The impact of sovereign credit signals on bank share prices during the European sovereign debt crisis

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Abstract

The ongoing financial crisis has drawn considerable attention to the role of credit rating agencies in the financial system. We examine how the share prices of major European banks react to sovereign credit events by S&P, Moody's and Fitch during the financial crisis period (2007-11). The sample includes a stock market listed subset of the banks which were part of the EU stress test in 2011, and is drawn from 16 countries. We investigate how bank abnormal returns are affected by European sovereign rating changes, watchlist and outlook announcements, to capture how the crisis spills over among countries and also from the sovereign to the financial sector. We find that rating agencies' signals do affect bank share prices, although there is no evidence that rating agency actions are the dominant force leading to falling share prices during the crisis. The findings are important in enhancing understanding of the role of rating agencies and the market response to their signals.

JEL classification: G15; G21; G24.

Keywords: European sovereign debt crisis; Credit signals; Spillover effect; Credit outlook/watch; Bank shares.

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1. Introduction

The European sovereign debt crisis has dominated international financial market sentiment in recent times. Sovereign rating actions by credit rating agencies (CRAs) have attracted huge attention (e.g. Alsakka and ap Gwilym, 2011; House of Lords, 2011). There remain widespread concerns over the transmission of the debt crisis from the sovereigns to the financial sector. One major channel for this is the European banking sector holdings of government debt of the home country and of other countries (e.g. Greece and Italy). Spillover effects across European countries became more likely as the crisis progressed. This study investigates possible links between sovereign rating actions and bank share prices across Europe during the recent sovereign debt crisis.

Sovereign ratings for developed countries have long been associated with high investment grade ratings along with high levels of stability. It was mainly the emerging economies that experienced poor credit rating quality and ratings instability. However, this situation has changed rapidly in the last three years, to the extent that the IMF Global Financial Stability Report (April 2010) highlights that sovereign default was the most pressing risk facing the global economy. The IMF World Economic Outlook (January 2011) also emphasises the interactions between sovereign and financial sector risk, which are considered a source of economic problems in many countries.

The BIS (2011) emphasises concerns about euro area sovereign debt problems spreading from Greece, Ireland and Portugal to Italy and Spain, and leading to tighter funding conditions for European banks and affecting pricing in euro area markets. The deterioration in sovereign creditworthiness adversely impacts European banks' funding costs and market access. Sovereign debt problems can affect banks through various channels, including: (i) direct losses on sovereign holdings, (ii) lower collateral values for wholesale and central bank funding, (iii) reduced benefits that banks derive from government guarantees, and (iv) lower

bank ratings. Currently, there are fears that serious debt strains will spill over to Italy and Spain leading to a broad-based sell-off of bank stocks and bonds. Selling pressure has spilled over from banks in Italy and Spain to those in Belgium and France, and later to banks across the entire continent. This led to a plunge in bank equity valuations as a result of reduced overall allocations to bank equity by asset managers, causing bank equity to sharply underperform an already declining broader market.

Sovereign ratings are opinions of the CRAs on the ability and willingness of the governments to meet their financial commitments. They represent a measure of the credit risk of a given country, and a ceiling for the ratings assigned to non-sovereign issuers within the country, although the ceiling is no longer applied in an absolute sense by the largest three agencies (Alsakka and ap Gwilym, 2010). However, non-sovereigns rarely pierce the sovereign ceiling, Borensztein et al. (2007) refer to the sovereign ceiling 'lite', and bank ratings are particularly sensitive to sovereign rating migrations (Williams and ap Gwilym, 2011). The downward rating trend recently experienced by many European sovereigns has caused the same to happen to European bank ratings e.g. on 18th October 2011, Moody's downgraded Spain to A1 from Aa2 with negative outlook, and on the following day Moody's downgraded five Spanish banks to A1 with negative outlook. This causes problems for the banks as it strongly influences their borrowing costs.

The CRAs have faced close scrutiny over the last few years due to severe rating downgrades suffered by very highly rated mortgage-backed securities and collateralized debt obligations during the subprime mortgage crisis. Now they are being criticised on the extent and timing of their downgrading of European countries such as Greece and Portugal. We investigate the effects of sovereign credit signals by S&P, Moody's and Fitch on the share prices of European banks during the 2007-2011 financial crisis. We hope to discover, despite the ongoing criticisms of the CRAs, how markets participants perceive their credit signals. It

has generally been found in the literature that markets respond more to negative sovereign credit signals than they do to positive sovereign credit signals, which means that only rating downgrades convey new information to the market (see Brooks et al., 2004; Hill and Faff, 2010). There is also evidence of negative sovereign credit signals in one country having significant detrimental spillover effects into other nearby countries and financial markets (see Gande and Parsley, 2005; Ferreira and Gama, 2007; Arezki et al., 2011).

To the best of our knowledge, this is the first paper that examines the effect of sovereign credit signals on share prices of banks. We evaluate these effects both for banks in the same country as the sovereign, and also on banks from other countries. In addition, we investigate the relative impact of three types of credit signals: rating changes, outlook signals and watch events.[1] The outlooks and watch signals have been found to be at least as important as rating changes in their market impact (e.g. Kaminsky and Schmukler, 2002; Sy, 2004; Hill and Faff; 2010; Afonso et al, 2012). However, most prior research on CRAs actions has mainly centred on rating changes.

The remainder of the paper is organised as follows. Section 2 reviews the relevant literature, and Section 3 discusses the data and methodology. Section 4 presents the empirical results and Section 5 concludes the paper.

[1] Outlooks reflect a CRA's medium-term (one to two years) view on the development of a credit rating, while watchlists are stronger indications focused on a typical ex-ante target horizon of three months.

2. Literature Review

2.1. The effect of the financial crisis on European sovereigns and banks

Following the collapse of Lehman Brothers in September 2008, many governments in the euro area and elsewhere committed large resources to guarantee and rescue financial institutions (Gerlach et al, 2010). This led to increasing public debt and thereby higher risk of sovereign default. Mody (2009) finds that governments' exposures to financial sector weakness became more prominent as the crisis progressed. Investors perceived this as a credit risk transfer from the banking sector to governments, and thereby sovereign debt spreads widened while risk spreads of financial institutions narrowed (Ejsing and Lemke, 2011). For example, sovereign bond spreads for Ireland started to increase after the government extended a guarantee to the banking system (Sgherri and Zoli, 2009). The cost of insuring against sovereign risk, as implied by credit default swap (CDS) premia, substantially increased for most European countries. For example, the senior five-year CDS premia on debt issued by the UK, US, France, Germany, Greece and Spain increased from 9, 8, 10, 7, 22 and 18 basis points in January 2008 to 93, 43, 95, 50, 762 and 269 basis points in June 2010, respectively (Bank of England, 2010).

Sovereign debt concerns raised doubts about the strength of some European banks, including those in France, Germany and the UK. Blundell-Wignall and Slovik (2010) find that banks are heavily exposed to the sovereign debt of their own country. For example, the exposure of Greek banks to Greek sovereign debt represented 226% of their Tier 1 capital, while in Italy, Hungary and Spain, the equivalent figures were 157%, 133% and 113%, respectively. Globally, banks faced a tough refinancing challenge, with at least US$5 trillion of medium to long-term funding maturing between 2010 and 2013 (Bank of England, 2010).

There are many potential channels through which sovereign credit news may spillover across countries due to the globalized nature of modern financial markets. Ferreira and Gama

(2007) and Sy (2009) provide in-depth analysis of such channels, including rating-based triggers arising in banking regulation, investment mandates (see Cantor et al., 2007) and European Central Bank (ECB) collateral rules. One main channel through which sovereign risk may spillover to financial sectors across countries is where domestic banks hold foreign sovereign debt (Arezki et al., 2011). An increase in a given sovereign's risk will likely affect the stability and profitability of banks in other countries holding this debt, and this was the case in Europe during 2007-11. For example, Blundell-Wignall and Slovik (2010) find that British banks have large exposures to Greece (€4,131 M.), Ireland (€5,580 M.), Italy (€10,029 M.), Portugal (€2,571 M.) and Spain (€5,916 M.). Bank of England (2010) also indicated that a default by Greece or another sovereign could lead to the collapse of many European banks. Figure 1 shows the exposures of banks in the countries shown to the sovereign debt of Greece, Hungary, Ireland, Italy, Portugal and Spain as a percentage of Tier 1 capital.

2.2. Credit rating agencies and regulation

During the financial crisis, CRAs came under close scrutiny. Many commentators argue that the role played by CRAs in structured finance exacerbated the crisis. For example, the high-level group chaired for the European Commission by Jacques de Larosiere stated that when CRAs evaluated the credit risk associated with collateralised debt obligations (CDOs), there were 'flaws in their rating methodology'. CRAs have also been criticised recently on the basis of inherent conflicts of interest within their business model, lack of transparency, poor communication, cliff effects and related overreliance on ratings by users (Bank of England, 2011).

In response to the perceived role of CRAs in the financial crisis, several policy actions have already occurred and new legislation has been passed in the United States and Europe.

The International Organization of Securities Commissions (IOSCO) revised the Code of Conduct Fundamentals for Credit Rating Agencies in 2008 to address issues of independence, conflict of interest, transparency and competition. Also, a formal regulation on CRAs was approved by the European Parliament and entered into force in December 2009. This requires CRAs operating in Europe to register with the European Securities and Markets Authority (ESMA). Many other G-20 countries have introduced or are in the process of introducing new regulatory oversight for CRAs (Bank of England, 2011). Further, the Basel Committee of the Bank for International Settlements reviewed the role of external ratings in the capital adequacy framework, mainly to incorporate the IOSCO Code into the eligibility criteria. The Financial Stability Board published a set of principles for reducing reliance on CRA ratings in standards, laws and regulations (FSB, 2010).

CRAs were accused of precipitating the sovereign debt crisis by downgrading the ratings of euro-zone sovereigns too far and too fast. Politicians across the EU have called for further regulation to improve quality and transparency in sovereign ratings. The UK House of Lords report (2011) argues that such criticisms are largely unjustified since rating downgrades reflect the seriousness of the problems faced by euro-zone sovereigns. This report also encourages legislative changes to enhance the quality of national statistical data, and advocates that sovereigns should cooperate closely with CRAs.

The overall objective of the above regulatory changes is to reduce the impact of rating actions in financial markets, especially the mechanistic reactions induced by hardwiring and cliff effects (e.g. see Cantor et al, 2007). As regulatory changes are ongoing, we anticipate that strong market reactions would still be expected in our sample period. Even after current legislation has come into full effect, one would still expect CRA signals to produce reactions if the markets continue to believe that the CRAs' views reflect private or price-relevant information. National governments are the largest borrowers in capital markets, accounting

for more than 60% of debt issued (House of Lords, 2011). Therefore, sovereign ratings are still expected to impact on investors' behaviour and their risk expectations.

2.3. The market impact of sovereign rating signals

Prior literature demonstrates that sovereign rating news does affect financial markets. The fact that markets react to sovereign credit signals implies that CRAs possess private information, not previously priced in the market. Negative rating events impact own-country equity and bond markets and cause significant spillovers to other countries' equity and bond markets, while upgrades have limited or insignificant impact (e.g. Kaminsky and Schmukler, 2002; Brooks et al., 2004, Sy, 2004, Gande and Parsley, 2005; Ferreira and Gama, 2007; Hooper et al., 2008; Hill and Faff; 2010, Afonso et al, 2012). Negative credit announcements are typically more informative than positive ones, given the stronger negative reputational effects for an agency being tardy in the case of downgrades (Alsakka and ap Gwilym, 2010). Issuers may have no incentive to leak negative news prior to a downgrade, while they do so for positive news prior to an upgrade.

Alsakka and ap Gwilym (2012) provide evidence of the effects of European sovereign rating signals on exchange rates for the period 2000-2010. They also identify strong spillover effects in the foreign exchange market during the financial crisis period. Arezki et al. (2011) examine the spillover effects of sovereign rating news on CDS spreads and stock market indices for selected European countries during 2007-2010. They find that rating downgrades lead to significant spillovers across countries. Afonso et al. (2012) finds evidence of significant spillover effects of sovereign rating news from the three major CRAs (pooled together) for bond markets for 24 European countries during 1995-2010.

3. Data and methodology

3.1. Credit data

We investigate abnormal stock returns for a set of European banks around the timings of all sovereign credit signals for European countries by Standard and Poor's (S&P), Moody's and Fitch during the period 1st January 2007 to 19th September 2011. The credit dataset includes long-term (LT) foreign-currency (FC) sovereign ratings, outlooks and watchlists. The study focuses on all sovereign credit signals, not only the credit rating level. The data is verified by using S&P, Moody's and Fitch publications. We identify actual rating changes according to mapped 20-point numerical ratings, a rating scale that only includes actual ratings (AAA/Aaa = 20, AA+/Aa1 = 19, AA/Aa2 = 18 …CCC-/Caa3 = 2, CC/Ca, SD-S/C = 1) by notches on the basis of daily intervals. To identify positive and negative credit signals we use a 58-point numerical rating scale; a comprehensive credit rating (CCR) scale that incorporates both the actual ratings and credit outlook and watch, as follows: AAA/Aaa = 58, AA+/Aa1 = 55, AA/Aa2 = 52 …CCC-/Caa3 = 4, CC/Ca, SD-D/C = 1, and we add '+2' for positive watch, '+1' for positive outlook, '-1' for negative outlook, '-2' for negative watch, and '0' for stable outlook and no watch/outlook assignments (see Sy, 2004).[2] A positive credit signal would be one that moves up the 58-point scale e.g. to 47 from 43, and a negative credit signal would be one that moves down the 58-point scale e.g. to 54 from 58.

We also employ a logit-type transformation of the above 58-point numerical rating scale to address possible non-linearity, as follows (see Sy, 2004):

[2] Using the CCR rating scale, the same numerical score may represent different credit status. For example, issuers rated AAA with negative watch and AA+ with positive outlook carry the same numerical score '56'. However, migrations between such states (with the same numerical score) would be extremely unlikely and there are no such cases in the data sample.

$$LCCR_t = \ln\left[\frac{CCR_t}{59 - CCR_t}\right]$$

CCR_t is the rating according to the 58-point numerical rating scale. In this case, a non-zero change in the logarithmic comprehensive 58-point numerical rating defines the event of interest: 'positive', an upgrade resulting from an upward move in the letter credit rating of the sovereign and/or from a favourable signal in the credit outlook/watch; 'negative', a downgrade resulting from a downward move in the letter credit rating of the sovereign and/or from an unfavourable signal in the credit outlook/watch.

Outlook and watch signals are defined as follows. *Negative watch* signals include placing sovereign *s* on watch for possible downgrade, and the action of confirming the rating of sovereign *s* after being on watch for possible upgrade. *Positive watch* signals include placing sovereign *s* on watch for possible upgrade, and the action of confirming the rating of sovereign *s* after being on watch for possible downgrade. *Negative outlook* signals contain changes to negative outlook from stable/positive outlook, and changes to stable outlook from positive outlook. *Positive outlook* signals contain changes to positive outlook from stable/negative outlook, and changes to stable outlook from negative outlook.

3.1.1. S&P credit signals

The S&P credit data includes sovereign credit signals for 19 countries, 10 of which are in the Euro-Zone, eight other European Union members and we also include Iceland due to its recent difficulties. There were a total of 102 S&P credit signals for the 19 countries during this relatively short time period, averaging over five credit signals per country in less than five years. There are 40 (8) downgrades (upgrades) by S&P (Rows 3 + 12 + 13 and 2 + 11 of Table I), most of which are by one-notch. However, there are two cases of three-notch

rating changes in the sample period, where S&P downgraded Greece twice in April 2010 and June 2011. There are seven cases of two-notch downgrades, e.g. Portugal was downgraded to BBB from A- in March 2011. Estonia and the Czech Republic were both upgraded by two notches in August 2011. The dataset also comprises: 47 (15) negative (positive) outlook adjustments; and 26 (0) negative (positive) watch announcements (see Rows 6 + 12, 5 + 11, 9 + 13 and 8 of Table I). There is only one occasion, ever, when S&P has placed a sovereign on watch for possible upgrade (Ukraine for one week in July 2010) and this does not meet our sampling criteria.

The majority of signals in this sample are announced in isolation, although combined-signals for a given sovereign (i.e. actual rating change and watch/outlook signal simultaneously) occur in 33.33% (34/102) of cases (see Row 14 of Table I). The majority of signals are announced individually, i.e. for one sovereign on a given day, although multiple-sovereign events (i.e. credit signals for more than one sovereign in a given day) occur in 25.49% (26/102) of cases (see Row 16). All multiple sovereign events on a single day are of the same type i.e. they all are negative signals, or they are all positive signals, which avoids having positive and negative credit signals occurring on the same day for our event day analysis.

We have five observations (for Estonia in April 2009, Lithuania in August 2009, Greece in March 2010, and for Iceland in March 2010 and May 2011) where the status of sovereigns was changed to negative outlook from negative watch (with no rating change), which we consider to be a positive credit signal (since it moves up the 58-point scale). As expected, negative credit signals dominate positive credit signals in the sample, due to the time window of 2007-11. 72.55% (74/102) of the observations are negative credit signals (see Rows 17 and 18 of Table I). This reflects the downward pressure on sovereign ratings due to

the increased indebtedness, larger deficits, slower economic growth and austerity measures across Europe at this time.

3.1.2. Moody's credit signals

The Moody's credit data includes sovereign credit signals for 17 countries, 11 of which are in the Euro-Zone, five European Union members and Iceland. There were a total of 84 Moody's credit signals for the 17 countries during this relatively short time period, averaging to almost five credit signals per country in less than five years. There are 32 (5) downgrades (upgrades) by Moody's (Rows 3 + 12 + 13 and 2 + 11 in Table I), most of which are by one-notch. However, there are eight cases of two-notch downgrades, five cases of three-notch downgrades and two cases of four notch downgrades. There is one case of a five-notch rating change when Moody's downgraded Ireland to Baa1 from Aa2 with negative outlook in December 2010. Each of the five upgrades in the sample was by one-notch. The dataset also comprises: 38 (11) negative (positive) outlook adjustments; and 20 (3) negative (positive) watch announcements (see Rows 6 + 12, 5 + 11, 9 + 13 and 8 of Table I).

The majority of signals in this sample are announced in isolation, although combined-signals for a given sovereign (i.e. actual rating change and watch/outlook signal simultaneously) occur in 29.76% (25/84) of cases (see Row 14 of Table I). The majority of signals are announced individually, i.e. for one sovereign on a given day, although multiple-sovereign events (i.e. credit signals for more than one sovereign in a given day) occur in 28.57% (24/84) of cases (see Row 16). There were two days in the sample period where Moody's assigned positive and negative credit signals to different sovereigns on the same day. On 23rd April 2009 Latvia and Lithuania were both downgraded by one and two-notches, respectively, with negative outlook, which are negative signals. On the same day, Estonia was taken off negative watch and placed on negative outlook, with no rating change, which

we consider to be a positive credit signal (since it moved up the 58-point scale). On 5th April 2011 Portugal was downgraded with negative watch, which is a negative signal, while Bulgaria was taken off positive outlook and placed on positive watch which is a positive signal.[3]

There are two one observations (for Estonia in April 2009 and for Hungary in August 2010) where its status was changed to negative outlook from negative watch (with no rating change), which we consider to be a positive credit signal. As expected, negative rating signals dominate positive rating signals in the sample. 76.19% (64/84) of the observations are negative credit signals (see Rows 17 and 18 of Table I).

3.1.3. Fitch credit signals

The Fitch credit data includes sovereign credit signals for 17 countries, 9 of which are in the Euro-Zone, 7 European Union members and Iceland. There were a total of 80 Fitch credit signals for the 17 countries during this relatively short time period, averaging to over four credit signals per country in less than five years. There are 34 (9) downgrades (upgrades) by Fitch (Rows 3 + 12 + 13 and 2 + 11 in Table I), most of which are by one-notch. However, there are six cases of two-notch downgrades and five cases of three-notch downgrades. There is one case of a four-notch rating change when Fitch downgraded Greece to CCC from B+ in July 2011. There are eight cases of a one-notch upgrade, and one case of a two notch upgrade. The dataset also comprises: 38 (14) negative (positive) outlook adjustments; and 10 (2) negative (positive) watch announcements (see Rows 6 + 12, 5 + 11, 9 + 13 and 8 of Table I).

The majority of signals in this sample are announced in isolation, although combined-signals for a given sovereign (i.e. actual rating change and watch/outlook signal

[3] These five observations are taken out of the univariate analysis (see Sections 3.2 and 4.1) to avoid contaminating the results.

simultaneously) occur in 33.75% (27/80) of cases (see Row 14 of Table I). The majority of signals are announced individually, i.e. for one sovereign on a given day, although multiple-sovereign events (i.e. credit signals for more than one sovereign in a given day) occur in 23.75% (19/80) of cases (see Row 16). All multiple sovereign events on a single day in the sample are of the same type i.e. they all are negative signals, or they are all positive signals.

There are three observations (Latvia in December 2008, Iceland in December 2009 and Ireland in April 2011) where its status was changed to negative outlook from negative watch (with no rating change), which we consider to be a positive credit signal. As expected, negative rating signals dominate positive rating signals in the sample. 66.25% (53/80) of the observations are negative credit signals (see Rows 17 and 18 of Table I).

3.2. Banks, share prices, abnormal returns and univariate analysis

We focus solely on the reaction of bank share prices to sovereign credit signals, instead of looking at stock indexes. One reason for this is that bank ratings are found to be strongly influenced by sovereign ratings from the same country. Williams and ap Gwilym (2011) find that sovereign ratings strongly influence the ratings of banks, and that banks are rarely rated above the sovereign (sovereign ceiling). Another reason is that many banks are heavily exposed to the sovereign debts of European governments such as Greece and Italy. The banks in the sample are the European banks that were included in the 2011 EU stress test and this information was gathered from SNL. Table II contains the bank information. There were a total of 91 banks, from 21 European countries included in the EU stress test. However, some had to be excluded for the following reasons:

a) Bank not listed, hence no share price information;

b) Illiquid bank shares;[4]

c) Bank share prices not available for the majority of the time window, e.g. DZ Bank AG-Deutsche Zentral-Genosbk.

This reduces the sample to 51 banks, from 16 countries (see Table II). The daily share price data was gathered using Thomson One Banker and spans 2nd January 2006 to 6th October 2011. The share price data spans a longer timeframe than the credit data in order to calculate the abnormal returns. The share prices for TT Hellenic Postbank SA, Caixabank SA and Caja Ahorros Del Mediterraneo (see Rows 23, 42 and 43 of Table II) were only available from 5th June 2006, 10th October 2007 and 28th July 2008, respectively.

The share prices are quoted in Euros, which are transformed into log returns.[5] We follow Hill and Faff (2010) in measuring the abnormal returns via the mean-adjusted return, which we report alongside raw returns. The mean daily return for each bank prior to a sovereign rating event is calculated using 200 daily observations for the period t = -230 to t = -30.[6] This represents the expected daily return (ER). Daily abnormal returns (AR) are calculated for each day in the event window as follows:

$$AR_{it} = R_{it} - ER_{it} \qquad (1)$$

Where:

i = 1, 51 (banks)

AR_{it} = abnormal return of bank i at time t.

R_{it} = log return of bank i at time t.

[4] Illiquid shares were identified when the share prices were transformed into log returns, and so banks were deleted from the sample when the returns were zero often e.g. Landesbank Hessen-Thuringen Giro which exhibited returns of zero more often than non-zero returns.

[5] Bank share prices from Denmark, Norway, Poland, Sweden and the UK were quoted in their respective currencies and so were transformed into Euros via the Thomson One Banker Price Wizard.

[6] In the event of a bank holiday, we take the next available share price.

ER_{it} = expected return of bank *i* at time *t*.

The event days are the sovereign credit events. The abnormal returns are based primarily on possible international spillovers i.e. the impact of a credit event for sovereign A on banks in countries B, C, D, etc. Several countries represented in Table II did not receive any sovereign credit signal up to the end of the sample period (although they have subsequently).

Abnormal returns are cumulated over consecutive days to give cumulative abnormal returns (CARs). Following Hill and Faff (2010) we evaluate the CARs over the pre-event (-10, -1), event (0, +1) and the post-event (+2, +11) windows, where 0 represents the actual event day, $t = 0$. Gande and Parsley (2005) suggest the short two-day (0, +1) event window to reduce contamination from other credit events. The pre-event (-10, -1) window will capture market anticipation of rating announcements (Hull et al. 2004), and the post-event (+2, +11) window will capture possible longer term or delayed impacts of the sovereign credit events on the bank share prices. Standard errors are calculated following Boehmer et al. (1991), as implemented in Hill and Faff (2010). We utilize the Dow Jones Stoxx Europe 600 to calculate the standardized residual over the 2nd January 2006 to 6th October 2011 period.

In our robustness checks, we follow Hill and Faff (2010) and split the sample into independent and clustered sovereign credit signals. An independent event is when sovereign *s* experiences a credit signal with no other credit signal given to sovereign *s* by any of the three main rating agencies (S&P, Moody's and Fitch), within the (-10, +11) window (21 trading days). A clustered event for sovereign *s* is when it has received another credit signal within 21 trading days by any of the three agencies. e.g. on 29th September 2008 S&P downgraded Iceland to A- from A with negative watch, and on the 30th September 2008 Fitch downgraded Iceland to A- from A+ with negative watch, whilst also on 30th September 2008 Moody's put

Iceland on negative watch from stable outlook. Independent and clustered events appear in Rows 19 and 20 of Table I.[7]

We anticipate that positive credit signals will have positive effects on the bank's returns, and that negative credit signals will have negative effects on the bank's returns.

3.3. Regression model

We conduct multivariate analysis of the factors that affect the CARs of banks around the time of sovereign credit signals. The models are as follows:

$$CAR_{it}(CARR_{it}) = \alpha + \beta_1 \Delta LCCR_{st} + \beta_2 Lag\Delta LCCR_{bt} + \beta_3 CCR_{bt} + \beta_4 CCR_{st} + \beta_5 Co_s + \beta_6 Ba_i + \beta_7 y_t + \varepsilon_{it} \quad (2)$$

CAR_{it} $(CARR_{it})$ is the mean-adjusted (raw) cumulative abnormal returns of bank *i* in the event time *t*: (0, +1). Gande and Parsley (2005) suggest the short two-day (0, +1) event window to reduce contamination from other credit events. $\Delta LCCR_{st}$ is the 1-day change in the logit-type transformation of the 58-point rating (see Section 3.1) for sovereign *s* at event date *t*. We only examine negative credit signals since they strongly outweigh positive signals in the 2007 to 2011 period. For ease of interpretation, the absolute value of $\Delta LCCR_{st}$ is used in the regression. *Lag* $\Delta LCCR_{bt}$ is the cumulative change in the LCCR of the bank's country's sovereign rating (assigned by the 'event agency') during the ten days (-10, -1) preceding the event at date *t*. This is included to control for banks that may be reacting to credit signals for their home sovereign rather than the spillover effects. CCR_{bt} (CCR_{st}) are the levels of the bank's country (*b*) (and event country (*s*)) comprehensive credit rating. These are used as a proxy to control for the financial conditions of bank country (*b*) and event country (*s*). This

[7] There are cases where there are independent and clustered events occurring on the same day. These are taken out of the sample for the univariate analysis in Section 4.1.

allows the impact of sovereign credit news to vary with the credit rating (i.e. the financial position) of the bank's country and event country under consideration. Co_s is a full set of event country dummies, Ba_i is a full set of bank dummies and y_t is a full set of year dummies.

In the second element of the analysis, we distinguish between the effects of different types of negative credit signals across CRAs (joint downgrade and negative outlook/watch signals (combined-signals), rating downgrade, negative outlook actions and negative watch announcements) as follows:

$$\begin{aligned} CAR_{it}(CARR_{it}) = \alpha + \beta_1 NOD_{st} + \beta_2 NWD_{st} + \beta_3 NW_{st} + \beta_4 DN_{st} + \\ \beta_5 Lag\Delta LCCR_{bt} + \beta_6 CCR_{bt} + \beta_7 CCR_{st} + \beta_8 Co_s \\ + \beta_9 Ba_i + \beta_{10} y_t + \varepsilon_{it} \end{aligned} \quad (3)$$

NOD_{st} is a dummy variable taking the value of 1 if sovereign s is downgraded and simultaneously placed on negative outlook at time t, zero otherwise. NWD_{st} is a dummy variable taking the value of 1 if sovereign s is downgraded and simultaneously placed on negative watch at time t, zero otherwise. NW_{st} is a dummy variable taking the value of 1 if sovereign s experiences a negative watch action at time t, zero otherwise. DN_{st} is a dummy variable taking the value of 1 if sovereign s is downgraded at the time t, zero otherwise. CAR_{it} $(CARR_{it})$, $Lag\ \Delta LCCR_{bt}$, CCR_{bt} (CCR_{st}), Co_s, Ba_i and y_t are included as for Eq. (2).

We do not include the 'solo' negative outlook signal (i.e. with no rating change) in Eq. (3) since this is taken as our reference category.

We anticipate that negative credit signals will negatively affect the returns of the banks in Eq. (2). In order to obtain robust estimators to any potential heteroscedasticity and/or autocorrelation in the residuals, a White correction is performed on the standard deviation of the estimated coefficients in all equations (Gande and Parsley, 2005; Ferreira and Gama, 2007; Arezki et al., 2011).

4. Empirical results

4.1. Univariate analysis

This section discusses the results on banks' share price reactions to S&P, Moody's and Fitch sovereign credit signals, which are presented in Tables III, IV and V, respectively. We consider the effects of sovereign credit signals on the share prices of banks from the same country as the sovereign but also on banks from different countries (i.e. spillover effects). The following sub-sections discuss the mean-adjusted CARs unless otherwise stated.

4.1.1. S&P positive credit signals

Panel A of Table III presents the CARs of banks for periods around positive credit signals. From Table I there a total of 28 positive rating events which gives 1313 observations of bank CARs. For the whole period, we report that the pre-event CAR is -0.52% and significant, and the post-event CAR is -0.15% and significant. The event window CAR is -0.05% and insignificant. The raw returns produce similar results as the mean-adjusted, although the coefficients are more strongly negative. These results show that the pre and post-event returns surrounding positive credit signals have been very negative during the financial crisis, which is as expected due to the strong downward trend experienced by the world's financial markets in this time period. The results show that the CAR in the event window is negative but much (negatively) weaker than the pre and post-event returns, which suggests that the positive credit signals as a whole have a modest effect on the bank share prices.

We also split the positive credit signals by year in Panel A of Table III. The CARs were all positive in 2007 and 2009 events, with event window CARs of 0.73% and 0.53%, respectively. Both coefficients aren't as (positively) strong as the pre-event window CARs of

1.78% and 1.31%, respectively, but the t-statistic is stronger in 2009 due to larger standard errors in the pre-event returns. The pre and post-event window CAR in 2011 display the largest negative values of -3.79% and -1.17%, respectively, which are both significant. The event window CAR of -0.32% is insignificant, which again provides evidence that the share prices react only modestly to positive sovereign credit signals.

4.1.2. S&P negative credit signals

Panel B of Table III presents the CARs of banks surrounding negative sovereign credit signals for the whole time period and also yearly sub-samples. The whole time period consists of 74 negative credit signals (see Table I) resulting in 3065 bank CARs. The event window CAR is -0.77% and strongly significant. This CAR is larger than the pre and post-event window CARs of -0.61% and -0.24%, respectively, which are both significant. These figures show that the bank share prices have reacted negatively to the negative sovereign credit signals as a whole, and that smaller CAR in the pre-event window indicates that the markets did not fully anticipate the rating news, and that the credit signals themselves contained new and valuable information. The raw CARs are also similarly negative and significant, with the only difference being that the pre-event CAR is (negatively) stronger than the event window CAR, which are -1.24% and -0.89%, respectively.

In 2007, the pre and post-event CARs are -0.72% and -0.81%, respectively, both significant, are stronger than the event window CAR of -0.14%, also significant, suggesting that the negative sovereign credit signals were less informative in this year than in the sample as a whole. The CARs are more negative in 2008 compared to 2007, with pre-event and event window CARs of -3.15% and -1.47%, respectively, both significant. The post-event CAR is insignificant in 2008. This would suggest a slight anticipation by the markets of the credit signals, whilst still providing valuable information on the day of the signal. In 2009 the pre

and post-event CARs are both positive and significant, whilst the event window CAR is highly negative and significant at -1.39%, which provides evidence of strong market reaction to negative sovereign credit signals in 2009. We find the opposite in 2010, where the event window CAR is insignificant, whilst the pre-event CAR is -0.47% and significant and the post-event CAR is 0.34% and significant. In 2011 the post-event CAR is the most negative at -2.17% and significant, compared to the pre-event and event CARs of -0.90% and -0.41%, respectively, both significant. This suggests a slight anticipation by the market preceding the credit signal, but more long run effects following the credit signal, which may indicate delay in markets' responses to the credit signals. The raw returns provide largely consistent results.

As part of the robustness tests for Panel B, it is important to consider independent versus clustered events (see Hill and Faff, 2010). Panel C of Table III presents the CARs surrounding independent negative sovereign credit signals. There are 27 independent negative credit signals in the sample resulting in 1304 bank CARs, which we also split by year but will not discuss here. For the whole sample of independent negative events, the pre-event CAR is -0.55% and significant, and is larger than the event window CAR of -0.22%, which is also significant. This suggests that the markets did anticipate the sovereign credit signals but not fully, since the event itself still caused a reaction. The insignificant post-event CAR suggests that there were no long run impact or inefficiencies in the market following the independent events, or possible over reactions to the event. The raw returns are fairly consistent, apart from the conflicting signs of the post-event CARs. The results of Panel C are quite consistent with Panel B.

Panel D of Table III presents the CARs surrounding clustered negative sovereign credit signals. There are 31 clustered negative credit signals in the sample resulting in 1458 bank CARs. We report pre-event, event and post-event CARs of -1.57%, -1.20% and -0.90%, respectively, which are all significant. This suggests strong market reactions to clustered

credit signals. The raw CARs are consistent in that the coefficients are significant and negative in all three windows, however, the event window CAR is weaker than the pre and post-event CARs, which doesn't agree with the mean-adjusted returns. However, the event window CARs are similar in both the mean-adjusted and raw returns.

It could be argued that the independent events would have a stronger market impact than the clustered events, since independent events should provide more new and valuable information since they are more unexpected. Clustered events are expected to move in the same direction as each other, and so after the initial movement one could expect no further market impact. However, this is not what we find. The results of Panels C and D show that the markets react more strongly to clustered rating events than they do to independent events. The explanation can be drawn from the credit data itself. The severe negative credit signals experienced by Greece, Iceland, Ireland, Portugal and Spain, by all three agencies in this time period, were often heavily clustered. The highly significant and negative CARs in Panel D may be indicating how strongly the negative credit signals experienced by these countries have been transmitted into the banking sector. e.g. on 6th October 2008, S&P downgraded Iceland to BBB from A- with negative outlook, on 8th October 2008 Fitch downgraded Iceland to BBB- from A- with negative watch, and also on 8th October 2008 Moody's downgraded Iceland to A+ from AA+ with negative watch. This is one example of very severe negative credit signals experienced by one sovereign by the three main agencies within two days of each other. The results of Panel D show that these types of credit events have had a significant impact on the European banking sector. The significantly negative pre-event CAR suggests that the banks were already facing downward pressure on their share prices and it is obviously not only the rating agencies' sovereign credit actions that are driving the prices down.

Panel E of Table III presents the CARs surrounding the negative credit signals to Greece, Ireland, Italy, Portugal and Spain only. The reason for focusing on sovereign credit signals for these countries specifically is because these are the Euro-Zone countries that have been in the spotlight of the sovereign debt crisis in recent times. There have been a total of 31 credit signals by S&P for these countries since 2009 (no signals in 2007 and 2008), 30 of which were negative signals, and only one positive signal. The one positive signal is when Greece's sovereign rating was changed to BBB+ with negative outlook, from BBB+ with negative watch on 16th March 2010. The pre and post-event CARs are -0.22% and -0.44%, respectively, and significant. The event window CAR is much stronger at -0.99% and significant, which suggests significant reactions to credit signals on these countries in this time period. These results were expected to be strong due to the severity of the actions applied to these sovereign ratings. For instance since 2009 Ireland and Spain both lost their AAA rating, Greece lost its investment grade status and Portugal has been modified to BBB- from AA- over the time period. The raw CARs have stronger coefficients but the inferences do not change. The CARs in Panel E aren't as strong as they are in Panel D which is mainly attributed to the very strongly negative CARs in 2008 in Panel D, whilst there are no observations in 2008 in Panel E.

Panel F of Table III presents the CARs surrounding negative outlook and watch signals only, to investigate whether the share prices have reacted more strongly to these types of signals compared to actual downgrades. There are 1351 bank CARs surrounding negative outlook and watch signals. We report that the event window and post-event CARs are both -0.46% and significant, which are weaker than the pre-event CAR of -0.84%. The event window CAR is weaker for the negative outlook and watch signals than for all negative signals in Panel B at -0.77%. This means that negative outlook and watch signals alone haven't had as strong an impact as actual downgrades and downgrades combined with

negative outlook and watch. But the CARs are still significant which implies that these signals do provide new and valuable information for the markets. The raw CARs are more strongly negative and the post-event raw CAR is stronger than the event window raw CAR.

When we compare the results of different negative credit signals (Panels B to F of Table III), for all years, we find that the clustered events have the strongest negative event window CAR and the independent events have the weakest negative event window CAR. The pre-event window CAR is larger than the event window CAR for the independent, clustered and negative outlook and watch events, which suggests slight market anticipation for these specific events. The post-event CAR is weaker than the event window CAR in each case (apart from in Panel E when they are equal), and is positive and insignificant for the independent events. We see the largest difference between the pre-event, event, and post-event window CARs for the negative credit signals of Greece, Ireland, Italy, Portugal and Spain, which suggests that the markets reacted more strongly to these events than to credit signals from other countries and that they were less anticipated. The raw CARs don't always present a similar pattern to the mean-adjusted CARs, however their statistical significance is largely similar.

4.1.3. Moody's positive credit signals

Panel A of Table IV presents the CARs of banks for periods around positive credit signals by Moody's. From Table I there a total of 18 positive rating events which gives 647 observations of bank CARs. For the whole period, we report that the pre-event, event and post-event CARs are -0.05%, -0.05% and -2.28%, respectively, whilst only the event and post-event CARs are significant. The raw returns display similar results, apart from the insignificant event window CAR. The post-event CAR is far more negative than the pre-

event and event window CARs which suggests that the positive credit signals by Moody's had a slight positive impact on the bank share prices, but only in the very short term.

We also split the positive credit signals by year in Panel A of Table IV. There are no observations in 2009. The event window CARs are negative and significant in 2008 and 2011 at -0.36% and -0.42%, respectively, and 0.24% and significant in 2010. The event window CAR is insignificant but positive in 2007. The pre-event window CAR is positive and insignificant in each year apart from 2011 where it is -0.75% and significant. The post-event window CARs are all significant and negative at -0.96%, -1.78%, -2.47% and -5.13% for years 2007, 2008, 2010 and 2011, respectively. The raw returns display largely similar results to the mean-adjusted returns. The pattern that emerges from the yearly sub-samples are similar and agree with the conclusion of the positive sample as a whole where the positive credit signals seemed to have had modest positive impacts on the share prices, due to the (negatively) weaker pre-event and event window CARs compared to the post-event CARs.

4.1.4. Moody's negative credit signals

Panel B of Table IV presents the CARs of banks surrounding negative sovereign credit signals by Moody's for the whole time period and also yearly sub-samples. The whole time period consists of 61 negative credit signals (see Table I) resulting in 2785 bank CARs. The event window CAR is -0.17% and significant, which is weaker than the post-event window CAR of -1.08%. The pre-event window CAR is positive and insignificant. The raw returns differ because the pre-event window CAR of -0.30% is significant. The results show that the bank share prices have reacted negatively to negative credit signals by Moody's, but the CAR in the post-event window may indicate slight longer term negative impacts or delayed responses to the negative credit signals made by Moody's.

The yearly subsamples of Panel B show that the event window CAR is negative and significant only in years 2008 and 2011 at -0.12% and -0.43%, respectively. The pre-event window is negative and significant in 2007, 2008 and 2011 at -0.94%, -0.65% and -0.49%, respectively. The pre-event window CAR is very strongly positive and significant in 2009 at 2.26%. The post-event CARs are only negative and significant in 2008 and 2011 at -5.30% and -1.65%, respectively. The post-event window CAR is positive and insignificant in 2009 and 2010, and negative and insignificant in 2007. The raw returns display largely consistent results to the mean-adjusted returns through the individual years. The results of Panel B through the years show that the markets reacted modestly to negative credit signals made by Moody's, with some mixed evidence on the market's anticipation. The post-event CARs are weak, apart from the events in years 2008 and 2011 which produced strong negative returns in the longer run. The event window CAR is only stronger (more negative or less positive) than the pre and post-event window CARs in 2009 and 2010.

As part of the robustness tests for Panel B, it is important to consider independent versus clustered events (see Hill and Faff, 2010). Panel C of Table IV presents the CARs surrounding independent negative sovereign credit signals made by Moody's. There are 29 independent negative credit signals in the sample resulting in 1416 bank CARs, which we also split by year but will not discuss here. For the whole sample of independent negative events, the event window CAR is -0.11% and significant, which is weaker than the post-event window CAR of -0.19%, but is insignificant. The pre-event window CAR is positive and significant at 0.51%. The raw returns follow a similar pattern where the CARs become more strongly negative from the pre-event window, event window and post-event window. However, the post-event window is most significant for the raw returns. The results do show a modest negative impact on bank share prices due to independent negative credit signals

made by Moody's, but no clear indication of market anticipation, along with possible inefficiencies in the market responding to the credit signals.

Panel D of Table IV presents the CARs surrounding clustered negative sovereign credit signals. There are 24 clustered negative credit signals in the sample resulting in 1219 bank CARs. The event window CAR is negative and significant at -0.44%, but is weaker than the post-event CAR which is -1.81%, and significant. The pre-event window CAR is zero and negatively significant. The raw returns draw the same implications because the CARs become more strongly negative from the pre-event window through to the post-event window. The results of the clustered negative credit signals by Moody's draw similar implications as Panels B and C where the credit signals do negatively impact the banks share prices, but there seem to be stronger long term impacts or inefficiencies in reacting to credit signals made by Moody's. There is slightly more evidence of market anticipation for the clustered events compared to the independent events.

Panel E of Table IV presents the CARs surrounding the negative credit signals to Greece, Ireland, Italy, Portugal and Spain only. There have been a total of 31 credit signals by Moody's for these countries since 2007, 30 of which were negative signals, and only one positive signal. The one positive signal is when Greece's outlook was changed to positive on 11th January 2007. We have 29 negative credit signals to these particular countries in Panel E (Portugal was downgraded with negative watch on 5th April 2011 but is taken out of this sample since Bulgaria was put on positive watch on the same day), which gives us 1477 bank CARs. The CARs become less negative from the pre-event window through to the post-event window. The CARs are -0.28%, -0.24% and -0.06% and significant for the pre-event, event and post-event windows, respectively. The event window CAR has the strongest *t*-statistic. The raw returns don't agree fully because the post-event window CAR is more negative than the event window CAR. However, the event window CAR still holds the strongest *t*-statistic.

The results suggest that the markets have anticipated the negative credit signals made by Moody's to these countries, or that the announcement followed an already significant downward trend in the banks' share prices. The credit signals themselves still impacted negatively on the share prices, as well as modest longer run effects after the credit announcements.

Panel F of Table IV presents the CARs surrounding negative outlook and watch signals only, to investigate whether the share prices have reacted more strongly to these types of signals compared to actual downgrades. There are 1364 bank CARs surrounding negative outlook and watch signals. We report that the pre-event window CAR is 0.67% and insignificant, and the event-window CAR is -0.12% and insignificant. The post-event window CAR is -0.64% and significant. The raw returns differ from the mean-adjusted returns since the event window CAR is now significant, and the pre-event window CAR is negative and still insignificant. The results of Panel F suggest at best modest share price reactions to the negative outlook and watch signals. The evidence suggests more long run impacts post-event, or possible inefficiencies.

The general pattern that emerges from the results of Panels B to F of Table IV is that negative credit signals by Moody's in our sample have generally followed periods of positive (or very weakly negative) bank CARs. This suggests that the markets did not anticipate the credit signals. The CARs are then more negative in the event windows (but still not highly negative), suggesting that the markets reacted modestly to the signals themselves. The post-event returns are more negative than the pre-event and event windows in Panels B, C, D and F, but not in Panel E. This indicates that the markets have may have underreacted to the negative credit signals during the event window.

4.1.5. Fitch positive credit signals

Panel A of Table V presents the CARs of banks for periods around positive credit signals by Fitch. From Table I there a total of 27 positive rating events which gives 1304 observations of bank CARs. For the whole period, we report that the pre-event, event and post-event window CARs are -0.73%, -0.40% and -0.36%, and significant. The raw returns display very similar results. The CARs become less negative from the pre-event window through to the post-event window, which suggests that the positive credit signals by Fitch had very modest effects in lowering the severity of negative returns from pre-event, to post-event.

We also split the positive credit signals by year in Panel A of Table V. The event window CARs are -0.79% and -0.78% and significant in 2010 and 2011, respectively. The event window CAR is 0.37% and significant in 2008, whilst being insignificant in 2007 and 2009. The pre-event window CARs are -0.89%, -1.22%, -2.00 and -0.52% and significant in years 2007, 2008, 2009 and 2011, respectively. The pre-event window CAR is insignificant but negative in 2010. The post-event window CARs are 1.34%, 1.04% and 1.25% and significant in years 2008, 2009 and 2010, respectively, whilst they are -1.03% and -2.30% and significant in years 2007 and 2011, respectively. The raw returns display largely similar results.

4.1.6. Fitch negative credit signals

Panel B of Table V presents the CARs of banks surrounding negative sovereign credit signals by Fitch for the whole time period and also yearly sub-samples. The whole time period consists of 53 negative credit signals resulting in 2113 bank CARs. The event window CAR is -0.21% and significant, which is weaker than the pre-event CAR of -0.77%, but stronger than the post-event CAR of -0.09% and significant. The raw returns differ because the event window CAR is the weakest at -0.32%, whilst the pre-event window CAR is still the strongest at -1.32%. The results show that the bank share prices have reacted negatively

to negative credit signals by Fitch, but the pre-event CAR is stronger which indicates market anticipation.

The yearly subsamples in Panel B show that the event window CAR is negative and significant only in years 2008 and 2011 at -0.94% and -0.45%, respectively, whilst it is positive and significant in years 2007 and 2010 at 0.74% and 0.45%, respectively. The event window CAR is negative and insignificant in 2009. The pre-event window CAR is negative and significant in 2007, 2008 and 2011 at -0.33%, -1.34% and -1.67%, respectively, whilst it is insignificant in 2009 and 2010. The post-event window CAR is negative and significant in years 2008, 2010 and 2011 at -2.96%, -1.10% and -0.36%, respectively, whilst it is positive and significant in 2009 at 4.55%. The post-event window CAR is insignificant in 2007. The raw returns display largely consistent results to the mean-adjusted returns through the individual years. The results of Panel B through the years show mixed patterns, however the event window CAR is never more negative than the pre-event window CAR (apart from in 2009). The post-event CAR is far more negative than the event window CAR in years 2008, 2010 and 2011, but far more positive in 2009.

As part of the robustness tests for Panel B, it is important to consider independent versus clustered events (see Hill and Faff, 2010). Panel C of Table V presents the CARs surrounding independent negative sovereign credit signals made by Fitch. There are 21 independent negative credit signals in the sample resulting in 949 bank CARs, which we also split by year but will not discuss here. For the whole sample of independent negative events, the pre-event, event and post-event window CARs are -1.62%, 0.20% and 1.98% and significant, respectively. The raw returns follow a similar pattern except that the event window CAR is insignificant. The pre-event window CAR suggests that there is market anticipation of independent negative credit signals by Fitch, whereas the reaction in the event

and post-event windows suggest that the markets have overreacted pre-event and so the CARs are positive afterwards.

Panel D of Table V presents the CARs surrounding clustered negative sovereign credit signals. There are 27 clustered negative credit signals in the sample resulting in 1063 bank CARs. The pre-event, event and post-event window CARs are -0.16%, -0.44% and -1.49% and significant. The raw returns differ slightly since the pre-event CAR is more negative than the event window CAR. The pattern of CARs suggests that the markets do not (or very modestly) anticipate the clustered events by Fitch. Then the returns become more negative in the event period, and again into the post-event window. This is different to the pattern seen in Panels B and C where the returns become more positive from the pre-event window through to the post-event window.

Panel E of Table V presents the CARs surrounding the negative credit signals to Greece, Ireland, Italy, Portugal and Spain only. There have been a total of 25 credit signals by Fitch for these countries since 2007, with only three positive signals for Greece, Portugal and Ireland in March 2007, May 2007 and April 2011, respectively. We have 22 negative credit signals to these particular countries in Panel E, which gives 1067 bank CARs. The pre-event, event and post-event window CARs are -0.85%, -0.01% and 1.07%, where the pre-event and post-event CARs are significant and the event window CAR is insignificant. The raw returns are similar. The results in Panel E have a similar pattern to those in Panels B and C where the returns become less negative from the pre-event window through to the post-event window. This again suggests that the markets have strongly anticipated the signals.

Panel F of Table V presents the CARs surrounding negative outlook and watch signals only, to find whether the markets have reacted more strongly to these types of signals compared to actual downgrades. There are 799 bank CARs surrounding negative outlook and watch signals by Fitch. We report that the pre-event, event and post-event window CARs are

-0.93%, -0.17% and 2.08%, where the pre-event and post-event CARs are significant and the event window CAR is insignificant. The pattern seen in Panel F is similar to that seen in Panels B and C and also Panel E suggesting that the markets have strongly anticipated the signals.

The pattern that emerges from the results of Panels B to F of Table V is that negative credit signals by Fitch in our sample have followed periods of negative (or in Panel D very weak negative) bank CARs. This suggests that the markets anticipated the negative credit signals. The CARs are then less negative in the event window in Panels B, C, E and F (positive in Panel C), whereas in Panel D the event window CAR is more negative than the pre-event window. The post-event CAR is then more positive than the event window CAR in Panels B, C, E and F (still negative in Panel B), whilst it is more negative in Panel D. The pattern that emerges for negative credit signals by Fitch (apart from in Panel D) is that the markets anticipate the signals.

4.2. Regression analysis

This section discusses the results of Eq. (2) and (3) which focus on negative credit signals only.

Table VI presents estimates of the coefficients of Eq. (2) using data for European sovereigns rated by S&P, Moody's and Fitch separately, over the period January 2007 to September 2011. The variable of interest is '$\Delta LCCR$', representing the 1-day change in the logit-type transformation of the 58-point rating of sovereign *s* at event date *t*. Negative credit signals by S&P are found to decrease the two day CAR (0, +1) around the event by 0.76%, whilst negative credit signals by Moody's are found to decrease the two day CAR by 0.87%. The negative credit signals by Fitch are not found to significantly affect the two day bank CAR. We also find that the event country's comprehensive credit rating (EC CCR) is

negative and significant for S&P, which implies that the higher the CCR of the event country, the weaker the effect of the negative news by S&P on the bank returns.

Table VII presents estimates of the coefficients of Eq. (3), which splits the '*ΔLCCR*' in Table VI into the different types of negative credit signals (combined-signals (downgrade plus negative outlook/watch) rating downgrade, negative outlook actions and negative watch announcements). The 'solo' negative outlook signal (i.e. with no rating change) is taken as the reference category.

For S&P, we find that the bank share prices react more significantly in the expected direction following sovereign downgrades (with no outlook/watch assignment). The downgrade and negative watch combined-signal has the second strongest impact, whilst the downgrade and negative outlook combined-signal has the third strongest impact on the banks' share prices. The bank's country's comprehensive credit rating (BC CCR) is positive and significant for S&P, which implies that the higher the CCR of the bank's country, the stronger the effect of the negative news by S&P on the bank returns. The event country's comprehensive credit rating (EC CCR) is negative and significant, which implies that the higher the CCR of the event country, the weaker the effect of the negative news by S&P on the bank returns.

For Moody's, we find that the downgrade and negative watch combined-signals has the strongest negative effect compared to the other signals. The downgrade and negative outlook combined-signal is the second strongest signal. The negative watch signal (with no rating change) is the third strongest followed by downgrades (with no outlook/watch assignment). The event country's comprehensive credit rating (EC CCR) is positive and significant, which implies that the higher the CCR of the event country, the stronger the effect of the negative news by Moody's on the bank returns.

For Fitch, we find that actual downgrades (with no outlook/watch assignment) have a slightly more positive and insignificant effect compared to negative outlook signals. The downgrade and negative watch combined-signal has the strongest negative effect, followed by downgrade and negative outlook combined-signal and then the negative watch signal (with no rating change).

The results of Table VII show significant differences in how the markets value different negative credit signals from the three agencies. For S&P, downgrades (with no outlook/watch assignments) have stronger negative impacts than combined-signals and even more strongly negative impacts compared to negative outlook/watch signals (with no rating change). The results are different for Moody's where the banks' share prices are more strongly affected in the expected direction by combined-signals and negative watch signals, compared to 'solo' downgrades and 'solo' negative outlook. For Fitch, the downgrade and negative watch combined-signal has the strongest impact on the banks' share prices.

5. Conclusions

This paper assesses the impact on banks' share prices of credit rating agencies' sovereign rating actions. For the period 2007-11, we investigate the reaction of the share prices of large European banks to European sovereign rating actions by Standard and Poor's, Moody's and Fitch. There is no clear evidence that sovereign rating actions are a driving force for falling bank share prices. While share prices fall significantly on the days of sovereign rating actions, there is ample evidence that prices were also falling prior to the negative rating news.

Significant differences are identified in the impact of rating actions across the three rating agencies. Fitch signals have lesser impact than those of the other two main rating agencies. We find that combined actions (downgrade plus outlook/watch action) tend to have

the strongest impact on bank share prices for Moody's and Fitch, whilst downgrades (with no outlook/watch actions) have the strongest effect for S&P. Negative watch actions are found to have a stronger effect than downgrades for Moody's and Fitch. The findings are important in the context of widespread calls for increased regulation of the credit rating industry.

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Figure 1
Country banking exposure to sovereign debt of Greece, Portugal, Spain, Ireland, Italy and Hungary

Exposure to Greece	**Tier 1 Capital**	**Exposure to Portugal**	**Tier 1 Capital**
Greece	226%	Portugal	69%
Germany	12%	Germany	7%
France	6%	Spain	4%
Cyprus	109%	France	3%
Belgium	14%	Belgium	9%
United kingdom	1%	United kingdom	1%
Netherlands	4%	Netherlands	3%
Italy	2%	Italy	0.3%
Portugal	9%	Austria	1%
Spain	1%	Ireland	1%
Exposure to Spain	**Tier 1 Capital**	**Exposure to Ireland**	**Tier 1 Capital**
Spain	113%	Germany	8%
Germany	21%	United kingdom	2%
France	4%	Ireland	26%
United kingdom	2%	|France	1%
Belgium	11%	Portugal	4%
Netherlands	2%	Belgium	2%
Italy	2%	Netherlands	1%
Ireland	2%	Cyprus	10%
Portugal	2%	Italy	0.3%
Austria	1%	Denmark	4%
Exposure to Italy	**Tier 1 Capital**	**Exposure to Hungary**	**Tier 1 Capital**
Italy	157%	Germany	5%
Germany	48%	Hungary	133%
France	26%	Austria	21%
Belgium	67%	Italy	2%
Netherlands	14%	Belgium	7%
United kingdom	4%	France	1%
Spain	3%	United kingdom	0.2%
Luxembourg	158%	Spain	0.1%
Austria	7%	Netherlands	0.2%
Portugal	6%	Greece	0.3%

2010 EU banking system stress test
Source: Blundell-Wignall and Slovik (2010)

Table I
Descriptive statistics

		S&P	Moody's	Fitch
1	**No. of countries**	19	17	17
2	Upgrades (solo)	8	4	8
3	Downgrades (solo)	6	8	8
4	**Total rating changes (solo)**	14	12	16
5	Positive outlook signals (solo)	15	10	13
6	Negative outlook signals (solo)	21	17	18
7	**Total outlook signals (solo)**	36	27	31
8	Positive watch signals (solo)	0	3	2
9	Negative watch signals (solo)	18	17	4
10	**Total watch signals (solo)**	18	20	6
11	Upgrades and positive outlook signal	0	1	1
12	Downgrades and negative outlook signal	26	21	20
13	Downgrades and negative watch signal	8	3	6
14	**Total combined-signals for a given sovereign (actual rating change and watch/outlook signal simultaneously)**	34	25	27
15	**Total sovereign credit signals (Rows 4 + 7 + 10 + 14)**	102	84	80
16	**Number of single event days**	76	60	61
	Two events	8*2=16	7*2=14	3*2=6
	Three events	2*3=6	2*3=6	3*3=9
	Four events	1*4=4	1*4=4	1*4=4
17	**Total positive signals**	28	20	27
18	**Total negative signals**	74	64	53
19	**Independent negative events**	35	34	24
20	**Clustered negative events**	39	30	29

This table presents summary statistics for the dataset, which consists of long-term foreign-currency ratings, outlooks and watch for sovereigns rated by Standard and Poor's, Moody's and Fitch during the period 1st January 2007 to 19th September 2011.

Note: Actions which involve moving from negative watch to negative outlook (with no rating change) are regarded as a positive signal in Row 17 There are five such cases for S&P, two for Moody's and three for Fitch. This explains why adding up the negative credit signals in Rows 3 + 6 + 9 + 12 + 13 ≠ Row 18, and adding up the positive credit signals in Rows 2 + 5 + 8 + 11 ≠ Row 17. See Section 3.2 for definition of independent and clustered events.

Table II
Banks

	Bank Name	Country
1	Erste Group Bank AG	Austria
2	Raiffeisen Bank International AG	Austria
3	Dexia	Belgium
4	KBC Groep NV	Belgium
5	Bank of Cyprus Public Company Limited	Cyprus
6	Marfin Popular Bank Public Company Limited	Cyprus
7	Danske Bank A/S	Denmark
8	Jyske Bank AS	Denmark
9	Nordjyske Bank A/S	Denmark
10	Sydbank A/S	Denmark
11	Pohjola Pankki A	Finland
12	BNP Paribas	France
13	Credit Agricole SA	France
14	Societe Generale	France
15	Commerzbank AG	Germany
16	Deutsche Bank AG	Germany
17	Landesbank Berlin Holding AG	Germany
18	Agricultural Bank of Greece SA	Greece
19	Alpha Bank SA	Greece
20	Bank Of Piraeus SA	Greece
21	EFG Eurobank Ergasias SA	Greece
22	National Bank of Greece SA	Greece
23	TT Hellenic Postbank SA	Greece
24	Allied Irish Banks PLC	Ireland
25	Bank of Ireland	Ireland
26	Irish Life & Permanent Group Holdings PLC	Ireland
27	Banca Monte dei Paschi	Italy
28	Banco Popolare	Italy
29	Intesa Sanpaolo	Italy
30	UBI Banca	Italy
31	Unicredit	Italy
32	DNB Nor ASA	Norway
33	PKO Bank SA	Poland
34	Banco BPI SA	Portugal
35	Banco Comercial Portugues	Portugal
36	Banco Bilbao Vizcaya Argentaria SA	Spain
37	Banco de Sabadell SA	Spain
38	Banco Pastor SA	Spain
39	Banco Popular Espanol SA	Spain
40	Banco Santander SA	Spain
41	Bankinter SA	Spain
42	Caixabank SA	Spain
43	Caja Ahorros Del Mediterraneo	Spain
44	Nordea Bank AB	Sweden
45	SE Banken	Sweden
46	Svenska Handelsbanken AB	Sweden
47	Swedbank AB	Sweden
48	Barclays PLC	United Kingdom
49	HSBC Holdings PLC	United Kingdom
50	Lloyds Banking Group PLC	United Kingdom
51	Royal Bank of Scotland Group PLC	United Kingdom

This table presents the banks and their country of origin which are included in our sample to determine the market impact. The 51 banks were part of the 2011 EU stress test which actually consisted of 91 banks. 40 banks were excluded because: (a) not listed; (b) illiquid shares; (c) share prices not available for the majority of the time window.

We gathered share prices for these banks for the period 2nd January 2006 to 6th October 2011. The share price time window is larger than the ratings in order to calculate the abnormal returns. Three of the 51 banks did not have share prices available for this whole period: (a) TT Hellenic Postbank SA (Row 23) from 5th June 2006; (b) Caixabank SA (Row 42) from 10th October 2007; (c) Caja Ahorros Del Mediterraneo (Row 43) from 28th July 2008.

Table III
Bank cumulative abnormal returns around S&P credit signals

		Mean-adjusted returns			*Raw returns*			
	N	*Pre-event*	*Event*	*Post-event*	*Pre-event*	*Event*	*Post-event*	
Panel A: Positive rating events								
All events	1313	-0.0052**	-0.0005	-0.0015*	-0.0064**	-0.0008	-0.0027	*coeff*
		-4.41	-0.87	-2.40	-5.52	-1.33	-1.94	*t-stat*
2007	97	0.0178**	0.0073**	0.0039*	0.0195**	0.0076**	0.0056**	*coeff*
		11.26	7.34	2.17	12.75	6.95	2.70	*t-stat*
2008	197	-0.0056	0.0025	-0.0060	-0.0151**	0.0006	-0.0155**	*coeff*
		-0.84	-0.46	-1.69	-5.55	0.44	-5.87	*t-stat*
2009	254	0.0131**	0.0053**	0.0242**	0.0089**	0.0045**	0.0200**	*coeff*
		3.12	4.56	5.43	3.18	3.53	6.63	*t-stat*
2010	510	-0.0023	-0.0048**	-0.0084	0.0027*	-0.0038**	-0.0034*	*coeff*
		-0.47	-4.01	-6.32	2.08	-4.25	-2.40	*t-stat*
2011	255	-0.0378**	-0.0032	-0.0117**	-0.0430**	-0.0043*	-0.0170**	*coeff*
		-13.67	-1.95	-2.94	-14.56	-2.53	-3.43	*t-stat*
Panel B: Negative rating events								
All events	3065	-0.0061**	-0.0077**	-0.0024**	-0.0124**	-0.0089**	-0.0087**	*coeff*
		-10.20	-12.81	-5.43	-10.26	-13.53	-7.65	*t-stat*
2007	341	-0.0072**	-0.0014*	-0.0081**	-0.0043**	-0.0008	-0.0052**	*coeff*
		-6.31	-2.32	-6.14	-3.84	-1.61	-3.60	*t-stat*
2008	695	-0.0315**	-0.0147**	-0.0026	-0.0407**	-0.0165**	-0.0118**	*coeff*
		-13.63	-9.11	-0.02	-16.16	-9.39	-4.72	*t-stat*
2009	754	0.0192**	-0.0139**	0.0126**	0.0057	-0.0166**	-0.0009	*coeff*
		5.21	-10.48	3.97	1.61	-10.49	-0.28	*t-stat*
2010	612	-0.0047**	0.0005	0.0034*	-0.0062**	0.0002	0.0018	*coeff*
		-4.13	0.33	2.17	-3.98	0.26	1.19	*t-stat*
2011	663	-0.0090**	-0.0041**	-0.0217**	-0.0130**	-0.0049**	-0.0257**	*coeff*
		-6.11	-4.66	-11.81	-6.86	-3.93	-11.01	*t-stat*
Panel C: Independent negative rating events								
All events	1304	-0.0055**	-0.0022**	0.0015	-0.0081**	-0.0027**	-0.0011	*coeff*
		-8.25	-4.86	0.14	-7.28	-4.78	-1.05	*t-stat*
2007	341	-0.0072**	-0.0014*	-0.0081**	-0.0043**	-0.0008	-0.0052**	*coeff*
		-6.31	-2.32	-6.14	-3.84	-1.61	-3.60	*t-stat*
2008	98	-0.0154**	-0.0049*	0.0433**	-0.0234**	-0.0065**	0.0353**	*coeff*
		-6.07	-2.24	11.70	-10.05	-2.81	9.25	*t-stat*
2009	151	0.0064	-0.0015	-0.0050*	-0.0016	-0.0031**	-0.0129**	*coeff*
		0.30	-1.18	-2.43	-0.40	-2.57	-3.93	*t-stat*
2010	459	-0.0070**	0.0009	0.0057**	-0.0100**	0.0003	0.0027	*coeff*
		-4.68	1.50	2.90	-5.42	0.27	1.51	*t-stat*
2011	255	-0.0038	-0.0081**	-0.0058*	-0.0077*	-0.0089**	-0.0097**	*coeff*
		-1.32	-8.37	-2.47	-2.19	-5.03	-3.44	*t-stat*

Table IV continued

		Mean-adjusted returns			*Raw returns*			
	N	*Pre-event*	*Event*	*Post-event*	*Pre-event*	*Event*	*Post-event*	
Panel D: Clustered negative rating events								
All events	1458	-0.0157**	-0.0120**	-0.0090**	-0.0245**	-0.0137**	-0.0178**	*coeff*
		-10.29	-10.48	-8.29	-12.13	-11.35	-9.36	*t-stat*
2007	0							*coeff*
								t-stat
2008	547	-0.0318**	-0.0155**	-0.0160**	-0.0412**	-0.0174**	-0.0253**	*coeff*
		-10.88	-7.95	-5.83	-13.66	-8.44	-9.17	*t-stat*
2009	401	-0.0024	-0.0224**	0.0225**	-0.0189**	-0.0257**	0.0060	*coeff*
		-0.37	-10.28	5.12	-3.47	-9.44	1.32	*t-stat*
2010	153	0.0024	-0.0005	-0.0037	0.0052	0.0001	-0.0009	*coeff*
		0.23	-1.50	-0.58	1.93	0.05	-0.30	*t-stat*
2011	357	-0.0137**	0.0004	-0.0360**	-0.0181**	-0.0005	-0.0404**	*coeff*
		-6.30	0.79	-13.25	-7.53	-0.29	-11.87	*t-stat*
Panel E: Negative rating events to specific countries								
All events	1318	-0.0022**	-0.0099**	-0.0044**	-0.0087**	-0.0112**	-0.0109**	*coeff*
		-3.94	-11.50	-4.81	-4.97	-10.43	-5.48	*t-stat*
2007	0							*coeff*
								t-stat
2008	0							*coeff*
								t-stat
2009	553	0.0104**	-0.0180**	0.0025	-0.0010	-0.0203**	-0.0089*	*coeff*
		2.87	-11.12	0.63	-0.26	-9.95	-2.35*	*t-stat*
2010	306	-0.0232**	-0.0031*	0.0064*	-0.0245**	-0.0034*	0.0050*	*coeff*
		-13.91	-2.40	2.28	-12.63	-2.31	2.37	*t-stat*
2011	459	-0.0035**	-0.0047**	-0.0198**	-0.0075**	-0.0055**	-0.0238**	*coeff*
		-3.09	-5.27	-9.43	-4.67	-3.73	-8.03	*t-stat*
Panel F: Negative outlook and watch signals								
All events	1351	-0.0084**	-0.0046**	-0.0046*	-0.0122**	-0.0054**	-0.0084**	*coeff*
		-8.00	-6.08	-2.54	-7.09	-7.19	-5.20	*t-stat*
2007	292	-0.0081**	-0.0021**	-0.0078**	-0.0056**	-0.0016**	-0.0052**	*coeff*
		-6.37	-3.46	-5.34	-4.48	-2.82	-3.22	*t-stat*
2008	247	-0.0285**	-0.0216**	0.0183**	-0.0357**	-0.0230**	0.0110**	*coeff*
		-8.37	-8.14	5.80	-9.86	-9.03	3.13	*t-stat*
2009	302	0.0020	-0.0114**	-0.0237**	-0.0076	-0.0134**	-0.0333**	*coeff*
		0.99	-8.13	-5.44	-1.36	-7.83	-6.35	*t-stat*
2010	357	0.0071**	0.0086**	0.0052**	0.0050**	0.0082**	0.0032	*coeff*
		3.25	10.82	3.16	2.68	8.93	1.63	*t-stat*
2011	153	-0.0330**	0.0004	-0.0203**	-0.0361**	-0.0002	-0.0235**	*coeff*
		-7.46	0.68	-5.00	-6.05	-0.15	-5.65	*t-stat*

This table presents the results of the bank cumulative abnormal returns (CARs) around the time of sovereign credit signals by S&P in the period 1st January 2007 to 19th September 2011. Following Hill and Faff (2010) we report the pre-event (-10, -1), the two-day event (0, +1) and the post-event (+2, +11) mean-adjusted and raw CARs. Mean-adjusted returns calculations are specified in Section 3.2. *t*-statistics are the Boehmer at al. (1991) standardized cross-sectional *t*-statistics.

** Significant at the 1% level; * significant at 5% level.

Table IV
Bank cumulative abnormal returns around Moody's credit signals

		Mean-adjusted returns			*Raw returns*			
	N	*Pre-event*	*Event*	*Post-event*	*Pre-event*	*Event*	*Post-event*	
Panel A: Positive rating events								
All events	647	-0.0005	-0.0005*	-0.0228**	-0.0002	-0.0005	-0.0225**	*coeff*
		-0.10	-2.57	-16.87	-0.15	-0.69	-15.93	*t-stat*
2007	194	0.0000	0.0007	-0.0096**	0.0039**	0.0015*	-0.0057**	*coeff*
		0.15	0.20	-7.08	3.59	2.20	-4.49	*t-stat*
2008	147	0.0031	-0.0036**	-0.0178**	-0.0019	-0.0046**	-0.0228**	*coeff*
		0.51	-3.86	-7.76	-0.82	-4.73	-10.14	*t-stat*
2009	0							*coeff*
								t-stat
2010	204	0.0000	0.0024**	-0.0247**	0.0037	0.0031*	-0.0210**	*coeff*
		0.50	3.24	-11.17	1.58	2.35	-10.00	*t-stat*
2011	102	-0.0075*	-0.0042**	-0.0513**	-0.0130**	-0.0053*	-0.0568**	*coeff*
		-1.98	-5.36	-10.48	-3.03	-2.05	-10.46	*t-stat*
Panel B: Negative rating events								
All events	2785	0.0038	-0.0017**	-0.0108**	-0.0030**	-0.0031**	-0.0176**	*coeff*
		0.93	-6.37	-11.22	-2.63	-6.76	-12.62	*t-stat*
2007	49	-0.0094**	0.0022	-0.0003	-0.0083**	0.0024	0.0007	*coeff*
		-4.15	1.70	-0.09	-3.95	1.95	0.31	*t-stat*
2008	398	-0.0065**	-0.0012*	-0.0530**	-0.0178**	-0.0035*	-0.0643**	*coeff*
		-3.72	-2.01	-13.83	-6.18	-2.29	-16.49	*t-stat*
2009	706	0.0226**	-0.0014	0.0047	0.0110**	-0.0037**	-0.0069*	*coeff*
		7.70	-1.67	1.06	4.02	-3.29	-2.01	*t-stat*
2010	765	0.0025	0.0004	0.0024	0.0000	-0.0001	-0.0001	*coeff*
		1.36	0.24	1.23	-0.03	-0.12	-0.09	*t-stat*
2011	867	-0.0049*	-0.0043**	-0.0165**	-0.0097**	-0.0053**	-0.0212**	*coeff*
		-2.42	-9.38	-9.88	-4.54	-7.97	-8.95	*t-stat*
Panel C: Independent negative rating events								
All events	1416	0.0051*	-0.0011**	-0.0019	-0.0023	-0.0026**	-0.0093**	*coeff*
		2.13	-2.58	-1.62	-1.44	-4.15	-5.38	*t-stat*
2007	49	-0.0094**	0.0022	-0.0003	-0.0083**	0.0024	0.0007	*coeff*
		-4.15	1.70	-0.09	-3.95	1.95	0.31	*t-stat*
2008	148	0.0018	0.0062	-0.0103*	-0.0095*	0.0039	-0.0216**	*coeff*
		-1.31	0.86	-2.03	-2.48	1.83	-5.96	*t-stat*
2009	454	0.0117**	-0.0060**	-0.0054	0.0007	-0.0082**	-0.0164**	*coeff*
		3.36	-4.81	-1.54	0.18	-5.98	-3.78	*t-stat*
2010	408	0.0107**	0.0018*	0.0146*	0.0071**	0.0010	0.0109**	*coeff*
		6.32	2.35	7.35	3.71	1.28	5.43	*t-stat*
2011	357	-0.0064*	-0.0018*	-0.0131*	-0.0129**	-0.0031**	-0.0196**	*coeff*
		-2.45	-3.04	-6.70	-3.79	-2.65	-7.53	*t-stat*

Table IV continued

		Mean-adjusted returns			*Raw returns*			
	N	*Pre-event*	*Event*	*Post-event*	*Pre-event*	*Event*	*Post-event*	
Panel D: Clustered negative rating events								
All events	1219	0.0000*	-0.0044**	-0.0181**	-0.0049**	-0.0054**	-0.0230**	*coeff*
		-2.05	-8.76	-11.48	-2.88	-8.22	-10.98	*t-stat*
2007	0							*coeff*
								t-stat
2008	150	-0.0206**	-0.0106**	-0.0527**	-0.0330**	-0.0130**	-0.0650**	*coeff*
		-4.41	-4.02	-9.00	-5.66	-4.23	-10.28	*t-stat*
2009	202	0.0370**	-0.0015	-0.0023	0.0282**	-0.0033	-0.0111	*coeff*
		6.40	-0.88	-0.78	6.11	-1.95	-1.92	*t-stat*
2010	357	-0.0068**	-0.0011	-0.0114**	-0.0082**	-0.0014	-0.0128**	*coeff*
		-4.91	-1.42	-5.34	-4.76	-1.27	-6.27	*t-stat*
2011	510	-0.0039	-0.0061**	-0.0188**	-0.0075**	-0.0069**	-0.0224**	*coeff*
		-1.01	-10.41	-7.66	-2.72	-8.85	-6.22	*t-stat*
Panel E: Negative rating events to specific countries								
All events	1477	-0.0028*	-0.0024**	-0.0006**	-0.0070**	-0.0032**	-0.0048**	*coeff*
		-2.00	-7.53	-3.62	-4.24	-6.08	-3.38	*t-stat*
2007	0							*coeff*
								t-stat
2008	0							*coeff*
								t-stat
2009	304	-0.0046	0.0049*	0.0186**	-0.0113*	0.0036**	0.0119**	*coeff*
		-1.38	3.92	5.52	-2.39	2.65	4.24	*t-stat*
2010	561	-0.0008	-0.0014	0.0018	-0.0031*	-0.0018*	-0.0006	*coeff*
		-0.93	-1.77	0.41	-2.04	-2.44	-0.29	*t-stat*
2011	612	-0.0037	-0.0069**	-0.0124**	-0.0083**	-0.0078**	-0.0170**	*coeff*
		-1.22	-12.03	-7.56	-2.91	-10.03	-6.85	*t-stat*
Panel F: Negative outlook and watch								
All events	1364	0.0067	-0.0012	-0.0064**	-0.0013	-0.0028**	-0.0143**	*coeff*
		1.13	-1.86	-4.56	-0.72	-4.10	-6.98	*t-stat*
2007	49	-0.0094**	0.0022	-0.0003	-0.0083**	0.0024	0.0007	*coeff*
		-4.15	1.70	-0.09	-3.95	1.95	0.31	*t-stat*
2008	199	-0.0063**	0.0124**	-0.0612**	-0.0181**	0.0101**	-0.0730**	*coeff*
		-2.87	5.22	-9.89	-4.74	5.07	-11.89	*t-stat*
2009	402	0.0274**	-0.0093**	0.0107**	0.0116**	-0.0125**	-0.0052	*coeff*
		7.46	-2.83	5.17	2.59	-8.05	-1.19	*t-stat*
2010	408	0.0004	-0.0007	0.0040**	-0.0022	-0.0012	0.0014	*coeff*
		-0.61	-1.35	3.08	-1.09	-1.27	0.85	*t-stat*
2011	306	-0.0013*	-0.0005**	-0.0080**	-0.0049*	-0.0012*	-0.0115**	*coeff*
		-2.19	-3.34	-3.79	-2.57	-2.53	-4.40	*t-stat*

This table presents the results of the bank cumulative abnormal returns (CARs) around the time of sovereign credit signals by Moody's in the period 1st January 2007 to 19th September 2011. Following Hill and Faff (2010) we report the pre-event (-10, -1), the two-day event (0, +1) and the post-event (+2, +11) mean-adjusted and raw CARs. Mean-adjusted returns calculations are specified in Section 3.2. *t*-statistics are the Boehmer at al. (1991) standardized cross-sectional *t*-statistics.

** Significant at the 1% level; * significant at 5% level.

Table V
Bank cumulative abnormal returns around Fitch credit signals

		Mean-adjusted returns			*Raw returns*			
	N	*Pre-event*	*Event*	*Post-event*	*Pre-event*	*Event*	*Post-event*	
Panel A: Positive rating events								
All events	1304	-0.0073**	-0.0040**	-0.0036**	-0.0074**	-0.0040**	-0.0037*	*coeff*
		-7.35	-9.93	-4.87	-6.95	-9.15	-2.52	*t-stat*
2007	291	-0.0089**	0.0002	-0.0103**	-0.0063**	0.0007	-0.0077**	*coeff*
		-8.04	0.30	-8.21	-5.58	1.46	-6.11	*t-stat*
2008	197	-0.0122**	0.0037*	0.0134**	-0.0219**	0.0018	0.0036	*coeff*
		-3.13	2.31	3.28	-6.73	1.63	1.07	*t-stat*
2009	51	-0.0200**	-0.0007	0.0104*	-0.0075*	0.0018*	0.0229**	*coeff*
		-4.88	-0.55	2.28	-2.09	2.51	5.71	*t-stat*
2010	357	-0.0039	-0.0079**	0.0125**	0.0009	-0.0069**	0.0174**	*coeff*
		-0.71	-9.29	7.13	0.51	-7.46	8.51	*t-stat*
2011	408	-0.0052*	-0.0078**	-0.0230**	-0.0083**	-0.0085**	-0.0262**	*coeff*
		-2.33	-11.75	-9.47	-3.64	-9.67	-7.37	*t-stat*
Panel B: Negative rating events								
All events	2113	-0.0077**	-0.0021**	-0.0009**	-0.0132**	-0.0032**	-0.0064**	*coeff*
		-7.77	-3.34	-4.51	-9.19	-4.88	-4.57	*t-stat*
2007	194	-0.0033*	0.0074**	0.0001	-0.0013	0.0078**	0.0021	*coeff*
		-2.14	12.38	0.58	-0.57	13.51	1.40	*t-stat*
2008	547	-0.0134**	-0.0094**	-0.0296**	-0.0223**	-0.0112**	-0.0385**	*coeff*
		-4.28	-6.25	-11.83	-6.55	-7.44	-13.23	*t-stat*
2009	454	0.0012	-0.0005	0.0455**	-0.0114**	-0.0030	0.0329**	*coeff*
		-0.53	-1.38	13.02	-3.08	-1.75	10.24	*t-stat*
2010	408	-0.0007	0.0045**	-0.0110**	0.0000	0.0046**	-0.0101**	*coeff*
		-1.12	6.25	-6.67	0.01	5.47	-6.45	*t-stat*
2011	510	-0.0167**	-0.0045**	-0.0036*	-0.0201**	-0.0052**	-0.0071*	*coeff*
		-7.83	-6.02	-2.22	-7.15	-4.14	-2.43	*t-stat*
Panel C: Independent negative rating events								
All events	949	-0.0162**	0.0020**	0.0198**	-0.0227**	0.0007	0.0135**	*coeff*
		-8.90	3.97	6.26	-9.04	0.79	6.67	*t-stat*
2007	194	-0.0033*	0.0074**	0.0001	-0.0013	0.0078**	0.0021	*coeff*
		-2.14	12.38	0.58	-0.57	13.51	1.40	*t-stat*
2008	198	-0.0422**	0.0031	0.0074	-0.0494**	0.0017	0.0002	*coeff*
		-7.93	0.66	0.74	-8.10	1.12	0.08	*t-stat*
2009	302	-0.0074*	-0.0001	0.0649**	-0.0243**	-0.0035	0.0480**	*coeff*
		-2.39	-1.10	14.48	-4.79	-1.56	11.35	*t-stat*
2010	153	-0.0115**	0.0025*	-0.0072**	-0.0098**	0.0028*	-0.0049*	*coeff*
		-5.08	2.43	-2.83	-3.79	2.38	-2.09	*t-stat*
2011	102	-0.0239**	-0.0053**	-0.0120**	-0.0257*	-0.0056**	-0.0139	*coeff*
		-2.98	-4.34	-2.74	-2.33	-3.02	-1.49	*t-stat*

Table V continued

		Mean-adjusted returns			*Raw returns*			
	N	*Pre-event*	*Event*	*Post-event*	*Pre-event*	*Event*	*Post-event*	
Panel D: Clustered negative rating events								
All events	1063	-0.0016*	-0.0044**	-0.0149**	-0.0062**	-0.0053**	-0.0195**	*coeff*
		-2.50	-4.99	-9.35	-3.68	-5.26	-10.75	*t-stat*
2007	0							*coeff*
								t-stat
2008	299	-0.0006	-0.0153**	-0.0449**	-0.0105**	-0.0173**	-0.0548**	*coeff*
		0.09	-6.15	-13.99	-2.63	-7.87	-15.41	*t-stat*
2009	152	0.0184**	-0.0011	0.0070*	0.0144**	-0.0019	0.0031	*coeff*
		3.88	-0.84	2.15	3.98	-0.78	0.86	*t-stat*
2010	204	0.0088**	0.0090**	-0.0139**	0.0098**	0.0092**	-0.0128**	*coeff*
		3.89	9.88	-5.64	4.29	8.44	-5.86	*t-stat*
2011	408	-0.0149**	-0.0044**	-0.0015	-0.0188**	-0.0051**	-0.0054	*coeff*
		-7.73	-4.75	-0.74	-8.52	-3.39	-1.92	*t-stat*
Panel E: Negative rating events to specific countries								
All events	1067	-0.0085**	-0.0001	0.0107**	-0.0129**	-0.0010	0.0063**	*coeff*
		-6.68	-0.19	4.89	-6.65	-1.12	3.63	*t-stat*
2007	0							*coeff*
								t-stat
2008	50	-0.1404**	0.0150**	0.0055	-0.1483**	0.0134**	-0.0024	*coeff*
		-12.46	4.00	1.08	-10.46	3.61	-0.32	*t-stat*
2009	354	0.0037	-0.0015	0.0392**	-0.0049	-0.0032	0.0306**	*coeff*
		0.11	-1.42	9.48	-1.21	-1.78	8.07	*t-stat*
2010	357	-0.0018	0.0034**	-0.0076**	-0.0027	0.0032**	-0.0082**	*coeff*
		-1.45	4.77	-4.65	-1.41	3.66	-5.14	*t-stat*
2011	306	-0.0088**	-0.0051**	-0.0001	-0.0121**	-0.0057**	-0.0033	*coeff*
		-5.69	-4.50	0.07	-6.36	-2.97	-1.06	*t-stat*
Panel F: Negative outlook and watch								
All events	799	-0.0093**	-0.0017	0.0208**	-0.0186**	-0.0036**	0.0114**	*coeff*
		-4.14	-1.13	4.90	-7.02	-3.27	5.25	*t-stat*
2007	97	0.0216**	0.0055**	-0.0076**	0.0222**	0.0056**	-0.0070**	*coeff*
		8.79	7.87	-3.66	9.21	8.40	-3.24	*t-stat*
2008	247	-0.0392**	-0.0029	-0.0103**	-0.0451**	-0.0041	-0.0162**	*coeff*
		-7.68	-0.99	-4.47	-8.30	-1.82	-6.01	*t-stat*
2009	251	0.0049	-0.0031*	0.0802**	-0.0172**	-0.0075**	0.0581**	*coeff*
		0.24	-2.39	16.86	-2.95	-2.92	12.23	*t-stat*
2010	51	-0.0002	0.0036**	-0.0164**	-0.0029	0.0031	-0.0190**	*coeff*
		-0.43	2.83	-4.88	-0.90	1.78	-4.43	*t-stat*
2011	153	-0.0067**	-0.0039**	0.0038	-0.0095**	-0.0045**	0.0011	*coeff*
		-3.11	-3.74	0.79	-3.88	-4.12	0.36	*t-stat*

This table presents the results of the bank cumulative abnormal returns (CARs) around the time of sovereign credit signals by Fitch in the period 1st January 2007 to 19th September 2011. Following Hill and Faff (2010) we report the pre-event (-10, -1), the two-day event (0, +1) and the post-event (+2, +11) mean-adjusted and raw CARs. Mean-adjusted returns calculations are specified in Section 3.2. *t*-statistics are the Boehmer at al. (1991) standardized cross-sectional *t*-statistics.

** Significant at the 1% level; * significant at 5% level.

Table VI
Regression analysis of bank share price reactions to negative sovereign credit signals

		Mean-adjusted returns		Raw returns	
		Coeff	*t*-Val	Coeff	*t*-Val
S&P	Constant	0.0322	1.78	0.0293	1.62
	Δ*LCCR*	-0.0076**	-2.65	-0.0095**	-3.32
	Lag Δ*LCCR*	0.0025	0.40	0.0031	0.49
	BC CCR	0.0004	1.83	0.0004*	2.20
	EC CCR	-0.001**	-4.80	-0.001**	-4.92
	Y/Co/Ba	Yes		Yes	
	R^2	9.43%		10.68%	
	Obs.	3646		3646	
Moody's	Constant	-0.0319**	-3.26	-0.0324**	-3.26
	Δ*LCCR*	-0.0087**	-7.55	-0.0099**	-8.68
	Lag Δ*LCCR*	0.0000	0.01	0.0004	0.17
	BC CCR	-0.0001	-0.60	0.0000	0.04
	EC CCR	-0.0001	-0.67	-0.0001	-1.4
	Y/Co/Ba	Yes		Yes	
	R^2	25.18%		24.86%	
	Obs.	3171		3171	
Fitch	Constant	-0.1456**	-5.33	-0.1480**	-5.44
	Δ*LCCR*	-0.0041	-1.30	-0.0047	-1.49
	Lag Δ*LCCR*	-0.0267*	-1.97	-0.0290*	-2.13
	BC CCR	0.0008*	2.29	0.0009**	2.64
	EC CCR	0.0011**	5.42	0.0011**	5.31
	Y/Co/Ba	Yes		Yes	
	R^2	17.75%		17.85%	
	Obs.	2610		2610	

This table presents the coefficient estimates of Eq. (2) using data samples of European countries rated by S&P, Moody's and Fitch during January 2007 - September 2011. CAR_{it} ($CARR_{it}$): the dependent variable, is the mean-adjusted (raw) cumulative abnormal return of bank *i* in the event window (0, +1) around a negative European sovereign credit signal at time *t*. $\Delta LCCR_{st}$ is the 1-day change in the logit-type transformation of the 58-point rating scale of sovereign *s* at time *t*. *Lag ΔLCCR* is the cumulative change in the LCCR of the bank's country's sovereign rating during the ten days (-10 to -1) preceding the event. *BC CCR* is the level of the bank's country's comprehensive credit rating. *EC CCR* is the level of the event country comprehensive credit rating. Full sets of year/event country/bank dummy variables included. We apply Huber-White robust standard errors.
** Significant at 1% level; * significant at 5% level.

Table VII
Regression analysis with split negative credit signals

		Mean-adjusted returns		Raw returns	
		Coeff	*t*-Val	Coeff	*t*-Val
S&P	Constant	0.0298*	1.99	0.0230	1.55
	NOD	-0.0054**	-3.13	-0.0071**	-4.19
	NWD	-0.0079**	-3.09	-0.0092**	-3.58
	NW	-0.0032	-1.62	-0.0048*	-2.48
	DN	-0.0194**	-4.51	-0.0222**	-5.14
	Lag ΔLCCR	-0.0043	-0.69	-0.0046	-0.74
	BC CCR	0.0004*	2.05	0.0005*	2.45
	EC CCR	-0.0010**	-5.81	-0.0010**	-5.79
	Y/Co/Ba	Yes		Yes	
	R^2	10.38%		11.80%	
	Obs.	3646		3646	
Moody's	Constant	-0.0661**	-6.60	-0.0694**	-6.85
	NOD	-0.0110**	-6.89	-0.0111**	-6.98
	NWD	-0.0139**	-5.32	-0.0141**	-5.40
	NW	-0.0104**	-6.02	-0.0108**	-6.28
	DN	-0.0064**	-4.43	-0.0066**	-4.58
	Lag ΔLCCR	-0.0004	-0.18	-0.0001	-0.04
	BC CCR	-0.0001	-0.53	0.0000	0.12
	EC CCR	0.0003**	3.40	0.0003**	3.01
	Y/Co/Ba	Yes		Yes	
	R^2	25.63%		24.98%	
	Obs.	3171		3171	
Fitch	Constant	-0.2014**	-6.81	-0.2073**	-7.01
	NOD	-0.0112**	-6.27	-0.0112**	-6.27
	NWD	-0.0175**	-6.24	-0.0180**	-6.47
	NW	-0.0106**	-2.96	-0.0113**	-3.15
	DN	0.0008	0.43	0.0012	0.67
	Lag ΔLCCR	-0.0275*	-2.01	-0.0299*	-2.17
	BC CCR	0.0008*	2.30	0.0009**	2.66
	EC CCR	0.0016**	7.24	0.0016**	7.26
	Y/Co/Ba	Yes		Yes	
	R^2	19.68%		19.90%	
	Obs.	2610		2610	

This table presents the coefficient estimates of Eq. (3) where the $\Delta LCCR_{st}$ variable in Table VI has been split into its constituent credit signals: NOD_{st} is the combined-signal of a downgrade and negative outlook action to sovereign *s* at time *t*; NWD_{st} is the combined-signal of a downgrade and negative watch action to sovereign *s* at time *t*; NW_{st} is when sovereign *s* is put on negative watch at time *t*; DN_{st} is when sovereign *s* is downgraded at time *t*. CAR_{it} ($CARR_{it}$), *Lag ΔLCCR*, *BC CCR* are *EC CCR* are included as in Eq. (2), (see Table VI and section 3.3). Full sets of year/event country/bank dummy variables included. We apply Huber-White robust standard errors.

** Significant at 1% level; * significant at 5% level.