Insider Trading Prior to Credit Rating Downgrades? Evidence from the European Sovereign Crisis

Arturo Bris*

IMD, Yale ICF, ECGI

April 2017

*IMD, Chemin de Bellerive 23, P.O. Box 915, CH-1001 Lausanne, Switzerland. Tel: +41 21 6180111; email: arturo.bris@imd.org.

Abstract

Our paper presents strong evidence of securities lending market anticipation of sovereign bond dowgrades in Europe during the period $2008 - 2012$. We construct a sample of bonds from 18 European countries which includes members of the Euroland; EU, non-euro members, as well as non-EU countries. We find that, in the five days preceding a downgrade to speculative grade, securities lending demand and supply increase significantly with respect to the non-downgrade periods for the same issue. We rule out that CRAs use this information to form their decision regarding the downgrade because of the special $T + 3 + 1$ settlement and reporting period for securities lending transactions in Europe. We find that the increases in lending demand and supply are only significant for downgrades that surprise the market, i.e. downgrades that are not preceded by a previous downgrade or an outlook revision within the past 30 days. The difference in results between these two types of downgrades is evidence against investors using publicly available information to benefit from securities lending.

"*Question 5e*: Could a short sale on sovereign debt be considered covered by a repo contract executed in the days following the short sale but with the same settlement date as the short sale (e.g. a spot next repo for a T+3 cash sale)? *Answer 5e*: Yes, it is possible to cover a short sale by entering into a repo contract afterwards provided that:

1/ prior to the short sale, the short seller entered into one of the arrangements with a third party under article 13(1)(c) of the Regulation and article 7 of the ITS (e.g. obtained an "easy to purchase sovereign debt confirmation" according to article 7(5));

2/ the repo contract has an earlier or the same settlement date as the short sale, so that the delivery of the relevant sovereign debt can be effected when it is due."

"Questions and Answers: Implementation of the Regulation on short selling and certain aspects of credit default swaps", European Securities Markets Authority, September 13, 2012

I Introduction

The Washington Summit of the G-20 Leaders on November 15 2008 marked the beginning of a regulatory revolution in financial markets that is still going on. On the background of such regulatory overhaul was the Lehman Brothers collapse and its devastating consequences, including the social pressure to control the incentives of financial institutions and their executives, to enhance transparency and accountability, and to restore trust in financial markets. Credit Rating Agencies (CRAs), as an important agent in these, were partly blamed for the crisis because of their inability to appropriately identify the risks of certain firms and securities. World leaders encouraged financial regulators to design and enact rules that would ensure that "*credit rating agencies meet the highest standards [...] and that they avoid conflicts of interest, provide greater disclosure to investors and to issuers, and differentiate ratings for complex products.*"[1] Almost ten years later, such call for stringent regulation of CRAs has mainly materialized into the specific provisions contained in the Dodd–Frank Wall Street Reform and Consumer Protection Act (2010), and especially in the EU Regulation on Credit Rating Agencies approved by the European Parliament on January 16, 2013.

The role and impact of corporate credit ratings has been extensively studied in the literature (see Bongaerts et al., 2012; Boot et al., 2006; and Cantor, 2004 for earlier references). In the context of

[1]Final Communiqué of the G20 Special Leaders Summit on the Financial Situation, Washington DC, November 14-15, 2008.

the recent European Sovereign Debt crisis, CRAs have been partly blamed for the fate of the Greek, Portuguese and Irish sovereign bonds. Indeed, public consultation by the European Commission highlighted some market participants' concerns regarding the methodology and information that CRAs use to establish their sovereign ratings. Others consider instead that the criticism that CRAs precipitated the euro area crisis is largely unjustified, because their downgrades merely reflected the seriousness of the problems that some Member States were currently facing. In that regard–it is argued–ratings followed markets rather than the opposite.[2]

In this paper we investigate a particular aspect of the CRAs activity—the interaction with market participants. In the last years, there have been accusations of insider trading against: S&P in the US[3], S&P and Moody's in Italy[4], and Moody's in Australia[5]. These claims are based on potential leakages of information from employees of rating agencies or government officials to investors, who in turn exploit such information in their benefit, before the downgrade has been properly announced to the market. While the accusations have not been yet sustained, the fear that CRAs information is made privately available and exploited by a few is a regulator's concern. In the original draft of the CRA European Directive there was a proposal to force CRAs to communicate their ratings to the sovereigns involved three days prior to the public announcement. The proposal was disregarded by the European authorities on the ground that an extension of the period from the current twelve hours to three days would increase the risk of market abuse.[6]

Michaelides et al (2015) analyze the stock market performance around 874 rating changes in 65 countries, and find significant abnormal returns in the five days prior to the public announcement. Henry et al. (2011) find that short selling is significantly large in the year prior to a corporate bond downgrade. These papers therefore suggest that somehow investors anticipate the behavior of CRAs. However, establishing the causality of the relationship between market variables and CRAs behavior is quite difficult. Indeed, Michaelides et al (2011) conclude that, because their abnormal returns are larger in countries with weak legal systems, this is probably evidence of leakages of private information. However, Henry et al. (2011) show that, as short sales are not significantly high in the days immediately preceding the downgrade announcement, it is more likely the case

[2]See House of Lords, European Union Committee, 21st Report of Session 2010–12: "Sovereign Credit Ratings: Shooting the Messenger?"

[3]New York Times, August 15, 2011, "Was There Insider Trading on S.&P.'s Downgrade?

[4]Wall Street Journal, January 20, 2012.

[5]The Australian, December 28, 2012.

[6]See Public Consultation on Rating Agencies, European Commission, November 5, 2010.

that CRAs use information from the market to make their decisions.

Our focus is not on the equity or bond markets, but rather on the securities lending market. There are several advantages of studying this market. The first and most important one is that a special characteristic of the securities lending market in Europe is that, until October 2014, transactions are known to the market at day $T + 4$ relative to the transaction day. This is because the settlement period for loans of sovereign bonds in Europe is three days.[7] Besides, because these trades happen over the counter, the database that is commonly used by market participants (DataExplorers) reports transactions at day $T + 1$ relative to the settlement date. It immediately follows that a securities lending transaction involving a European sovereign bond that happens two days before a downgrade of the issuer is not known by either other securities lenders/borrowers, nor by the rest of the market.

A second advantage of the securities lending market, especially compared to the market for Credit Default Swaps, is that our data allow us to identify shifts in the supply and demand curves for a particular issue. In the spirit of Cohen et al. (2007), we can analyze market behavior and expectations beyond reporting prices and volumes. Finally, even though there is a simultaneous relationship between the CDS market and the securities lending market (Ammer et al., 2007; and Chan-Lau & Kim, 2004), the ability of the CDS community to avert in the last years a credit event to trigger swap payments (for instance in the case of the Greek debt restructuring), makes the securities lending market more appropriate for traders to benefit from private information.[8]

Several authors have studied the securities lending market. Saffi and Sigurdsson (2011) analyze the impact of securities lending on market efficiency. Kaplan et al. (2013) conduct a market experiment by exogenously increase the lending supply, and find no adverse impact of securities lending on security prices.[9] However, most of the papers in the literature analyze the corporate bond market, not the sovereign market. The reason is that, by and large, the objective of government securities lending is not to generate a short sale, but rather to borrow money using the sovereign as collateral. Therefore, in the data is difficult to distinguish a securities borrowing transaction (which

[7] On July 23, 2014, the European Parliament approved Regulation 909/2014 on "Improving securities settlement in the European Union and on Central Securities Depositories" that entered into force on January 1, 2015. Such regulation reduced the settlement period from T+3 to T+2 days. The new rules applies to transactions concluded on the exchange regulated market and in the alternative trading system (ATS) secured with the clearing guarantee system. It has however extended informally to all markets and securities.

[8] See Credit Lime, December 28, 2011: "When a short beats a CDS".

[9] See also Duffie et al. (2002).

is motivated by traders willing to short a sovereign bond) from a cash borrowing transaction (a repo). Additionally, lending sovereign bonds does not necessarily imply shorting sovereign bonds. Very often institutions borrow sovereign bonds in order to collateralize other transactions, including securities lending. For example, a broker-dealer can be borrowing equities from a lender who requires sovereign debt as collateral; therefore they will borrow the sovereign debt to collateralize the transaction. Other financial transactions that may require sovereign debt as collateral include derivatives and futures and options[10]. More recently, Aggarwal et al. (2016) have also studied the securities lending market for European sovereign bonds, and found that securities lending allows borrowers to upgrade to high-quality collateral that can be used to obtain financing in the repo market.

We use the DataExplorers European government bond daily buy-side files between June 2006 and October 2012, which contain information regarding lending amount and fees for government bonds (central government and governmental institutions) issued in 18 countries. Before June 28, 2006, the DataExplorers information is only published with a weekly frequency. We stop our sample on October 2012 because on November 2012 the European Union enacted new rules prohibiting naked short sales of European government bonds. Data Explorers records daily bond loan information from about 100 participants representing approximately 85% of the OTC securities lending markets. Such information is voluntarily reported in exchange for having access to the consolidated information. This information includes transaction data, which DataExplorers do not make available to academics. Instead, we only have access to the total securities lending supply and demand on the day, and the average lending fees. We have securities lending information from $6,052$ bonds from 18 countries, and we complement this information with price and yield bond information from Datastream. Our final sample consists of more than 1.2 million of daily observations at the issue level.

We also collect information regarding the history of bond rating changes in those countries by S&P, Moody's, and Fitch. Our dataset includes changes in the outlook of the sovereign as well. There are 72 downgrade events in the sample period: 68 downgrades and 2 upgrades. We further distinguish between downgrades between different rating categories (*notch* downgrades), and downgrades from investment to speculative grade (*junk* downgrades). There are 6 downgrades of the latter type, all corresponding to only three countries: Greece (3), Ireland (1), and Portugal

[10]Securities Finance Trust Company (2012).

(2). We then generate indicators of the pre-rating periods for all of these events, and try to identify abnormal shifts in demand, supply, and utilization (the ratio of demand to supply) rates, as well as changes in lending fees around the downgrade.

In order to distinguish between securities lending and cash lending transactions, we exploit the magnitude and richness of the dataset. Intuitively, repo transactions (cash lending agreements) are in the benefit of the securities lender, so typically cash flows are beneficial to the securities borrower. Instead, securities lending transactions are in the benefit of the securities borrower, so the lending fee will be generally higher than the interest received on the collateral. Consequently, securities lending transactions are by definition more costly to the borrower, so even in the absence of an indicator of the type of transaction, we can identify securities lending transactions are those where the lending fee is high enough. We therefore identify *special* bonds (high lending fees) and consider that these are normally the underlying asset in a securities lending transaction. We then estimate panel regressions with country controls and issue-fixed effects, distinguishing between cheap-to-borrow and expensive-to-borrow bonds.

We first find a significant increase in utilization rates in the days prior to the announcement of a junk downgrade. Average utilization of Greek, Irish, and Portuguese bonds is 21.6% of the available lending supply five days before the corresponding downgrade announcement, and it increases to 23.37% one day before. It then reaches up to 25% at $t = +3$, and goes back to its original levels at date $t = +8$. Because of the settlement and disclosure dates described above, the securities lending activity reported at $t + 3$ is happening before the downgrade announcement.

The increase in utilization rates is not reflected in the prices of the bonds involved. We estimate cumulative abnormal returns before, at, and after the announcement of a credit rating event. We find that in the five days preceding a notch downgrade, bond prices experience a positive and significant abnormal return of 0.11%. However the notch downgrade announcement is associated with a one-day abnormal return of -0.19% (significant at the 1% level). In the case of junk downgrades, we do not find significant abnormal returns either prior or at the announcement in Greece, but they are both negative and significant in the case of the Ireland downgrade. For Portugal, we find positive and significant pre-announcement returns, and negative and significant at-announcement returns.

We then run panel regressions to explain the dynamics of securities lending demand, supply, utilization and fees. We control for macroeconomic conditions (euro-dollar exchange rates, the German benchmark ten-year bond yield), country-specific variables (the MSCI country stock market index), bond characteristics (yield, daily return, maturity controls, bond liquidity), as well as determinants

of stock lending (the euro overnight rate index or EONIA, the average utilization for all secuties loans that day, CDS spreads). We also estimate regressions with issue-fixed effects. We isolate securities trading transactions motivated by shorting demand by controlling for the specialness of the bond.

We find very weak evidence that investors anticipate notch downgrades in Europe. For the whole sample of downgraded bonds there is no significant movement in either lending supply or demand. In the subsample that includes only Greece, Ireland, and Portugal, we find that, in the five days prior to the downgrade, the securities lending demand reduces signficantly by 0.1%. By rating agency, this effect is concentrated among Moody's and Fitch's notch downgrades: in the five days before the announcement, securities demand reduces -0.69% and -1.69% per day on average, respectively (significant at the 1% level). However we do find that securities lending demand increases significantly before S&P notch downgrades ($+2.52\%$, significant at the 10% level). The final impact of the notch downgrade on borrowing costs is not significant before the announcement.

In the case of downgrades to speculative grade (*junk downgrades*, which correspond to only three countries in the sample but to all three CRAs), we find that, prior to the downgrade announcement, both securities lending supply and demand rates increase signficantly. Such effect is associated to a significant reduction in borrowing fees. There is strong evidence of market anticipation which translates into securities lenders willing to increase their supply of bonds–which, in the expectation of a downgrade, will be settled at a lower value three days later, and securities borrowers increasing their demand for shorting purposes. Such shifts in the demand and supply curves result in lower borrowing fees and higher bond utilization rates, which is a potential indication of increasing (naked) short sales prior to the downgrade of a sovereign issue.

These results have two potential explanations. One explanation is that (similar to Henry et al., 2011) investors anticipate sovereign downgrades on the basis of public information. A second explanation is that some investors possess private information (acquired from CRAs or from the governments involved) regarding an upcoming downgrade. We separate out these two hypothesis by considering only those rating events which are not preceded by market news: we define a *new* downgrade as one where no previous downgrade has happened in the previous 30 days, and where no CRA has published an outlook revision. There are 32 *new* notch downgrades in the sample, but only five junk downgrades that qualify as new downgrades: one by S&P (Portugal, January 13, 2012), three by Moody's (Greece, June 14, 2010; Ireland, July 13, 2011, and Portugal, July 5, 2011), and one by Fitch (Portugal, January 13, 2012).

The relevance of our results lies on the fact that the previous effects are mostly concentrated among new ratings. This evidence contradicts the public information hypothesis, because we do not find significantly higher securities lending activity when there are clear public signals of a potential downgrade within the previous month, but rather the opposite: securities lending is more intense when the information regarding the downgrade is more valuable because it is not known by the market. Furthermore, the behavior of securities lending markets prior to junk downgrades is consistent across CRAs. For all five of the new downgrades there is evidence of increasing lending supply and demand, and lower lending fees. Our results are also robust to excluding Germany for the sample, restricting the sample period to the post-2008 observations, and restricting the pre-downgrade window to exclude securities lending transactions that are settled after the downgrade announcement.

> "ESMA also observed cases of external communication consultants supporting one or more CRAs in the disclosure of rating actions, with an outsourcing agreement which allows confidential rating information to be shared with the consultants before a rating action is published. ESMA is concerned that these practices may impair the CRAs' ability to directly control confidential information on credit ratings from being: i) disclosed; and ii) used or shared for the purpose of trading in financial instruments, or for any other purpose other than the credit rating activity. CRAs must ensure that any confidentiality agreements adequately protect the confidentiality of ratings information, and that they set up appropriate controls to actively monitor and verify that there is no inappropriate use of the information."[11]

The next Section of the paper describes the sovereign rating process to differentiate it from the better known corporate bond rating process. In Section III we describe our bond data, securities lending variables, as well as rating downgrade information. Section IV analyzes the securities lending market and explains the differences between securities lending and cash lending transactions, and how we use such difference in the paper. The results of our study are presented in Section V. We conclude after a final section (Section VI) that presents some robustness tests.

[11] European Securities and Markets Authority, "*Credit Rating Agencies, Sovereign ratings investigation. ESMA's assessment of governance, conflicts of interest, resourcing adequacy and confidentiality controls*", December 2014.

II The Mechanics of Sovereign Bond Ratings

A Rating Process

The process of rating a sovereign bond is somehow different from the mechanics that apply to corporate bonds (see Gaillard 2012 for an excellent description of the process). Usually sovereign ratings start with a formal request by a government to rate a particular debt issue (Standard and Poors, 2012; FitchRatings, 2012), unless the rating is unsolicited. The 2009 European Directive requires that CRAs state prominently in the credit rating "*whether or not the rated entity or related third party participated in the credit rating process and whether the credit rating agency had access to the accounts and other relevant internal documents of the rated entity or a related third party*" (EU Regulation 1060/2009). The directive also mandates CRAs to specify their policies regarding the issuance of unsolicited ratings[12]. Among the countries in our sample, S&P issues unsolicited ratings on Belgium, France[13], Germany, Italy, Netherlands, Switzerland and the UK.[14] Moody's list of unsolicited issuers in Europe includes France, Germany, Italy, Netherlands, Switzerland, and the UK. Fitch publishes unsolicited ratings for France, Portugal, the UK, Germany, Netherlands, Switzerland, Austria, Spain, Norway and Sweden. Not surprisingly, only AAA countries (Germany, Netherlands, Switzerland and the UK) do not request ratings because these are mostly demand driven and produced by the CRAs anyway.[15] That the rating is unsolicited does not mean that the sovereign does not participate in the rating process. S&P reports (House of Lords, 2011) that out of the 15 unsolicited ratings it produces, only Germany, Netherlands and Switzerland do not meet with them on a regular basis as of 2011.

[12]Such policy is similar for the three main CRAs: they usually decide to issue an unsolicited rating if it is useful to capital markets, and if there is sufficient information that is publicly available to produce the rating.

[13]France had a bitter reaction to CRAs in response to its downgrade by Moody's on November 2012. Under new enacted rules, CRAs can only issue unsolicited ratings three times a year designated in advance by the CRA and may publicly release the change between the market close and one hour prior to the market open.

[14]Interestingly, on February 24th 2011, S&P announced that it would start issuing sovereign ratings on the United States on an unsolicited basis. This was caused by S&P losing its rating agreement with the US government.

[15]As of December 2012, other countries with unsolicited ratings were: Argentina, Australia, Cambodia, India, Japan, Singapore, Taiwan, and the US (S&P); Kenya, Mauritius, Nigeria, and Zambia (Moody's); and Argentina, Bolivia, Australia, Ecuador, Mongolia, Turkey, Canada, Taiwan, Malaysia, Mozambique, Sri Lanka, Bulgaria, India, Estonia, Japan, Vietnam, Thailand, China, Singapore, Jamaica, New Zealand, Costa Rica, Dominican Republic, Czech Republic, Latvia, Lithuania, USA, Cyprus, Slovenia (Fitch).

When a rating agreement exists, the initial process usually takes four to six weeks to complete, and includes an analysis of publicly reported financial information of the country, as well as meetings with government, central bank, and private sector representatives. The three CRAs generally notify the issuer of the rating and the outlook, providing a rationale for the decision. Fitch and S&P ratings can be appealed prior tCFo their publication if new factual information is presented. Moody's ratings cannot be appealed (Gaillard, 2012). In addition to notifying the issuer, CRAs typically signal in advance their intention to consider rating changes. They use negative *review* or *watch* notifications to indicate that the downgrade is likely within the next 90 days (IMF, 2010).

Once the final decision has been made, CRAs have the obligation to inform the issuer of the rating, in advance of its publication. The advance copy time is of 12 hours in the EU (per the EU 2009 Directive[16]), and two hours in other regions. The information contained in these reports is confidential and cannot be disclosed or released prior to its publication by the CRAs. In recent years, and because of the criticism that CRAs have been exposed to, ratings are usually disclosed to the public after markets close.

Although CRAs are extremely opaque on the fees they charge governments for their service, the few disclosures available[17] suggest that for Public Finance ratings, fees range from $50,000 to $200,000.

B Short and Long Term; Local and Foreign Currency Ratings

S&P, Moody's, and Fitch produce two distinct types of sovereign credit ratings: issuer ratings and debt ratings (referred to as *senior unsecured ratings*). Issue and issuer rating should only differ at the lowest rating levels. However, CRAs tend to assign debt ratings somehow automatically and based on pre-prescribed correlations, that is why they are of very little utility. At most rating levels, both tend to be equal (Vir Bathia, 2002). Additionally, for the same sovereign there may be several issuers with different ratings: for example, both the Kingdom of Spain and the Instituto de Crédito Oficial (the Public Lending Institute) are rated even though they both represent the same sovereign bonds.

For each issuer, S&P, Moody's and Fitch issue short-term and long-term ratings.[18] They match

[16] http://www.esma.europa.eu/system/files/L_302_1.pdf

[17] See, for instance: Standard & Poor's Ratings Sewices U.S. Ratings Fees Disclosure, January 16, 2007. See also Becker and Milbourn (2011) and Cornaggia et al. (2012).

[18] Moody's generates long- and short-term foreign currency ceilings as explained below, but not ratings.

the maturity of the corresponding bonds. Short-term ratings indicate the potential level of default within a twelve-month period. Fitch and Moody's scales for short-term and long-term ratings are different. While long-term ratings follow the usual alphabetical scale from AAA to D, short-term ratings range from F1+ (best quality grade), then F1, F2, F3, B, C, and finally D (Default).[19] Moody's system is somehow similar.

Additionally, the three CRAs produce local- and foreign-currency ratings, depending on the currency of the corresponding issue. Local currency sovereign ratings reflect the CRA's opinion on the capacity and willingness of a government to raise resources in its own currency to repay its debt obligations to bondholders on a timely basis (Moody's, 2008). The foreign currency rating reflects the capacity of the government to mobilize foreign reserves to repay its debt on a timely basis. Moody's and Fitch's foreign currency ratings are constrained by the country ceiling (the highest rating that can be assigned to a foreign-currency denominated security issued by the country). Almeida et al. (2017) have studied the relationship between country ceilings and corporate borrowing costs and show that companies policies change in reaction to changes in the country celing rating. Such country ceiling for foreign-currency bonds and notes is expressed on the same long-term scale. For instance, on February 2007, Portugal's ceiling was increased from A1 to Aa3, which automatically meant a foreign currency rating upgrade of the same magnitude, while the local currency rating remained at Aa2.

S&P's tends to rate a sovereign's local currency debt from zero to three notches above the sovereign's foreign currency debt rating.[20] The magnitude of the difference depends on the development of the domestic capital market. In 2001, the local currency rating of sovereign issuers was, on average, one notch higher than the foreign currency rating (Gaillard 2012). The difference has been declining over time. When the issuer is a member of a monetary union like the Euro, local and foreign currency ratings are identical. Only when membership in the Eurozone is uncertain, does S&P penalizes the foreign currency rating with one notch. This has not happen during the sample period even in the worse moments of the Euro bond crisis. Therefore, in our sample of bonds and sovereigns we do not distinguish between local and currency ratings.

[19]Sometimes long-term ratings are downgraded while short-term ratings are not. On April 9, 2010, Greek long-term rating was downgraded to BBB- from BBB+, but the short-term rating was preserved at F2.

[20]http://www.standardandpoors.com/ratings/articles/en/ap/?assetID=1245227841398

III Sample Construction

A Bond Data

We first collect bond-specific information from Datastream. In particular, we select all government bonds issued by the 25 European countries available in Datastream. We drop bonds from Cyprus, Hungary, Latvia, Lithuania, Luxembourg, Poland, Slovak Republic and Slovenia because there is only one bond with data available in these countries. We collect price and yield data for the period June 2006 to October 2012 (which corresponds to the time span of the DataExplorers dataset), as well as spreads relative to the US T-Bond, volume and amount outstanding. Our sample includes bonds from countries that are members of the Euro (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain). We also have bonds from European Union, non Euro members (Czech Republic, Denmark, Sweden and the U.K.), as well as two European countries which are not members of the EU (Norway and Switzerland). Prices are in dollars, as this is the reporting currency of the bond lending data.

B Securities Lending Data

We use the DataExplorers European government bond daily buy-side files between June 2006 and October 2012, which contain information regarding lending amount and fees for government bonds (central government and governmental institutions) issued in the 18 countries above. Before June 28, 2006, the DataExplorers information is only published with a weekly frequency.

Data Explorers records daily bond loan information from about 100 participants representing approximately 85% of the OTC securities lending markets. Therefore we have information on the total value of the securities offered and borrowed, the inventory of securities on loan held by institutions, the number of transactions happening every day as well as information regarding lending fees. For a detail description of the dataset, see Saffi and Sigurdsson (2011). DataExplorers makes transaction information available only to clients. To gain access to all fields, clients must in exchange contribute their stock lending/borrowing transactions to the DataExplorers securities lending data universe . A subset is available to non-contributors (academics). Instead of transaction-by-transacion data, we have access to daily consolidated information (total demand on the day, and average lending fees for instance). Average lending fees for a given day are providing in different ways. First, DataExplorers provides us with the simple average buy side cost to borrow expressed

as a fee, calculated from all transactions from the hedge fund peer group. Absolute fee data are however very scarce in the dataset. We have also compiled a value weighted average fee score (VWAF), which is computed from the average of all applicable loan fees weighted by loan value. Each average is then assigned to a fee bucket from 0 to 5, with 0 representing the least expensive fee bucket (general collateral) and 5 the most expensive (most expensive/special).[1]

Table 1 shows that our final sample contains 6,052 bonds from 18 countries, for which we have daily data on securities lending, pricing and volume, and rating information (see below).

[Insert Table 1]

Most of the issues (28%) are German bonds, and 16% of bonds are French. There are also 459 bonds (8% of the sample) from the UK. Table 1 shows as well that 1,123 bonds (19% of the sample) are *PIIGS* (Portugal, Italy, Ireland, Greece, and Spain) bonds. These are bonds frequently downgraded during the sovereign bond crisis. Specifically, 187 bonds in the sample (corresponding to Greece, Ireland, and Portugal) are downgraded to junk status at some point during the sample period.

Table 2 reports the number of observations by country and year. We have 3,418,846 daily observations in total and 189,936 on average per country.

[Insert Table 2]

In Table 3 we report bond lending information. We compute a relative lending demand for an issue as the ratio of the value of current inventory on loan from beneficial owners, divided by the total market value of the issue (both in dollars). Similarly, a measure of supply is the ratio of the active inventory value (current inventory available from beneficial owners less what is deduced to be temporarily restricted from lending[2]) to the total market value of the issue. The ratio of lending demand to lending supply is referred to as *utilization*, and measures how much of the lending supply of a particular issue is indeed on loan. *Active* utilization sharpens this ratio by removing inventory which is not readily available to be borrowed. These three variables are in parentheses. We also report lending fee scores (0=cheap to lend/borrow; 5=expensive to lend/borrow or *special*)

[1]For a good explanation of lending fees, see D'Avolio (2002). Specials can earn revenue of anything between 100 bps to 6000 bps or higher on an annualized basis (Securities Finance Trust Company, 2012)

[2]For example, where securities are held in too small parcels or have been restricted by the beneficial owners.

[Insert Table 3]

Its noteworthy that the average lending demand (bonds actually on loan) for all issues in our sample is 2.85%. This compares to an average on loan value of 0.58% for stocks in the Cohen et al. (2007) sample. Similarly, the average lending supply is 13.89%, and Saffi and Sigurdsson (2011) report 8% average weekly lending supply for international stocks. While this is certainly an indication that sovereign bonds are more heavily lent than stocks, most of these transactions could well be representing repo transactions, as we describe in detail in Section IV, and collateralizations of short sales of equities. This is also consistent with the UK (24.59%) and Switzerland (23.82%) displaying the largest lending supply in the sample. Notwithstanding, we observe that, while in 2006 issues of Germany, the UK, and Switzerland have higher utilization rates than issues of Greece, Portugal, and Ireland (the three countries whose bonds are downgraded to junk during the sovereign crisis), the situation is the reverse by 2012. These results are consistent with Aggarwal et all. (2016) who find that, during crises, lending fees increase for high-quality government bonds. Utilization of Greek issues increases from 33% to 63% in this period; the increase is from 15% to 46% for Ireland and from 41% to 52% for Portugal. These increases are the result of declines in both lending supply and lending demand, but with lending demand decreasing at a lower rate during the period.

With respect to fees, lending becomes more expensive for Greek, Irish, and Portuguese issues. Note that DataExplorers classifies fees into undisclosed buckets, so it is difficult to give an absolute magnitude of these costs. In Table 4 we report fee scores by country, and show that only 0.1% of the observations in the sample correspond to special bonds. D'Avolio (2002) reports that the percentage of stocks on *special* in his sample is 9%.

[Insert Table 4]

Only 61% of Greek bonds, to cite a severely downgraded country, are cheap to lend/borrow, compared to a 95% of UK issues. No issues from Switzerland, the UK, or France are the in highest fee bucket, but 1.3% of Greek, 1.1% of Portuguese, and 0.3% of Irish issues are. To provide a comparison with the previous literature, we have computed the average fees per fee bucket, even though there are very few observations with available data on actual fees ($2,512$ observations). These figures are reported in the bottom row of the Table. Fees for cheap issues are 54 bps on average, and increase to 533 bps for the very expensive ones. If we consider as specials those issues with fees above 100 bps (which is equivalent to being in buckets 2 to 5), then the percentage of special issues in Greece, Ireland, and Portugal is 19, 22, and 19 respectively during the period.

C Rating Data

In this Section we describe the collection process for ratings and downgrades. Section II explains that, for each sovereign and CRA, there is no single rating. First of all, ratings can be different for different bonds issued by the same country (which is especially true for different maturities). Moreover, S&P and Fitch produce short-term and long-term ratings, as well as local- and foreign-currency ratings and their combinations. Moody's produces foreign currency ceilings, as well as long-term and short-term ratings.

We obtain individual issuer rating information from S&P, Moody's and Fitch. We confirm with data at the issue level from S&P Rating Xpress that all bonds issued by a given country with similar maturity and currency are given the same rating. Moreover and as described above, in our sample countries there is no difference in the sample period between local and foreign currency ratings.[3] We are therefore confident that we can use only two ratings (short term and long term) for all ratings of a sovereign by the three CRAs. We subsequently match issues and ratings (long-term and short-term) by country depending on whether the maturity of the bond exceeds five years or not.[4] We observe that CRAs consistently downgrade all bonds of a given country and similar maturity at once.

We additionally obtain information on outlook changes for the three CRAs. For each of the rating agencies, we generate a set of rating variables. First we record the date at which any country's rating (irrespective of whether short/long term or local/foreign currency) changes. Similarly for outlook changes. We distinguish between notch changes and junk downgrades[5] (the latter only applicable to Greece, Ireland, and Portugal during the sample period). We classify downgrades (whether notch or grade changes) into *unique* (if there has not been a previous grade change by any of the three rating agencies in the previous thirty trading days) and *not-unique*. We also construct, from each bond and rating change, an indicator that equals one when, within the previous 30 days, there has been an outlook change.

In order to accurately measure the date of a rating change, we use Factiva to check, for each

[3] In the sample countries, the last episode when domestic and foreign currency Moody's ratings differed was August 1999, when Sweden's foreign currency rating was Aaa and the local currency rating was Aa1. In the case of Fitch, it was September 2000 (Denmark, with foreign rating AA+ and local rating AAA).

[4] Note that within a particular bond, the relevant rating becomes the short term rating as soon as the date to maturity equals five years.

[5] For S&P and Fitch, a downgrade to junk status means that the issuer ratings changes from BBB- to BB+. For Moody's it means a change from Baa3 to Ba1.

bond rating change that we identify, when the announcement by the rating agency takes place (usually when markets are closed). Table 5 shows the entire history of rating episodes, including changes (or confirmations) of investment outlooks by the three CRAs.

[Insert Table 5]

There is no CRA action between June 2006 and October 2012 in Denmark, Norway, Sweden, and Switzerland. In the Table we distinguish between notch downgrades (from AA+ to AA, from Baa2 to Baa3 for instance), and downgrades to junk status (from BBB- to BB+, from Baa3 to Ba1). Only three countries (Greece, Ireland, Portugal) are downgraded to junk in that period. Greece is downgraded by the three CRAs (first by S&P, and subsequently by Moody's and Fitch), as it is Portugal (first by Moody's, then by S&P and Fitch); Ireland is downgraded only by Moody's. These are obviously the countries with most rating events, in addition to Spain and Italy. There are also very few upgrades, all in the Czech Republic.

In Table 6 we consolidate rating events by CRA, and depending on whether they are notch downgrades, downgrades to junk status, or upgrades.

[Insert Table 6]

There are in total 62 notch downgrades, 7 downgrades to junk status, and 2 upgrades[6]. Out of these, in 32 of the notch downgrades, and 5 of the downgrades to junk status, there is no previous rating event (whether another downgrade or an outlook change). Only in 58 of the 62 notch downgrades the downgrade itself is not a follow-up of a previous downgrade (in the last 30 days) by another CRA.

D Additional Data

D.1 Benchmark Bonds

The risks associated with lending a sovereign bond depend, among other variables, on the liquidity of the issue. Unfortunately, trading volume data for the bonds in our sample are not widely available in Datastream (only $1,828$ issues). To classify bonds depending on liquidity, we follow an alternative

[6]Because upgrades are extraordinary events during the sample period, and because they all correspond to a single country, we do not provide a particular study of these in the paper.

strategy. For each country, debt agencies (Bloomberg and Reuters) select a short-term and a long-term reference bond (the "benchmark" bonds) which change over time and which represent the country's solvency both in the short and the long run. Benchmark government bonds are the most actively traded issues of government bonds among all outstanding issues. From time to time and in accordance with established rules, government bonds of maturity nearest to the benchmark tenor are chosen as the benchmark issue to represent that tenor. We obtain the time-series list of benchmark bonds per country from Datastream. In fact, the *country rating* assigned to each country by the agencies is therefore the rating (short term or long term) that is assigned to the corresponding benchmark bond. Additionally, government-bond markets and credit-default swap markets follow closely the developments of benchmark bonds because they are used to determine a country's spread vs. for instance the German (benchmark) bond. Generally, the benchmark bond is the latest issue within the given maturity band; consideration is also given to yield, liquidity, issue size and coupon.

D.2 Credit Default Swap Data

For each country in the sample, we collect daily data on Credit Default Swaps referenced to the country, and for different maturities (6 months, 1, 2,..., 10, 20, and 30 years). For Switzerland and the Netherlands we do not have data on CDS of 20 and 30 year maturities. We then match each bond in our sample with CDS data depending on maturities. That is, we assign the nine-year CDS spread to a bond with a nine-year-to-maturity at the time of the observation. We match bonds with maturities between 10 and 15 years to the 10-year CDS; bonds with maturities between 16 and 25 years to the 20-year CDS; and bonds with maturities longer than 25 years to the 30-year CDS.[7]

DataExplorers (2011) has analyzed the relationship between securities lending costs and CDS spreads and found that sometimes CDS spreads lead securities lending costs, and sometimes it is the opposite.[8]

D.3 Other Variables

We include in our cross-sectional analysis several financial indicators at the daily frequency. These include the MSCI country stock market indices for the countries in the sample; the yield on the 10 year German benchmark bond; the euro-dollar exchange rate; and the euro overnight index

[7]For Switzerland and Netherlands we match bonds with maturities of 10 or higher to the 10-year CDS.

[8]http://www.dataexplorers.com/sites/default/files/Research%20Note%20%234%20EU%20Sovereign%20Bond%20Borrow

			Before Ban	After Ban
Supply	Country is a Euro member	No	17.4%	17.3%
Demand			5.5%	2.4%
Utilization			19.7%	14.8%
Fee Score			15.6%	14.3%
Supply		Yes	12.0%	14.2%
Demand			3.0%	2.0%
Utilization			18.7%	15.0%
Fee Score			37.2%	33.9%

Figure 1: Lending Supply and Demand Around the German Ban

average (EONIA).[9] Many repo transactions have repo rates that are linked to an overnight index such as EONIA (for instance the repo rate could be EONIA+10 bps). As we discuss below, the repo market is an important determinant of the sovereign securities lending market. As EONIA increases, securities lending is more costly (cash lending is more profitable).

On May 19th 2010, The German financial regulator, BaFin, announced unilateral regulation of credit derivatives which included a ban on naked short-selling and naked credit default swaps on Eurozone sovereign debt.[10] Such a prohibition must have a severe impact in sovereign bond lending markets as any short sale of bonds from the Eurozone now requires a prior loan. However, BaFin could only impose the law in German exchanges. We therefore generate a dummy variable that equals one if the bond issuer is a Euro member and the observation is from after the prohibition date, and zero otherwise. A careful perusal of the data (below) shows no clear pattern of effects (see Figure 1).

[9]EONIA is a measure of the effective interest rate prevailing in the euro interbank overnight market. It is calculated as a weighted average of the interest rates on unsecured overnight lending transactions denominated in euro, as reported by a panel of contributing banks. See http://www.ecb.int/home/glossary/html/act4e.en.html#189

[10]New York Times, May 19 2010. The ban on naked short sales in certain shares and government bonds was introduced (§ 30h of the German Securities Trading Act, WpHG) by means of the German Abusive Securities and Derivatives Trades Prevention Act from July 21, 2010.

IV Securities Lending of Government Bonds

A Securities Lending vs. Repo Transactions

A securities lending agreement consists of a lender transferring a security (equity, corporate bond, or government bond) to a borrower, who in exchange pays a lending fee. The borrower in turn posts collateral to guarantee the future delivery of the borrowed instrument, and the lender must pay interest on such a collateral (the lending fee is usually netted against such interest into what is called the rebate rate). Typically, because securities lending transactions are in the interest of and initiated by the borrower, they result in cashflows which are positive for the lender. That is why, with few exceptions, the rebate is negative (that is, the lending fee exceeds the interest rate on the collateral). This is usually not the case when the downward price pressure on a security is so intense that the demand for borrowing securities is too low.

The borrower will then sell the borrowed security in the market, establishing a short position (see Figure 2). In the case of government bonds, the borrower could use the sovereign to guarantee a short position in another security (a corporate bond of a firm from that country for example). Or can hold the sovereign for hedging purposes. In a securities lending transaction the lender can call the deal off at any time by requesting the return of the security from the borrower, in which case the borrower will need to buy the security back from the market. However, until this happens, if the value of the security fluctuates in the market, so does the collateral that the borrower needs to post to the lender. Both the lending fee and the interest rate are contracted upon at the time of the transaction. Besides cash collateral, a bond lending transaction collateralized by other securities is also possible (securities lending against non-cash collateral). Bond loans which are not collateralized by cash are not very frequent (DataExplorers, 2011). They often form part of an arbitrage (between two similar bonds) or a hedge (for example, shorting the government curve component of a corporate bond to create a pure long exposure to credit spreads). In Asquith (2013), corporate bond loans which are collateralized by cash represent 99.6% of the sample.[11]

When there is a negative sentiment regarding the value of the sovereign bond, lending demand will increase and so will do the lending fee that borrowers will be willing to pay. For securities lenders, an increase in the lending fee is an indication that the borrower is willing to sell the sovereign short for a profit, and therefore the value of the bond when the securities loan is returned

[11] However, FSB (2012) reports that with regards to European sovereigns, about 50% of the lending transactions are collateralized with cash (the percentage is only 20% for UK bonds).

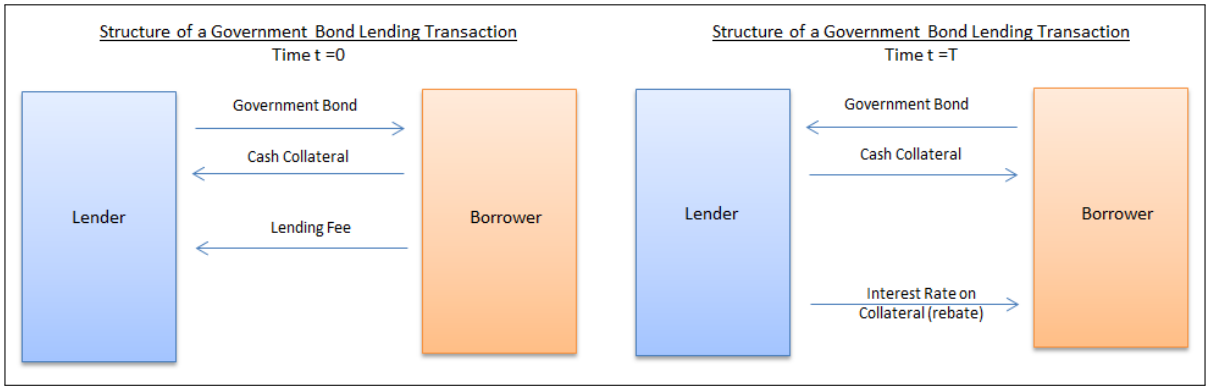

Figure 2: Anatomy of a Securities Lending Transaction

will be lower.

Note what would happen if a securities borrower receives a signal regarding a drop in the value of the sovereign bond (for instance because of an impending downgrade). The securities lending demand for that bond will increase, as well as the lending fee. The lending supply may increase (if the securities lender responds to the higher return on the loan) or decrease (because the negative signal conveyed by the increased lending demand decreases de expected value of the bond). The securities borrower will now sell the sovereign in the market to benefit from the securities' expected drop in price. The cost of securities lending (lending fee minus rebate) increases (possible making the sovereign *special*) or decreases depending on the interaction between supply and demand.

What makes government bonds peculiar is that there is a very similar transaction that results in almost identical payoffs, but which is entirely initiated by the securities lender: a repo transaction.[12] In a repo transaction ("repurchase agreement" or "repossession", see Figure 3), also known as "cash lending transaction", securities lender is in fact a cash borrower. In this case the securities lender (cash borrower) receives cash after posting a government bond as collateral. The cash received may be equal to the market value of the collateral, but more typically the securities borrower (cash lender) discounts a haircut, which reflects the different liquidity of the collateral vs. cash. As the securities lender may now use such collateral, it has to pay interest to the securities borrower at the corresponding repo rate, which is typically lower than LIBOR given that it corresponds to a collateralized loan–and which is, in Europe, usually benchmarked to EONIA.

Because the cash lending agreement is in the benefit of the securities lender, typically cash flows are beneficial to the securities borrower. This is the main difference between a repo transaction and

[12]A splendid guide to repo transactions is Euroclear (2009). The role of repo markets during the financial crisis is described in detail in Gorton and Metrick (2012).

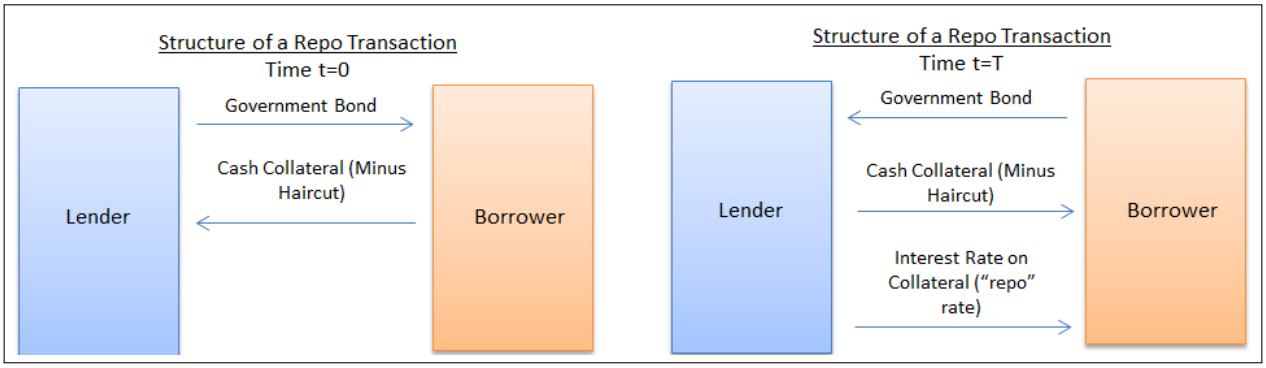

Figure 3: Anatomy of a Repo Transaction

a securities lending transaction.

When there is a negative sentiment regarding the value of the sovereign bond, securities lending supply will drop because the deteriorating quality of the collateral means a higher haircut and therefore more costly borrowing. Demand will subsequently decrease as well because securities borrower will be less willing to accept the low-quality bond as collateral. Ultimately securities lending cost (=minus repo rate) is very low. Note that a securities borrower with private negative information regarding the value of the sovereign will not enter a repo transaction, which represents accepting an overpriced bond as collateral.

Finally, and of great importance for this paper, there are two main differences between cash lending and securities lending transactions:

1. The collateral in a cash lending transaction is usually a high-quality (AAA-rated) bond. Although in practice repo transactions can be collateralized by lower-rated bonds, this is unusual. Collateral re-use (re-hypothecation) and collateral velocity, or the length of collateral re-use chains, can also be procyclical. According to Singh (2011), the length of "re-pledging chains" has shortened significantly since the crisis. Immediately after the failure of Lehman Brothers, some securities lenders withdrew from the market entirely. However, many will only accept high-quality government bonds as collateral or cash collateral that they will reinvest at short maturities in high quality government bond repo, Treasury bills and/or in MMFs (FSB, 2012).

2. The tenor of the transaction is pre-determined, so there can be overnight repos, or term repos (typically ten days to one month). At the maturity of the security, the cash lender (security borrower) returns the collateral and receives cash+repo rate from the cash borrower (security

lender).

B Distinguishing cash from securities lending

Unfortunately, the database of securities lending transactions for government bonds includes both cash lending and securities lending transactions. Only the data that are provided to practitioners (transaction based) distinguish between the two. DataExplorers only provides consolidated data to academics (by day and security), which means that, for the same bond and in the same day there may be a repo and a bond lending transaction, that is reported jointly by consolidating volumes, and averaging fees and rebates.

This explains why, as described in Section B, most of the transactions in the database correspond to German and UK bonds (AAA rated throughout the sample period). For these countries, most transactions must be repo transactions, that is, cash-lending transactions rather than securities-lending transactions. There are two potential strategies in order to isolate pure security lending transactions: one is to assume that only high-quality bonds (let say AA and better) will be used as collateral in repo transactions, meaning that the rest can be considered as pure securities lending. Even if they are, repos of lower-quality bonds become cheaper and easier to implement through the ECB, especially after 2011, as Nyborg (2011) has shown. The problem with such strategy is that it is biased towards observing more securities lending for say Portuguese or Greek bonds.

Alternatively, we note that the rebate rate will be reported only when there is at least one securities lending transaction on the day. The histogram in Figure 4 plots rebate rates for the non-missing observations.

In the sample, rebates are only available in $2,512$ issue-days, which leaves us with very few observations where the rebate is observable (see Figure 5).

These are almost for sure securities lending transactions, but there are too few. We say almost surely, because on occasions, buyers will seek a specific security as collateral in the repo market. The security is said to *go on special* in the repo market when the repo rate becomes negative and therefore resembles a rebate rate. This happens if a certain security is in very high demand. Then the cash lender (securities borrower) will compete by offering cheaper than their competitors, so the borrowing fee may be large enough to force the repo rate on that security so low as to make the difference negative. The situation is not uncommon in equity repos and becomes more likely for all types of securities when interest rates in general are very low. However, this phenomenon is

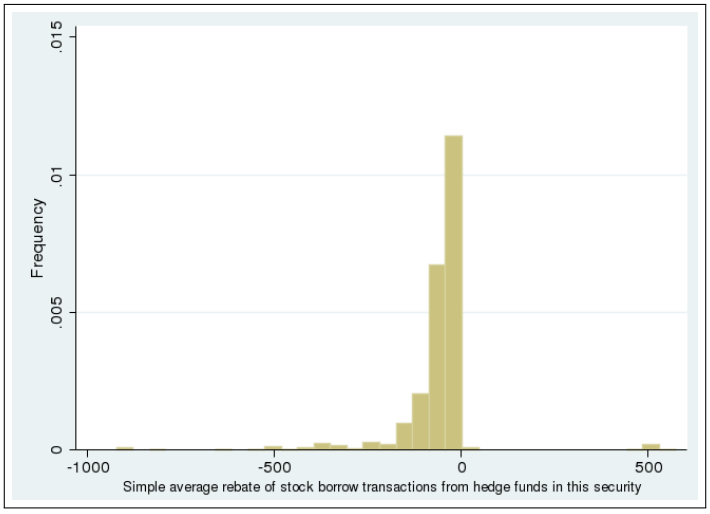

Figure 4: Histogram: Rebate Rates (N=2,512)

year	AUSTRIA	BELGIUM	FRANCE	GERMANY	GREECE	IRELAND	ITALY	NETHERLANDS	PORTUGAL	SPAIN	UK
2007											16
2009					1				2		
2010							6			3	
2011		6	38				94		102	56	
2012	2	101	348	3		13	80	7	70	85	
Total	2	101	348	3	0	13	80	7	70	85	0

Figure 5: Data Availability on Rebate Rates

Daily Cost of Borrow Score	Observations	Percent
Cheap 1	448,135	13
2	34,971	1.01
3	4,276	0.12
4	984	0.03
5	263	0.01
6	53	0
7	43	0
8	28	0
9	47	0
Expensive 10	3	0
Missing	2,957,586	85.82
Total	3,446,389	100

Figure 6: Distribution of Borrowing Cost

certainly impossible to happen for bonds in the higher risk category.

To isolate pure security lending transactions, we use instead the following strategy: DataExplorers compiles a variable (*DCBS* in the dataset) defined as "*Data Explorers Daily Cost of Borrow Score; a number from 1 to 10 indicating the rebate/fee charged by the agent lender based on Data Explorers proprietary benchmark rate, where 1 is cheapest and 10 is most expensive*". This is similar to the fee score described earlier. The 10 cost buckets are not of the same size, with most of the observations falling into the first one, when it is not missing. For borrow scores greater than one, the bond is likely to be a *special* bond (see Figure 6)

In fact, the correlation between *DCBS* and the rebate is -0.77, suggesting that DCBS is high (higher than one) in securities lending transactions. Therefore, we identify securities lending transactions as those for which the variable DCBS is 2 or more, which is at least available for 15% of the observations in the sample. The table below reports the available observations where the cost of borrowing index satisfy this condition.[13] As it can be seen, the finding that most observations correspond to Greece, Portugal and Ireland is consistent with the hypothesis that these are indeed securities lending transactions (there are only 23 bond/days in the UK, see Figure 7).

Hence, when the cost of borrowing index is 2 or more, we deem the observation as special or "Expensive to Borrow" and should therefore considered a stock lending transaction, and a repo

[13]There are also a significant number of German bonds in the sample of "Expensive to Borrow" issues. The reason is that, at the onset of the European crisis, the demand for German bond-collateralized repos was so high that repo rates became negative. See Financial Times, Nov. 28, 2011: http://ftalphaville.ft.com/2011/11/28/767721/the-german-bond-market-is-all-about-buy-and-hold/

Country	2006	2007	2008	2009	2010	2011	2012	Total
AUSTRIA	4	5	175	30	3	13	0	230
BELGIUM	0	0	41	0	0	9	0	50
CZECH REPUBLIC	0	0	34	3	16	16	16	85
DENMARK	2	0	39	9	6	0	0	56
FINLAND	2	0	71	1	0	34	0	108
FRANCE	3	10	314	57	62	62	31	539
GERMANY	2	11	669	214	195	358	184	1,633
GREECE	0	7	139	5	145	513	127	936
IRELAND	1	0	48	0	10	204	135	398
ITALY	2	15	127	4	22	24	7	201
LUXEMBOURG	0		0	0	0	0	0	0
NETHERLANDS	3	0	178	29	18	10	56	294
NORWAY	3	3	38	21	26	20	21	132
PORTUGAL	2	4	56	3	8	84	399	556
SPAIN	1	3	117	10	11	56	138	336
SWEDEN	1	2	45	4	7	5	23	87
SWITZERLAND	0	0	21	0	0	0	0	21
UK	0	0	35	0	0	0	0	35
Total	26	60	2,147	390	529	1,408	1,137	5,697

Figure 7: Number of Observations with High Fees

transaction otherwise. In case of German bonds, they also became special in the last years because of the ECB haircut policy (see Nyborg, 2011). Therefore we perform robustness checks (Section **??**.A) to eliminate the impact of German bonds from our results.

V Results

A Univariate Results

In Table 7 we report initial results on securities lending data corresponding only to the three countries that are downgraded to junk status in the sample period (Greece, Ireland, and Portugal). Panel A of Table 7 reports average utilization rates in a window of $t = -5$ to $t = +10$ relative to the rating downgrade announcement. We provide results by individual downgrade. There are six of those, as per Table 6, one of them simultaneous for two CRAs (Portugal was downgraded on January 13, 2012, by both S&P and Fitch).

[Insert Table 7]

Average utilization is 21.6% of the available lending supply five days before the downgrade announcement, and it increases to 23.37% one day before (see Figure 8). It then reaches up to 25% at $t = +3$, and goes back to its original levels at date $t = +8$. Note that, because of settlement and disclosure dates, the securities lending activity reported at $t+3$ is happening before the downgrade announcement.

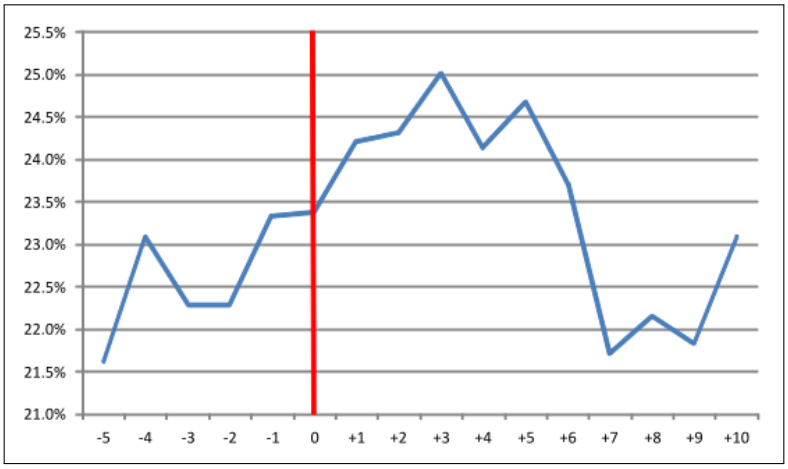

Figure 8: Average Utilization Around Downgrades to Junk Status

To get a better understanding of these findings, Panel B of Table 7 reports average utilization relative to non-downgrade dates. To that end, we construct, for every issue in our sample, a time-series average of utilization rates, excluding rating events, that is, 15 day periods around downgrade announcements (whether notch downgrades or downgrades to junk status). The time series average excludes observations before January 1, 2009, to exclude the abnormal behavior of securities lending around the Lehman crisis. We then compute the ratio of the observed utilization rates on rating periods, relative to the time-series averages of the variables. Our results show that, in the pre-downgrade period, average demand is 3%, 1%, and 9% higher than in no-rating periods in Greece, Ireland, and Portugal respectively. In the window $[t = 0, t = +3]$, these percentages increase to 5%, 30%, and 8%. These results suggest that, even if the increase in lending activity when a downgrade is announced is not large relative to the previous five days, we find that securities lending is overall intensive in the few days before, at, and after a downgrade announcement.

B Event Study around Bond Downgrades

Several papers have studied the impact of bond downgrades on stock markets. Brooks et al. report that sovereign rating downgrades have a negative impact on stock markets when they are announced (a one-day abnormal return of 197 basis points). Michaelidis et al. (2012), studying stock markets from 65 countries, find evidence that country stock indices moves before the public announcement of a sovereign rating downgrade, with a weaker reaction at the announcement and a mild correction after the event. Arezki, Candelon, and Sy have examined the spillover effects of selected European sovereign rating downgrades during the 2007–2010 period. Their main finding is that sovereign

rating downgrades impact not only the financial markets in the country that was downgraded but also other euro area countries. These papers analyze the impact of downgrades on equity, not bond prices. In this section we perform an event study to analyze the impact of sovereign downgrades on issue prices.

As market benchmarks, we use the Markit IBoxx benchmark indices for Euro-denominated sovereign bonds. These indices include investment grade, fixed income, sovereign issues in Euro. We obtain daily returns on the benchmarks from Datastream, for five different maturity groups: from 1 to 3, 3 to 5, 5 to 7, 7 to 10, and more than 10. We match each issue in our sample with the corresponding maturity benchmark, and estimate market model regressions of daily sovereign return on the benchmark, using daily observations for each bond and in the period June 2006-December 2007, excluding days $t = -5$ to $t = +10$ relative to any rating event, if there is one. We compute abnormal returns for a window of -5 to $+10$ relative to the downgrade event date with the estimates from the previous regressions, for all downgrades in the period January 2008-October 2012.[14]

Table. First we distinguish between notch downgrades (from AA to AA-, or from A to BBB for instance), and "junk" downgrades (from investment grade to junk). Note that junk downgrades have only happened for Ireland, Portugal, and Greece. These downgrades may correspond to any of the three rating agencies. Sometimes rating downgrades overlap, in which case we only consider the nearest future downgrade for each day.

[Insert Table 8]

In general we find that notch downgrades are associated to positive pre-announcement effect ($+0.11\%$, significant at the 5% level), a negative and significant effect at the announcement day (-0.19%, significant at the 1% level), and an insignificant price impact afterwards. For most countries the CARs in the pre-announcement period are positive (and significant, except for Greece). Only Portugal (-0.28%, significant at the 5% level) and Spain (-0.38%, significant at the 1% level) display negative returns.

CARs around downgrades to junk are reported for only three countries. We find insignificant pre-announcement returns for Greece. In Ireland, the CAR over the five-day window is

[14]One difficulty of the event study is that it is very difficult to define the "pre-event" dates, because downgrades overlap and follow each other over time. That is why we follow the strategy of estimating market model regressions using 19 months of data at the beginning of the sample, and eliminating those when estimating abnormal returns.

-1.86%(significant at the 5% level). Surprisingly, pre-announcement returns are positive and significant for Portugal ($+0.11\%$). At the announcement day of a junk downgrade, Ireland and Portugal display negative returns (-0.84% and -0.39%, both significant at the 5% level or more); Greece's announcement effect is being insignificant. Post-downgrade, bond prices drop in Greece (-2.28% in a ten-day window) and Portugal (-1.43%), both significant at the 1% level, and increase in Ireland ($+2.27\%$, significant at the 10% level).

C Cross-Sectional Regressions

C.1 Variables

In this table I regress stock lending variables on natural explanatory variables. For the remaining tables, the endogenous variables are defined as follows:

- Supply measure: defined as the active inventory value of beneficial owners (in dollars), divided by the total market value of the securities. The Active inventory value is the current inventory available from beneficial owners less what is deduced to be temporarily restricted from lending, e.g., where securities are held in too small parcels or have been restricted by the beneficial owners. That is, the demand variable measures how much of a bond is available for loan.

- Demand measure: defined as the value of current inventory on loan from beneficial owners, divided by the total market value of the securities. It represents how much of a security is currently taken on loan.

- Active Utilization: a ratio of the previous two, Demand value as a % of the realistically available supply (BO On Loan Value / Active BO Inventory Value)

- Lending Fee. This is very scarce in the data, typically available only for 20% of the sample. As explained in Section B, the lending fee is expressed as an index that varies between one (cheapest to borrow) and five (most expensive to borrow).

We estimate regressions of the form:

$$y_{t+1} = \alpha + \sum_{j=1}^{n} \beta_j x_{jt} \tag{1}$$

where y is one of the variables below, and x_j, $j = 1, \ldots n$ is a set of explanatory variables, including credit rating downgrade indicators. The reason why we date securities lending variables

in $t+4$ is that, in Europe, securities lending transactions can be settled up to day $T+3$ relative to the loan date. Moreover, DataExplorers discloses its data with a one-day delay. This means that observations at any day t indeed represent securities lending transactions that may have occurred between days $t-4$ and $t-1$. We are conservative enough to choose a one-day delay to make sure that the reported securities lending transactions we use have happened before a sovereign bond downgrade being announced at $t=0$, but not known to the market yet.

The set of controls x_j includes:

- CDS spread in percent, as a measure of the riskiness of the bond. The relationship between CDS spreads and securities lending activity has been analyzed in several papers (see Gorton and Metrick, 2012). Daniels and Jensen (2005) analyze the relationship between corporate CDSs and corporate bonds. They find that credit rating is a significant determinant of both CDS spreads and credit spreads for investment grade issues and especially for non-investment-grade issues, but not the reverse. In our paper we use CDS spreads as a determinant of securities lending decisions even though there may be a simultaneous relationship between the CDS market and the securities lending market. This could happen if securities lending leads bond prices and these cause trading in the CDS market. There is supporting evidence in the literature for a simultaneous relationship: see for instance Ammer et al. (2007), and Chan-Lau & Kim (2004). That is why in our regressions we lag the CDS spread by one day. In the corporate CDS market, Aktug et al (2012), Zhu (2006), and Blanco et al. (2005) have shown that CDS spreads lead bond spreads.[15]

- Interest Yield of the bond at time t; Bond Daily Returns, computed from Datastream bond clean prices (which take into account coupon payments); EONIA (Euro OverNight Index Average), which is a measure of the cost of money and therefore of the cost of borrowing the stock; Euro-Dollar Exchange Rate, as an indicator of European-wide risk; MSCI Country Stock Market Index. These variables are explained in Section III.D.D.3

- Ban on German Shorts dummy. On May 19th 2010 Germany prohibited shorting on German bonds, and on Germany territory. The prohibition definitely had an impact on stock lending activity of these bonds (and therefore on the repo market) although, because of the

[15]Note in any case that, because the securities lending transactions are dated at $t+1$, they may represent actual transactions occurring at $t-1$ as well.

geographical scope of the prohibition, the impact was only mild. We consistently find that the German ban increases utilization rates, probably because most of the lending activity in Germany moved to London. Note in any case that German bonds are generally repoed, not lent.

- The daily average utilization in all bonds, to control for average stock lending activity in the market which responds to market-wide changes in investor sentiment.
- The Germany Benchmark 10-year Bond yield
- A dummy that equals one if the bond is a benchmark bond (see Section III.D.1).
- Bond maturity. We construct three dummy variables, one for each maturity (short term, medium term, and long term bonds), and estimate the effect of the last two in the regressions.

C.2 Determinants of Lending Supply and Demand

Table 9 reports the first set of cross-sectional regressions. These show that the previous-day CDS spread is a significant determinant of both securities lending demand and supply. A 100 bps increase in CDS spreads reduces the lending inventory by 0.3% of the total capitalization of the bond (significant at the one percent level), and the lending demand by 0.05% basis points (significant at the 10 percent level). The impact on utilization is significant, although economically meaningless as well (less than one bps). Additionally, the higher riskiness of the issuer makes securities borrowing more expensive.[16]

A significant determinant of lending demand is the overnight lending rates in the Eurozone: a 100 bps increase in EONIA increases lending demand by 0.23%, and thus increases utilization by 1% (these results are significant at the five and one-percent levels, respectively) and lending fees by 10 bps. The impact of EONIA on lending demand is consistent with cash lending (and therefore securities borrowing) becoming more profitable when interest rates increase.

[Insert Table 9]

Finally, we find that securities lending demand is higher for short-term and medium-term bonds (significant at the one-percent level). The rest of variables (except for the average utilization of

[16]Economically, the magnitude of this coefficient is difficult to gauge becase lending fees are consolidated into fee buckets which are undisclosed by DataExplorers.

the day) are not statistically significant. In the subsequent Tables we will always control for these variables. However we do not report their corresponding coefficients because their effects do not change either quantitatively or qualitatively.

C.3 Bond Rating Indicators

We construct several dummy variables to isolate securities lending transactions in the period before rating downgrade announcements. Our first dummy variables are two indicators (*Pre-Notch Downgrade* and *Pre-Downgrade to Junk*) that equal one in days $t = -5$ to $t = -1$ relative to a notch downgrade or downgrade to junk status, respectively. Additionally, we create similar dummy variables for each of the three CRAs we study.

Sometimes downgrades of either type happen so close in time that observations overlap. In that case the relevant downgrade is the earlier one.[17] Even though most downgrade announcements happen after market closures, we constraint the pre-downgrade period to day $t = -1$ to avoid the possibility of disclosures during market hours. Also, we do not go beyond day $t = -5$ to make sure that all our securities lending transactions are not known by the market at the time of the bond downgrade.[18]

C.4 Securities Lending Before Downgrade Announcements

In Table 10 we show the volume of securities lending prior to sovereign downgrades. We first construct a dummy variable ("*Expensive to Borrow*" indicator), as we discuss in Section IV.B, and we interact this dummy with the downgrade indicators. We first find that, for issues of any type, both securities lending demand and supply is significantly lower (0.5% and 0.19% respectively) during the five days preceding a downgrade to junk status. Note that because these are average daily effects, the compounded effect is economically important (the increase in utilization in the total pre-downgrade period is 1% of the total value of the issue). Such effect is obviously concentrated among the PIIGS countries, as they are the only one downgraded during the sample period. However, the utilization of expensive-to-borrow or *special* bonds (which are most likely used in securities lending transactions) is significantly higher (at the one-percent level).

[17] For instance, Greece was downgraded by Moody's on July 25, 2012, and by S&P on July 27, 2012. In that case, the dummy "Pre-Notch Downgrade" equals one on July 26, but not on July 25. However, the "Pre-Notch Downgrade by S&P" equals one on July 25.

[18] We in any case perform robustness tests on different event windows. See Section **??**.C.

[Insert Table 10]

The panel regressions also show a significant increase in fees, reasonably following a demand increase. This result is statistically significant for downgraded PIIGS bonds, both relative to all the other bond-days in the sample, as well as relative to all other PIIGS, non-downgrade days. As we discuss in Section IV.B, some of the expensive issues may correspond to Germany, especially in the later part of the sample. The last columns of Table 10 confirm that it is only for downgraded countries that utilization rates increase.

With respect to notch downgrades there is also a significant increase in utilization rates, but not due to more securities lending. Instead, we find significant drops in securities lending demand in the five days preceding the downgrade: using all observations, the drop is of 1.64% per day, and 1.94% in the subsample of PIIGS countries.

C.5 The Impact of News

So, far, we have found that investors have anticipated downgrades of European issues, especially those downgrades to junk debt suffered by Greece, Ireland and Portugal. Nashikkar and Pedersen (2007) report similar results using a sample of US corporate bond loan data from one of the world's largest custodian banks. They find significant lending activity already 20 days before a downgrade to speculative grade. We now entertain three different explanations for these findings.

- The first hypothesis is that rating agencies use financial markets information to form the decision to downgrade a European issues. If investors possess valuable information regarding the solvency of a sovereign, and this information is incorporated into market prices, then bond yields and prices, as well as securities lending decisions, will be public signals that rating agencies can easily use. Section V.B shows that, on average, abnormal returns prior to notch downgrades are slightly positive and significant; abnormal returns prior to junk-downgrades are insignificant on average and, by country, positive and significant in Portugal, negative and significant in Ireland, and negative but insignificant in Greece. It is therefore difficult to reject the hypothesis that the market does not anticipate European bond downgrades–at least one can say that the only downgrade that was anticipated by the market was that of Ireland (by Moody's, on July 2011). More importantly, it turns out that securities lending information is not observable by the market at the time of the downgrade, as we argue above. Therefore, such hypothesis is rejected by the data.

- The second hypothesis is that investors anticipate sovereign downgrades. This can happen if CRAs signal their decisions with anticipation (for example through warnings or outlook revisions), or if CRAs actions are predictable using publicly available information. We call this hypothesis the *public information* hypothesis. Nashikkar and Pedersen (2007) also argue that increased short-selling before a downgrade could be an indication of (1) private information regarding the bond downgrade; (2) public information not fully reflected in prices; and (3) investors' hedging reason to short in connection with the downgrade. Their evidence is consistent with (2) and (3).

- The third hypothesis is that investors receive private information–from CRAs or the governments involved–before the public announcement of a sovereign downgrade (remember that the decision to downgrade has to be communicated to the issuer at least 12 hours before the public announcement). We call this hypothesis the *private information* hypothesis. Michaelidis et al. (2012) find that stock markets anticipate sovereign downgrades. They argue that their results seem more consistent with information leakages about the content and timing of the pending announcement. The reason is that most of the significant pre-downgrade abnormal returns are concentrated among markets with low institutional quality.

The last two hypotheses should lead to the same findings, namely that securities lending activity increases before bond rating downgrade. This is so because, in the presence of an impeding downgrade, sovereign securities lending supply increases–as a response of financial institutions expecting negative returns–and lending demand increases–as short sellers target the affected country's debt and borrow securities in the market. However the *public information* hypothesis predicts that, the more public information regarding the impending downgrade there is in the market, the more pronounced such effect will be.

[Insert Table 11]

We try to test these two hypotheses in two steps. We first identify those downgrades that are not subsequent downgrades following an earlier one, at least during the last 30 days. We call these *new* downgrades. Greece was downgraded by Fitch on October 22, 2009, and later on December 8, also by Fitch. Subsequently S&P downgraded Greece on December 16, 2009, and also by Moody's on December 22, 2009. The first two downgrades by Fitch are *new* under our characterization (because the previous downgrade on a Greek issue had happened); all the others are *not new*.

Fee Bucket	0	1	2	3	4	5
Lending Fee (bps)	54.7	85.9	166.1	222.2	492.2	533.3

Figure 9: Average Lending Fees by Fee Bucket

To shed additional light to the distinction between the public and private information hypotheses, we also consider those downgrades that do not follow a previous warning (change to *Negative Outlook*) by the rating agency (in the previous 30 days). Warnings are usually released in pre-specified dates (typically quarterly) by the rating agency. There are a few notch downgrades that are new, but only five junk downgrades that qualify as new downgrades, as shown in Table 3: one by S&P (Portugal, January 13, 2012), three by Moody's (Greece, June 14, 2010; Ireland, July 13, 2011, and Portugal, July 5, 2011), and one by Fitch (Portugal, January 13, 2012). We therefore interact four indicators: a pre-downgrade indicator, the *Expensive to Borrow* dummy, a control for *New* downgrades, and an *Outlook Change* indicator.

We report regression results in Table 11. Our first finding is that, in the whole sample, lending supply is lower for *special* bonds. Consistent with this finding, utilization rates and fees are higher (significantly at the 1% level). However, there is a significant additional reduction in lending supply in the five days that precede a bond downgrade to speculative grade: lending demand drops, and borrowing fees increase. Note that we find significantly lower fees before the announcement of a notch downgrade.

In the case of *new* junk downgrades with no prior warnings (no downgrade or outlook revision in the prior 30 days), we find strong evidence that lending supply and demand increase, resulting in a lower cost of borrowing. In the whole sample, lending supply increases by 0.39% (significant at the 1% level) in the pre-downgrade period[19]; and lending demand increases by 0.11% (significant at the 1% level). For the whole five-day period, these coefficients imply that lending supply and demand increase by 2% and 0.5%, respectively. As a result, there is a significant increase in utilization rates (up 0.11%). Lending fees are lower as well: they are 0.7 buckets lower in the pre-downgrade period, which represents a estimated increase in fees of 67 bps. [Figure 9 reports all observations with available data on lending fees, classified into fee buckets.

The average difference in fees between to consecutive buckets is 95 bps.

The shift in lending demand and supply curves that we identify is equivalent to a SOUT shift

[19]For new downgrades with no prior warnings, the full pre-rating effect is the sum of the significant coefficients of the four *Pre-Junk Period* dummies

(using Cohen et al.,2007 terminology), which happens in their case when stocks see their loan fee fall but the loan quantity rise. Cheaper borrowing makes it possible for more investors to enter the market, thus relaxing a previously existing shorting constraint. They argue that SOUT predicts an immediate downward price adjustment. Table 8 reports negative abnormal returns in the post-downgrade period (which is also the time at which securities lending information is released to the market).

Our results are consistent across subsamples. They are strong among Euro countries, and also among PIIGS countries. In the subsample that only includes Greek, Irish, and Portuguese issues, the supply and demand increases (+2.09% and 0.37%) are significant at the 1% level, as well as the reduction in fees (−0.8 buckets). The significant increase in utilization rates (0.12%, significant at the 5% level) is consistent with Figure 8.

Overall, our findings suggest that most of the abnormal securities lending activity prior to bond downgrades in Europe is concentrated among rating announcements that surprise the market. Indeed, we do not find that, when the market receives public signals of an impeding downgrade (either a prior downgrade by another rating agency, or a more straightforward negative outlook on the sovereign), there is significant securities lending activity (there is indeed a drop in lending demand of about −0.29%). This is quite intuitive because the public signal should have impacted securities lending at the time of the news release, thus making any future trading on public information unprofitable. Therefore, our results provide support against the *public information* hypothesis. In line with Nashikkar and Pedersen (2007), the remaining explanation for our results–that traders possess private information regarding an impeding downgrade–is not per se an indication of illegal insider trading[20] in the securities lending market. Traders may well be using public information that it is

[20]Section C, Article 3 of Regulation (EC) No 1060/2009 of the European Parliament and of the Council of 16 September 2009:

"Credit rating agencies shall ensure that persons referred to in point 1:

[...] (b) do not disclose any information about credit ratings or possible future credit ratings of the credit rating agency, except to the rated entity or its related third party;"

Similarly, the Securities Exchange Act of 1934, § 240.17g-4 states: "*Prevention of misuse of material nonpublic information.*

(a) The written policies and procedures a nationally recognized statistical rating organization establishes, maintains, and enforces to prevent the misuse of material, nonpublic information pursuant to section 15E(g)(1) of the Act (15 U.S.C. 78o–7(g)(1)) must include policies and procedures reasonably designed to prevent:

[...] (3) The inappropriate dissemination within and outside the nationally recognized statistical rating organization

	Supply	Demand	Utilization	Fees
S&P	1.282	0.262	0.163	-1.092
Moody's	2.670	-0.080	0.412	-0.334
Fitch	0.029	0.236	0.143	-0.930

Figure 10: Total Effects of Junk Downgrades

ignored by the market; we cannot rule out that information about securities lending transactions are privately obtained by CRAs.

Henry et al. (2011) study whether short sellers anticipate corporate bond rating downgrades. They find significant short selling activity during the one year before the downgrade. They find no evidence of increased short selling in the days close to the downgrade announcement, which contradicts the hypothesis that short sellers possess private information. However, they find that short selling is more severe for firms which went through a previous downgrade, which they interpret as evidence that short sellers are informed traders who anticipate rating downgrades. The question remains as why the market does not use the information contained in short selling activity.

C.6 Results by Rating Agency

We further explore the robustness of our results by analyzing the market for borrowing sovereign bonds depending on which CRA downgrades a particular issue. We split our dummy variables into three different categories, one per CRA, and present results in Table 12

[Insert Table 12]

Let us first focus on junk downgrades. The first set of regressions shows a joint estimation for all three CRAs. Because the Fitch and S&P junk downgrade of Portugal happened the same day, Fitch coefficients cannot be estimated. In the Figure 10 we report total effects from regressions 5 to 16, which we compute by adding the coefficients of the two downgrade dummies per CRA. All coefficients are significant at the 5% level or better:

We find consistent results with the ones in the previous Section. Lending demand increases consistently across CRAs, while lending demand slightly decreases prior to Moody's downgrades, and increases elsewhere. Utilization is consequently higher. The shifts in the demand and supply

of a pending credit rating action before issuing the credit rating on the Internet or through another readily accessible means."

curves resulting in lower lending fees are again consistent with supply-driven securities, cheaper lending transactions.

In the case of notch downgrades, results are qualitatively different. In the case of S&P, we find marginally weak increases in securities lending demand (1.54% increase, significant at the 10% level), which may suggest some market anticipation. However, in the case of Fitch and Moody's downgrades, both demand and supply are lower in the pre-downgrade period, which is inconsistent with market anticipation.

VI Robustness Tests

In this section we test the robustness of our previous results by performing additional tests which involve: removing potential contamination of German bonds' repo transactions in the later part of the sample; excluding the pre-2009 period from the sample; and reducing the event window to only pre-rating downgrade announcement days.

A Excluding Germany

In Section IV.B we discuss that after 2009, German bonds became *special* because of an extraordinarily higher demand from market participants. Such demand was the consequence of the European Central Bank policy regarding collateral and repo haircuts. As we have shown, the result was extremely high borrowing costs and negative rebates for German bonds, despite their low riskiness. Because our panel regressions compare the securities lending demand and supply for sovereigns that suffer a downgrade, comparing them to non-downgraded bonds (potentially German), our results may be overstating the magnitude of the effect of the rating event.

[Insert Table 13]

Table 13 reports a similar regression to Table 12, but without the observations corresponding to German issues. The number of observations drops from $1,294,307$ to $832,563$ because German bonds represent the largest part of our original sample. In any case, we do not find qualitative differences in our results.

B Excluding the pre-2009 period

As a second robustness test, we exclude the observations from the year 2008 and before. One reason is that most of the bond downgrades in our study, and certainly all of the downgrades to junk status, happen after 2008. The second reason is that the short selling activity in government bonds during 2008 is intense and therefore many sovereigns, including those of AAA-rated countries, went into *special*, so it is again difficult to benchmark our results against the normal behavior of securities lenders and borrowers.

[Insert Table 14]

Table 14 presents the results.

C Different Event windows

There is no evidence other than the one coming from market participants that the $T+3$ settlement window is fully exploited by securities lenders/borrowers, and certainly DataExplorers does not provide detailed transaction and settlement information. Therefore, and to take a conservative approach, we have also estimated our regressions with securities lending variables dated at $t+1$. That is, we still consider the DataExplorers reporting delay of one day, which means that the pre-rating period ends at $t=0$ relative to the downgrade announcement. This ensures that all securities lending transactions have for sure happened before the downgrade.

[Insert Table 15]

Table 15 reports this results, which are still consistent with our overall picture of demand and supply increases, with a significant reduction in lending fees.

D Other Tests

We have additionally checked the consistency of the results to extending the event window before day $t-5$. Note that, because downgrade events overlap sometimes, it is less appropriate in our view to attribute an increase in securities lending demand or supply to a longer pre-event window. We have also estimated panel regressions using only the subsample of PIIGS countries, as well as only the subsample that only includes Greece, Ireland, and Portugal. Finally, we have estimated the

regressions separately for notch and junk downgrades. The results (not reported) do not represent a significant qualitative change with respect to our major findings.

We have also used a coarser definition of *new* downgrades, assuming that a downgrade is a surprise only when there are no public signals (a previous downgrade or an outlook revision) within the last 90 days before its public announcement. One problem with such definition is that we are left with only two new downgrades, which correspond both to the same country (Portugal). We find in any case consistent results.

VII Conclusions

Our paper presents strong evidence of securities lending market anticipation of sovereign bond dowgrades in Europe during the period $2008 - 2012$. We construct a sample of bonds from 18 European countries which includes members of the Euroland; EU, non-euro members, as well as non-EU countries. We compile the history of bond downgrades (notch downgrades as well as downgrades to speculative grade) for the sovereigns in our sample and complement it with issue-, as well as issuer-specific information. We then focus on the securities lending market. We obtain from DataExplorers the complete set of securities lending transactions for $6,052$ sovereign bonds, with information on securities lending demand and supply, as well as borrowing costs.

We find that, in the five days preceding a junk downgrade, securities lending demand and supply increase significantly with respect to the non-downgrade periods for the same issue. We rule out that CRAs use this information to form their decision regarding the downgrade because of the special $T + 3 + 1$ settlement and reporting period for securities lending transactions in Europe. This means that a securities lending transaction occurring two days before the public announcement of the downgrade is only known to the market one day after the announcement. Therefore, the only explanation that remains for our findings are that some investors anticipate the downgrade. However, we find that the increases in lending demand and supply are only significant for downgrades that surprise the market, i.e. downgrades that are not preceded by a previous downgrade or an outlook revision within the past 30 days. The difference in results between these two types of downgrades is evidence against investors using publicly available information to benefit from securities lending.

References

Aggarwal Reena, Jennie Bai, Luc Laeven, 2016, "The Role of Government Bond Lending Market in Collateral Transformation," working paper.

Aktug, Rahmi Erdem, Geraldo Vasconcellos, and Youngsoo Bae, 2012, "The Dynamics of Sovereign Credit Default Swap and Bond Markets: Empirical Evidence from the 2001-2007 period," *Applied Economics Letters* 19, 251-259.

Almeida, Heitor, Geraldo Vasconcellos, and Youngsoo Bae, 2012, "The Dynamics of Sovereign Credit Default Swap and Bond Markets: Empirical Evidence from the 2001-2007 Period," working paper.

Arezki, R., B. Candelon, and A. Sy, 2010, "Sovereign Ratings News and Financial Markets Spillovers," IMF Working Paper.

Asquith, Paul, Andrea S. Au, Thomas R. Covert, Parag A. Pathak, 2013, "The Market for Borrowing Corporate Bonds", *Journal of Financial Economics*, 107, 155-182.

Becker, Bo, and Todd Milbourn, 2011, "How did increased competition affect credit ratings?", *Journal of Financial Economics* 101(1), 493-514.

Blanco, R., Brennan, S., Marsh, I.W., 2005, "An empirical analysis of the dynamic relation between investment grade bonds and credit default swaps." *The Journal of Finance* 60, 2255-2281.

Cantor, Richard, 2004, "An introduction to recent research on credit ratings", *Journal of Banking & Finance* 28, 2565–2573.

Chan-Lau, J.A., Kim, Y.S., 2004, "Equity prices, credit default swaps, and bond spreads in emerging markets," IMF Working Paper. WP/04/27.

Bongaerts Dion, K.J. Martijn Cremers, and William N. Goetzmann, 2012, "Tiebreaker: Certification and Multiple Credit Ratings", The Journal of Finance 67, 113-152.

Boot Arnoud, Todd Milbourn, and Anjolein Schmeits (2006), "Credit Ratings as a Coordination Mechanism, Review of Financial Studies" 19(1), 81-118.

Brooks, R., R. Faff, D., Hillier, and J. Hillier, 2004, "The national market impact of sovereign rating changes," *Journal of Banking and Finance*, 28, 233–250.

Cohen, Lauren, Karl B. Diether, and Christopher J. Malloy, 2007, "Supply and Demand Shifts in the Shorting Market", *Journal of Finance* 62, 2061–2096.

Cornaggia, Jess, Kimberly J. Cornaggia, and John E. Hund, 2012, "Credit Ratings across Asset Classes: A≡A?", working paper.

D'Avolio, Gene, 2002, "The Market for Borrowing Stock", *Journal of Financial Economics* 66, 271-306.

Daniels, K.N. and M.S. Jensen, 2005, "The Effect of Credit Ratings on Credit Default Swap Spreads and Credit Spreads," *Journal of Fixed Income*, 14, 16-33.

DataExplorers, "EU Sovereign Bonds: Borrow Costs and CDS Spreads", Research Note #4, 8 August 2011.

Duffie, Darrell, 1996, "Special Repo Rates." *Journal of Finance* 51(2), 493-526.

Duffie, Darrell, Nicolae Gârleanu, and Lasse H. Pedersen, 2002, "Securities Lending, Shorting, and Pricing", *Journal of Financial Economics* 66, 307–339.

Euroclear, "Understanding Repos and the Repo Markets", March 2009.

Financial Stability Board, "Securities Lending and Repos: Market Overview and Financial Stability Issues", April 27, 2012.

FitchRatings, The Ratings Process–Special Report, December 2011

Gaillard, Norbert, "A Century of Sovereign Ratings", Springer, 2012, 206 pp.

Gorton, Gary, and Andrew Metrick,2012, "Securitized banking and the run on repo", *Journal of Financial Economics* 104, 425–451.

Henry, Tyler R., Darren J. Kisgen, and Julie Wu, 2011, "Do Equity Short Sellers Anticipate Bond Rating Downgrades?", working paper.

House of Lords, European Union Committee, "Sovereign Credit Ratings: Shooting the Messenger? (Credit Rating Agencies - Oral evidence and associated written evidence)", July 21 2011.

Kaplan, Steven, Tobias Moskowitz, and Berk Sensoy, 2013, "The Effects of Stock Lending on Security Prices: An Experiment", *Journal of Finance*, forthcoming.

Michaelides, Alexander, Andreas Milidonis, George Nishiotis, and Panayiotis Papakyriacou, 2015, "The adverse effects of systematic leakage ahead of official sovereign debt rating announcements,"
.

Moody's Global Sovereign, Rating Methodology, September 2008.

Nashikkar, Amrut, and Lasse H. Pedersen (2007), "Corporate Bond Specialness", working paper.

Nyborg, Kjell G., 2011, "The Euro Area Sovereign Debt Crisis: Secure the Debt and Modify Haircuts", Swiss Finance Institute Occasional Paper Series N° 11 – 01.

Saffi, Pedro A.C., and Kari Sigurdsson, 2011, "Price Efficiency and Short Selling", *Review of Financial Studies* 24(3), 821-852.

Securities Finance Trust Company, "Securities Lending Best Practices, A Guidance Paper for US Mutual Funds", 2012.

Standard & Poor's RatingsDirect, How We Rate Sovereigns, March 2012.

Vir Bhatia, Ashok, 2002, "Sovereign Credit Ratings Methodology: An Evaluation", IMF Working Paper WP/02/170.

Zhu, H., 2006, "An empirical comparison of credit spreads between the bond market and the credit default swap market," *Journal of Financial Services Research* 29, 211-235.