Transnational Spillover Effects of Sovereign Rating Signals on Bank Stock Returns: Evidence from the Euro Area

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Abstract

Using a comprehensive sample of listed Eurozone banks we conduct an event study to investigate whether and how sovereign rating events affect foreign financial institutions' stock prices. We find that negative sovereign rating signals are associated with positive cross-country spillover effects before the European sovereign debt crisis and with negative spillover effects after October 2009. Moreover, positive sovereign rating signals issued by Moody's or Fitch seem to induce negative cross-country spillover effects in the pre-crisis period, but have no significant effect during the crisis. Finally, we identify differences with respect to the factors driving abnormal returns conditional on which credit rating agency issues the rating signal, and on whether the respective signal is positive or negative.

JEL classification: G15; G21; G24

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1. Introduction

Sovereign credit ratings are readily available measures of countries' default risk, and in this capacity they can influence capital market investors' long-term lending decisions. Following substantial critique with respect to the quality and timeliness of the ratings they have issued, credit rating agencies (CRAs) have faced increased regulatory scrutiny since the beginning of the global financial crisis. In Europe, the European Commission has taken several steps to improve CRAs' corporate governance, internal controls, disclosure standards and rating methodologies[1]. The effect of these regulatory measures on sovereign ratings' information content, however, is still unclear.

As previous research shows, negative sovereign rating signals tend to affect foreign stock and bond markets, but evidence for positive rating signals is mixed (e.g. Kaminsky and Schmukler (2002), Brooks et al. (2004), Gande and Parsley (2005), Ferreira and Gama (2007), Afonso, Furceri, and Gomes (2012), Christopher, Kim, and Wu (2012), Bhanot et al. (2014)). In addition, some studies also identify spillover effects of sovereign rating events on CDS spreads, foreign exchange markets, or economic growth rates. For instance, Ismailescu and Kazemi (2010) report that Standard & Poor's (S&P) sovereign rating upgrades are associated with spillovers to other emerging countries' CDS markets, while S&P rating downgrades seem to have no such effect. They argue that upgrades may have more informational content than downgrades in emerging economies. Alsakka and ap Gwilym (2012) focus on foreign exchange markets of emerging countries and treat rating signals by S&P, Moody's and Fitch separately. The results illustrate that both positive and negative sovereign rating signals affect other countries' exchange rates on the one hand, and provide evidence on unequal market reactions to the three agencies' rating events on the other hand. Chen et al. (2016) employ data from 103 countries and show that both S&P sovereign rating upgrades and downgrades have spillover effects on other countries' economic growth mainly through the trade and financial linkages.

[1] Regulation (EC) No 1060/2009 of the European Parliament and of the Council on credit rating agencies was released on 16 September 2009. The regulation entered into force on 7 December 2010 and was further amended in 2011, in 2013, and in 2014.

From the perspective of the rated country, sovereign credit ratings play a crucial role in determining the country's access to international capital markets and provide warning signals for possible deterioration in its creditworthiness. Reinhart (2002) reports the phenomenon that sovereign defaults and currency crises are strongly linked to each other in emerging markets. However, Goldstein, Kaminsky, and Reinhart (2000) and Reinhart (2002) argue that sovereign ratings only help to predict sovereign defaults but not financial crises. Sy (2004) further shows that although sovereign ratings do not succeed to anticipate forthcoming banking and currency crises, they still act as trustable proxies for a country's financial defaults.

Since a country's sovereign ratings do have predictive power for its default risk, changes in the country's rating level may exert remarkable impact on domestic and foreign financial institutions which have a large holding in the country's sovereign debt. Blundell-Wignall and Slovik (2010) illustrate that European banks tend to have substantial exposure to sovereign debt issued by both their home country and foreign countries within the EU. Arezki, Candelon, and Sy (2011) point out that the holding of foreign sovereign debt by domestic banks is an important transmission channel of sovereign credit risk. By using detailed asset holdings of systematically important financial institutions (SIFIs) included in the 2010-2011 stress tests, which are conducted by the European Banking Authority (EBA), De Bruyckere et al. (2013) confirm the existence of contagion effects between sovereign and banking sectors during the European sovereign debt crisis. Furthermore, also by examining the banks' asset holding data of EBA stress tests, Acharya and Steffen (2015) attribute the banking instability within the European Union (EU), which substantially arises during the 2007-2013 turmoil period, to the so-called carry-trade behavior: European banks have positive exposure to the PIIGS countries' (Portugal, Ireland, Italy, Greece and Spain) sovereign bonds, and simultaneously maintain negative exposure to German bunds.

The aim of this paper is to investigate whether and under which conditions sovereign rating events within the European Monetary Union have cross-border effects on financial institutions' stock prices. Focusing on this cross-country risk transmission channel, we empirically examine if one country's sovereign rating events have significant impact on stock returns of other countries' banks. In this context, prior evidence provided by Williams, Alsakka, and ap Gwilym (2013a) shows that negative sovereign rating events issued by S&P and Moody's induce significant spillovers on bank share prices, while spillover effects are weaker for Fitch's rating signals. Tying in with these results, we conduct an event study for a

comprehensive sample including all listed Euro zone banks, but we distinguish between domestic and cross-country spillovers to bank stock returns. The rationale underlying this distinction is that the effects induced by a sovereign rating change may differ between domestic banks and foreign banks, as domestic banks are prone to being more exposed to the respective sovereign's debt than foreign banks due to home bias. Thus, cross-border transmission effects of sovereign rating signals should be separated from respective domestic effects. Moreover, as effects may be conditional on bank characteristics such as asset quality, profitability, or size, we study how bank-specific variables explain the variation in across-country abnormal bank stock returns following sovereign rating signals.

Our univariate results indicate that the strength of the transmission effect of a sovereign rating change varies depending on which rating agency issued the signal. For the sub-sample of positive rating events, we find that positive signals issued by S&P are associated with positive cross-country spillover effects, but we also observe that positive signals issued by Moody's and Fitch lead to negative spillover effects. Similarly, in the sub-sample of negative rating events, we find that S&P's signals do not lead to significant stock price reactions of foreign banks, while negative sovereign signals issued by Moody's and Fitch tend to induce negative foreign bank abnormal returns. In the multivariate analysis, we identify differences with respect to the factors driving abnormal returns conditional on credit rating agency and on the nature of sovereign rating signal. In particular, we find that negative cross-border spillover effects induced by positive signals issued by Moody's and Fitch tend to be more negative during the crisis. In a similar manner, the regression results also show that abnormal bank returns induced by negative signals issued by S&P and Moody's are significantly more negative during the crisis.

The remainder of the paper is structured as follows. In section two, we discuss the data set underlying our study. In section three we outline the methodology used, and in section four we present the empirical results. In section five we summarize our main conclusions.

2. Data

2.1. Sovereign rating dataset

Our rating dataset consists of long-term foreign-currency sovereign ratings, credit watches and outlooks issued by the largest three credit rating agencies (CRAs), namely Standard & Poor's, Moody's, and Fitch for the period January 2004 to December 2013. The sovereign

rating sample covers 17 member countries of the euro area[2]. The sovereign rating data (including watches and outlooks) for Moody's and Fitch are manually collected from their publications, while the data for S&P are sourced from the S&P Global Credit Portal database.

In line with Williams, Alsakka, and ap Gwilym (2013b), Alsakka, ap Gwilym, and Vu (2014) and others, original rating letters are transformed into cardinal values according to a 20-point numerical scale ranging from 20 (Aaa/AAA) to 1 (C/SD-D). On the basis of the numerical rating scale, upgrades (downgrades) are identified if the numerical current rating is higher (lower) than the previous rating. Moreover, watches and outlooks are defined as follows. Positive (negative) watch signals contain placements on positive (negative) watch lists of the CRAs which can be solo events or accompanied by rating upgrades (downgrades). Positive (negative) outlook events, which can also be solo events or combined with rating changes, include additions to positive (negative) outlooks for the countries with stable outlooks or no outlook announcement in advance.

Table 1 reports the distribution of sovereign rating events, watches and outlooks by rating agency with respect to the differentiation between solo and combined events. For the sub-sample with solo rating events, which are issued individually without other simultaneous credit signals released by the same agency for the same sovereign, there are 15 (42) solo sovereign upgrades (downgrades) by S&P, 5 (15) by Moody's, and 11 (9) by Fitch, respectively. Moreover, negative solo watches (outlooks) are more than positive solo watches (outlooks) across all the three rating agencies for the whole sample period.

(Insert Table 1)

Although Fitch has more upgrades (11) than downgrades (9) in case of solo rating events, the proportion is fundamentally changed if we look at the distribution of combined signals. In fact, there are 29 downgrades combined with negative outlooks and only 3 upgrades combined with positive outlooks by Fitch, 19 (3) by Moody's, and 1 (0) by S&P. It seems like that Fitch is the agency among the Big Three which uses a combination of downgrades and negative outlooks most frequently for sovereigns of the euro area[3]. Meanwhile, Moody's and S&P also employ the combined rating tools more often than upgrades or downgrades in isolation.

[2] Our sovereign rating dataset does not include Latvia and Lithuania since both countries joined the EMU in 2014 and 2015 respectively.

[3] Since other event combinations such like combined upgrades and negative outlooks, or combined downgrades and positive watches, do not exist in our sovereign rating sample, we ignore to report these non-existing combinations.

Facing this phenomenon, it is necessary to introduce a more powerful rating scale which fully takes the differences between solo and combined rating signals into consideration.

Following Sy (2004), Ferreira and Gama (2007), Alsakka and ap Gwilym (2013), we extend the original 20-point scale measuring sovereign rating changes to a 58-point system, which is named as comprehensive credit rating (CCR) scale by prior literatures. The CCR incorporates ratings, watch and outlook signals simultaneously in a new scale as follows: AAA/Aaa = 58, AA+/Aa1 = 55, AA/Aa2 = 52 …CCC-/Caa3 = 4, CC/Ca, SD-D/C = 1. In addition, "+2" ("-2") is adjusted for positive (negative) watch signal, while "+1" ("-1") is adjusted for positive (negative) outlook signal and "0" for stable outlook and no watch/outlook assignments.

The bottom part of Table 1 reports distribution of positive and negative signals according to the CCR. Any non-zero change in the comprehensive rating measure is attributed to one of the new sorts of rating signal: positive signal, which can result from a solo upgrade, a favourable revision in the credit watch or outlook, or a combination of both upgrade and favourable watch/outlook assignment; and negative signal, which can result from a solo downgrade, an unfavourable revision in the credit watch or outlook, or a combination of both downgrade and unfavourable watch/outlook assignment. In total, there are 20 (90) positive (negative) rating signals by S&P, 21 (68) by Moody's, and 26 (77) by Fitch, respectively.

To address possible non-linearity in the 58-point system, in line with Sy (2004) and Alsakka and ap Gwilym (2013), we take a logit-type transformation of the above comprehensive credit ratings as basis for the control variable Delta LCCR in later regression analysis:

$$LCCR_t = ln\left[\frac{CCR_t}{59-CCR_t}\right] \qquad (1)$$

Since we pool all sovereign rating signals of the euro zone countries by rating agency, there is a high volume of negative signals for relatively few countries in a short time period. Therefore, we split the positive and the negative sample of rating signals into independent and clustered sub-samples, respectively. A rating signal is defined as clustered if the event country receiving a positive (negative) rating signal while at least one another positive (negative) signal is emitted to the same sovereign by any of the three agencies within the (-10, 0) window, independent otherwise. There are 0 (16) clustered positive (clustered negative) rating signals by S&P, 0 (15) by Moody's, and 2 (18) by Fitch, respectively. In line with Gande and Parsley (2005) and Ferreira and Gama (2007), we also control for the short-term clustering

effects of rating signals in the regression analysis only for negative rating events, since there are not enough clustered positive signals in the sample.

2.2. Bank dataset

In order to test the cross-country spillover effect of sovereign rating signals on European bank stock returns, we attempt to include all identifiable listed banks from the euro area into our sample. The sample selection procedure starts with BvD Bankscope providing various bank-specific accounting data and the information about listing status. In case that a bank from a Euro zone country with available accounting data is identified as "listed" by Bankscope, we match the bank with daily stock price data from Compustat Global database by ISIN. Manuel matching examination and improvement are executed to assure that listed banks from the Euro zone are correctly identified. As a result, 154 listed banks are found in total.

(Insert Table 2)

Panel A of Table 2 presents the distribution of listed banks by country. France (32), Italy (27) and Germany (26) have the most listed banks in our sample. Furthermore, we collect time series of total return stock indices for each country as proxies for market portfolio in the event study. The indices are obtained from Datastream and take alternative benchmarks where MSCI total market return indices are not available.

Previous studies regarding information opacity, solicitation and determinants of bank ratings take different bank-specific accounting items and ratios as control variables (see e.g. Morgan (2002), Iannotta (2006), Bannier, Behr, and Güttler (2010), Caporale, Matousek, and Stewart (2012), Shen, Huang, and Hasan (2012)). And especially following Poon, Lee, and Gup (2009), we select a number of financial variables to reflect a bank's asset quality, liquidity, capital adequacy, profitability and size in the later regression models based on bank abnormal returns. In consideration of data availability and multicollinearity issue, Panel B of Table 2 shows the definition and calculation methods of bank-specific variables remained to be used for our analysis.

3. Methodology

3.1. Event study

Typing with prior literatures which empirically study the cross-border transfer effects of sovereign ratings, i.e. Gande and Parsley (2005), Ferreira and Gama (2007), Ismailescu and

Kazemi (2010), Alsakka and ap Gwilym (2013), we use event study technique which allows us to measure short-term bank stock abnormal returns that result from positive or negative sovereign rating signals from abroad. Predicted normal returns on bank stocks are calculated using a multi-factor model based on Fama and French (1993) as follows:

$$R_{it}^{j} - rf_{it}^{j} = a_i + \beta_i\left(RM_{it}^{j} - rf_{it}^{j}\right) + \gamma_i\left(SMB_{it}^{j}\right) + \delta_i\left(HML_{it}^{j}\right) + e_{it} \qquad (2)$$

where R_{it}^{j} is the logarithmic stock return of bank i from country j on day t, and rf_{it}^{j} is the country-specific risk free rate. RM_{it}^{j} is the logarithmic return of country j's market portfolio that is proxied by its total return stock market index[4]. The Fama and French factors SMB_{it}^{j} and HML_{it}^{j} capture variations in the return generating process attributable to differences in size and book-to-market equity. We calculate these factors using all firms from a particular Eurozone country that are available in both the Compustat Global Securities and the Compustat Global Fundamentals databases.

After the estimation of abnormal returns for each bank from country j following sovereign rating event of a foreign country k ($k \neq j$), cumulative abnormal returns (CAR) are computed for the event windows (0, +1), (-1, +1) and (-2, +2) respectively. Day 0 is defined as the announcement date of a sovereign rating signal from a foreign country that is different from the bank's home country. In order to avoid biased results of event study, we control for a (-5, +5) examination window to eliminate bank-related confounding events by using Bloomberg and I/B/E/S databases[5]. Despite of elimination of contaminated events, it is still impossible to control for all kinds of macroeconomic events around the sovereign signal which have significant impacts on bank stock returns. Hence, as Gande and Parsley (2005) suggest, we only focus on the three short event windows.

To test the null hypothesis that CARs over the three event windows are equal to zero, we conduct the standardized cross-sectional test of Boehmer, Masumeci, and Poulsen (1991). The BMP test is chosen since it is robust to event-induced variance due to increases in stock returns. Furthermore, we report the proportion of negative abnormal returns and conduct a non-parametric generalised sign test proposed by Cowan (1992) under the null hypothesis that the portion of negative abnormal returns over a specific event window is not statistically

[4] We choose local stock market index for each euro zone country, as given in Table 2, because we seek to explore potential country-related differences in sovereign rating spillover effects.
[5] Confounding events to be controlled include the bank's issuer rating changes, analyst forecasts and earnings guidance.

different from zero. We expect that the test statistics verify our hypothesis regarding bank stock price reactions to foreign sovereign rating signals: CARs following positive rating signals are positive and significant, while bank abnormal returns following negative rating events are negative and significant. Moreover, we anticipate differentiated abnormal share price returns hinging on distinct sovereign rating spillover effects among the three rating agencies.

3.2. Regression model

We scrutinise our results from the above univariate event study analysis by examining the bank- and sovereign-related factors associated with cross-sectional variations in abnormal bank returns following foreign country's sovereign rating signals. Although the global financial crisis began in 2007 and entered into a new stage in September 2008 with the bankruptcy of Lehman Brothers, Lane (2012) points out that the European sovereign debt markets remained calm even during 2008 and most of 2009. After the general election in Greece in late 2009, however, market conditions changed dramatically. Thus, in line with Lane (2012) and Bhanot et al. (2014) we choose October 2009 as the starting month of the European sovereign debt crisis.[6]

We conduct an ordinary least squares (OLS) regression analysis controlling for multicollinearity with robust t-statistics. The model is specified as follows:

$$\begin{aligned} CAR_{it}^{j} = {} & \alpha + \beta_1 Crisis_t + \beta_2 Cluster_t^k + \gamma_1 PIIGS\_bank_i^j + \gamma_2 PIIGS\_sov^k \\ & + \delta_1 CCR\_bank_{it}^j + \delta_2 CCR\_sov_t^k + \theta DeltaLCCR_t^k + \lambda NPLGL_{it}^j \\ & + \upsilon LTA_{it}^j + \xi ETA_{it}^j + \mu ROE_{it}^j + \pi LnAsset_{it}^j + \varepsilon_{it}, \ j \neq k \end{aligned} \quad (3)$$

CAR_{it}^{j} are dependent variables of the multivariate regression analysis which represent the respective bank *i*'s CARs (from country *j*) for the event windows (0, +1), (-1, +1) and (-2, +2), following either a positive or negative sovereign rating signal from country *k* ($k \neq j$).

$Crisis_t$ is a dummy variable equalling 1 if the sovereign rating signal from abroad at event date *t* falls into the crisis period from October 2009 to December 2013; 0 otherwise.

[6] Regarding this assumption, we conduct a robustness check using September 2008 as an alternative starting date of the crisis.

$Cluster_t^k$ is a dummy variable equalling 1 if the event country *k* receives a positive (negative) rating signal at event date *t* while at least one another positive (negative) signal is emitted to the same sovereign by any of the three agencies within the (-10, 0) window; 0 otherwise.

$PIIGS\_bank_i^j$ is a dummy variable equalling 1 if origin country of the bank is one of the PIIGS countries, namely Portugal, Ireland, Italy, Greece and Spain; 0 otherwise.

$PIIGS\_sov^k$ is a dummy variable equalling 1 if the event country *k* is one of the PIIGS countries; 0 otherwise.

$CCR\_bank_{it}^j$ is the level of the bank's origin country j 58-point comprehensive credit rating.

$CCR\_sov_t^k$ is the level of the event country k ($k \neq j$) 58-point comprehensive credit rating.

$DeltaLCCR_t^k$ is the change in the logit-type transformation of the 58-point comprehensive credit ratings, LCCR, which is computed according to Equation (1).

$NPLGL_{it}^j$ measures the bank's asset quality and is calculated as non-performing loans divided by gross loans.

LTA_{it}^j measures the bank's liquidity by indicating what percentage of the assets are tied up in loans. It is computed as loans divided by total assets.

ETA_{it}^j measures the bank's capital adequacy and is calculated as book value of equity divided by total assets.

ROE_{it}^j measures the bank's profitability and is computed as net income divided by book value of equity.

$LnAsset_{it}^j$ measures the bank's size as logarithm of book value of total assets (in thousand euros).

4. Empirical results

4.1. Abnormal bank returns following sovereign rating signals

This section shows the event study results for testing cross-border spillover effects of positive and negative sovereign rating signals separately. In view of potential differences among the

three rating agencies concerning degrees of sovereign rating spillovers, event studies are executed individually for Standard & Poor's, Moody's, and Fitch. The cumulative average abnormal returns (CAARs) of domestic banks following positive and negative sovereign rating signals from abroad are presented in Table 3.

(Insert Table 3)

Panel A of Table 3 shows bank CARs associated with positive sovereign rating signals for the whole sample period (Jan 2004 – Dec 2013). For the S&P sub-sample, mean CARs over the (0, +1) window with 0.24% CAAR is significant at the 5% level. By contrast, mean CARs associated with Moody's and Fitch positive rating signals for the whole sample period are overall negative: CAAR of the Moody's (-1, +1) window is -0.33% and significant at the 1% level, while mean CARs of the Fitch (0, +1) and (-1, +1) window are -0.28% and -0.27% and significant at least at the 5% level. These results are consistent with those reported by Williams, Alsakka, and ap Gwilym (2013a) for Moody's and Fitch, since the mean bank CARs induced by positive rating signals are negative and significant for their sole sample period (Jan 2007 – Sep 2011).

Panel B of Table 3 then illustrates the event study results for negative sovereign rating signals by rating agency. For the whole period, S&P negative signals do not induce significant cross-border spillover effects in all three windows. On the contrary, Moody's provides clear evidence for the existence of negative cross-border spillover effects, since mean CARs are negative and significant in all three events windows. Negative signals issued by Fitch, nevertheless, show mixed evidence as only event window (-2, +2) has CAAR of -0.08% that is significant at the 5% level.

In addition to conducting event studies for the entire sample period, we also split the sample of negative rating signals into independent and clustered sub-samples. Respective results are shown in Panel C and Panel D of Table 3. We expect that independent negative events are associated with stronger cross-border spillover effects than clustered negative events as their information content is not diluted by preceding sovereign events in the same direction.

Our univariate test results for the S&P and Moody's sub-samples provide some empirical support for this hypothesis. In the S&P sub-sample, independent negative events lead to more negative abnormal foreign bank returns over the (-1, +1) window in both statistical and economic terms. Furthermore, the Moody's sub-sample shows negative and significant mean

CARs over all three event windows of independent events, whilst abnormal bank returns associated with Moody's clustered negative events are statistically insignificant. Compared to the S&P and Moody's sub-samples, while CAAR over the (-2, +2) event window of clustered negative events with -0.42% is significant at the 1% level, there is no clear evidence for independent negative rating signals by Fitch. This is consistent with Alsakka and ap Gwilym (2010) who show that Fitch tends to be the follower in sovereign rating downgrades. If Fitch's negative rating signals are led by negative signals from S&P or Moody's, the negative rating events act as confirmation function of previous signals in the same direction and result in negative spillovers to some extent.

4.2. Multivariate regression analysis

We run regression analysis on the basis of individual bank CARs from the event studies. The aim is to investigate the bank- and sovereign-specific factors which contribute to explain cross-sectional variations in abnormal bank returns following foreign country's sovereign rating signals. After controlling for potential multicollinearity by using variance inflation factor (VIF) as an indicator, we conduct the regression analysis (see Equation (3)) for bank CARs over the three main event windows induced by positive or negative sovereign credit signals, respectively.

(Insert Table 4)

Table 4 shows regression estimates for positive signals rated by S&P, Moody's and Fitch separately, for the whole sample period from January 2004 to December 2013. The variable of special interest is *"Crisis"*, a dummy taking the value 1 if the foreign country's sovereign rating signal is issued during the crisis period. Coefficients estimated for the crisis dummy for Moody's and Fitch over the window (-1, +1) are negative and significant. This result provides some evidence that the negative cross-border spillover effects associated with signals issued by Moody's and Fitch tend to be stronger during the crisis period. For the (-2, +2) event window of S&P, as shown in Panel A of Table 4, the coefficient of the variable *"PIIGS_sov"* is positive and significant. The positive parameter of *"PIIGS_sov"* shows if the sovereign issued with a positive rating signal is one of the PIIGS countries, cross-country bank stock price reactions tend to be more positive than following positive rating signals by S&P for other countries. In the regression models for Moody's, as shown in Panel B of Table 4, *"CCR_sov"* is negative and significant over the (-1, +1) event window. The negative coefficient of *"CCR_sov"* indicates that the higher the current rating level of the event

country, the weaker the negative cross-border spillover effects of the positive signals by Moody's on the bank returns. Moreover, the coefficients of the variables *"LTA", "ETA"* and *"LNASSET"* are positive and significant for the (-2, +2) event window of Moody's. These positive coefficients illustrate that two bank-specific characteristics, liquidity and capital adequacy, have positive contributions to explain the variations in bank CARs, whilst the larger the bank is, the more positive cross-border sovereign spillover effects the bank faces.

(Insert Table 5)

We then shift our focus on interpreting regression results for bank abnormal stock returns following foreign countries' negative sovereign rating signals. The variables *"Crisis"* and *"Cluster"* attract our special attentions, since most of the clustered negative rating signals are emitted during the crisis[7]. The coefficients of *"Crisis"* are significantly negative over all the three event windows for S&P and over the last two windows for Moody's, as shown in Panel A and B of Table 5. This indicates that negative rating signals issued by S&P and Moody's lead to more negative abnormal bank returns during the crisis period. Moreover, the coefficients of *"Cluster"* are negative and significant over all three windows for Fitch. Therefore, the multivariate analysis supports previous findings in the event study that clustered negative events by Fitch are associated with more negative cross-border spillover effects than independent negative events.

For the (-2, +2) event window for Moody's (Panel B), we observe negative and significant coefficients on *"PIIGS_sov"* and *"CCR_sov"*. The negative coefficient on *"PIIGS_sov"* indicates that negative sovereign events from the PIIGS countries significantly decrease stock returns on banks of the other countries in the euro area. This empirical evidence supports the carry-trade hypothesis developed by Acharya and Steffen (2015) with a larger sample of 154 listed banks within the euro zone.

4.3. Robustness check

The return-generating model used in our event studies is the Fama and French (1993, 1996)-type multi-factor model. As a robustness check, we also conduct univariate event studies based on the market model. Brown and Weinstein (1985) emphasize that if adding further factors only marginally improves a model's explanatory power, it seems reasonable to use the more parsimonious single-factor market model to describe the underlying return-generating

[7] We do not include an interaction term *"Crisis*Cluster"* into our regression models since this term is overall highly correlated with the dummy variable *"Cluster"*.

process. To this effect, we compare event study results by using market model with those based on the Fama and French three-factor model. Overall, respective results are similar to those of the main analysis in both economical and statistical terms. Detailed results are available upon request from the authors.

5. Conclusion

With a comprehensive sample of 154 listed Eurozone banks, we conduct an event study to scrutinize the cross-country transmission effect of an EMU member country's sovereign rating signals. Specifically, we expect that positive and negative sovereign rating signals, which are transformed from original rating events including rating changes, watches and outlooks within the 58-point CCR system, have significant and differentiated cross-border spillover effect on banks' stock returns.

To the best of our knowledge, Williams, Alsakka, and ap Gwilym (2013a) provide the only direct evidence for the effect of sovereign rating signals on bank stock prices in a European context. By taking the contribution by Williams, Alsakka, and ap Gwilym (2013a) as a reference, we further develop our research design from two main aspects: Firstly, we clearly focus on the cross-country spillovers to foreign banks' stock returns in the univariate event study. Domestic banks may be affected by own country's rating changes to a different degree compared with foreign banks, since domestic banks may load more own country's sovereign bonds than foreign banks due to home bias. Secondly, we employ various dummy variables and bank characteristics in the following multivariate regression to control whether the intensity of sovereign spillover effect depends on country- or bank-level fundamentals.

Our results highlight differences in cross-country spillover effects conditional on which CRA issues the credit rating. The empirical results of the event study show that positive signals issued by S&P are associated with positive spillover effects, while positive signals issued by Moody's and Fitch generally lead to negative spillover effects. Moreover, negative sovereign rating signals issued by S&P do not lead to significant foreign bank abnormal stock return while negative signals issued by Moody's and Fitch tend to induce negative spillover effects on foreign banks. These CRA-related differences support claims raised by Alsakka and ap Gwilym (2010) regarding the effects of differences in CRA's market shares and potential

lead-lag relationships in sovereign ratings .[8] Based on the regression analysis, our study further indicates that bank stock reactions to foreign countries' rating events are different not only conditional on which credit rating agency issues the signal, but also on the economic environment and on whether the rating event is preceded by another signal for the same sovereign.

Our study contributes to the discussion on the role of credit rating agencies as information intermediaries and show that sovereign credit ratings constitute an effective cross-country transmission channel of value-relevant information to listed banks' stockholders. In particular, we identify a strong link between sovereign debt ratings and bank stability in times of economic turmoil in particular. As a consequence, our findings also shed light on the systemic relevancy of the leading three rating agencies' signals in that they illustrate how quickly they may propagate shocks to sovereign creditors' stability even to foreign countries' financial institutions. In this regard, our results should be of interest to financial market supervisors, investors, bank managers, and rating analysts alike.

[8] ESMA (2014) illustrates each CRA's market share based on rating business turnover in the EU in 2013 as follows: Standard & Poor's had 39.69%, while Moody's owned a similar fraction of 34.53%. By contrast, Fitch had only 16.22%. The market shares of the three CRAs remained nearly unchanged in 2014 (ESMA (2015)).

References

Acharya, Viral V., and Sascha Steffen, 2015, The "greatest" carry trade ever? Understanding eurozone bank risks, *Journal of Financial Economics* 115, 215–236.

Afonso, António, Davide Furceri, and Pedro Gomes, 2012, Sovereign credit ratings and financial markets linkages: Application to European data, *Journal of International Money and Finance* 31. Financial Stress in the Eurozone, 606–638.

Alsakka, Rasha, and Owain ap Gwilym, 2010, Leads and lags in sovereign credit ratings, *Journal of Banking & Finance* 34, 2614–2626.

Alsakka, Rasha, and Owain ap Gwilym, 2012, Foreign exchange market reactions to sovereign credit news, *Journal of International Money and Finance* 31. Emerging Markets Finance, 845–864.

Alsakka, Rasha, and Owain ap Gwilym, 2013, Rating agencies' signals during the European sovereign debt crisis: Market impact and spillovers, *Journal of Economic Behavior & Organization* 85. Financial Sector Performance and Risk, 144–162.

Alsakka, Rasha, Owain ap Gwilym, and Tuyet Nhung Vu, 2014, The sovereign-bank rating channel and rating agencies' downgrades during the European debt crisis, *Journal of International Money and Finance* 49, Part B. The impact of the Global Financial Crisis on Banks, Financial Markets and Institutions in Europe, 235–257.

Arezki, Rabah, Bertrand Candelon, and Amadou Nicolas Racine Sy, 2011, Sovereign Rating News and Financial Markets Spillovers: Evidence from the European Debt Crisis. SSRN Scholarly Paper, Social Science Research Network, Rochester, NY.

Bannier, Christina E., Patrick Behr, and Andre Güttler, 2010, Rating opaque borrowers: why are unsolicited ratings lower?*, *Review of Finance* 14, 263–294.

Bhanot, Karan, Natasha Burns, Delroy Hunter, and Michael Williams, 2014, News spillovers from the Greek debt crisis: Impact on the Eurozone financial sector, *Journal of Banking & Finance* 38, 51–63.

Blundell-Wignall, Adrian, and Patrick Slovik, 2010, The EU Stress Test and Sovereign Debt Exposures. OECD Working Papers on Finance, Insurance and Private Pensions, OECD Publishing.

Boehmer, Ekkehart, Jim Masumeci, and Annette B. Poulsen, 1991, Event-study methodology under conditions of event-induced variance, *Journal of Financial Economics* 30, 253–272.

Brooks, Robert, Robert W. Faff, David Hillier, and Joseph Hillier, 2004, The national market impact of sovereign rating changes, *Journal of Banking & Finance* 28, 233–250.

Brown, Stephen J., and Mark I. Weinstein, 1985, Derived factors in event studies, *Journal of Financial Economics* 14, 491–495.

Caporale, Guglielmo Maria, Roman Matousek, and Chris Stewart, 2012, Ratings assignments: Lessons from international banks, *Journal of International Money and Finance* 31, 1593–1606.

Chen, Sheng-Syan, Hsien-Yi Chen, Shu-Ling Yang, and Chong-Chuo Chang, 2016, Output spillovers from changes in sovereign credit ratings, *Journal of International Money and Finance* 63, 48–63.

Christopher, Rachel, Suk-Joong Kim, and Eliza Wu, 2012, Do sovereign credit ratings influence regional stock and bond market interdependencies in emerging countries?, *Journal of International Financial Markets, Institutions and Money* 22, 1070–1089.

De Bruyckere, Valerie, Maria Gerhardt, Glenn Schepens, and Rudi Vander Vennet, 2013, Bank/sovereign risk spillovers in the European debt crisis, *Journal of Banking & Finance* 37, 4793–4809.

ESMA, 2014, Credit rating agencies' 2014 market share calculation according to Article 8d of the CRA regulation.

ESMA, 2015, Competition and choice in the credit rating industry - Market share calculation required by Article 8d of Regulation 1060/2009 on Credit Rating Agencies as amended.

Fama, Eugene F., and Kenneth R. French, 1992, The cross-section of expected stock returns, *The Journal of Finance* 47, 427–465.

Fama, Eugene F., and Kenneth R. French, 1996, Multifactor explanations of asset pricing anomalies, *The Journal of Finance* 51, 55–84.

Fama, Eugene, and Kenneth French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.

Ferreira, Miguel A., and Paulo M. Gama, 2007, Does sovereign debt ratings news spill over to international stock markets?, *Journal of Banking & Finance* 31, 3162–3182.

Gande, Amar, and David C. Parsley, 2005, News spillovers in the sovereign debt market, *Journal of Financial Economics* 75, 691–734.

Goldstein, Morris, Graciela Laura Kaminsky, and Carmen M. Reinhart, 2000, *Assessing Financial Vulnerability: An Early Warning System for Emerging Markets* (Peterson Institute).

Iannotta, Giuliano, 2006, Testing for Opaqueness in the European Banking Industry: Evidence from Bond Credit Ratings, *Journal of Financial Services Research* 30, 287–309.

Ismailescu, Iuliana, and Hossein Kazemi, 2010, The reaction of emerging market credit default swap spreads to sovereign credit rating changes, *Journal of Banking & Finance* 34. International Financial Integration, 2861–2873.

Kaminsky, Graciela, and Sergio L. Schmukler, 2002, Emerging market instability: Do sovereign ratings affect country risk and stock returns?, *The World Bank Economic Review* 16, 171–195.

Lane, Philip R., 2012, The European Sovereign Debt Crisis, *The Journal of Economic Perspectives* 26, 49–67.

Morgan, Donald P., 2002, Rating Banks: Risk and Uncertainty in an Opaque Industry, *The American Economic Review* 92, 874–888.

Poon, Winnie P. H., Junsoo Lee, and Benton E. Gup, 2009, Do solicitations matter in bank credit ratings? Results from a study of 72 countries, *Journal of Money, Credit and Banking* 41, 285–314.

Reinhart, Carmen M., 2002, Credit ratings, default and financial crises: Evidence from emerging markets, *World Bank Economic Review* 16, 151–170.

Shen, Chung-Hua, Yu-Li Huang, and Iftekhar Hasan, 2012, Asymmetric benchmarking in bank credit rating, *Journal of International Financial Markets, Institutions and Money* 22, 171–193.

Sy, Amadou N. R., 2004, Rating the rating agencies: Anticipating currency crises or debt crises?, *Journal of Banking & Finance* 28. Recent Research on Credit Ratings, 2845–2867.

Williams, Gwion, Rasha Alsakka, and Owain ap Gwilym, 2013, The impact of sovereign credit signals on bank share prices during the European sovereign debt crisis.

Williams, Gwion, Rasha Alsakka, and Owain ap Gwilym, 2013, The impact of sovereign rating actions on bank ratings in emerging markets, *Journal of Banking & Finance* 37, 563–577.

Tables

Table 1: Descriptive characteristics for the sovereign rating data sample

		S&P	Moody's	Fitch	Total
1	No. of rated countries	17	17	17	
2	Upgrades (solo)	15	5	11	31
3	Downgrades (solo)	42	15	9	66
4	**Total rating changes (solo)**	57	20	20	97
5	Positive watch signals (solo)	0	5	1	6
6	Negative watch signals (solo)	26	16	14	56
7	**Total watch signals (solo)**	26	21	15	62
8	Positive outlook signals (solo)	5	8	11	24
9	Negative outlook signals (solo)	12	12	22	46
10	**Total outlook signals (solo)**	17	20	33	70
11	**Total solo signals for a given country (rows 4 + 7 + 10)**	100	61	68	229
12	Combined upgrades and positive outlook signals	0	3	3	6
13	Combined downgrades and negative watch signals	9	6	3	18
14	Combined downgrades and negative outlook signals	1	19	29	49
15	**Total combined signals for a given country**	10	28	35	73
16	**Total sovereign credit signals (rows 11 + 15)**	110	89	103	302
19	Independent positive signals	20	21	24	65
20	Clustered positive signals	0	0	2	2
21	**Total positive signals**	20	21	26	67
22	Independent neagtive signals	74	53	59	186
23	Clustered neagtive signals	16	15	18	49
24	**Total neagtive signals**	90	68	77	235

The table presents summary statistics for long-term foreign-currency sovereign ratings, watch and outlook signals of 17 Eurozone countries in our sample during the period January 2004 to December 2013. The first part shows the distribution of solo and combined rating signals. The second part illustrates the sample statistics for the independent and the clustered rating signals. Rating signals are classified as clustered if a sovereign rating event is preceded by other credit events issued by the same or another CRA in the same direction for the same country within a (-10, 0) event window, independent otherwise.

Table 2: Descriptive characteristics for the bank data sample

Panel A: Geographical distribution of listed banks and respective total return benchmarks

Country	No. of listed banks	Total return stock index
Austria	10	MSCI Austria
Belgium	6	MSCI Belgium
Cyprus	5	DS Market Cyprus
Finland	5	MSCI Finland
France	32	MSCI France
Germany	26	MSCI Germany
Greece	8	MSCI Greece
Ireland	2	MSCI Ireland
Italy	27	MSCI Italy
Luxembourg	4	Luxembourg SE General
Malta	5	DS Market Malta
Netherlands	6	MSCI Netherlands
Portugal	4	MSCI Portugal
Slovak Republic	4	Slovakia SAX
Slovenia	2	MSCI Slovenia
Spain	8	MSCI Spain
Total	154	

Panel B: Bank-specific independent variables

Variable	Symbol	Definition and computation method
Asset quality	NPLGL	Non-performing loans to gross loans
Liquidity	LTA	Loan to total assets
Capital adequacy	ETA	Equity to total assets
Profitability	ROE	Return on equity
Size	LNASSET	Natural logarithm of total assets

The table presents the number of listed banks, total return benchmarks and bank-specific variables used in the later regression analysis. Panel A reports the sample of 154 banks which are identified as exchange-listed in Bankscope and have stock price data in Compustat Global for the 17 countries of the Eurozone. Estonia is not reported since no Estonian banks fulfill these conditions. Panel A also reports total return benchmarks for each country that are employed to estimate abnormal stock returns in the market model. The indicies are obtained from Datastream and take alternative benchmarks where MSCI total market return indicies are not available. Panel B shows the bank-specific independent variables used for regression analysis of individual abnormal stock returns and their calculation methods. All yearly fundamental data of the banks are obtained from Bankscope.

Table 3: Abnormal bank equity returns following positive versus negative sovereign rating signals

Event window	S&P Mean CAR(%)	S&P % of CAR > 0	S&P No. of obs	Moody's Mean CAR(%)	Moody's % of CAR > 0	Moody's No. of obs	Fitch Mean CAR(%)	Fitch % of CAR > 0	Fitch No. of obs
Panel A: All positive events									
[0;1]	0.24 **	57.84	1,102	-0.05	51.50	830	-0.28 ***	47.16 ***	1,353
[-1;1]	0.10	57.68	1,102	-0.33 ***	48.72 **	830	-0.27 **	49.32 ***	1,353
[-2;2]	0.13	58.35	1,102	-0.32	51.47 *	830	-0.25	52.03 *	1,353
Panel B: All negative events									
[0;1]	0.00	56.93	4,162	-0.10 ***	57.20 *	3,841	-0.05	57.24	4,052
[-1;1]	-0.05 *	58.78 *	4,162	-0.18 ***	60.06 ***	3,841	-0.01	58.31	4,052
[-2;2]	0.06	61.62 *	4,162	-0.16 ***	62.05 **	3,841	-0.08 **	58.76	4,052
Panel C: Independent negative events									
[0;1]	-0.05	57.74 **	3,197	-0.12 ***	57.84 **	2,865	0.06	55.24	3,009
[-1;1]	-0.13 **	59.16 **	3,197	-0.24 ***	60.48 ***	2,865	0.14	55.58	3,009
[-2;2]	-0.02	63.91 ***	3,197	-0.22 ***	61.64 **	2,865	0.13	56.99	3,009
Panel D: Clustered negative events									
[0;1]	-0.11	55.36	965	-0.04	55.70	976	-0.25	62.15	1,043
[-1;1]	-0.11 *	58.05	965	-0.01	58.75	976	-0.28	64.35	1,043
[-2;2]	-0.22	57.45	965	-0.13 *	68.11	976	-0.42 ***	65.31	1,043

This table displays mean cumulative abnormal returns (CARs) on bank shares associated with foreign countries' positive versus negative sovereign rating signals issued by the three main rating agencies. Abnormal returns are calculated against the Fama and French type three-factor model. The two additional factors, namely size and book-to-market ratio, are computed by using all firms from a particular euro zone country that are available in both the Compustat Global Securities and the Compustat Global Fundamentals databases. The event windows are [0;1], [-1;1] and [-2;2]. Panel A and Panel B show bank CARs associated with positive versus negative sovereign rating signals during the whole sample period (Jan 2004 – Dec 2013), separately. Panel C and D break down the whole sample of negative sovereign events into the sub-samples of independent versus clustered negative rating signals, respectively. A rating signal is defined as clustered if the event country receiving a negative rating signal while at least one another negative signal is emitted to the same sovereign by any of the three agencies within the (-10, 0) window, independent otherwise.To test the null hypothesis of CAR being equal to zero, we use the standardized cross-sectional test of Boehmer, Musumeci, and Poulsen (1991). The percentage of negative CARs is reported on the basis of the generalized sign test by Cowan (1992). Asterisks indicate significance at the 10% (*), 5% (**) and 1% (***) level, respectively.

Table 4: Regression on the cross-border spillover effects of positive sovereign rating signals

	Panel A: S&P			*Panel B: Moody's*			*Panel C: Fitch*		
Independent Variables	CAR(0,1)	CAR(-1,1)	CAR(-2,2)	CAR(0,1)	CAR(-1,1)	CAR(-2,2)	CAR(0,1)	CAR(-1,1)	CAR(-2,2)
Crisis	0.20	-0.04	0.03	-3.12	-6.54	-2.40	-0.22	-0.48	-0.11
	(-0.93)	(-0.13)	(-0.09)	(-1.42)	(-2.69)***	(-0.86)	(-1.07)	(-1.96)**	(-0.43)
PIIGS_bank	-0.28	-0.40	-0.19	0.19	0.57	0.53	-0.13	-0.22	0.08
	(-1.04)	(-1.25)	(-0.48)	(-0.80)	(2.42)**	(1.85)*	(-0.61)	(-0.78)	(-0.27)
PIIGS_sov	0.31	0.85	1.30	-0.17	0.27	0.65	0.08	0.09	0.12
	(-0.66)	(-1.54)	(2.30)**	(-0.48)	(-0.57)	(-1.44)	(-0.32)	(-0.29)	(-0.27)
CCR_bank	0.01	0.01	0.00	0.01	0.03	0.02	-0.01	-0.01	0.00
	(-0.37)	(0.00)	(-0.43)	(-0.05)	(1.74)*	(-0.99)	(-0.73)	(-0.62)	(-0.03)
CCR_sov	0.02	0.02	-0.02	-0.05	-0.08	-0.04	-0.01	-0.01	0.00
	(1.92)*	(-1.33)	(-1.38)	(-1.63)	(-2.54)**	(-0.99)	(-1.06)	(-0.78)	(-0.25)
DeltaLCCR	0.27	0.08	-0.41	0.86	2.11	0.66	0.22	0.3	0.32
	(-1.05)	(-0.26)	(-1.18)	(-1.00)	(2.32)**	(-0.59)	(-1.57)	(-1.61)	(-1.42)
NPLGL	-0.01	-0.04	-0.06	0.00	-0.01	-0.02	0.00	0.00	-0.02
	(-0.54)	(-1.61)	(-2.10)**	(-0.12)	(-1.26)	(-2.21)**	(-0.27)	(-0.11)	(-0.77)
LTA	-0.35	-0.43	-0.16	0.36	0.60	1.39	0.46	0.63	0.39
	(-0.86)	(-0.79)	(-0.26)	(-0.93)	(-1.40)	(2.66)***	(1.69)*	(1.73)*	(-0.93)
ETA	0.97	1.23	0.38	-1.19	-0.59	1.36	0.99	1.62	-0.09
	(-1.26)	(-1.31)	(-0.35)	(-1.21)	(-0.56)	(-1.21)	(-1.34)	(1.72)*	(-0.08)
ROE	-0.04	-0.02	-0.03	-0.36	-0.34	0.58	0.03	0.04	0.02
	(-0.96)	(-0.74)	(-0.77)	(-0.79)	(-1.01)	(2.33)**	(-0.46)	(-0.42)	(-0.34)
LNASSET	0.05	-0.02	-0.12	-0.07	0.08	0.16	0.08	0.10	0.09
	(-0.73)	(-0.29)	(-1.45)	(-1.14)	(-1.09)	(2.08)**	(-1.57)	(1.66)*	(-1.35)
Constant	-1.74	-0.25	2.31	3.03	-0.2	-3.65	-0.64	-1.05	-1.83
	(-1.03)	(-0.14)	(-1.10)	(-1.38)	(-0.11)	(-1.51)	(-0.45)	(-0.61)	(-0.97)
Observations	1,102	1,102	1,102	830	830	830	1,353	1,353	1,353
Adj. R-squared	0.0063	0.0122	0.0162	0.0047	0.0337	0.0372	0.0102	0.0074	0.0076
p-value for F-statistics	0.4102	0.1040	0.0018	0.4847	0.0099	0.0000	0.0331	0.0970	0.3315

This table shows the results of regression models testing for bank abnormal returns associated with foreign countries' positive sovereign rating signals. Dependent variables are individual bank CARs, which are calculated against the Fama and French type three-factor model, over the event windows [0;1], [-1;1] and [-2;2]. Crisis is a dummy variable equalling 1 if the sovereign rating signal from abroad at event date t falls into the crisis period from October 2009 to December 2013; 0 otherwise. PIIGS_bank is a dummy variable equalling 1 if origin country of the bank is one of the PIIGS countries, namely Portugal, Ireland, Italy, Greece and Spain; 0 otherwise. PIIGS_sov is a dummy variable equalling 1 if the event country k is one of the PIIGS countries; 0 otherwise. CCR_bank is the level of the bank's origin country's 58-point comprehensive credit rating.CCR_sov is the level of the event country's 58-point comprehensive credit rating. DeltaLCCR is the change in the logit-type transformation of the 58-point comprehensive credit ratings, LCCR, which is computed according to Equation (1). See definition and computation method for the five bank-related factors (NPLGL, LTA, ETA, ROE and LNASSET) in Panel B of Table 2.

Table 5: Regression on the cross-border spillover effects of negative sovereign rating signals

	Panel A: S&P			*Panel B: Moody's*			*Panel C: Fitch*		
Independent Variables	CAR(0,1)	CAR(-1,1)	CAR(-2,2)	CAR(0,1)	CAR(-1,1)	CAR(-2,2)	CAR(0,1)	CAR(-1,1)	CAR(-2,2)
Crisis	-0.25	-0.44	-0.50	-0.09	-0.48	-0.84	-0.11	-0.14	-0.09
	(-2.01)**	(-2.90)***	(-2.62)***	(-0.50)	(-2.21)**	(-3.27)***	(-0.70)	(-0.77)	(-0.36)
Cluster	0.07	0.13	0.06	-0.05	-0.03	-0.02	-0.25	-0.43	-0.58
	(-0.67)	(-0.97)	(-0.38)	(-0.47)	(-0.29)	(-0.11)	(-2.44)**	(-3.40)***	(-3.64)***
PIIGS_bank	-0.10	-0.27	-0.08	0.13	0.14	0.19	-0.11	-0.24	-0.42
	(-0.64)	(-1.41)	(-0.32)	(-0.97)	(-0.89)	(-0.99)	(-0.58)	(-1.09)	(-1.50)
PIIGS_sov	-0.12	-0.20	-0.20	-0.12	-0.10	-0.34	0.02	-0.10	-0.14
	(-1.08)	(-1.55)	(-1.29)	(-1.12)	(-0.78)	(-2.22)**	(-0.15)	(-0.80)	(-0.89)
CCR_bank	-0.02	-0.02	-0.01	0.01	0.01	0.01	0.01	0.00	0.00
	(-1.75)*	(-2.01)**	(-0.83)	(-1.09)	(-0.71)	(-1.20)	(-1.09)	(-0.14)	(-0.11)
CCR_sov	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00
	(0.00)	(-0.08)	(-0.78)	(-0.89)	(-0.49)	(-2.67)***	(-0.43)	(-0.51)	(-0.43)
DeltaLCCR	0.09	0.10	-0.20	0.37	0.24	0.07	-0.05	-0.02	-0.13
	(-0.66)	(-0.58)	(-0.99)	(2.30)**	(-1.28)	(-0.32)	(-0.27)	(-0.08)	(-0.47)
NPLGL	0.00	0.00	-0.02	0.02	0.00	0.02	-0.01	0.00	0.00
	(-0.19)	(-0.16)	(-1.06)	(-1.53)	(-0.23)	(-0.99)	(-0.91)	(-0.61)	(-0.45)
LTA	0.02	0.07	-0.46	-0.09	-0.10	0.04	-0.15	-0.14	-0.22
	(-0.10)	(-0.26)	(-1.48)	(-0.40)	(-0.43)	(-0.13)	(-0.79)	(-0.60)	(-0.75)
ETA	-0.39	-0.13	0.04	-0.79	-0.64	-0.57	0.21	0.08	-0.23
	(-0.91)	(-0.25)	(-0.06)	(-1.86)*	(-1.28)	(-0.95)	(-0.51)	(-0.15)	(-0.34)
ROE	0.00	0.1	-0.02	0.08	0.07	0.06	0.07	0.08	0.15
	(-0.03)	(-1.13)	(-0.19)	(1.66)*	(-1.10)	(-1.13)	(-0.88)	(-0.67)	(-1.40)
LNASSET	0.00	0.03	0.03	-0.03	0.00	0.06	0.02	0.02	0.01
	(-0.09)	(-0.83)	(-0.70)	(-0.99)	(-0.12)	(-1.32)	(-0.63)	(-0.50)	(-0.20)
Constant	1.18	1.07	0.47	0.35	0.17	-0.49	-0.62	-0.09	0.31
	(-1.35)	(-1.04)	(-0.38)	(-0.45)	(-0.19)	(-0.44)	(-0.72)	(-0.09)	(-0.24)
Observations	4,162	4,162	4,162	3,841	3,841	3,841	4,052	4,052	4,052
Adj. R-squared	0.0017	0.005	0.0012	0.004	0.0022	0.0061	0.0038	0.0033	0.0051
p-value for F-statistics	0.2821	0.0258	0.1277	0.1098	0.3692	0.0043	0.1249	0.0197	0.0051

This table shows the results of regression models testing for bank abnormal returns associated with foreign countries' negative sovereign rating signals. Dependent variables are individual bank CARs, which are calculated against the Fama and French type three-factor model, over the event windows [0;1], [-1;1] and [-2;2]. Crisis is a dummy variable equalling 1 if the sovereign rating signal from abroad at event date t falls into the crisis period from October 2009 to December 2013; 0 otherwise. Cluster is a dummy variable equalling 1 if the event country k receives a positive (negative) rating signal at event date t while at least one another positive (negative) signal is emitted to the same sovereign by any of the three agencies within the (-10, 0) window; 0 otherwise. PIIGS_bank is a dummy variable equalling 1 if origin country of the bank is one of the PIIGS countries, namely Portugal, Ireland, Italy, Greece and Spain; 0 otherwise. PIIGS_sov is a dummy variable equalling 1 if the event country k is one of the PIIGS countries; 0 otherwise. CCR_bank is the level of the bank's origin country's 58-point comprehensive credit rating.CCR_sov is the level of the event country's 58-point comprehensive credit rating. DeltaLCCR is the change in the logit-type transformation of the 58-point comprehensive credit ratings, LCCR, which is computed according to Equation (1). See definition and computation method for the five bank-related factors (NPLGL, LTA, ETA, ROE and LNASSET) in Panel B of Table 2.
Asterisks indicate significance at the 10% (*), 5% (**) and 1% (***) level, respectively.