	(0.880)	(0.367)	
Finland	1998/06/03	0.000	0.179[a]	0.056	0.083[a]	0.000	0.548[a]	-0.142	0.016	15.9%	1998-07	0.004	0.214[a]	-0.179	0.308[a]	-0.002	0.425	0.226	0.398[c]	18.3%
		(0.217)	(0.000)	(0.111)	(0.000)	(0.787)	(0.000)	(0.173)	(0.850)			(0.503)	(0.005)	(0.160)	(0.001)	(0.909)	(0.155)	(0.450)	(0.083)	
Greece	1997/12/01	0.000	1.072[a]	-0.002	0.151[a]	0.000	0.314[a]	-0.165	-0.254	86.1%	1997-12	-0.004[c]	1.176[a]	-0.126[b]	0.052	0.000	-0.197	0.185	0.225	93.0%
		(0.109)	(0.000)	(0.799)	(0.000)	(0.655)	(0.000)	(0.882)	(0.325)			(0.055)	(0.000)	(0.020)	(0.468)	(0.127)	(0.167)	(0.846)	(0.418)	
Holland	1994/06/01	0.000	1.203[a]	0.000	-0.031	-0.002[b]	0.455[a]	0.289[a]	-0.533	45.9%	1994-06	0.001	1.141[a]	-0.007	0.022	-0.007	1.099[a]	-0.147	0.351	73.9%
		(0.764)	(0.000)	(0.488)	(0.331)	(0.026)	(0.000)	(0.000)	(0.173)			(0.598)	(0.000)	(0.917)	(0.772)	(0.706)	(0.000)	(0.748)	(0.475)	
Ireland	1994/06/01	0.000	0.912[a]	-0.041[b]	0.014	-0.002	0.624[a]	0.142	0.860[c]	56.6%	1994-06	0.003	0.867[a]	-0.315[a]	-0.001	-0.003	0.385[b]	1.238[a]	1.046[a]	64.6%
		(0.486)	(0.000)	(0.040)	(0.824)	(0.335)	(0.000)	(0.520)	(0.085)			(0.395)	(0.000)	(0.000)	(0.986)	(0.905)	(0.036)	(0.004)	(0.000)	
Italy	1994/06/01	0.000	0.902[a]	-0.005	0.006	0.000	0.274[a]	-0.064	0.008	72.8%	1994-06	0.002	0.877[a]	0.032	0.109[a]	-0.004	0.089	-0.074	0.015	76.5%
		(0.214)	(0.000)	(0.715)	(0.544)	(0.753)	(0.000)	(0.251)	(0.801)			(0.364)	(0.000)	(0.521)	(0.006)	(0.628)	(0.635)	(0.696)	(0.903)	
Luxembourg	1999/01/31	0.000	0.233[a]	-0.017	-0.023	-0.002[b]	0.175[c]	-0.014	0.296[a]	12.3%	1999-02	0.009[a]	0.235[a]	-0.099	-0.048	-0.051[a]	0.506[c]	0.392[b]	-0.459	38.3%
		(0.278)	(0.000)	(0.298)	(0.560)	(0.016)	(0.052)	(0.833)	(0.000)			(0.008)	(0.004)	(0.208)	(0.215)	(0.004)	(0.064)	(0.017)	(0.758)	
Portugal	1996/06/01	0.000	0.870[a]	0.000	0.006	0.147	-0.032	0.055	0.113	60.9%	1996-06	0.001	0.863[a]	0.013	0.061	-0.034[a]	0.303[c]	0.702[a]	-0.327[c]	74.9%
		(0.492)	(0.000)	(0.177)	(0.804)	(0.356)	(0.671)	(0.352)	(0.134)			(0.588)	(0.000)	(0.807)	(0.555)	(0.002)	(0.055)	(0.000)	(0.086)	
United Kingdom	1994/06/01	0.000	1.235[a]	0.001[a]	0.001	-0.002[c]	0.025	0.189[c]	0.180[c]	61.6%	1994-06	0.004	1.112[a]	-0.038	0.064	-0.021	-0.241	-0.081	0.371[b]	61.6%
		(0.177)	(0.000)	(0.000)	(0.961)	(0.059)	(0.789)	(0.061)	(0.071)			(0.113)	(0.000)	(0.590)	(0.312)	(0.128)	(0.351)	(0.657)	(0.012)	
Sweden	1994/06/01	0.000	0.891[a]	0.010	0.088[a]	0.000	0.484[a]	-0.019	0.203[a]	44.4%	1994-06	0.003	0.753[a]	-0.245[c]	0.253[b]	0.001	0.280	0.468[c]	0.160	46.9%
		(0.569)	(0.000)	(0.728)	(0.001)	(0.712)	(0.000)	(0.701)	(0.001)			(0.543)	(0.000)	(0.096)	(0.029)	(0.942)	(0.222)	(0.070)	(0.439)	

Table 9: EU-15 Listed Banks with Real Estate Market Exposure at a Regional Level

The following table shows the listed banks in the EU-15 countries with asset exposure to the real estate market at the regional or international level (assets associated with the real estate sector have a weight of at least 40% in international market). Data regarding geography exposure is from the reports and accounts of listed banks in the EU-15 (IAS 14 and IFRS 8). The table shows average figures for the period 2002-2008.

Country	# Listed Banks	'Global' Banks				
		# Banks	Name	Main Regional Market	Non-domestic Asset Weight (%)	Ranking[1]
Germany	24	2	Deutsche Bank	Europe	47.0	1
			Commerzbank	Europe	40.0	2
Austria	8	3	Bank Austria	Europe	66.0	1
			Erste Group Bank	Europe	51.0	2
			Raiffeisen International Bank	Europe	100	6
Belgium	5	3	Dexia	Europe	83.9	1
			Fortis	Europe	58.2	2
			KBC Group	Europe	59.6	3
Spain	10	2	Santander	Europe	62.4	1
			BBVA	Europe	40.9	2
France	34	2	BNP Paribas	Europe	67.0	1
			Société Générale	Europe	51.0	3
Holland	7	1	ING Groep	Europe	48.2	1
Ireland	3	2	Allied Irish Banks	United Kingdom	40.1	2
			Bank of Ireland	United Kingdom	60.9	4
Italy	30	1	Unicredit	Europe	61.7	1
Luxembourg	3	1	Espírito Santo Financial Group	BENELUX and Europe	50.9	1
United Kingdom	14	4	Barclays	Europe	39.3	2
			HSBC	Europe	61.8	3
			Lloyds	Europe	39.7	4
			Standard Chartered	Asia	98.0	5
Sweden	6	2	Nordea Bank	Scandinavia	76.6	1
			SEB	Scandinavia	47.0	2

[1] Ranking at the domestic level in terms of Total Assets for 2008; Source: BANKSCOPE.

Table 10: Three-Factor Model Estimates - Monthly Stock Returns and Regional Indices

The table reports the estimation results of the model defined in equation (1): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + e_{jt}$, for the subset of the EU-15 countries whose banking sector has some degree of internationalization. The region is chosen on the basis of information provided in financial reports. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for country j in period t and R_{Rjt} is the real estate companies return index for region j in period t. β_{mj}, β_{Ij} and β_{Rj} are the coefficients to estimate. The model is estimated for three different periods based on monthly stock returns: Total Period: the estimation is performed for a specified period beginning in the column "Start" and end in 2008, 2002 to 2006 and 1997 to 2006. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Country (Region)[1]	Start	Total Period					Period: 2002-2006 (5 years)					Period: 1997-2006 (10 years)				
		β_0	β_m	β_I	β_R	Adj. R²	β_0	β_m	β_I	β_R	Adj. R²	β_0	β_m	β_I	β_R	Adj. R²
Germany (Europe)	1993-10	-0.008[b]	1.035[a]	0.051	0.192[b]	63.7%	-0.015	1.084[a]	-0.025	0.255[b]	76.0%	0.002	1.029[a]	0.134	0.151[a]	61.0%
		(0.021)	(0.000)	(0.547)	(0.037)		(0.268)	(0.000)	(0.823)	(0.020)		(0.731)	(0.000)	(0.210)	(0.003)	
Austria (Europe)	1991-11	0.001	0.946[a]	0.155[b]	0.088[b]	58.8%	0.002	1.132[a]	0.072	0.088[c]	51.6%	0.004	1.131[a]	0.118	0.129[b]	53.6%
		(0.809)	(0.000)	(0.029)	(0.042)		(0.668)	(0.000)	(0.398)	(0.064)		(0.366)	(0.000)	(0.157)	(0.042)	
Belgium (Europe)	1989-07	-0.005[b]	1.260[a]	0.119[b]	0.210[a]	80.0%	-0.006[b]	1.402[a]	0.019	0.077[c]	90.3%	-0.005[b]	1.344[a]	0.043	0.136[c]	83.5%
		(0.017)	(0.000)	(0.040)	(0.002)		(0.040)	(0.000)	(0.760)	(0.082)		(0.053)	(0.000)	(0.492)	(0.069)	
Spain (Europe)	1991-05	-0.003	1.264[a]	0.158[a]	0.122[a]	84.7%	-0.004	1.435[a]	0.204[a]	0.294[b]	88.3%	0.000	1.384[a]	0.160[a]	0.250[b]	86.8%
		(0.150)	(0.000)	(0.001)	(0.061)		(0.210)	(0.000)	(0.004)	(0.030)		(0.961)	(0.000)	(0.008)	(0.015)	
France (Europe)	1987-08	-0.002	0.956[a]	-0.011	0.313[c]	58.5%	-0.005	1.022[a]	0.002	0.253[b]	72.3%	-0.001	1.132[a]	-0.049	0.274[b]	64.1%
		(0.549)	(0.000)	(0.865)	(0.002)		(0.214)	(0.000)	(0.975)	(0.035)		(0.850)	(0.000)	(0.544)	(0.044)	
Holland (Europe)	1986-06	-0.006	1.267[a]	0.020	0.367[b]	66.7%	-0.010	1.642[a]	-0.186	0.485[b]	80.2%	-0.009[c]	1.414[a]	-0.022	0.473[a]	75.5%
		(0.154)	(0.000)	(0.833)	(0.029)		(0.113)	(0.000)	(0.277)	(0.011)		(0.051)	(0.000)	(0.844)	(0.002)	
Ireland (United Kingdom)	1986-06	-0.005	0.933[a]	-0.161[c]	0.196[a]	53.3%	-0.022[a]	1.024[a]	0.152	0.469[a]	61.7%	-0.008	1.090[a]	-0.018	0.329[a]	52.9%
		(0.223)	(0.000)	(0.066)	(0.003)		(0.002)	(0.000)	(0.338)	(0.000)		(0.185)	(0.000)	(0.893)	(0.002)	
Italy (Europe)	1987-04	0.001	0.919[a]	0.035	0.144[b]	76.0%	0.008[c]	1.215[a]	0.075	0.278[b]	79.8%	0.001	1.013[a]	0.019	0.117[c]	82.3%
		(0.651)	(0.000)	(0.479)	(0.026)		(0.053)	(0.000)	(0.336)	(0.041)		(0.656)	(0.000)	(0.755)	(0.076)	
Luxembourg (Benelux)	1999-01	-0.002	0.261[a]	-0.036	0.360[b]	21.1%	-0.005	0.498[a]	-0.051	0.357[b]	30.3%					
		(0.633)	(0.002)	(0.716)	(0.025)		(0.315)	(0.000)	(0.632)	(0.017)						
United Kingdom (Europe)	1986-06	0.001	1.053[a]	-0.065	0.295[a]	65.6%	-0.010[b]	0.866[a]	0.089	0.350[a]	61.4%	-0.002	1.138[a]	-0.012	0.250[b]	60.6%
		(0.654)	(0.000)	(0.360)	(0.000)		(0.022)	(0.000)	(0.420)	(0.006)		(0.563)	(0.000)	(0.891)	(0.035)	
Sweden (Scandinavia)	1988-12	0.002	0.687[a]	-0.153	0.410[a]	50.1%	0.000	0.755[a]	0.116	0.187[b]	69.8%	0.001	0.568[a]	0.035	0.305[a]	52.1%
		(0.625)	(0.000)	(0.134)	(0.000)		(0.994)	(0.000)	(0.201)	(0.045)		(0.728)	(0.000)	(0.702)	(0.001)	

[1]In parentheses the geographic region chosen to proxy the real estate market risk factor.

Table 11: Three-Factor Model Estimates - Daily Stock Returns and Regional Indices

The table reports the estimation results of the model defined in equation (1): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + e_{jt}$, for the subset of the EU-15 countries whose banking sector has some degree of internationalization. The region is chosen on the basis of information provided in financial reports. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for country j in period t and R_{Rjt} is the real estate companies return index for region j in period t. β_{mj}, β_{Ij} and β_{Rj} are the coefficients to estimate. The model is estimated for three different periods based on daily stock returns: Total Period: the estimation is performed for a specified period beginning in the column "Start" and end in 2008, 2002 to 2006 and 1997 to 2006. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Country (Region)[1]	Start	Total Period					Period: 2002-2006 (5 years)					Period: 1997-2006 (10 years)				
		β_0	β_m	β_I	β_R	Adj. R^2	β_0	β_m	β_I	β_R	Adj. R^2	β_0	β_m	β_I	β_R	Adj. R^2
Germany (Europe)	1993/10/01	0.000 (0.296)	0.737[a] (0.000)	0.074[a] (0.005)	0.612[a] (0.000)	51.7%	0.000 (0.169)	0.736[a] (0.000)	0.133[a] (0.003)	0.636[a] (0.000)	55.0%	0.000 (0.887)	0.742[a] (0.000)	0.106[a] (0.001)	0.614[a] (0.000)	52.2%
Austria (Europe)	1991/10/11	0.000 (0.998)	1.122[a] (0.000)	0.068[a] (0.004)	0.141[a] (0.001)	59.0%	0.000 (0.922)	1.375[a] (0.000)	0.022 (0.424)	0.183[c] (0.066)	57.2%	0.000 (0.452)	1.200[a] (0.000)	0.037[b] (0.037)	0.097[a] (0.006)	54.5%
Belgium (Europe)	1989/06/06	0.000 (0.159)	1.355[a] (0.000)	0.000 (0.305)	0.056[b] (0.047)	69.1%	0.006[b] (0.019)	1.500[a] (0.000)	0.031[b] (0.014)	0.090[a] (0.000)	92.8%	0.010[a] (0.000)	1.433[a] (0.000)	0.052[a] (0.000)	0.062[b] (0.021)	82.7%
Spain (Europe)	1991/04/05	0.000 (0.122)	1.233[a] (0.000)	0.060[a] (0.000)	0.162[c] (0.060)	85.4%	0.000 (0.204)	1.375[a] (0.000)	0.054[a] (0.000)	0.188[a] (0.009)	90.6%	0.000 (0.243)	1.317[a] (0.000)	0.074[a] (0.000)	0.201[a] (0.009)	88.3%
France (Europe)	1987/07/09	0.000 (0.574)	1.076[a] (0.000)	0.018 (0.224)	0.137[a] (0.001)	55.8%	0.000 (0.543)	1.118[a] (0.000)	-0.019 (0.173)	0.116[a] (0.000)	82.5%	0.000 (0.343)	1.039[a] (0.000)	-0.009 (0.637)	0.100[a] (0.000)	59.8%
Holland (Europe)	1986/05/16	0.000 (0.702)	1.217[a] (0.000)	0.000 (0.484)	0.121[a] (0.009)	44.7%	0.006 (0.411)	1.434[a] (0.000)	0.031 (0.437)	0.205[a] (0.000)	82.9%	0.000 (0.490)	1.288[a] (0.000)	0.000 (0.293)	0.130[a] (0.001)	71.9%
Ireland (United Kingdom)	1986/05/28	0.000 (0.192)	1.087[a] (0.000)	0.041[b] (0.045)	0.128[a] (0.008)	52.9%	0.000 (0.965)	0.863[a] (0.000)	0.172[a] (0.000)	0.146[a] (0.007)	52.8%	0.000 (0.295)	0.946[a] (0.000)	0.110[a] (0.000)	0.184[a] (0.004)	50.4%
Italy (Europe)	1987/04/01	0.000 (0.846)	0.880[a] (0.000)	-0.002 (0.883)	0.259[a] (0.000)	73.3%	0.000 (0.311)	1.062[a] (0.000)	0.022 (0.206)	0.088[a] (0.010)	78.8%	0.000 (0.254)	0.958[a] (0.000)	0.041[a] (0.010)	0.083[a] (0.002)	75.2%
Luxembourg (Benelux)	1998/12/31	0.000 (0.989)	0.275[a] (0.000)	-0.018 (0.324)	0.146[a] (0.001)	9.7%	0.000 (0.802)	0.247[a] (0.000)	-0.049 (0.199)	0.101 (0.105)	4.9%					
United Kingdom (Europe)	1986/05/16	0.000 (0.970)	1.183[a] (0.000)	0.001 (0.366)	0.234[a] (0.000)	62.0%	0.000 (0.958)	1.136[a] (0.000)	0.153[a] (0.000)	0.151[a] (0.001)	70.5%	0.000 (0.542)	1.244[a] (0.000)	0.103[a] (0.000)	0.075[b] (0.020)	66.0%
Sweden (Scandinavia)	1988/11/29	0.000 (0.814)	0.885[a] (0.000)	0.019 (0.355)	0.209[a] (0.000)	44.7%	0.000 (0.531)	1.006[a] (0.000)	0.030 (0.199)	0.072[b] (0.019)	69.8%	0.000 (0.561)	0.713[a] (0.000)	0.004 (0.868)	0.233[a] (0.000)	51.0%

[1]In parentheses the geographic region chosen to proxy the real estate market risk factor.

Table 12: Fama and French Extended Model Regional Indices Estimates - Daily and Monthly Stock Returns

The table reports the estimation results of Fama and French extended model defined in equation (2): $R_{jt} = \beta_{0j} + \beta_{mj}R_{mjt} + \beta_{Ij}I_{jt} + \beta_{Rj}R_{Rjt} + \beta_{vj}HML_{jt} + \beta_{sj}SMB_{jt} + e_{jt}$, for the subset of the EU-15 countries whose banking sector has some degree of internationalization. The region is chosen on the basis of information provided in financial reports. R_{jt} is the banking industry return index for country j in period t; R_{mjt} is the general stock return index for country j in period t; I_{jt} is the interest rate for the country j in period t and R_{Rjt} is the real estate companies return index for region j in period. HML_{jt} e SMB_{jt} measure, respectively, the excess of the historical returns of value stocks vis a vis growth stocks, and the excess returns of stocks with small capitalization vis a vis large capitalization stocks. $\beta_{mj}, \beta_{Ij}, \beta_{Rj}, \beta_{vj}$ and β_{sj} are the coefficients to estimate. The model is estimated for Total Period based on monthly and daily stock returns. The estimation for Total Period is performed for a specified period beginning in the column "Start" and end in 2008. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-values* are presented in brackets.

Country (Region)[1]	Total Period – Monthly Returns								Total Period – Daily Returns							
	Start	β_0	β_m	β_I	β_R	β_v	β_s	Adj. R^2	Start	β_0	β_m	β_I	β_R	β_v	β_s	Adj. R^2
Germany (Europe)	1994-06	-0.008[b]	1.092[a]	0.090	0.152[a]	0.343[a]	-0.052	65.5%	1994/06/01	0.000	0.629[a]	0.109[a]	0.660[a]	0.344[a]	-0.433[a]	56.3%
		(0.025)	(0.000)	(0.295)	(0.000)	(0.002)	(0.611)			(0.123)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Austria (Europe)	1994-06	-0.001	0.973[a]	0.106	0.046	0.340[a]	-0.120[b]	69.0%	1994/06/01	0.000	1.125[a]	0.063[a]	0.088[b]	0.166[a]	-0.168[a]	66.9%
		(0.711)	(0.000)	(0.136)	(0.685)	(0.002)	(0.034)			(0.751)	(0.000)	(0.003)	(0.026)	(0.000)	(0.000)	
Belgium (Europe)	1994-06	-0.007[a]	1.330[a]	0.074	0.102[b]	0.389[a]	-0.143[b]	89.5%	1994/06/01	0.010[a]	1.263[a]	0.052[a]	0.051[b]	0.478[a]	-0.254[a]	85.0%
		(0.001)	(0.000)	(0.150)	(0.049)	(0.000)	(0.017)			(0.005)	(0.000)	(0.004)	(0.022)	(0.000)	(0.000)	
Spain (Europe)	1994-06	-0.001	1.122[a]	0.152[a]	0.155[b]	-0.063	-0.250[a]	87.5%	1994/06/01	0.000	1.183[a]	0.063[a]	0.058[b]	0.152[a]	-0.124[a]	87.5%
		(0.737)	(0.000)	(0.001)	(0.039)	(0.344)	(0.000)			(0.347)	(0.000)	(0.000)	(0.018)	(0.004)	(0.000)	
France (Europe)	1994-06	-0.004	1.174[a]	-0.016	0.149[c]	0.702[a]	-0.170	66.7%	1994/06/01	0.000	1.376[a]	-0.010	0.134[a]	0.394[a]	0.231[a]	62.9%
		(0.208)	(0.000)	(0.822)	(0.075)	(0.000)	(0.181)			(0.273)	(0.000)	(0.527)	(0.009)	(0.000)	(0.000)	
Holland (Europe)	1994-06	-0.009[b]	1.381[a]	0.027	0.339[b]	0.595[a]	-0.100	76.9%	1994/06/01	0.000	1.450[a]	0.000	0.465[b]	0.352[a]	0.132	46.7%
		(0.022)	(0.000)	(0.755)	(0.015)	(0.000)	(0.405)			(0.634)	(0.000)	(0.210)	(0.026)	(0.000)	(0.465)	
Ireland (United Kingdom)	1994-06	-0.003	1.039[a]	-0.115	0.226[b]	0.128	-0.322[a]	57.4%	1994/06/01	0.000	1.191[a]	0.104[a]	0.127[c]	0.000	0.000	55.9%
		(0.549)	(0.000)	(0.319)	(0.014)	(0.138)	(0.000)			(0.488)	(0.000)	(0.009)	(0.078)	(0.118)	(0.145)	
Italy (Europe)	1994-06	0.000	1.037[a]	0.015	0.134[c]	0.280[a]	-0.057	82.5%	1994/06/01	0.000	0.997[a]	-0.002	0.112[a]	0.307[a]	-0.017	78.3%
		(0.845)	(0.000)	(0.793)	(0.068)	(0.004)	(0.398)			(0.939)	(0.000)	(0.893)	(0.000)	(0.000)	(0.364)	
Luxembourg (Benelux)	1999-02	-0.003	0.315[a]	-0.004	0.274[b]	0.316	0.186	22.7%	1999/01/31	0.000	0.276[a]	-0.018	0.143[a]	0.027	-0.028	9.7%
		(0.437)	(0.001)	(0.962)	(0.032)	(0.129)	(0.186)			(0.975)	(0.001)	(0.239)	(0.000)	(0.238)	(0.118)	
United Kingdom (Europe)	1994-06	-0.001	1.123[a]	0.024	0.302[a]	0.296[a]	-0.237[b]	63.1%	1994/06/01	0.000	1.256[a]	0.054[b]	0.186[b]	0.834[a]	-0.171[b]	71.3%
		(0.815)	(0.000)	(0.756)	(0.005)	(0.007)	(0.011)			(0.538)	(0.000)	(0.028)	(0.027)	(0.000)	(0.034)	
Sweden (Scandinavia)	1994-06	0.000	0.994[a]	-0.190[b]	0.128[c]	0.673[a]	-0.153[c]	61.9%	1994/06/01	0.000	1.016[a]	-0.016	0.135[a]	0.771[a]	-0.181[a]	70.9%
		(0.895)	(0.000)	(0.017)	(0.075)	(0.000)	(0.093)			(0.457)	(0.000)	(0.293)	(0.000)	(0.000)	(0.000)	

[1]In parentheses is indicated the geographic region used as a risk factor of the real estate industry in the estimation of equation (2).

Table 13: Real Estate Market Sensitivities and Bank Size

The table shows bank's real estate market sensitivities in different size quantiles, for the period 2002-2008. Proxies for size are Total Assets, Total Loans and Market Capitalisation (Panel A, B and C, respectively) from BANKSCOPE ("Total Assets", "Total Loans - Net" and "Current Market Capitalization", respectively). The average estimates of real estate market sensitivities were obtained based on the three-factor model (equation 1) and Fama and French extended model (equation 2), using daily and monthly stock returns of the 202 listed banks in the EU-15 countries. Each quantile comprises 40 banks except for the lowest quantile which is composed of 42 banks. Banks with the lowest average value of total assets, market capitalization or total loans are included in the "Small" quantile. *t*-test are for average differences between quantiles. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Panel A: Total Assets

Quantile	Average Value of Total Assets	Average Real Estate Market Sensitivity			
		Three-factor Model		Fama and French Extended Model	
		Daily Returns	Monthly Returns	Daily Returns	Monthly Returns
Large	519,358.3	0.0737	0.1062	0.0344	0,0778
Q2	32,088.8	0.1322	0.1608	0.0560	0,0763
Q3	7,529.9	0.1150	0.1541	0.0768	0,0544
Q4	1,369.1	0.1304	0.1805	0.0690	0,0790
Small	213.8	0.1737	0.2737	0.1450	0,2046
t-Test		1,746[b]	3.241[a]	1.943[b]	2.044[b]
(*p-value*)		(0,040)	(0.001)	(0.026)	(0.020)

Panel B: Total Loans

Quantile	Average Value of Loans	Average Real Estate Market Sensitivity			
		Three-Factor Model		Fama and French Extended Model	
		Daily Returns	Monthly Returns	Daily Returns	Monthly Returns
Large	208,050.4	0.0767	0.1054	0.0362	0,0754
Q2	19,224.2	0.1283	0.1682	0.0565	0,0806
Q3	4,313.0	0.1028	0.1536	0.0589	0,0455
Q4	586.3	0.1040	0.1540	0.0649	0,0897
Small	53.1	0.2108	0.2787	0.1580	0,1900
t-Test		2,334[a]	3.390[a]	2.095[b]	1.786[b]
(*p-value*)		(0,010)	(0.000)	(0.018)	(0.037)

Panel C: Market Capitalization

Quantile	Average Value of Loans	Average Real Estate Factor Sensitivity			
		Three-factor Model		Fama and French Extended Model	
		Daily Returns	Monthly Returns	Daily Returns	Monthly Returns
Large	20,919.2	0.087	0.095	0.149	0,148
Q2	2,139.8	0.102	0.114	0.156	0,152
Q3	685.8	0.070	0.095	0.185	0,242
Q4	157.8	0.119	0.147	0.189	0,274
Small	33.8	0.156	0.175	0.208	0,263
t-Test		1,700[b]	1.591[c]	1.698[b]	2.603[a]
(*p-value*)		(0,045)	(0.056)	(0.045)	(0.005)

Table 14: Real Estate Market Sensitivities and Bank Asset Exposure to the Real Estate Market

The table shows bank's real estate market sensitivities in different size quantiles, for the period 2002-2008. Proxies for Bank Asset Exposure to the Real Estate are Real Estate/Equity, Real Estate/ Assets, Real Estate Loans/Equity and Real Estate Loans/Assets (Panel A, B, C and D, respectively). *Real Estate* refers to real estate holdings obtained by adding Real Estate Loans and Direct Real Estate Investments. Equity and Assets are the book value of equity and total assets. The average estimates of real estate market sensitivities were obtained based on the three-factor model (equation 1) and Fama and French extended model (equation 2), using daily and monthly stock returns of the 202 listed banks in the EU-15 countries. Each quantile comprises 40 banks except for the lowest quantile which is composed of 42 banks. Banks with lowest Real Estate/Equity, Real Estate/Assets, Real Estate Loans/Equity or Real Estate Loans/Assets ratios are aggregated in the "Low" quantile. *t*-test are for average differences between quantiles. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets.

Panel A: Real Estate/Equity

Quantile	Average Value Ratio Real Estate/Equity	Average Real Estate Factor Sensitivity			
		Three-factor Model		Fama and French Extended Model	
		Daily Returns	Monthly Returns	Daily Returns	Monthly Returns
High	9.1041	0.1714	0.2432	0.0753	0,1330
Q2	3.7419	0.1213	0.2043	0.0675	0,1283
Q3	2.2929	0.1010	0.1597	0.0561	0,0953
Q4	1.1700	0.0869	0.1306	0.0405	0,1047
Low	0.1639	0.0819	0.1275	0.0522	0,0287
t-Test		2,071[b]	2.002[b]	0.741	1.464[c]
(*p-value*)		(0,019)	(0.023)	(0.229)	(0.072)

Panel B: Real Estate/Assets

Quantile	Average Value Ratio Real Estate/Assets	Average Real Estate Factor Sensitivity			
		Three-factor Model		Fama and French Extended Model	
		Daily Returns	Monthly Returns	Daily Returns	Monthly Returns
High	0.4566	0.1525	0.2893	0.0621	0,1853
Q2	0.2707	0.0887	0.1707	0.0460	0,0917
Q3	0.1901	0.0886	0.1878	0.0388	0,0935
Q4	0.1195	0.0889	0.1743	0.0547	0,0820
Low	0.0272	0.0866	0.1271	0.0454	0,0113
t-Test		1,323[c]	2.472[a]	0.348	2.111[b]
(*p-value*)		(0,093)	(0.007)	(0.364)	(0.017)

Table 14: Real Estate Market Sensitivities and Bank Asset Exposure to the Real Estate Market (cont.)

Panel C: Real Estate Loans/Equity

Quantile	Average Value Ratio Real Estate Loans /Equity	Average Real Estate Factor Sensitivity			
		Three-factor Model		Fama and French Extended Model	
		Daily Returns	Monthly Returns	Daily Returns	Monthly Returns
High	8.917	0.1410	0.1720	0.1960	0,2370
Q2	3.529	0.0800	0.0750	0.1990	0,1780
Q3	2.028	0.0880	0.1000	0.1490	0,1850
Q4	1.021	0.0860	0.0980	0.1520	0,1650
Low	0.091	0.0700	0.0840	0.0770	0,1260
t-Test		1.574[c]	1.743[b]	2.384[a]	1.653[b]
(*p-value*)		(0.058)	(0.041)	(0.009)	(0.049)

Panel D: Real Estate Loans/Assets

Quantile	Average Value Ratio Real Estate Loans /Assets	Average Real Estate Factor Sensitivity			
		Three-factor Model		Fama and French Extended Model	
		Daily Returns	Monthly Returns	Daily Returns	Monthly Returns
High	0.4220	0.1220	0.1480	0.1930	0,2840
Q2	0.2530	0.0920	0.0850	0.1490	0,2100
Q3	0.1730	0.0850	0.1120	0.1320	0,2120
Q4	0.0990	0.0760	0.0670	0.1310	0,2200
Low	0.0170	0.0720	0.0780	0.0840	0,1160
t-Test		1.285[c]	1.403[c]	1.944[b]	2.221[b]
(*p-value*)		(0.099)	(0.080)	(0.026)	(0.013)

Table 15: Simple Cross-Sectional Regressions

The tables reports the results of simple cross-sectional regressions defined in equation (4) based on daily and monthly returns for the period 2002-2008, given by: $\widehat{\beta_{Ri}} = \alpha_0 + \alpha_1 VR_i + \varepsilon_i$. $\widehat{\beta_{Ri}}$ is the estimated beta value associated to real estate market risk for bank i and VR_i is a variable associated to size or relative exposure to the real estate assets, for bank i. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets. In panels A and B, respectively, the real estate market sensitivities were obtained based on the three-factor model (equation 1) and the Fama and French extended model (equation 2), for the 202 listed banks in the EU-15 countries.

Panel A: Three-Factor Model

Risk Variable	Daily Returns				Monthly Returns			
	α_0	α_1	R^2 Aj.	*F-Statistic*	α_0	α_1	R^2 Aj.	*F-Statistic*
Log (Assets)	0.233[a]	-0.013[c]	3.00%	44.59[a]	0.360[a]	-0.021[a]	8.00%	84.08[a]
	(0.001)	(0.072)			(0.000)	(0.001)		
Log (Loans)	0.162[a]	-0.006[b]	2.10%	47.45[a]	0.231[a]	-0.008[b]	3.40%	82.00[a]
	(0.000)	(0.024)			(0.000)	(0.021)		
Log (Market Capitalization)	0.172[a]	-0.010[b]	2.40%	59.65[a]	0.208[a]	-0.013[b]	2.51%	51.42[a]
	(0.000)	(0.028)			(0.000)	(0.025)		
Real Estate/Equity	0.070[a]	0.013[b]	8.80%	58.69[a]	0.109[a]	0.019[a]	9.90%	78.32[a]
	(0.000)	(0.021)			(0.000)	(0.000)		
Real Estate/Assets	0.072[a]	0.135[c]	0.90%	32.21[a]	0.114[a]	0.358[a]	6.20%	73.41[a]
	(0.001)	(0.094)			(0.000)	(0.002)		
Real Estate Loans/Equity	0.068[a]	0.008[a]	3.48%	43.51[a]	0.069[a]	0.012[a]	5.43%	42.87[a]
	(0.000)	(0.008)			(0.000)	(0.009)		
Real Estate Loans/Assets	0.063[a]	0.134[c]	1.78%	14.09[a]	0.064[a]	0.173[c]	1.79%	30.07[a]
	(0.000)	(0.059)			(0.003)	(0.058)		

Panel B: Fama and French Extended Model

Risk Variable	Daily Returns				Monthly Returns			
	α_0	α_1	R^2 Aj.	*F-Statistic*	α_0	α_1	R^2 Aj.	*F-Statistic*
Log (Assets)	0.203[a]	-0.015[b]	4.10%	19.12[a]	0.239[a]	-0.016[b]	3.20%	20.18[a]
	(0.007)	(0.050)			(0.003)	(0.039)		
Log (Loans)	0.117[a]	-0.006[b]	1.90%	18.71[a]	0.118[a]	-0.003	1.00%	18.62[a]
	(0.000)	(0.030)			(0.000)	(0.413)		
Log (Market Capitalization)	0.245[a]	-0.011[b]	1.25%	21.07[a]	0.378[a]	-0.025[a]	4.86%	25.10[a]
	(0.000)	(0.042)			(0.000)	(0.002)		
Real Estate/Equity	0.046[a]	0.004	1.10%	26.40[a]	0.060[b]	0.012[b]	2.40%	17.36[a]
	(0.000)	(0.333)			(0.014)	(0.016)		
Real Estate/Assets	0.046[b]	0.017	0.10%	10.50[a]	0.021	0.354[a]	4.40%	38.19[a]
	(0.012)	(0.798)			(0.588)	(0.006)		
Real Estate Loans/Equity	0.129[a]	0.007[c]	1.62%	19.67[a]	0.131[a]	0.015[a]	4.46%	23.81[a]
	(0.000)	(0.071)			(0.000)	(0.003)		
Real Estate Loans/Assets	0.129[a]	0.156	1.10%	21.00[a]	0.138[a]	0.264[b]	1.98%	26.38[a]
	(0.000)	(0.139)			(0.000)	(0.046)		

Table 16: Multiple Cross-Sectional Regressions

The tables reports the results of the multiple cross-sectional regressions defined in equation (5) based on monthly returns for the period 2002-2008, given by: $\widehat{\beta_{Rt}} = \alpha_0 + \alpha_1 VRD_i + \alpha_2 VRE_i + \varepsilon_i$. $\widehat{\beta_{Rt}}$ is the estimated beta value associated to real estate market risk for bank i and VRD_i e VRE_i are the variables associated to the size and relative exposure to the real estate assets, for bank i, respectively. α_0 is the independent term and ε_i is the error term. [a], [b] and [c] denote statistical significance at 1%, 5% and 10%, respectively. The *p-value*s are presented in brackets. In panels A and B the real estate market sensitivities were obtained based on the model of three factors (equation 1) and Fama and French extended model (equation 2), respectively, for 202 listed banks in the EU-15.

Panel A: Three-Factor Model (Monthly Returns)

Model	1	2	3	4	5	6	7	8
α_0	0.293[a] (0.000)	0.352[a] (0.000)	0.310[a] (0.000)	0.352[a] (0.000)	0.262[a] (0.000)	0.296[a] (0.000)	0.280[a] (0.000)	0.299[a] (0.000)
Log (Assets)	-0.014[b] (0.028)	-0.022[a] (0.002)	-0.014[b] (0.030)	-0.021[a] (0.003)				
Log (Market Capitalization)					-0.014[c] (0.074)	-0.020[b] (0.019)	-0.014[c] (0.079)	-0.019[b] (0.022)
Real Estate/Equity		0.017[a] (0.001)				0.014[a] (0.006)		
Real Estate/Assets	0.228[b] (0.044)				0.214[c] (0.059)			
Real Estate Loans/Equity				0.015[a] (0.003)				0.013[b] (0.012)
Real Estate Loans/Assets			0.167 (0.177)				0.145 (0.238)	
Adjusted R²	3.81%	6.97%	2.72%	6.18%	3.01%	4.94%	1.93%	4.37%
F-Statistic	25.34[a]	24.92[a]	25.48[a]	25.03[a]	25.45[a]	25.20[a]	25.59[a]	25.27[a]

Panel B: Fama and French Extended Model (Monthly Returns)

Model	1	2	3	4	5	6	7	8
α_0	0.080 (0.225)	0.142[b] (0.028)	0.103 (0.116)	0.141[b] (0.031)	0.054 (0.380)	0.101[c] (0.087)	0.078 (0.204)	0.103[c] (0.081)
Log (Assets)	-0.004 (0.028)	-0.009 (0.266)	-0.004 (0.563)	-0.007 (0.330)				
Log (Market Capitalization)					-0.001 (0.892)	-0.004 (0.647)	-0.001 (0.883)	-0.004 (0.702)
Real Estate/Equity		0.012[b] (0.027)				0.011[b] (0.049)		
Real Estate/Assets	0.303[b] (0.014)				0.295[a] (0.017)			
Real Estate Loans/Equity				0.011[c] (0.058)				0.009[c] (0.094)
Real Estate Loans/Assets			0.222[c] (0.099)				0.208[c] (0.092)	
Adjusted R²	3.03%	2.47%	1.39%	1.83%	2.88%	1.96%	1.24%	1.43%
F-Statistic	27.52[a]	27.60[a]	27.75[a]	27.70[a]	29.55[a]	27.68[a]	25.78[a]	27.78[a]