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# Downgrades of sovereign credit ratings and impact on banks CDS spread: does disclosure by banks improve stability?

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## **Abstract**

This paper investigates the relationship between disclosure and bank CDS spread during the sovereign debt crisis over the period 2011-2013. We cumulated the evolution of the spread of CDS on 4 different timeframes. We modeled two transparency index: one global and one specifically dedicated to sovereign exposure. We obtained significant results on the impact of targetted sovereign disclosure on the evolution of the CDS spreads, while the global index have not significant impact on the evolution of the CDS spread.

JEL Classification: G14, G21

Key words: bank, sovereign crisis, disclosure, CDS

# 1 Introduction

The European crisis have raised major concern about the solvability of some countries and about the solvability of some banks. The main issues of the recent European crisis are diverse. One of the important issues is the increasing probability of default of European countries. The sovereign downgrade have an impact on bank risk portfolio. Furthermore, deeply in debt countries may not bail banks in financial difficulties. For these two reasons, sovereign crisis has important consequences on the solvability of banks, especially when domestic bank are the more likely to be buy domestic sovereign debt. The combine effect of “no bailing” and “higher risk” asset can be harmful for the interconnected banking sector. An other important issue of the recent years concern the disclosure around the situation. Actually, the so-called “subprime crisis” has enlightened the lack of disclosure and transparency in the management of the crisis by banks and have led regulation authority to review the international agreement in order to restore and maintain stability in the banking sector. So the European Central Bank (ECB) and the European Banking Authority (EBA) created stress tests to prepare banks to extrem scenari and to help them reacting to emergency situations. The EBA and the ECB decided to enable access to the public to the results and the data used for the resilience tests (called here stress tests) conducted for the year 2009, 2010 and 2011. The decision to publicly disclosure, data and results of those stress have also play an important role on banks communication policy, especially regarding their disclosure to sovereign exposure. In the same idea, the new Basel 3, and Basel 2 Pillar III before it, agreement’s prerogatives emphasize the necessity of disclosure and market discipline in order to avoid similar situation and increase financial stability and banks resilience.

The aim of this article is to analyse wether disclosure by banks did improve financial stability during the European sovereign crisis. We analyze the relationship between disclosure by banks and their credit default swaps (CDS) spreads during the European sovereign debt crisis. We focus on the reaction of CDS spread when the credit rating of a country has been downgraded. Does bank disclosure reduce the fluctuation of the CDS spread ? If not, does it affect positively or negatively the spread of the CDS? The divulgation of information by the banks should reduce the informationnal risk premium, and as a consequence, disclosure should reduce the reaction of the CDS market. We consider two kinds of disclosure: first, we consider divulgation of information about sovereign risk exposure (“specific disclosure”). If investors have access to such information, do they more or less react than if they do not have information? Second, we consider divulgation of general information (such as corporate governance) (“global disclosure”), because a strategy of global disclosure may create confidence: if investors have access to general information they may react less than if they do not.

This question is important from a regulatory point of view: does disclosure increase financial stability? May disclosure avoid potential systematic crisis on the banking sector? Finally, is mandatory disclosure necessary?

We use the data obtained from the European Banking Authority and from the database Bankscope. We assess the impact of downgrading sovereign credit ratings on the evolution of the CDS spreads when controlling for bank sovereign exposure to the different banks and countries participating in to the EBA stress tests. We analyse the role played by banks' disclosure on the CDS spread reactions. We show that specific disclosure reduces reaction of the spread. This analysis also shows that global disclosure is less benefic for financial stability. We also shows that banks in the Eurozone are more likely than non-eurozone banks to see their CDS spread increases during this period. This article provides several contribution. First, we analyse the role of disclosure by banks when a sovereign downgrading is announced wheease only the impact of disclosure by the ABE has already been analysed (see Petrella and Resti, 2013). Second, we create a new disclosure index based on yearly reports of banks. The index reward banks that are the most transparent based on our selected criterion. Our third originality come with the use of the bank CDS spreads instead of equity or bonds, as most of the empirical literature related to disclosure.

The paper will be divided as follow. The section 2 reviews the existing literature about disclosure, disclosure policies and CDS; and presents our theoretical background. Section 3 describes the empirical strategy and the data set. Section 4 presents the results. Section 5 concludes and brings further discussions for upcoming researches.

## **2 Related Literature**

### **2.1 Empirical literature**

#### **2.1.1 Disclosure and financial stability**

A growing literature analysis the impact of mandatory disclosure on stability of financial markets. Most of the literature has been done on stock market data or bond and not much on CDS market, and more generally on derivative market. Baumann and Nier (2004) showed that the stock prices volatility is reduced by disclosure. Their results suggest that disclosure and transparency is useful to investors because it reduces the rumor effect. By reducing the rumor effect, disclosure participates into the reduction of unwanted volatility. Since stakeholders prefer stability when calculating their expectations, disclosure reduces the undesired volatility. So the probability of a drop under the value leading to default of the subsequent bank (throughout its equity) is reduced. Jirasakuldech et al. (2010) also studied the relationship between disclosure and the volatility of stock prices when facing an external shock. They show disclosure participates into the reduction of the extreme volatility when the magnitude of the shock is reasonable but when the magnitude of the shock is large, disclosure does not have a significant impact on stock prices volatility. Tadesse (2006)

focuses on the impact of the introduction of mandatory disclosure on banking stability. He shows a very significant negative relationship between quantity and quality of disclosure and the probability of occurrence of a systemic banking crisis. This finding is valid for any macroeconomics control variable used in the model, especially variables that translate instability in the real economic sphere like it was the case in the European Union in our sample. The introduction of Basel 3 came along with the introduction of new prudential recommendation for banks concerning to disclosure. Most of the new disclosure tools are quite complicated, even for someone familiar with the topic, to understand. Choosing simpler tools or more qualitative tools is important in order to grant stability on the sector where disclosure is introduced. Akhigbe and Martin (2008) also demonstrated the existence of a negative relationship between transparency, governance and risk variation. The authors provide an extensive analysis of the cost of disclosure and its relationship with the reduction of all kind of risk: disclosure and transparency decrease individual risk, systemic risk and also total risk. The two previous articles provide detailed information about the necessity of having disclosure policies: The disclosure policies participate into creating market discipline where at some point the voluntary disclosure will out reach the potential effect of the mandated disclosure (Baumann and Nier (2004)).

The closest article to our analysis is Bischof and Daske (2013) who study the consequences of supervisory disclosure of bank specific information such as credit risk exposure and stress-test simulations. They analyze how mandatory supervisory disclosures interact with banks' subsequent voluntary disclosures or opaqueness. Their results show a substantial rise in voluntary disclosure of sovereign credit risk exposure in all of their sample firms over the investigation period (from 2009 to 2011). The general pressure of stakeholders, auditors, regulators or rating agencies to provide such specific disclosure increased with the severity of the Eurozone debt crisis. They used both stress test participants and non stress test participant . And shows that for stress-test participants, the likelihood of a change in disclosure behavior was significantly greater during the reporting periods immediately after the stress-tests. These results are consistent with the literature about the impact of disclosure regulation on corporate reporting behavior (Beyer et al. (2010) or Bushman and Landsman (2010)) and is also consistent with the literature which examines market reaction to supervisory bank disclosures (Peristiani et al. (2010) and Ellahie (2012) analyze short term market reaction at the surroundings of the European stress-test).

In addition to empirical papers, the theoretical literature shows interesting results about the impact of disclosure on the financial market. Vauhkonen (2011) show the impact of mandatory information disclosure on bank safety in a model of banking competition in which the bank probability of continuing its activity depends on the quality of its risk management and measurement systems. In the model, banks collect deposits and invest them in a loan project with variable quality. It shows, under the scenario of partially or

fully observable health information about the bank imposed by mandatory requirements (for e.g. Basel 2 Pillar 3), disclosure lowers the cost of outside equity and fosters bank's quality competition. Such result has important consequences where bank competition become safer and avoid behavior which could be harmful to the financial market stability. The results supports the claim by Gordy and Howells (2006) that the ultimate success of Basel II standards depends on how well the Pillar 3 works. It also shows disclosure reinforcement enhance the benefits of the use of other regulatory tools such as capital requirements. Cordella and Yeyati (2002) also study the impact of disclosure on disciplinary effect. The article also analyze the banks' risk taking behavior under different assumptions about dissemination of information. All of the banks are fully financed by deposits and banks chose to invest in a pool of risky projects. Depositors can asses the financial information of the bank to monitor banks probability of default. Their results shows that banks have an incentive to improve the quality of their portfolio and to become less risky when the monitoring of the bank's conditions is possible. Informed depositors participate to an increase in stability through the modification of the risk management.

The recent change in the disclosure literature still provide incentives to impose more mandatory disclosure in order to ensure market discipline.

### **2.1.2 Stress-tests and sovereign debt exposure**

The first objective of the EU's stress testing exercises of the banking sector is the assessment of whether banks will maintain an adequate level of capitalization even when facing an exogenous shock. To such purpose, banks core capital are simulated under different scenarii. The first stress-testing exercise was done in 2009 with 22 participants and none of the results nor the identity of the participants were disclosed. The second and third stress test of the proposed by the EBA was then publicly disclosed and the test of 2011 provided more intelligence about exposure to financial institutions, corporations, retail customers and sovereign exposure.

Grilli, Masciandaro and Tabellini (1991) shows evidence there are different path of sustainability for public debt: sustainable paths which do minimize the distortionary effects of taxation and the unsustainable paths which do not participate in to minimizing the distortionary effect of taxation. The articles investigates the reasons of government deficit (form of the democracy, political stability, etc.) and therefore government debt over 12 countries located in the European union and 5 other large countries (US, Japan, New Zealand, Canada and Switzerland). It provides conclusions about the different paths of the different participating countries where each countries had to face heterogeneous economic incentive leading to a variety amount of debt. The results of this article, especially concerning inflation and the short-lived government, have im-

portant implications for the ongoing debate over the feasibility and appropriate sequencing of the European monetary integration and the regulation authorities must reinforce the regulation criterion to avoid a risk to stability of the financial sector if governments would fail to service their public debt.

The risk of government default in the EMU has been a chronic fear over last decades and the instauration of the Maastricht criterion were purposely introduce to limit those fear. At the beginning of the Economic and Monetary Union (EMU) some concerns in the literature were related to the change in the riskiness of euro-investment hold by euro-area banks. The change in the risk of a German bond to a mix German-Greek-Spanish bond raise awareness about the risk of the situation especially when euro banks are largely holding public debt: prior the peak of the sovereign debt crisis, on average euro-area bank's holdings of public debt are larger than their capital (Arnold (2012)). Goodhart (1997) argues the EMU alters the risk profile of public debt due to the lose of monetary sovereignty of central government. The right to print money to pay off domestic debt has been largely diminished by the introduction of one independent European central bank leading to a decrease of inflation or currency risk and the only risk would then be the risk of default of a country. This academic argument were not taken into account by policymakers at the creation of such regulation. Policymakers only based their analysis on the EMU entry requirements and the independence of the European Central Bank. With a regard to the current situation in Europe, Goodhart's argument seems to would have been relevant.

Arnold (2012) shows the relationship between sovereign risk and banking risk during the recent European sovereign crisis. The article tries to address the question if information provided, by market valuations prior to the stress tests, to stakeholders was sufficient or if the new data released with the stress test add up to the information available to investors. It uses the data provided about the sovereign exposure of July 2010 in the EBA stress test. it investigate whether heavily exposed banks were hit harder during the crisis in May 2010, at the peak of the EBA release. The results of the article are mixed. Banks exposed to distressed sovereign debt are also the one responding more to a change in a change in sovereign CDS rates and appears to be driven by fixed effects on banks located in PIGS countries. Banks in these countries appear more vulnerable to sovereign risk either directly due to their exposure to domestic debt or indirectly by the impossibility of government to bail them out increasing the risk of default of bank and all the spillover risk which come with. The sovereign risk has a positive impact on banking risk.

Acharya et al. (2014) show that financial sector bailouts and sovereign credit risk are intimately linked. A bailout benefits the economy by improving the under-investment problem of the financial sector. The authors show that the announcement of financial sector bailouts was associated with an immediate opening

of sovereign CDS spreads, while the banks' one were becoming more and more narrow. After the bailout, however, a significant co-movement between bank CDS and sovereign CDS are visible even after controlling for bank's equity performance.

Bischof (2012) also provide in its analysis an important features about the relationship between stress-test results and subsequent reduction in sovereign risk-taking by a bank. Their findings show that negative stress-test results are associated with a subsequent reduction in sovereign risk taking. Enhancing the efficacy of supervisory disclosure as a prudential tool. The market discipline is made possible with the action of disclosure on the reduction of sovereign exposure by the use of the stress test publication. The stress test on sovereign exposure can then be used as a prudential tool to ensure the stability of the financial sector.

De Bruyckere et al. (2013) also study the spillovers effects in the European debt crisis from sovereign debt to banks. The contagion effect between bank risk and sovereign risk is investigated in Europe over the period 2006-2011. Contagion is here define as an excess of correlation between banks and sovereigns using CDS spreads at the bank and at the sovereign level from both sides either from bank to sovereign or the opposite. The article also explain which channel is more sensitive to drive contagion from sovereign to banks. The article shows significant empirical evides where contagion between bank and sovereign credit risk exist especially at the emergence of the debt crisis in 2009 where significant spillovers for 86% of the banks in the sample is visible in 2009. In the mean time, several critical channel of contagion are identify. It exists a strong home bias in banks exposure where domestic banks holds majoritarly domestic sovereign debt. And finally the last findings of this article is imputable to short term funding sources. The higher a bank rely on short term funding the higher the spillovers between sovereign risk and bank risk are. All of the results provided here suggest that the stress test add new information for stakeholders and show a market reaction to stress test.

Petrella and Resti (2013) also propose to analyze the impact of supervisors test as an information tool on bank stock prices in 2011. The article tests several hypothesis about the impact of stress tests. The first hypothesis tested assess the question of relevance of such information for market participants and if the answer was positive, what was driving such result? Historical data or resilience indicator? The results of this article suggests that market participants significantly react upon disclosure of the stress-test results. Stress-test do reveal new information which were not already accessible to stakeholders and the abnormal returns of bank stock prices are strongly correlated to the output of the stress tests. Both historical data and for resilience indicators appear to be showing that stress tests provide investors very relevant information and are an effective tool to mitigate bank opacity. This article shows empirical evidences on the benefits, to



investors, of stress tests providing information. It also provides important policy implication on the debate of disclosing stress test results.

### **2.1.3 Bank's CDS, probability of default and market efficiency**

The following subsection overlook the relationship between CDS spreads and default probability in the recent empirical Literature. This subsection will also deal with the contagion effect during the European sovereign debt crisis.

Amato (2005) analyze the relationship between the risk aversion and the risk premia in the CDS market. As mentioned earlier, the credit default swap (CDS) spread compensate investors for expected loss, throughout the risk premia. The risk premia provide enough information to study the behavior of investors and its potential risk aversion. The author used data for the period 2002 till 2005 to measure the relationship between the risk premia and the risk aversion on the CDS market, while investigating for the main determinants of risk premia in the CDS market. The results of this article suggest that default risk premia and risk aversion are strongly related to fundamental factors, such as indicators of the real economic activity and the stance of monetary policy, an technical market factors, such as issuance of collateralized debt obligations (CDOs). The results are similar to the one obtained by Berndt et al (2005).

Norden and Weber (2004) analyzes the response of stock and credit default swap markets to rating announcements by the main rating agencies during the 2000-2002. They applied traditional event study methodology to examine whether stock and CDS markets responded to rating announcements during the ongoing period for corporates financials and sovereigns entities. Ratings announcements were collected from the three major rating agencies: Standard & Poor's, Moody's and Fitch. They used both actual rating changes and the different reviews coming aside with the rating announcement. The findings in this article suggest that both market are able to anticipate both rating downgrades and reviews for downgrade by all rating agencies if taken separately. On the other hand, both markets do not show any significant response to positive changes in rating. But most importantly, on a combined analysis of different rating events within and across agencies, the authors show that the stock market and CDS market exhibit a significantly negative abnormal return on days of reviews for downgrade from Standard & Poor's and Moody's, whereas actual downgrades are only showing sign of abnormal performance for the CDS market. The magnitude of abnormal performance in both markets is influenced by the level of the old rating, previous rating events and, only in the CDS market, by the pre-event average rating level by all agencies. In this article we can see that the change in the CDS spread is not related to the macroeconomic environment but also due to the individual outcome.

Arnold (2012) analyzes the relationship between sovereign risk and banking risk during the European sovereign debt crisis in May 2010. They used a dataset of 51 European banks with listed CDS spreads, which participated to EU stress test of 2010. The author analyzes the relationship between bank's stock returns and CDS rates to sovereign CDS. The main objective of this study was to examine the spillover of sovereign risk onto the banking system in the EU. They also used the sovereign exposures of the listed bank in the European stress test from 2010 to assess if heavily exposed banks were more likely to be hit harder during the sovereign debt crisis. Banks mostly exposed to countries in distress respond more to changes in the sovereign CDS rate. This result appears to be driven mainly by banks which are located in countries experiencing sovereign debt problems. Banks in those countries are more vulnerable to such changes because the sovereign debt problem tends to limit the government's ability to bailout banks asking for help. Meanwhile when the author controls for this risk factor, the power of information in the stress test, is greatly reduced. The author also insists on the fact that such disclosure of sovereign debt exposures adds information to the market, leading to interesting policy implications where government would not have to bail banks when bonds market is unstable.

Carboni (2011) studies the sovereign CDS market from 2 perspectives. First, it analyzes the relationship between CDS and bond spreads. And secondly, the relationship between CDS spreads for sovereign and corporate entities using CDS indices and individual spreads for both the sovereign and the banking sector. The results suggest that the relationship between sovereign CDS and bond spreads offers several useful indications. First, the credit risk indicators do not move in the same direction in the long run. For short term, the result suggests that one market has a predictive effect on the other one, with a two-way relationship. Then lastly, the credit risk seems to be led mainly by the CDS sovereign market during 2010, especially for higher spread countries.

## **2.2 Theoretical background**

The main purpose of this analysis is to investigate the impact of disclosure on the evolution, and stability, of bank CDS during the period 2010-2013. Several results can be seen in this analysis, both the sovereign downgrade announcements and the publication of the EBA results can make the CDS market fluctuate. If disclosing stress test results or disclosing a change in a sovereign rating provides information, the different stakeholders will react based on their expectations and adjust their future actions. The impact of such disclosure is visible through the evolution of the subsequent asset (here the CDS spread): if the price of the spread goes up or down, the disclosing process provided enough information to the different stakeholders. On the stock market, an increase of disclosure participates into the reduction of the information risk premium and

reduce the modify the risk premium, depending on the quality of the signal. In case of a negative quality signal, the premium goes up and in case of a positive outcome the premium is reduced. The same argument is also valid for the CDS market, or the bond market.

The information disclosed by the bank on its sovereign exposure can also have an impact in the evolution of the CDS spreads. Disclosing information for a bank is a way to disclose information throughout the year and more frequently than the results provided by regulation agencies. By disclosing information more regularly, a bank can reduce or even cancel the informative purpose of “public” disclosure such as the publication of the stress tests results. On the other hand, if both the “private” disclosure and the “public” disclosure provide valuable information, then participating agents are responsive to any kind of information and both disclosure have combined effect on the evolution of the CDS spread. The stakeholders are then considered rational. There is no “over” reaction when the participating agents are already informed. Banks can also provide different information than the one related to sovereign exposure, this would have an impact on the stakeholder reaction to the intelligence provided by the EBA. If the results of the EBA whichever the quality of the signal, stakeholders will not react too strongly to such information if the bank is known to its stakeholder to be transparent. In other words, the information provided by such tests are not impacting the stakeholders decision making process. All of the scenarios can provide interesting policy implication and motivates us to conduct research in this direction.

The different rating agencies publicly and frequently disclose when a change in the credit rating of a country is happening. The point of disclosing such information is to informed all of the market participant on the risk of such asset. It informs the bond buyers (typically a bank) and the stakeholder (of the same bank). If the downgrade or the upgrade of a credit rating has an impact on the spread of the CDS, then this disclosure provide information that was not already known or anticipated by the participating agents. A change in the spread is explained by a change in the information risk premium and in the non informative risk premium. A downgrade should increase the risk premium of the entities buying the downrated asset due to an increase of the probability of default. The information provided by such announcement play a role on the aversion for uncertainty. More information reduce the uncertainty, and therefore on the aversion itself. The disclosure also increase the liquidity of the asset when the signal emitted is able to reassure stakeholders. The inverse effect is also possible when the signal is not.

Most of all, the purpose of this paper is to analyze whether or not disclosure increase stability on the CDS market. The following sections will be oriented around the role of disclosure as part of the market discipline on the financial market. The idea is then to study if the spread vary less at the surrounding of a downgrade

announcements if the participating agents are more informed. A large part of the theoretical Literature on disclosure is devoted to the stock market and we will try to apply it to the derivative market. The following subsection is devoted to the empirical Literature that helped us for this analysis. It will present the empirical results concerning disclosure, the sovereign risk and the relationship between CDS spreads and probability of default.

### 2.3 Testable hypothesis

The stress test created by the regulation authority are designed around possible scenarios close to real macroeconomic situation. Such test can assess the resilience of the banking sector, and the resilience of each participating bank. The use of the data collected for those tests helps us to analyze the reaction of bank CDS spreads when banks are confronted to disclosure. If the bank that disclose the most have the smallest reaction, then disclosure is an enhancer of financial stability on the CDS market. The CDS spread is an indicator which translate the risk of the bank, through the probability of default.

- In this situation our first hypothesis is:
  - *H1* disclosure has stability effect over the CDS spreads

This hypothesis is the core hypothesis of our research project and the one which driven us to conduct such research. The policy implication of such result is important and justify this research. If disclosure act like an enhancer of stability over the CDS spreads, the recommendations and the decisions to increase successfully the mandatory level of disclosure coming from bank have provided important regulation features. Contrary to evolution, stability contribute to the achievement of high levels of financial activity. On the other hand, if disclosure is shown has not enhancing stability it is interesting to see if disclosure participates to a reduction or an increase of CDS spread. This result also have a significant importance and significant policy implications. Two scenarios would, then, be offer to us: the first one concern the capacity of disclosure to be an enhancer of stability or to provide a reduction of the CDS spreads which lead to a reduction of the probability of default.

We are also investigating here the modification of the information premium through the question why information disclose by a bank, about sovereign exposure or not, might have an impact on the subsequent CDS spread? If the bank decide to disclose more information about its exposure to a variety of sovereign debt, we are going to analyze if the bank just bring complement information to the EBA results or if it is the opposite. A negative link between bank specific disclosure about sovereign exposure and an evolution of the CDS spread would tell us that the results of the EBA does not bring significant information. On the other

hand, if there is a positive link between an increase of specific sovereign debt disclosure and an evolution of the CDS spread, it would actually give us information about stakeholders behavior: stakeholders react to any kind of information even if they already have some incomplete information. For some reason, if the CDS spread is significantly reactive to a different kind of disclosure, not related to sovereign exposure, it would mean that stakeholders reaction is dependent of the global disclosure of the bank. In case of a negative significant link between disclosure, not related to sovereign exposure, it indicates that stakeholders react more rationally when they already have access to similar information.

- In this situation the second hypothesis is:
  - *H2* disclosure related to sovereign debt has stability effect over the CDS spreads

The result of such hypothesis has also great policy implication. In a situation where all the light is on sovereign debt, it can provide incentive to decision maker to reinforce the regulation around disclosure and to force disclosure to be more oriented on the cause of the financial disturbance. Such result would probably help the future research around the question of disclosure when the benefits of disclosure has not yet been well entrenched.

For our research we also analyze the degree of exposure to sovereign debt of each bank of our set. The data set provided by the EBA offers us information about the amount of sovereign debt held by each bank. Those results, and the fact that they are publicly available, have an impact on the behavior of participating actors. Different stakeholders are going to react to such disclosure of information if they consider that the EBA stress tests results brings significantly more information than what they already have. In the case where we have an increase in the amount of information given by the tests, stakeholders will react and the spread of the CDS will be modified. The quality of the information can also affect the evolution of the CDS spread: if the information is positive, the CDS spread will tend to decrease due to a reduction of the informational premium or the opposite if the information is sending a bad quality signal. On the other hand, the test can also not bring enough information leading to a null evolution of the CDS spread.

- In this situation the third hypothesis is:
  - *H3* sovereign debt exposure has an impact on the CDS spreads

If we would reject the null hypothesis, the policy implications for supranational supervisor could force bank to diversify more their portfolio of sovereign debt (especially for banks largely holding sovereign debt of

countries in difficulties) or can impose a conversion system to guarantee those debts even if they got downgraded.

The recent literature, provided in the previous subsection, has brought interesting results to the impact of disclosure and we are hoping this analysis will also bring interesting results on the relationship between disclosure and CDS spreads during period of financial disturbances. The following subsection will detail more our empirical strategy and the model used for our analysis.

## 3 Data and empirical methodology

### 3.1 Events used

#### 3.1.1 Chronicle of the sovereign crisis

Before going any deeper we are going to reassess the historical process of the so called crisis. First we have to understand the link between banks and government deficit. When a government is facing a deficit in its budget, it has two possibility in order to make sure its expenses are covered: increase taxes or emit treasury bonds to finance that deficit. Since the Maastricht treaty, the central bank is not allow to directly purchase those bonds, from its national government, then sold to other buyers. With this treaty those bonds are now purchased by commercial banks and other investors. The transmission link between bank and government debt is nowadays more direct. The process of emitting treasury bonds in order to finance a deficit is not a recent procedure but the recent financial crisis have shown that the process of financing can cause problem. A macroeconomic shock stroke the Eurozone right after the publication of the, newly elected Greek government. By December of the year 2009, Greece admitted that its debts had reached more than 300 billion euros (113% of its GDP), nearly the double of the Eurozone limit of 60%. Rating agencies started to downgrade Greek banks and the sovereign debt, while Mr Papandreou<sup>1</sup> insisted that his country is “not about to default on its debts”. In January 2010, an EU report from Eurostat, deplored the fact that Greece had revised its budget deficit last year from 3.7% of its total GDP to 12.5% (four times the maximum allowed by EU rules). After this announcement and in order to avoid the potential rumor effects, the European Central Bank (ECB) dismissed several rumors which were arguing that Greece would have to leave the Eurozone, leading euro members into a communautary trust issue. The European Commission and the ECB pressured Greece to unveil a series of austerity measures aimed at curbing the deficit. Several heavily indebted countries, such as Portugal, Ireland, Greece and Spain (PIGS), started to rise concerns about their ability to avoid default or ECB bailout. By the end of the first quarter the Eurozone members and the International Monetary Fund agreed on a safety net of 22 billion euros to help Greece to curb its

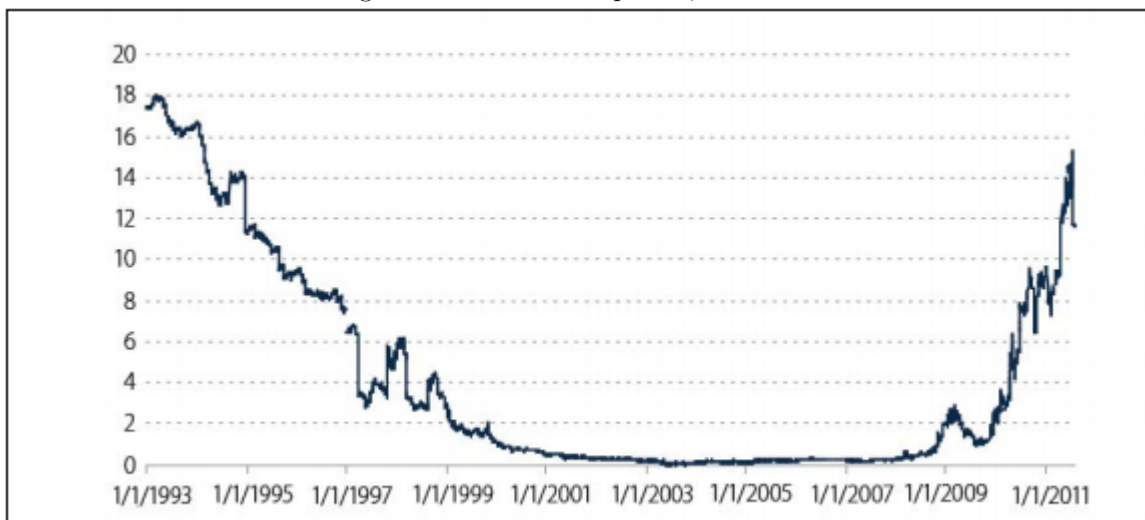
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<sup>1</sup>Greek Prime Minister on December, 11<sup>th</sup> 2009.

deficit and its debt, in exchange for drastic austerity measures<sup>2</sup>.

During the second quarter of the year 2010, the Eurozone members agreed to provide a second help plan by providing a 30 billion euros emergency loan. Ratings agencies downgraded Greek sovereign debt again for the fourth time in 6 months, leading Greek borrowing costs to reach record high, up to 15% interest rate for 10 years bonds. The following chart shows us the large change in Greek sovereign debt cost over the last 15 years. Its cost increased so much, that it started to become unsustainable.

Figure 1: Greek Bond Spreads, 1993-2011



Source: Global Financial Data.

On April 22th, 2010, The European Commission announced that the Greek deficit is even worse than thought after reviewing its accounts: net deficit was nearer to 13.6% of its GDP for the year 2009 instead of 12.7%. Amid growing speculation around a failure of Greece to honor its Sovereign debt and in order to avoid new downgrade, on May 2nd, the Eurozone members and the IMF finally agreed on a 110 billion euros bailout package to rescue Greece and stabilize the European macro-economic environment. During the entire year the value of euro currency continued to fall by comparison to the USD as a consequences of the financial situation in the Eurozone and other EU member started to be pointed at for theirs, yet heavy, sovereign debt starting with the Republic of Ireland. As a consequence, the EU and the IMF agreed to a bailout package to the Irish Republic totaling 85 billion euros in exchange of austerity measures (toughest of the country's history) on November 28th. During 2009, the ECB and the IMF bailed out two countries and spend over 250 billion euros in order to avoid default of one of its members, while growing speculation, strongly dismissed

<sup>2</sup>During this period, the austerity plans spark strikes and riots all over Greece

by the EU, announced that Portugal will soon need to be bailed out. The year 2010 was somehow the most difficult year for the unique currency since its introduction in 1999.

The year after, seemed to be just as tense as the previous one for EU members decision makers. In January a new member, Estonia, joined the euro currency and rose up the number of countries with the single currency to 17. February saw the implementation of a permanent bailout fund for the region: 500 billion euros called the European Stability Mechanism (ESM). Portugal admitted it cannot handle its financial situation and asks the EU for help which was granted for 78 billion euros on May 17th. Later that year, the Greek situation was not improving and during the month of June, the Eurozone ministers insisted on the necessity that Greece must impose new austerity measures in order to benefit from its next part of its emergency plan: the country would have likely defaulted without the plan. In July, the Greek parliament voted in favor of a fresh round of drastic austerity measures while the EU approved the latest tranche of the Greek loan, for more than 12 billion euros. The end of 2011 was still tense, Greece received a second bailout package for more than 109 billions euros while other countries bonds, such as Spain and Italy, started to rise sharply and while the German bonds fell to record lows. As a consequence, on August 7th, the ECB decided to buy Italian and Spanish sovereign bonds<sup>3</sup> to bring down their borrowing cost. At the same time, the G7 also reminds its determination “to react in a coordinated manner”, in an attempt to reassure investors in the wake of massive falls on global stock markets. With this unity, the G7 group is hoping to reduce tension on sovereign debt market and hoping rating agencies would reevaluate their rating on the weakest EU members, while the strongest would back them up. The month of September is full of austerity measure in Spain and Italy, respectively adding a “golden rule” to the constitution and a 50 billions euro austerity budget, but could not avoid the new downgrade, late September, for Italy. After the US Treasury Secretary, Timothy Geithner, speech, asking Europe to create “firewall” around its problems to stop the crisis from spreading, the month of October had shown several actions of central banks to avoid economics contractions. The Bank of England injected £75 billion into the UK economy while the Franco-Belgian bank *Dexia* received a huge bailout from the French and Belgian government. EU members summit on the debt crisis is delayed by a week but continued its efforts to find a solution to the debt crisis in the Eurozone. During the month of December, Eurozone members were pressed to define a regional treaty that will emphasize new safer budgetary rules to put an end to the crisis. Several attempts to get all 27 EU countries to agree to treaty changes failed due to the objections of the UK and Hungary.

The year 2012 can be considered as less tough than the two previous one but the beginning of it had also a lot of implications: less downgrades were announced and the communication around the struggle from members

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<sup>3</sup>By this mechanism, the ECB hoped that investors would reevaluate their demand returns to borrow since the debt would be “guaranteed” by the central bank

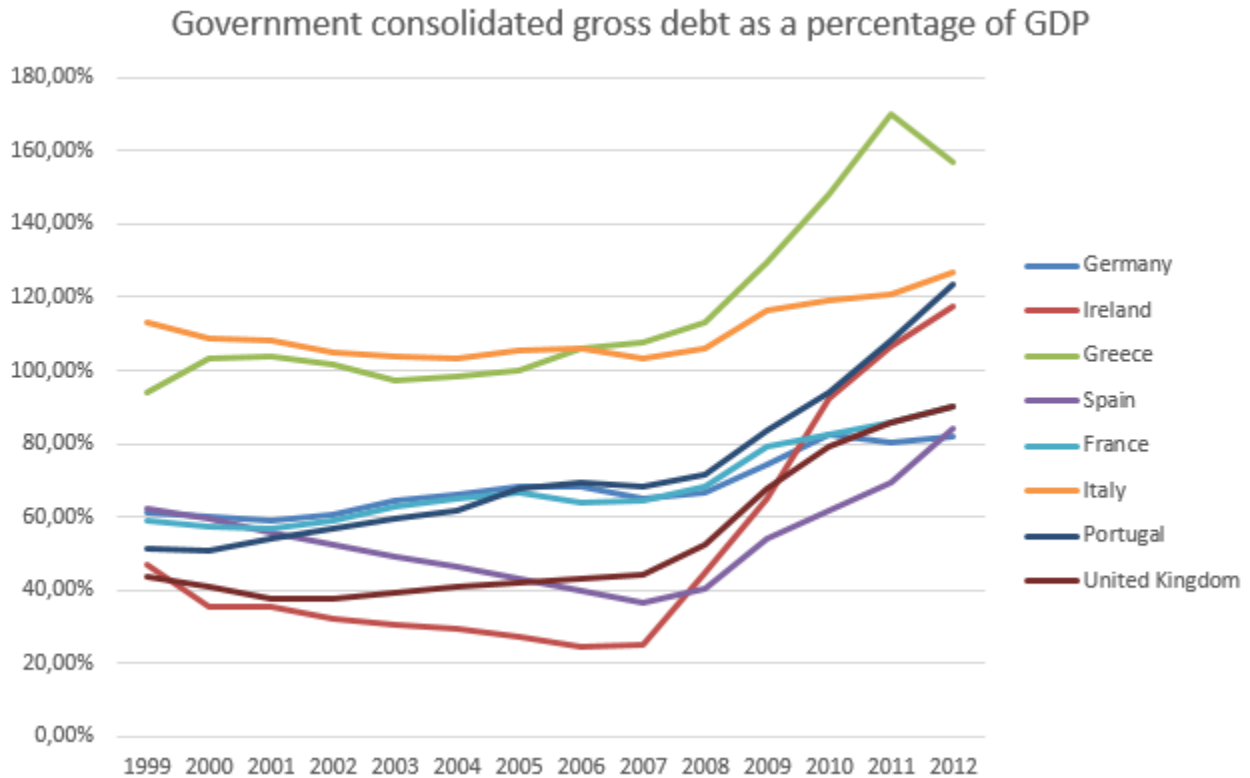


of the European Union, European Commission and the ECB are largely diminishing. The government of the each country member of the Union have reinforce dialog and policies in order to avoid such shock in the future. On January 13th, Standard & Poor's (S&P) downgraded France and eight other Eurozone countries, blaming the failure of Eurozone leaders to deal with the debt crisis. France and Austria both lost their AAA ratings while Germany's perspective is announced as positively stable by S&P. January also brought the signature of the "fiscal pact" by 25 members besides the UK and the Czech Republic. During the beginning of the year, weeks of negotiations ensue between Greece and the "troika"<sup>4</sup> as Greece tried to get a debt write-off and make even more spending cuts to get its second bailout. Those negotiations will finally be passed by the Greek coalition government, leading to dramatic riots and protests all over Greece and more generally in Europe. The EU commission expected this year to be "economically rough" by predicting a contraction of .3% in 2012. The year 2012 is also marked by the announcement of a better future for the European Union: the economic situation is getting better: official figures are showing that the Eurozone retail sales increased unexpectedly in January by .3% and is reported as a positive tentative sign of recovery. The rest of the year rhymed with increase in Italian and Spanish borrowing cost but none of those countries are asking for bailout yet. Although, several banks are facing financial difficulties mostly in Spain, asking for their respective government for a bailout<sup>5</sup>.

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<sup>4</sup>European Commission, ECB and IMF

<sup>5</sup>Spain's fourth largest bank, *Bankia*, says it has asked the government for a bailout worth of 19 billion euros



The figure above is provided as a reminder of the evolution of Government consolidated gross debt as a percentage of GDP for PIGS countries, France, the United Kingdom, Italy and Germany. It shows us that the 2007 crisis had consequences for all of those countries in the volume of their debt.

### 3.1.2 Downgrade events.

Before deciding which downrating we would be using for the analysis we collected information about the beginning of the Greek sovereign crisis. We investigated the historical background of the crisis in order to carefully define the event we will be using. We used the *Europress.com* database to determine the exact date of each downgrade. The news obtained from the gathering of french newspaper was useful to determine the chronology of the different downgrades announcement by three different agencies: Standard & Poor's, Moody's, and Fitch.

The ratings agencies announced more than 65 sovereign downgrades over the period February 2011 to June 2013 in the European Union. The different rating agencies even announced several downgrade on the same day, reducing the 65 announcements to 56 unique dates. We detailed every downgrade per date in order to satisfy the third hypothesis of event studies. Each date, each downgrade, is detailed as follow:

- Country that was just downgraded.
- The magnitude of the downgrade.
- The name of the rating agency, which is downgrading
- The initial rating, before the downgrade.
- The rating after the downgrade.

After analyzing the different news report published in the European news report, we were able to define a first list of downgrades to which we will apply different criterion to limit our study horizon.

For this analysis, we use different kinds of events: first, when the magnitude is at least equal to three, then when a triple A country is downgraded (even if the magnitude is below 3), and finally when at a single date there is more than two countries downgraded. By choosing only the events that have a larger magnitude, we eliminate the downgrades that are considered as adjustments: the downgrade of a country can be interpreted as an adjustment when the country is in a situation where its economic forecast will not be fulfill. For example: if Spain economics forecast is supposed to be negative, and 6 months after the rating agency downgrade the sovereign debt ; then this downgrade is considered as an adjustment because it is supposed to be anticipated. We also avoid the consecutive announcement about the same country.

If we decide not to take into account downgrade with a low magnitude, we need to make sure we take into account the downgrade of significant countries that are less likely to be downgraded by such a large magnitude. By choosing to incorporate AAA countries that are suffering from a downgrade of their sovereign debt rating, we ensure that we take into account larger countries and not only the PIGS<sup>6</sup> countries. By choosing to incorporate the downgrade of France, the United Kingdom or other AAA countries, it allows us to analyze sovereign debt that used to be considered as “risk free”.

We also integrate an event with more than one downgrade on the same day. In January 13th, 2012 S&P downgraded 9 European countries. Those downgrades are the answer from S&P to European policy maker that judge that the initiatives taken in the recent weeks may be insufficient to fully address ongoing systemic stresses in the Eurozone. S&P try to encourage Euro Zone member decision’s makers to solve the sovereign debt issue, to cooperate in order to stabilize the European Union and to raise awareness about the potential contagion effect of the situation.

*“Today’s rating actions are primarily driven by our assessment that the policy initiatives that have been taken by European policymakers in recent weeks may be insufficient to fully address ongoing systemic*

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<sup>6</sup>Portugal, Ireland, Greece and Spain

*stresses in the eurozone. In our view, these stresses include: (1) tightening credit conditions, (2) an increase in risk premiums for a widening group of eurozone issuers, (3) a simultaneous attempt to deliver by governments and households, (4) weakening economic growth prospects, and (5) an open and prolonged dispute among European policymakers over the proper approach to address challenges.”*

The list of events is now up to 16 dates around which we conduct our study. The events used here covers the following period: January 1st 2011 and will stop by the end of June 2013. The following list enumerate the different events selected.

Table 1: Events selected

*This table provides information about the downgrading events used in this study. For each date, we have the name of the downgraded country,  $y$ -the magnitude of the downgrade, the name of the agency which change the rating and in the last two columns, the initial and the final grade.*

Date	Country	Magnitude	Downgrading Agency	Initial Grade	Final Grade
03/07/2011	Greece	3	Moody's	Ba1	B1
04/02/2011	Portugal	3	Fitch	A-	BBB-
05/20/2011	Cyprus	3	Fitch	AA-	A-
06/14/2011	Greece	3	S&P	B	CCC
07/05/2011	Portugal	4	Moody's	Baa1	Ba2
07/14/2011	Greece	3	Fitch	B+	CCC
/	Ireland	1	Moody's	Baa3	Ba1
07/26/2011	Greece	3	Moody's	Caa1	Ca
10/05/2011	Italy	3	Moody's	Aa2	A2
01/13/2012	Austria	1	S&P	AAA	AA+
/	Cyprus	2	S&P	BBB	BB+
/	Spain	2	S&P	AA-	A
/	France	1	S&P	AAA	AA+
/	Italy	2	S&P	A	BBB+
/	Malta	1	S&P	A	A-
/	Portugal	1	S&P	BBB-	BB+
/	Slovakia	1	S&P	AA-	A+
/	Slovenia	1	S&P	A+	A
08/03/2012	Slovenia	3	Moody's	A2	Baa2
10/08/2012	Cyprus	3	Moody's	Ba3	B3
10/19/2012	Cyprus	3	S&P	BB	B
11/19/2012	France	1	Moody's	Aaa	Aa1
01/12/2013	Cyprus	3	Moody's	B3	Caa3
02/22/2013	United Kingdom	1	Moody's	Aaa	Aa1
04/20/2013	United Kingdom	1	Fitch	AAA	AA+

The definition and the guidance of the events are now set. We are going to take more time on the analysis of the data we are going to use for the event study. The following part will first present the data used and then will be added a static statistical analysis of the subsequent datas. Once the data will be presented we will focus on the model used for the event study.

## 3.2 Dataset

The following subsection will introduce the data we used and will be followed by an extensive statistical analysis about the data.

### 3.2.1 Description

We use both Bloomberg and Bankscope databases in addition to the data from the different stress tests of the EBA. The Bloomberg database covers a large amount of sectors worldwide, provides real-time and historical financial market data. The database provide also a large panel of analytics tools. Bankscope <sup>7</sup> provides ratings, individual bank analysis and global financial statement.

We have in our sample 47 banks that have participated to both stress test of 2011 and 2012 and that have CDS emitted in their name. the following table shows the list of bank used for our study.

We analyze the CDS spreads of banks over the period 03/01/2011 and 06/30/2013. As a reminder the CDS spread translate the probability of default of the issuer of the subsequent CDS. The explanatory variable is the fluctuation of the CDS spread over time, we use the cumulative abnormal return (CAR) of CDS. The abnormal return  $AR_{b,t}$  for the bank  $b$  at time  $t$  is the difference between the value of the CDS spread and a more global measure of the volatility of the CDS market: the CDS index used for the analysis is the SNRFIN CDSI GEN 5Y published by iTraxx over the same time period of time. The choice of this index rather than a European CDS index allows to limit the over representation of the European sovereign debt crisis in the index. The index reduces also the country-specific effects, reducing defacto the effect of large abnormal returns. The use of this index provides also originality to this analysis. We used the following method to compute the CARs:

$$CAR_{(t-x), (t+x)} = \sum_{i=t-x}^{t+x} (CDSspread_{(i, b)} - CDSindex_i) \quad (1)$$

where  $t$  is the date of the event and  $b$  the subsequent bank. For each one of the 16 events, we determine the CAR over four different window in the neighborhood of the date of the event:

- $CAR_{-5,+5}$  compute cumulative abnormal return over a period of 11 days: 5 days before the event, the event day and 5 days after the event.
- $CAR_{-2,+2}$  compute cumulative abnormal return over a period of 5 days: 2 days before the event, the day event and 2 days after the event.

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<sup>7</sup>BUREAU VAN DIJK

Table 2: List of bank used for the analysis

Name	Location	Total Asset in million USD
ABN AMRO BANK NV	NETHERLANDS	520 391
ALLIED IRISH BANKS PLC	IRELAND	161 652
ALPHA BANK	GREECE	76 999
BANCA MONTE DEI PASCHI DI SIENA S.p.A	ITALY	288 801
BANCO BILBAO VIZCAYA ARGENTARIA S.A. (BBVA)	SPAIN	841 516
BANCO COMERCIAL PORTUGUÊS, SA (BCP OR MILLENNIUM BCP)	PORTUGAL	118 411
BANCO DE SABADELL, S.A.	SPAIN	213 151
BANCO PASTOR, S.A.	SPAIN	39 301
BANCO POPOLARE - S.C.	ITALY	174 062
BANCO POPULAR ESPAÑOL, S.A.	SPAIN	207 967
BANCO SANTANDER S.A.	SPAIN	1 675 192
BANK OF IRELAND	IRELAND	195 469
BANKINTER, S.A.	SPAIN	81 066
BARCLAYS plc	UK	2 352 449
Bayerische Landesbank	GERMANY	378 444
BNP PARIBAS	FRANCE	2 516 546
CAIXA GERAL DE DEPÓSITOS, SA	PORTUGAL	140 858
CAJA DE AHORROS Y PENSIONES DE BARCELONA	SPAIN	473 821
COMMERZBANK AG	GERMANY	839 000
CREDIT AGRICOLE	FRANCE	2 430 876
DANSKE BANK	DENMARK	615 854
DEUTSCHE BANK AG	GERMANY	2 655 138
DEXIA	BELGIUM	471 315
DnB NOR Bank ASA	NORWAY	361 480
Erste Group Bank AG	AUSTRIA	282 127
HSBC HOLDINGS plc	UK	1 286 857
ING BANK NV	NETHERLANDS	1 103 138
INTESA SANPAOLO S.p.A	ITALY	888 603
IRISH LIFE AND PERMANENT	IRELAND	53 990
KBC BANK	BELGIUM	296 641
Landesbank Baden-Württemberg	GERMANY	443 760
Landesbank Hessen-Thüringen GZ, Frankfurt	GERMANY	262 965
LLOYDS BANKING GROUP plc	UK	1 487 761
NATIONAL BANK OF GREECE	GREECE	138 275
Norddeutsche Landesbank -GZ	GERMANY	297 599
Nordea Bank AB (publ)	SWEDEN	893 665
RABOBANK NEDERLAND	NETHERLANDS	992 756
Raiffeisen Zentralbank Österreich AG	AUSTRIA	192 578
ROYAL BANK OF SCOTLAND GROUP plc	UK	2 026 628
Skandinaviska Enskilda Banken AB (publ) (SEB)	SWEDEN	377 194
SNS BANK NV	NETHERLAND	107 324
SOCIETE GENERALE	FRANCE	1 650 212
Svenska Handelsbanken AB (publ)	SWEDEN	366 508
Swedbank AB (publ)	SWEDEN	283 936
UNICREDIT S.p.A	ITALY	1 222 889
UNIONE DI BANCHE ITALIANE SCPA (UBI BANCA)	ITALY	174 738
WestLB AG, Düsseldorf	GERMANY	130 282

- $CAR_{0,+5}$  compute cumulative abnormal return over a period of 6 days: the event day and 5 days after the event.
- $CAR_{0,+2}$  compute cumulative abnormal return over a period of 3 days: the event day and 2 days after the event.

The reaction of the market is analyzed to scan for ante announcement reaction and post announcement reaction. Our main hypothesis is that the cumulative abnormal return at the neighborhood of the event should tend to 0 to translate stability over the variation of the CDS spread. If such results are obtained, this would mean that there are no reaction of the market to such announcement: the market already anticipated this information in the spread of the CDS.

In order to try to explain the stability of the CDS spread, we are using different variables to understand which components participate into the stability of the CDS spread. The following paragraphs will be divided in several subsection. The first one will be focusing on sovereign exposure per bank, the second on transparency and finally be focusing on the control variables.

### **3.2.2 Sovereign exposure per bank**

Thanks to the stress test, conducted by the EBA in 2010 and 2011, we were able to obtain the sovereign exposure of the participating banks per bank and per country. The stress test provides extensive data at 3 different time:

- as of 31th, December 2010.
- as of 31th, December 2011.
- as of 30th, June 2012.

For each date, the stress tests give information about the amount and the type of sovereign exposure held by the bank depending on the country. Each exposure is also function of the residual maturity over different time period: from zero to three months, from three months to one year, from one to two years, and so on up to 15 years. For this analysis we use three maturities: from zero to three months, from three months to one year and finally from one year to five years. The last period used were summed for the different subperiods that are included in the larger one. The data provided in the two stress tests are expressed in million Euros.

With the exposure data, we compute nine different variables. The first variables translates the specific exposure of the country or countries that were downgraded at the date of the event. For each events,

we used the value of the gross and net direct exposure to the country that suffered the downgrades for the subsequent event. For example, the first event is based on the downgrade of Greece in March 2011. The different variables created translate the exposure of each bank to Greece. The *GROSS\_EXPO\_ST*, *GROSS\_EXPO\_MT*, *GROSS\_EXPO\_LT*<sup>8</sup> express the gross exposure to the country/countries suffering the downgrade for each individual event. The *NET\_EXPO\_ST*, *NET\_EXPO\_MT*, *NET\_EXPO\_LT* express the net exposure of the country suffering the downgrade for each individual event. In the case of the event of 12th, January 2012, we summed up the exposure data for each countries that were affected by the different downgrades (nine in total).

The total exposure of each bank to all of the participating countries of the EBA stress tests is also use. This variable is denominated *TOT\_EXPO*. This variable does not provide enough information about the exposure to a particular country but to bypass this inconvenient we computed other variables which will inhibit the exposure variations within countries for each bank.

The second variable is around the total exposure to the PIGS country summed for all of the residual maturity. The *PIGS\_EXPO* variable allows us to identify banks that are more exposed to PIGS sovereign debts. The third variable is trying to identify the exposure of each bank to countries that suffered from a downgrade over the period 01/01/2011 to 06/30/2013. The variable *DOWN\_TOT\_EXPO* does not take into account the exposure of countries like Germany, Luxembourg, Sweden, Norway, the Czech Republic or the baltic countries which has not been downgraded during our sample period. This variable was computed for all of the residual maturity.

These variables focused on the sovereign exposure of each bank. Each of the variables are expected to affect positively the stability of the CDS spread. The higher the exposure to PIGS countries for a bank, the higher the probability of the spread to increase. The increase in exposure to a riskier country increase the riskiness of a bank that is already expose to the country. This hypothesis is a strong component of our model.

To control for the size effect we divide each variables for each bank, by the total asset of each bank. The decision to use such variable will also give us important result about the impact on bank resilience.

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<sup>8</sup>*ST* stands for short term: [0, 3M]; *MT* stands for medium term: [3M, 1Y]; and *LT* for long term: [1Y, 5Y]



Table 3: Exposure variables

This Table gives information about the variables used in the statistical analysis. In the last column we give the expected sign over the CDS CAR considering our hypothesis.

Variable name	Meaning	Expected sign over CDS CAR
<i>TOT_EXPO</i>	Total exposure to EBA participating countries	Positive
<i>PIGS_EXPO</i>	Sum of PIGS countries exposure	Positive
<i>DOWN_TOT_EXPO</i>	Sum of downgraded countries exposure	Positive
<i>GROSS_EXPO_ST</i>	Short term gross exposure to the country suffering the downgrade, for the event $t$	Positive
<i>GROSS_EXPO_MT</i>	Medium term gross exposure to the country suffering the downgrade, for the event $t$	Positive
<i>GROSS_EXPO_LT</i>	Long term gross exposure to the country suffering the downgrade, for the event $t$	Positive
<i>NET_EXPO_ST</i>	Short term net exposure to the country suffering the downgrade, for the event $t$	Positive
<i>NET_EXPO_MT</i>	Medium term net exposure to the country suffering the downgrade, for the event $t$	Positive
<i>NET_EXPO_LT</i>	Long term net exposure to the country suffering the downgrade, for the event $t$	Positive

### 3.2.3 Transparency variables.

We defined two levels of transparency, a global one and a more specific one dedicated to sovereign exposure. The two transparency indexes, a specific and a global, are the main contribution of this paper.

To build the two variables, we downloaded the financial report of each participating bank for the year 2010 and 2011. The yearly financial reports are usually published during the month of March for the previous year. This information allows us to cover our whole set of events from early 2011 to mid 2013.

The first variable computed is the sovereign transparency index *TRANS\_SOV*. This variable is obtained like this: we analyzed the amount of time the word “sovereign” is pronounced in each financial reports for the two consecutive years: the variable is then denominated *TIME\_SOV*. We calculated the number of pages devoted to sovereign risk denominated *PAGES\_SOV*. To compute the variables, we decided to determine a subvariables which will be represented by the following ratio:

$$TIME\_SOV_{b,n} = \frac{\text{time the word sovereign is pronounced}_{b,n}}{\max \text{time the word sovereign is pronounce}_{\sum b,n}} \quad (2)$$

$$PAGES\_SOV_{b,n} = \frac{\text{number of pages dedicated to sovereign exposure}_{b,n}}{\max \text{number of pages dedicated to sovereign exposure}_{\sum b,n}} \quad (3)$$

where  $b$  is the bank  $b$ , where  $n=2010, 2011$  and where  $\sum b$  represent the total amount of banks. The variables are calculated relatively to the bank with the highest number of time the word sovereign is pronounced and with the highest number of pages devoted to sovereign: we then obtain a percentage value for each bank, each year. The degree of transparency is somehow hard to correctly measure, and the choice of using a relative scale allow us to think that it defines a better scale to measure transparency and disclosure over the market participants: all of the disclosure levels here are based on voluntary disclosure. The fact that it is not based on mandatory disclosure allow us to discriminate between banks. The choice of using relative value to the bank with the highest score reinforce the capacity of discrimination.

The last component of our proxy variable,  $QUAL\_SOV$  is about the pages devoted to sovereign exposure. The quality is measured by a 100% to 0% scale. In order to obtain the maximum grade, here 100%, the financial report must provide graphical analysis, charts, figures and must be easy to find in the report (typically if the sovereign exposure is easy to find across the summary or the table of content). The bank gets a grade of 66,66% if no graphical analysis is provided, gets a grade of 33,33% if it not easy to find in the report, and a grade of 0% if not reported or poorly reported.

The calculation of the sovereign transparency variable takes into account each components.

$$TRANS\_SOV_{b,n} = Mean(TIME\_SOV, PAGES\_SOV, QUAL\_SOV) \quad (4)$$

The second transparency index follows the same path but is more global than the sovereign transparency variable. The  $TRANS\_GLOB$  variable integrates several subcomponents, listed in the Table-6, to create the variable: the size of the financial reports in pages, the presence or absence of the Basel II Pillar 3 (B2P3) annexes, the presence of information about the remuneration of the decision maker (number of pages devoted to the say on pay), the presence of information if the bank comply with national or supranational rules of governance, the presence of information about the attendance of board members to meetings, the presence of information about majority shareholder and finally the presence of noticeable shareholder (hold more than

3% of the capital). For the two sub variables that pay attention to the number of pages, we transformed both variables into two dummy variables while following this condition: the variable takes the value 1 if it is above the median of the sample, 0 otherwise. Since we base this analysis only on mandatory disclosure, the choice of using the median reward banks that provide the more information in the most broaden communication and discipline otherwise. For the five other variables, we used dummies that reward disclosure: for example, if the financial report of the bank b gives information about the attendance of boards members to meeting the value of this variable will be 1 for this bank, and 0 otherwise.

Table 4: Global transparency variable

Variable name	Meaning	Value
FINANCIAL REPORT SIZE IN PAGES		1 if above median 0 otherwise
B2P3 APPENDIX	Presence or not of the appendix	1 if provided on website or in report 0 otherwise
SAY ON PAY	Page devoted to directors remuneration	1 if above median 0 otherwise
COMPLY OR EXPLAIN	With the governance code national or higher	1 if provided in the report 0 otherwise
MAJORITY SHAREHOLDER	Presence or not in the report	1 if provided in the report 0 otherwise
NOTICEABLE SHAREHOLDER	Presence or not in the report	1 if provided in the report 0 otherwise
MEMBER ATTENDANCE TO BOARD MEETING	Presence or not in the report	1 if provided in the report 0 otherwise

The *TRANS\_GLOB* is computed by cumulating the value of each component divided by 8, so its value is between 0 and 1.

This value of transparency allow us to define a more global value for transparency. We decided to only use the yearly financial report for several reasons: the first reason lies into the larger diffusion of yearly reports than quarterlies and the second lies into the fact that the yearly reports are more accurate to reality because of the necessity of certification by the audit committee (both internal and external).

Considering hypothesis where transparency enhance stability, the expected relationship between transparency and the cumulative should be negative. The transparency variables should increase the stability of

CDS spread over the sample period.

Now that we have defined the transparency variables and the exposure variables, we are going to introduce the different control variables. After presenting the last variables we provide an extensive statistical analysis for the different variables we use for our study.

### 3.2.4 Control variables.

The first control variables we used are a dummy variable which will take the value 1 if the bank is located in the same country affected by the downgrade, and 0 otherwise. The variable *SAME\_NAT* is different for each event and is function of the country affected by the downgrade. For the event of January, 12th 2012, the same procedure were applied. We expect this variable to have a negative impact on the stability of the spread. A bank usually is more likely to hold domestic sovereign debt. If the sovereign rating is decreased, we can assume that the risk portfolio of the bank is affected negatively which lead to an increase in the risk of the subsequent bank. At the same time, a country deeply in debt which cannot use treasury bonds to cover the bank that hold its bonds emphasize the probability of default of this bank. The choice of using this variable is very important for our analysis

The following control variables are related to the core problem of the European sovereign debt crisis. The totality of the countries who ask for support of both the IMF and the BCE are all Eurozone members. The variable *EURO\_ZONE* is a dummy variable which will take the value 1 if the bank is located in a Euro member country, and 0 otherwise. Our sample is composed of 10 banks that are not located in a Euro member country. Both expectation about the sign of this variable are possible:

- First, the Eurozone variable have a positive impact on stability. The size and the strength of the institutions of the Eurozone ensure the stability of the all zone even in period of trouble.
- Secondly, the Eurozone factor have a negative impact on stability. The situation in the Eurozone is difficult enough that the stability cannot be ensure.

PIGS is a dummy variable which take the value 1 if the bank is located in one of the following country: Portugal, Ireland, Greece and Italy. The choice of only using a narrow definition of the PIGS country is justified by the fact that they are the only countries that benefit from a ECB emergency rescue plan during of sample period. As we mentioned earlier, the PIGS countries are the countries the less able to ensure the bail out process of one its bank in case of default because of its high level of debt and the recent increase

in its cost of emitting new debt while the probability of default of its national bank are also getting worse. This vicious circle comfort us in the choice of this variable.

The last variable (*BANK\_TOT\_DOWN*) related to the sovereign debt crisis is a dummy variable that will take the value 1 if the country is located in a country that has been affected by a downgrade during the period 01/01/2011 to 06/30/2013. The expected sign of this variable is positive. Its justification can be explain by the fact that a bank located in country that haven't been downgrade during our sample period is more favorable to be rescue by the government in which the bank is located because of its capacity of creating new debt.

The rest of the control variables are accounting variables from the Bankscope database. The variable *RATIO\_EXPO\_ASSET* is our size control variable where the total exposure of the bank is divided by the total asset of the same bank. This variable allow us to understand the importance of the size of total exposure among the whole assets of the bank. The sign of this variable on the evolution of the spread of the CDS is positive. The choice of using relative data allow us to control for size problem. It seems understandable that a large bank is more likely to hold more sovereign debt than the smallest bank of our sample. Large bank can decide to hold more sovereign debt to diversify its asset portfolio. The data issued from Bankscope was for the year 2012.

In order to establish a variable to measure the risk of the bank, we used available data about the Risk-weighted asset (*RWA*). This asset calculation is used to determine the level of capital requirement for a bank, and more generally for a financial institution. The choice of this variable can be justify by one of the following methodology of Basel I agreement (which mandatory implemented it):

- Provides an interesting tool to compare banks across different geographical area. This value is a standardize unit of risk measurement which perfect for empirical analysis.
- *RWA* takes into account off balance sheet to provide a measurement of the risk. Off-balance-sheet exposure can be easily included in capital requirement. *RWA* provides a larger and more complete measure of the bank risk.

The *RWA* variable is expected to have a positive relationship with the volatility of the CDS spread. The higher the value of the *RWA*, the higher the amount of necessary capital to cover the risk is. To finish with the variables related to the risk of a bank, we use a variable which focus on the non performing loan. The *RATIO\_NPL* variable shows us the percentage of non performing loan (*NPL*) of a bank. A non performing loan is defined as a sum of borrowed money upon which the debtor has not made his or her schedule payments for at least 90 days. A non performing loan is not participating into financing the activity of the bank and is considered as a cost for the bank. It also participate to the increase of the probability of default of a bank.

Non performing loan does not provide any liquidity to the bank. A non performing loan is either in default or close to be, depending on the duration between the last payment and the probability for this loan to be fully repaid is significantly lower than a regular loan. This variable is supposed to have a positive impact over the CDS spread due to the fact that the bank does not receive any payment back for a loan that she provided in the past. The risk of default is significantly higher when the percentage of non performing loan in its asset is high.

The following subsection is dedicated to a deep statistical analysis and is followed by a presentation of the model.

### 3.3 Empirical strategy

We analyze about the evolution of CDS spreads of banks over the period 01/03/2011 to 06/30/2013. The general idea in this paper is to analyze the evolution of the CDS spreads when controlling for several factors at the moment when an announcement of downgrade is made. The explanatory variable is here the stability of the CDS spread over time, and we use the cumulative abnormal return (CAR) of CDS to measure the stability of the spread at the surrounding of an event. In stock or bond event studies, abnormal returns are calculated to measure the impact of any event on security prices. A spread change measures the change in the premium of newly issued default swap contracts with constant maturity. We used the method provided by Norden and Weber (2004). The abnormal return  $AR_{b,t}$  for the bank  $b$  at time  $t$  is the difference between the value of the CDS spread and a more global measure of the volatility of the CDS market: the CDS index used for the analysis is the SNRFIN CDSI GEN 5Y published by iTraxx over the same time period of time. The choice of this index rather than a European CDS index allows to limit the over representation of the European sovereign debt crisis in the index. The index reduces also the country-specific effects. We used the following method to compute the CARs:

$$CAR_{(t-x), (t+x)} = \sum_{i=t-x}^{t+x} (CDSspread_{(i, b)} - CDSindex_i) \quad (5)$$

where  $t$  is the date of the event and  $b$  the subsequent bank. The even used for the analysis are described further in this paper but an event happen at the moment of an announcement of a downrating in the European Union. For each event, we determine the CAR over four different time frames in the neighborhood of the date of the event:

- $CAR_{-5,+5}$  compute cumulative abnormal return over a period of 11 days: 5 days before the event, the event day and 5 days after the event.

- $CAR_{-2,+2}$  compute cumulative abnormal return over a period of 5 days: 2 days before the event, the day event and 2 days after the event.
- $CAR_{0,+5}$  compute cumulative abnormal return over a period of 6 days: the event day and 5 days after the event.
- $CAR_{0,+2}$  compute cumulative abnormal return over a period of 3 days: the event day and 2 days after the event.

The choice of several time frames with different length allow us to diversify the frequency of response of the CDS and allow us to study the effect before and after the announcement. The cumulative abnormal return at the neighborhood of the event should tend to 0 to translate stability over the variation of the CDS spread.

The empirical model estimates the relationship between the CDS CAR evolution, disclosure and sovereign exposure. The model is as follow:

$$CAR_{(t-x), (t+x)} = \alpha + \beta_1 SOVEREIGN\_DISCLOSURE + \beta_2 GLOBALDISCLOSURE + \beta_3 * SOVEREIGNEXPOSURE + \beta * CONTROL + \varepsilon_{\beta 1i, t} \quad (6)$$

where t is the date of the event, b is the bank, and n the year of the event. We decide to introduce two variables that will enhance the disclosure of banks: first globally and then more specifically about the sovereign debt exposure. The exposure of the banks to the country downgraded of the event and the global exposure are both taken into account in this model, while the last variables will be here to control our sample. The model originally used was based on an ordinary least square regression and we were confronted to a important level of heteroskedasticity which forced us to used an OLS regression which took into account the correction of heteroskedasticity. The model will control different characteristics of the sample, especially controlling for the highly indebted country. This control can also avoid collinearity problem in between banks that are not seize equivalent. It is rather understandable if large banks have the tendency to hold more sovereign debt than smaller bank.

We expect the relationship between CAR and the disclosure variables to be negative. In other words, this would mean that more transparent banks do not have stable CDS spreads but face a reduction of the premium of their CDS at worse. This expectation on the sign of the disclosure is consistent with the different recommendation of Basel 3 and Basel 2 before it. The recommendations about disclosure are such disclosure is a great enhancer of market stability. The decision to impose mandatory disclosure first to favor the

development of voluntary disclosure can also be explain by the disclosure variables because of the criterion used to create the variables. Most of the criterion are not part of mandatory disclosure because they would not give us any variance due to mandatory policies. The hypothesis about the sign of the coefficient of the exposure variable is also negative. The critics about banks exposure to sovereign debt during the European euro crisis have forced banks and also countries to diminish their exposure and the emission of sovereign debt as we mentioned earlier.

The methodology used here was a stacked panel (16 times the same sample of banks for 16 different dates). We use OLS regression. We investigate the robustness of our findings by including controls for several criterion in our regression such as size or location.

### **3.4 Statistical analysis**

This section will introduce our set of event and the different banks used in our analysis and be complemented by a statistical analysis of the events we used. We start first by analyzing our events then the distribution of bank, then the cumulative abnormal return of the CDS per event, the sovereign exposure variables and then the transparency variables.

#### **3.4.1 Banks distribution**

The following chart and tables provide information about the distribution of bank we use for our analysis. We have seen that our sample of bank is widely distributed and take into account large international bank such as the Deutsche Bank which has the largest total asset of our sample with more than 2 655 138 million USD of asset. We can also find large bank such as BNP PARIBAS, CREDIT AGRICOLE or HSBC. On the other hand the bank with the smallest amount of asset the BANCO PASTO with only 39 301 million USD. The wide distribution of our sample in term of bank size allow us to pay attention to the impact of disclosure on any sized bank.

The geographical distribution of bank among Europe is rather uniformly distributed but gives a high representativeness to German, Italian and Spanish banks. On the other hand, the largest banks are located in France, UK and Germany.



Table 5: Banks distribution

PIGS bank	EuroZone bank	Min Total Asset in million EUR	Max Total Asset in million EUR	Average asset in million EUR	Standard deviation
14 over 47	37 over 47	39 301	2 655 138	697 663	726938

### 3.4.2 Event statistical analysis.

The values of each cumulative abnormal returns about the CDS spreads are the key value of our model. As mentioned earlier our model is trying to understand what can affect the volatility of banks CDS. We believe that some of our variable can play important role on this volatility. The following model will be used for our econometric analysis and is trying to show the impact of our variables on the CDS cumulative abnormal returns.

We have 16 events which cover the period starting on 01/01/2011 till 06/30/2013. We used the Student test for each day surrounding each event from minus 10 days to plus 10 and also for each CDS cumulative abnormal return . The choice of this test allow us to analyze the weight of each day per event and try to see if a day appear significantly different than the value we chose for the test which is here 0. The following tables show the result of the test for the first and the second event, the rest of the test for the other events can be found in the annex section.

Table 6: Mean test

This table provides results about the mean of cumulative abnormal returns of the CDS spread. The means are provided for three main events and for different days or period surrounding the event. In parentheses are the values of the Student test. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5% and 10% level respectively.

	event of 03/07/2011	event of 03/16/2011	event of 11/19/2012
Days	Mean for all banks	Mean for all banks	Mean for all banks
-5	-3,7240	-5,8181***	3,2822***
	(-1,1577)	(-2,0152)	(8,2529)
-4	4,7799	-0,1147	-3,6293***
	(1,3942)	(-0,1004)	(-11,8307)
-3	-5,2720	7,2741***	1,0608**
	(-1,5554)	(3,2557)	(1,9891)
-2	-2,4651***	-1,5567	1,8090
	(-2,2677)	(-0,4071)	(1,5194)
-1	5,6540***	-1,6990	-0,1212
	(2,2586)	(-0,6631)	(-0,2325)
0	-1,3900	-1,1280	-7,0581***
	(-0,8851)	(-1,0670)	(-7,3756)
+1	1,6127	2,6732***	-4,9169***
	(0,9253)	(3,5124)	(-10,6787)
+2	0,0709	1,8295	-3,3689***
	(0,0550)	(0,9428)	(-10,1669)
+3	3,0048**	10,5642***	1,1396
	(1,9014)	(2,4135)	(0,7542)
+4	-2,1234**	-4,0809***	-0,8409***
	(-1,8618)	(-5,0092)	(-2,2404)
+5	-3,2058	2,9469***	5,6280***
	(-1,1218)	(7,3381)	(14,4582)
CAR CDS -5/+5	-3,0580	10,8905	-7,0158***
	(-1,0313)	(1,0717)	(-2,8389)
CAR CDS +5	-2,0308	12,8048***	-9,4173***
	(-0,7224)	(2,1246)	(-4,6838)
CAR CDS -2/+2	3,4825	0,1189	-13,6562***
	(1,0953)	(0,0146)	(-5,5280)
CAR CDS +2	0,2936	3,3746	-15,3440***
	(0,2137)	(1,2625)	(-9,5831)

As we can see, for the first event, the mean of the cumulative abnormal returns of the CDS spreads for the day -2, -1, +3 and +4 are significantly different from our null hypothesis where the value of the mean is 0 to translate a stability relation. For the rest of the days and for all of the four CAR windows, we cannot determine the sign of the evolution. This test also provide information about the size of the population for each events. For the first event we have 42 non-empty value for a total of 47 banks and 41 non-empty value for a total of 47 banks. The empty variables are mainly explained by calendar differences: the first example which come to our mind is the case of December 24-25-26th where quotation location are closed in different

countries (Germany for example, where the stock exchange markets are closed on the 24th, 25th and the 26th of December) and open is some others. The second and third reasons behind the blank spot are the lack of reporting of certain banks in the set and the suspension of quotation of certain bank for the second year of our period. Our data for the whole set of event is a minimum of 33 bank participating in the set and up to 43 banks. The rest of the events<sup>9</sup> shows interesting value about the significant difference to the null hypothesis especially at the peak of interest of the sovereign debt crisis (mid 2012) where in some cases the result about the mean of CDS spreads is almost entirely rejecting our stability hypothesis. The following table shows the case of the event of November 19th 2012.

The third event is related to the second downgrade of France, by Moody's. We can see that except for the days -2,-1 and +3, we can reject our hypothesis of stability. It indicates that stakeholders are reactive at the announcement of downgrade but also shows that such announcement participate in a reduction of the spread which is against first expectations. Surprisingly as well, the sign of the mean is often negative which is not consistent with our expectations where downrating are expect to either maintain the value of the spreads or to increase it. Such result need to be compare to the result obtain with the econometric study in order to conclude on the impact of stakeholders behavior.

### 3.4.3 Sovereign exposure variables' analysis

The sovereign exposure variables analysis needs to be separated into three different parts: the dummy variables related to exposure, the exposure variables (total exposure, PIGS exposure and the downgraded country exposure) and the exposure per event (gross and net exposure, same nationality variable). We are going to start with the dummy variables analysis and then we will take a closer look to the per country exposure.

Our sample is composed of 37 banks located in Euro-zone member country ; the ten<sup>10</sup> other banks are residents of the following countries: Denmark, Norway, United Kingdom and Sweden. In the same time, our sample is composed of 14 banks located in a PIGS country<sup>11</sup>. The last variable relating to sovereign exposure that is not changing at each event is the BANK\_TOT\_DOWN, as a reminder this variable takes the value 1 if the bank is located in a country that has been downgraded during our sample time period. 17 banks are not located in a country which has been downgraded during our sample period. Most of this banks are located in "AAA" countries like Germany, the Netherlands<sup>12</sup>, Denmark, Norway and Sweden during the period 01/01/2011 to 06/31/2013.

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<sup>9</sup>See in annex

<sup>10</sup>Four British banks, one danish, one norwegian bank and four swede banks

<sup>11</sup>Portugal, Ireland, Greece and Spain

<sup>12</sup>As the date of May 6th 2014, the Netherlands rating is now AA+

Table 7: Dummy exposure variables

This Table gives information about the dummy exposure variables. *SAME\_NAT* will take the value 1 if the bank is located in the same country affected by the downgrade, and 0 otherwise. *EUROZONE* take the value 1 if the bank is located in a Euro member country, and 0 otherwise. *PIGS* is a dummy variable which take the value 1 if the bank is located in one of the following country: Portugal, Ireland, Greece and Italy. *BANK\_TOT\_DOWN* is a dummy variable that will take the value 1 if the country is located in a country that has been affected by a downgrade during the period 01/01/2011 to 06/30/2013.

Variable name	Value	Ratio
SAME_NAT	1 located in a country suffering downrate	9,04%
	0 otherwise	90,96%
EUROZONE	1 if member	78,72%
	0 otherwise	21,28%
PIGS	1 if located in a PIGS country	71,22%
	0 otherwise	29,78%
BANK_TOT_DOWN	1 if located in a downgraded country	63,83%
	0 otherwise	36,17%

When we review the total exposure variable, we can see a negative evolution for the year 2012 compared to the 2011 situation. This negative evolution is consistent with the European Union commission decision and with the decision of the European Central Bank to reduce the amount sovereign exposure of bank. The ECB was proposing unlimited free support for banks involved in a sovereign state bailout/precautionary through some yield lowering Outright Monetary Transactions.<sup>13</sup>The evolution is ranged from 0% to -45%. The maximum was held by BNP PARIBAS for the year 2011 and by UNICREDIT S.P.A for the year 2012. The minimum exposure fluctuate less by only a decrease of 5%. The bank which held the shortest amount of sovereign debt was IRISH LIFE AND PERMANENT for the year 2012 and by BANCO PASTOR, S.A for the year 2011.

The situation is quite similar for the PIGS variable. The data shows us a large decrease in the average amount of sovereign debts held by the participating banks but the scatter of the distribution remains stable with a slight decrease in the standard deviation. We can also see that severals banks which decided to not hold any PIGS sovereign debt for the year 2011 and for the year 2012: three banks in 2011 and four in 2012. The maximum is obtained by the BBVA bank for both years. The variable PIGS indicates that the ECB plan to reduce exposure to the countries that are under surveillance by the ECB and the IMF are working

<sup>13</sup>Announced on August 2nd, 2012 and introduced in September 2012  
[http://www.ecb.europa.eu/press/pr/date/2012/html/pr120906\\_1.en.html](http://www.ecb.europa.eu/press/pr/date/2012/html/pr120906_1.en.html)

because exposure to those countries are decreasing. The idea was to reduce “toxic” exposure in order to stabilize the situation of the in endangered banks.

Concerning the last variable, the assessment is also similar and is consistent with our expectations. The maximum exposure is held by BNP PARIBAS in 2011 and in 2012. Both the average total exposure to the downgraded countries and the standard deviation are decreasing.

Table 8: Fixed exposure variables, in million EUR

	TOT_EXPO			PIGS Exposure			DOWN_TOT_EXPO		
	2011	2012	EVO	2011	2012	EVO	2011	2012	EVO
AVG	37804,80	35120,06	-8%	6 570	5379,47	-22%	23691,36	20963,39	-13%
STD	31512,95	26073,45	-21%	11 698	11644,30	0%	25597,53	21445,29	-19%
MED	32445	30444,38	-7%	2 608	2152,01	-21%	12347	9479,70	-30%
Q1	10123,75	9420,68	-7%	456	170,40	-62.6%	3964,75	4350,34	9%
Q3	58110,25	58250,66	0%	6 982	4472,63	-36%	37711,5	31146,64	-21%
D1	6862,70	5555,35	-24%	20	0,00033	-5786732%	1540	359,89	-328%
D9	78411,50	75862,94	-3%	14 849	10126,06	-47%	63873	59118,78	-8%
MIN	2553	2434,67	-5%	0	0	0%	0	0	0%
MAX	139661	96426,16	-45%	56 514	53925	-5%	99189	70058,39	-42%

The first thing is the amount of domestic sovereign debt own by a domestic bank: French banks own majoritarly French sovereign bonds, German banks german bonds, Greek banks greek bonds and so on. This findings match our expectations. It is reasonable to admit that a domestic bank largely hold treasury bond from the country its domiciled in. The second thing that come to our mine is the very large variance in between our sample. This large dispersion can be explained by the very large amount of banks that don't hold much sovereign debt of the concerned country at each event. The average exposure to the downgraded country is rather low compare to the total exposure value. The following table provides detailed statistics to understand better the distribution of the variables throughout the events.

Table 9: Exposure variables for the entire set of events, in million EUR

This Table provides summary statistics on exposure to downgraded country. *GROSS\_EXPO\_ST*, *GROSS\_EXPO\_MT*, *GROSS\_EXPO\_LT* express the gross exposure to the country/countries suffering the downgrade for each individual event. The *NET\_EXPO\_ST*, *NET\_EXPO\_MT*, *NET\_EXPO\_LT* express the net exposure of the country suffering the downgrade for each individual event. *ST* stands for short term:  $[0, 3M[$ ; *MT* stands for medium term:  $[3M, 1Y[$ ; and *LT* for long term:  $[1Y, 5Y[$

	GROSS_EXPO_ST	GROSS_EXPO_MT	GROSS_EXPO_LT	NET_EXPO_ST	NET_EXPO_MT	NET_EXPO_LT
AVG	384	362	961	335	304	961
STD	2 760 445	2 353 939	8 030 212	2 473 194	1 822 718	8 030 212
MED	0	0	9	0	0	9
Q1	0	0	0	0	0	0
Q3	64	78	268	50	41	268
D1	0	0	0	0	0	0
D9	718	735	2 647	606	651	2 647
MIN	0	0	0	-1 999	-391	0
MAX	17 977	13 566	26 674	17 784	12 961	26 674

When have a closer look to the evolution in between the events we can see a decrease in quantity of the amount of sovereign debt hold per bank the further we advance into our time period. This evolution can be explain like the previous statistics: the IMF and ECB plan were design to do such thing. The decrease in exposure is not observable crescendo but show a slight decrease from 2011 to 2012.

#### 3.4.4 Transparency variables' analysis

As a reminder, we have two variables that describe the degree of transparency and disclosure of the different banks used in this study: the *TRANS\_SOV* variable that focus on the communication about the sovereign exposure of the bank during the European sovereign crisis and a more general variable, *TRANS\_GLOB*, that describe the global transparency degree of the bank. The following tables reviews general statistics about the two variables for the two years 2010 and 2011.

Table 10: Transparency variables statistics.

*This Table provides summary statistics on transparency variables for 2010 and 2011. TRANS\_SOV is the mean between the amount of time the word “sovereign” is pronounced in each financial reports for the two consecutive year (TIME\_SOV), the number of pages devoted to sovereign risk (PAGES\_SOV) and the pages devoted to sovereign exposure (QUAL\_SOV). TRANS\_GLOB is a index of global transparency computed by cumulating the value of each subcomponent . Values of TRANS\_SOV and TRANS\_GLOB are percentages.*

	2010		2011		Evolution	
	TRANS_SOV	TRANS_GLOB	TRANS_SOV	TRANS_GLOB	TRANS_SOV	TRANS_GLOB
AVG	27,280%	41,489%	32,750%	39,722%	16,70%	-4,45%
STD	24,896%	20,157%	26,491%	19,595%	6,02%	-2,87%
MED	24,823%	37,500%	36,351%	37,500%	31,71%	0,00%
Q1	3,788%	25,000%	3,819%	25,000%	0,83%	0,00%
Q3	47,033%	62,500%	54,594%	56,250%	13,85%	-11,11%
D1	0,455%	12,500%	1,181%	12,500%	61,50%	0,00%
D9	60,227%	62,500%	69,525%	62,500%	13,37%	0,00%
MIN	0%	0%	0%	0%	0%	0%
MAX	92%	75%	88%	75%	-5,63%	0,00%

The table 13 above shows us different information about the distribution of the two transparency variables. First lets have a closer look to the sovereign debt transparency variable. The highest level of disclosure is 92% in 2010 obtained by the DEUTSCHE BANK AG, while the highest value in 2011 is equal to 88% obtained by ALLIED IRISH BANK PLC. Since all the sub component are not based on relative data the maximum was not possible to reach with the criterion used. The evolution over the test period should be positive after the rise of awareness all over Europe, and most largely all around the world, about the European sovereign debt crisis. The justification of such an evolution is arduous to interpret and can be interpret by the decision to only orienting the yearly financial report on sovereign communication. The first possible interpretation that comes to mind could lie in the will of banks to limit the communication about sovereign debt exposure, but other statistics shows us the opposite: on average the disclosure about sovereign disclosure appears to increase significantly. The banks which disclose the less are also increasing their disclosure about sovereign exposure. This interpretation is then not significant in this analysis. The second possible interpretation about it could lie in the fact that it has been worse reported into annual report than the year before. This interpretation seems more believable.

When we pay attention to the minimum value, we can see that there are five banks (BAYERISCHE LANDES-BANK, CAJA DE AHORROS Y PENSIONES DE BARCELONA, NORDDEUTSCHE LANDESBANK,

RABOBANK NEDERLAND and SWEDBANK AB) that have this score during the year 2010 and only one for the year 2011 (DANSKE BANK). This evolution is consistent with the prediction that the rise of awareness about the situation would also have been transported to the annual report of the following year.

The above statistics globally shows a positive evolution from 2010 to 2011 for the sovereign transparency variable: the average value of the variable distribution is increasing by more than 16% when the median is increasing by more than 30%. The different participating banks decided to explain throughout annual reports their situations concerning to their exposure to the different European countries. On the other hand, we can see an increase in the standard deviation translating a more scatter distribution.

Concerning the global transparency variable, the assessment is somehow reverse. On average, the level of global transparency is reducing in 2011 compared to what it was in 2010, but the dispersion of the distribution is also reducing. It can be interpreted like the banks are reorienting their communication on what matters the most at a significant time period. The banks could have decided to communicate more on the sovereign and could have reduce their global decision to disclosure. The maximum level of global disclosure in 2010 is 75%, obtained by three banks (ALLIED IRISH BANK, BARCLAYS PLC and HSBC). For the year 2011, the maximum is still 75% and is obtained by two banks (ROYAL BANK OF SCOTLAND and COMMERZBANK). In the mean time, the minimum value is 0% in both year obtained by the NATIONAL BANK OF GREECE in 2010 and in 2011.

## 4 Results

The above results shows important conclusion on the behavior of stakeholder when we are not controlling for such criterion as the participation to the Euro currency of the situation of the PIGS countries and the fact of being located in one of those country. We used the two disclosure variables (core of the analysis), the total exposure (corrected by the size of each bank total asset for the year 2012) to sovereign debt for every country that took part to the EBA tests, we also took other variables of exposure such as the three period of time for net and gross exposure, then the total exposure to the downgraded countries and finally we applied our control through the EURO\_ZONE variable, we used also took into account the exposure to the PIGS sovereign debt, then we added the variable PIGS which take the value 1 if the bank is located into one of the four country (Portugal, Italy, Greece and Spain) and finally we created a cross variable which measure the exposure to the PIGS sovereign debt when the bank is located in one of those countries: the variable PIGS\_C. Concerning the accounting variables, we used the RWA variable, the non performing loan variable and the tier 1. We keep the control on the variable SAME\_NAT. We obtained the following



results for each of the four period surrounding the event. All of this results obtained here were corrected to heteroskedasticity (the results obtained are not significantly different than the one where no correction is applied and can be found in the annex section).

Table 11: CAR +5 days surrounding the event

This Table analyzes the results of the regression of CAR on our variables. CAR +5 is the cumulative abnormal return over a period of 6 days (the event day and 5 days after the event). CAR +5/-5 is the cumulative abnormal return over a period of 11 days (5 days before the event, the event day and 5 days after the event). TRANS\_SOVS is the index of sobvereign transparency, TRANS\_GLOB is the index of global transparency, DOWN\_TOT\_EXPO is the sum of downgraded countries exposure, ratio\_expo\_asset is the ratio of the total exposure of the bank on the total asset of the same bank, TIER\_1 is the Tier 1 capital Ratio of the bank, RWA is the Risk Weighted Asset of the bank, RATIO\_NPL is the percentage of non performing loan, SAME\_NAT is 1 if the bank is located in the same country affected by the downgrade, and 0 otherwise, PIGS is a dummy variable which take the value 1 if the bank is located in one of the following country: Portugal, Ireland, Greece and Italy, PIGS\_EXPO is sum of PIGS countries exposure of the bank, *PIGS\_C* measure the exposure to the PIGS sovereign debt when the bank is located in one of those countries, EUROZONE take the value 1 if the bank is located in a Euro member country, and 0 otherwise, GROSS\_EXPO\_ST, GROSS\_EXPO\_MT, GROSS\_EXPO\_LT express the gross exposure to the country/countries suffering the downgrade for each individual event. The NET\_EXPO\_ST, NET\_EXPO\_MT, NET\_EXPO\_LT express the net exposure of the country suffering the downgrade for each individual event. ST stands for short term: [0, 3M]; MT stands for medium term: [3M, 1Y]; and LT for long term: [1Y, 5Y]. In parentheses are the values of the Student test. \*\*\*, \*\*, \* indicate statistical significance at the 1%,5% and 10% level respectively

	CAR +5	CAR +5	CAR +5 / -5	CAR +5 / -5
gross exp to	sov debt gross exp	sov debt net exp	sov debt gross exp	sov debt net exp
Variables	Coefficient	Coefficient	Coefficient	Coefficient
const	-1366,73*** (-14,417)	-1192,84*** (-14,686)	-2528,55*** (-14,110)	-2618,83*** (-14,294)
TRANS_SOV	-263,413*** (-3,492)	-224,389*** (-3,375)	-515,548*** (-3,649)	-530,951*** (-3,634)
TRANS_GLOB	1756,12*** (13,282)	1535,31*** (13,455)	3308,37*** (13,133)	3482,34*** (13,414)
DOWN_TOT_EXPO	0,0112*** (7,244)	0,0093*** (6,666)	0,0208*** (7,210)	0,0209*** (6,736)
ratio_expo_asset	3954,3*** (6,382)	3427,6*** (6,460)	7184,41*** (6,253)	7318,81*** (6,351)
TIER_1	-3,5139e-06* (-1,787)	-2,4932e-06 (-1,565)	-6,6670e-06* (-1,782)	-6,7026e-06* (-1,882)
RWA	-9,24207e-08 (-0,443)	-1,06708e-07 (-0,624)	-1,65585e-07 (-0,425)	-2,21206e-07 (-0,586)
RATIO_NPL	-2,51975e-06 (-1,010)	-2,34911e-06 (-1,002)	-5,06955e-06 (-1,087)	-5,50653e-06 (-1,101)
SAME_NAT	318,399** (2,199)	258,749** (2,001)	705,747** (2,506)	521,144* (1,791)
PIGS	3317,27*** (14,928)	3012,13*** (16,285)	6164,06*** (15,285)	6336,27*** (15,500)
PIGS_EXPO	-0,0888428*** (-8,089)	-0,0820721*** (-8,544)	-0,171383*** (-8,237)	-0,177642*** (-8,413)
PIGS_C	0,0282187*** (3,107)	0,0260311*** (3,316)	0,0580269*** (3,418)	0,0595136*** (3,444)
EUROZONE	668,437 (11,579)	604,682*** (12,345)	1241,99*** (11,371)	1315,57*** (11,834)
GROSS_EXPO_ST	0,0558* (1,652)		0,1067* (1,724)	
GROSS_EXPO_MT	0,0231 (0,834)		0,0326 (0,653)	
GROSS_EXPO_LT	-0,0378** (-2,240)	41	-0,0775** (-2,452)	

	CAR +5	CAR +5	CAR +5 / -5	CAR +5 / -5
gross exp to	sov debt gross exp	sov debt net exp	sov debt gross exp	sov debt net exp
Variables	Coefficient	Coefficient	Coefficient	Coefficient
NET_EXPO_ST		-0,01698		-0,0821
		(-0,487)		(-1,065)
NET_EXPO_MT		0,0479*		0,1127*
		(1,720)		(1,744)
NET_EXPO_LT		-0,0153		-0,0163
		(-0,835)		(-0,408)

Table 12: CAR +2 days

This Table analyzes the results of the regression of CAR on our variables. CAR +2 is the cumulative abnormal return over a period of 3 days (the event day and 2 days after the event). CAR +2/-2 is the cumulative abnormal return over a period of 5 days (2 days before the event, the event day and 2 days after the event). TRANS\_SOV is the index of sobvereign transparency, TRANS\_GLOB is the index of global transparency, DOWN\_TOT\_EXPO is the sum of downgraded countries exposure, ratio\_expo\_asset is the ratio of the total exposure of the bank on the total asset of the same bank, TIER\_1 is the Tier 1 capital Ratio of the bank, RWA is the Risk Weighted Asset of the bank, RATIO\_NPL is the percentage of non performing loan, SAME\_NAT is 1 if the bank is located in the same country affected by the downgrade, and 0 otherwise, PIGS is a dummy variable which take the value 1 if the bank is located in one of the following country: Portugal, Ireland, Greece and Italy, PIGS\_EXPO is sum of PIGS countries exposure of the bank, *PIGS\_C measure the exposure to the PIGS sovereign debt when the bank is located in one of those countries*, EUROZONE take the value 1 if the bank is located in a Euro member country, and 0 otherwise, GROSS\_EXPO\_ST, GROSS\_EXPO\_MT, GROSS\_EXPO\_LT express the gross exposure to the country/countries suffering the downgrade for each individual event. The NET\_EXPO\_ST, NET\_EXPO\_MT, NET\_EXPO\_LT express the net exposure of the country suffering the downgrade for each individual event. ST stands for short term: [0, 3M]; MT stands for medium term: [3M, 1Y]; and LT for long term: [1Y, 5Y]. In parentheses are the values of the Student test. \*\*\*, \*\*, \* indicate statistical significance at the 1%,5% and 10% level respectively.

	CAR +2	CAR +2	CAR +2/-2	CAR +2/-2
gross exp to	sov debt gross exp	sov debt net exp	sov debt gross exp	sov debt net exp
Variables	Coefficient	Coefficient	Coefficient	Coefficient
const	-643,377*** (-14,243)	-667,657*** (-14,631)	-1157,66*** (-14,494)	-1793,91*** (-10,768)
TRANS_SOV	-92,5284** (-2,477)	-99,5405*** (-2,656)	-212,151*** (-3,260)	-612,616*** (-4,317)
TRANS_GLOB	817,776*** (12,733)	838,057*** (13,112)	1484,44*** (13,040)	2298,84*** (11,088)
DOWN_TOT_EXPO	0,00547454*** (7,203)	0,00540475*** (6,951)	0,00924433*** (6,947)	0,0057264** (2,387)
ratio_expo_asset	1850,89*** (6,146)	1979,69*** (6,426)	3274,66*** (6,232)	6895,79*** (6,719)
TIER_1	-1,6088e-06* (-1,718)	-1,55687e-06* (-1,765)	-2,23815e-06 (-1,322)	3,3767e-06 (0,795)
RWA	-1,049e-07 (-1,071)	-7,6325e-08 (-0,819)	-1,29447e-07 (-0,711)	-2,60056e-08 (-0,061)
RATIO_NPL	-1,31649e-06 (-1,002)	-1,34323e-06 (-0,976)	-2,10277e-06 (-0,971)	8,53386e-07 (0,146)
SAME_NAT	238,628*** (2,935)	174,635** (2,068)	372,628*** (2,840)	639,82*** (3,899)

	CAR +2	CAR +2	CAR +2/-2	CAR +2/-2
gross exp to	sov debt gross exp	sov debt net exp	sov debt gross exp	sov debt net exp
Variables	Coefficient	Coefficient	Coefficient	Coefficient
PIGS	1553,01*** (14,236)	1633,72*** (14,513)	2863,73*** (16,245)	3435,08*** (26,855)
PIGS_EXPO	-0,0461711*** (-8,764)	-0,0470929*** (-8,697)	-0,0786349*** (-8,175)	-0,113991*** (-7,440)
PIGS_C	0,0172274*** (3,961)	0,0166053*** (3,657)	0,0252381*** (3,176)	0,0427381*** (3,380)
EURO_ZONE	336,549*** (12,236)	337,558*** (12,166)	586,624*** (12,029)	811,221*** (8,719)
GROSS_EXPO_ST	0,0323427* (1,913)		0,0734311*** (2,801)	
GROSS_EXPO_MT	0,0108461 (0,799)		0,0157502 (0,770)	
GROSS_EXPO_LT	-0,0227457*** (-2,666)		-0,0440236*** (-3,030)	
NET_EXPO_ST		-0,0096 (-0,464)		-0,1210*** (-2,983)
NET_EXPO_MT		0,0337** (2,099)		0,0303 (0,811)
NET_EXPO_LT		-0,0106 (-0,990)		0,0338 (1,352)

The disclosure variables are both very significant in our analysis for each time frame and for both gross exposure and net exposure. First we see sovereign disclosure have a negative relationship with the cumulative abnormal returns of CDS spreads when at the same time the global disclosure variable have a positive relationship with the evolution of the CDS spread for each of our window and for both net and gross exposure. The stability in the results obtain shows that stakeholder behavior are also stable. The results obtained are consistent with our expectation and hypothesis where sovereign disclosure have a significant relationship with the evolution of the CDS spreads and this relationship participate into the reduction of the value of CDS spreads. This result insist on the fact that disclosure does not participate to an increase of the stability of the spreads but indicates a reduction in the risk of default. On the other hand, we see an increase of the value of the spread for the global disclosure. Such result provide interesting behavioral result where stakeholders worship more oriented, specific, disclosure in their calculation of the premium. By comparison to the benchmark analysis, we see that the control provide better, and more stable, results in the analysis for both disclosure variable. These results show that the disclosure of characteristic which are more

in line with the current financial and economic situation are more likely to participate to the reduction of the spread of CDS. It does not participate to an increase of stability though. Specific disclosure is rewarded by stakeholder in the value of the spread when global disclosure, potentially judged vague, discipline the spread.

The total exposure per asset ratio has a significantly positive relationship with the cumulative abnormal return of the CDS market when using the both net and gross exposure variables. This means that the total exposure controlled for size have a positive relationship with the evolution of the CDS spreads for each of the window surrounding an events for our sample period (01/01/2011 to 06/30/2013). The result obtained above is consistent with our expectation where we expected the more implicated bank into the sovereign debt market to be the more vulnerable to an increase of the CDS spreads. The result does not appear surprising and is explained by the gravity of the situation concerning sovereign debt. Informed stakeholders react to the amount of exposure to sovereign debt even if it is not concern by a downgrade.

A closer look to the total exposure to countries that has been downgraded shows a significant positive relationship between the amount of sovereign debt, that has been downgraded over the past 2.5 years, hold and the cumulative abnormal return of CDS spreads, which is consistent with our hypothesis and the literature about sovereign debt exposure. This result is important in a sense that stakeholder react to announcement of downgrade when banks hold sovereign debt that have been, or will be downgraded. The stakeholders are responsive to downgrades. The stability of the results obtained comforts us in the choice of several window to reinforce our analysis. Concerning net and gross exposure for either short, medium and long term, the conclusion are somehow different but similar to the benchmark situation. Some of these variables are significant and it could be interpreted as the fact that our banks are not specifically affected by one event for a unique country. The fact that both coefficient and the significativity are not stable shows that this variables does not affect significantly the behavior of stakeholder in the calculation of the premium.

The accounting variables also provide interesting results. First of all, the Tier 1 variable's coefficient is negative and highly significant (at 1%) for each windows surrounding each events and for both net and gross exposure. The higher the Tier 1, the more the CDS spreads is reduced when a downgrade happens. It does not participate to the stability of the CDS spread but is still beneficial to the decrease of the CDS spreads. This result is consistent with the recommendations of Basel I capital agreement. Stakeholders reward banks with the highest Tier 1 at the downgrade announcement. Tier 1 is the core measure of a bank's financial strength from a regulator's point of view and proved it is an interesting value to measure the stability on the CDS market. The RWA is never significant for each window and for both gross and net exposure. Such result is interesting in a sense that stakeholder does not react to the RWA and they largely react to Tier

1. The non reaction can be interpret as RWA does not provide enough information to stakeholder when the total equity capital is not known. Concerning the NPL variable, we see it has a negative significant relationship with the cumulative abnormal return of the CDS spreads. This result does not appear to be consistent with our expectations where the higher the level of non performing loan the more the probability of default increase.

The coefficient of the variable SAME\_NAT is positive for each window and for both net and gross exposure. Such result indicates that stakeholder react negatively to announcement of downgrade by asking for a greater premium when using CDS for banks which are located in the downgraded country. The value of the coefficient increases also significantly from 722 for the shortest window (from the announcement to 2 days after) to 3752 for the longest window (from 5 days before the announcement to 5 days after). Stakeholders attach importance to the nationality of the bank and attach even more importance when the window is large at the surrounding of the event. Stakeholders don't anticipate the nationality of the bank in their calculation but react significantly when a downgrade happen.

The relationship between PIGS and the CDS spread reveals interesting results. The PIGS variable have a positive and significant relationship with the evolution of the CDS spreads at the downgrade surrounding. This result shows that stakeholders do take into account the nationality of the bank in their calculation of the spread. The fact of being located in one of the four country listed is interpreted as an increase of the probability of default of the bank and can be explain by the diminishing capacity of central government of those countries to ensure the potential bailing out of banks in trouble. This variable does not participate to an increase in stability and translate well the fear of stakeholders in the current economic situation. Do stakeholders take into account the exposure to PIGS sovereign debt? The answer is visible in this analysis where we can see that the PIGS exposure have a negative significant relationship with the cumulative abnormal return of the CDS spread. This result is a bit surprising when we expect a bank to see its CDS spread increase more, at the surrounding of a downgrade announcement, when the bank has a bigger amount of exposure to PIGS countries. It can be explain with the nationality of bank holding PIGS sovereign debt which are not located in one of those countries. If a strong German bank hold a significant amount of Italian sovereign debt, stakeholders are less afraid of the situation because of the solvability of the German government. In order to confirm the previous result, we see the impact on the evolution of CDS spreads of the cross variable PIGS\_C which is positive and significant. Such result indicates that stakeholders are more likely to revise positively their calculation about the CDS spread when the bank have the more PIGS sovereign debt when located in one of the four countries. This result can be explain by the diminishing capacity of those government to ensure the stability of their banking sector due to their highly indebted situation.

## 5 Conclusion

This analysis shows results on the relationship between disclosure and stability. The results are sometimes divergent, depending on the control criterion, but tend to outline some interesting results about the impact of disclosure. We can see that a too large measure of disclosure, too global, has not the expected effect on a market and does not participate to the reduction of volatility on a market. This finding is consistent with a large section of the empirical and theoretical literature which advocate for less disclosure. This phenomenon can be also interpret by the fact that the macroeconomic situation of each of the participating was not as stable as it could have been a couple years before. The global disclosure may not be rewarded during crisis or when there is a unstable perspective but it will require further research to understand more globally the impact of global disclosure on the CDS market.

Although, the previous argument can still validate our results on targeted disclosure. As mentioned before the literature around disclosure is dual sided about the impact of disclosure on stability. We see in our results a negative correlation between targeted disclosure, here sovereign disclosure, and the evolution of the CDS spreads compared to the evolution of the CDS index in most of the case where we control for some criterion. Targeted disclosure is in fact participating to market stability by limiting the increase of the probability of default of banks, during a period of unstable macroeconomic environ. This finding is extremely relevant for further research and it can definitely be a motivation for further research in two different macroeconomics situations: in a growing macroeconomics situation and in another crisis to corroborate the results.

The results found here also corroborate the critics emitted during the European sovereign debt crisis. It looks like that being a bank located in the Eurozone tend to significantly increase the volatility of the CDS spreads. The recent crisis has proven that the Eurozone has been fragilized due to the crisis and it is reasonable to think a bank located in one of the countries member of the unique currency. In the mean time, the fact of being located in PIGS country seems to tend to increase the probability of default for those banks. Those banks are holding a large amount of sovereign that were getting closer to default after each downgrade: the risk of default was then transferred from the country to the subsequent bank. The contagious effect found by Arnold (2012) is here verified. Meanwhile, on the other hand the PIGS exposure does not seem to impact positively the CDS volatility.

The validity of the results found during this analysis comfort us on doing deeper analysis about the benefits and the cost of disclosure. This paper went over the cost of disclosure but would be a very interesting track to



follow while doing further research. It would also be extremely pertinent to develop some theoretical research on the impact of disclosure and the volatility of CDS spreads, in either stable and unstable environment. The field of research has not been investigate much and the results we obtained in this paper convinces us to go deeper in this direction.

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